The

World Directory

of

Custom Bullet Makers

D. R. Corbin

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Published by
Corbin Manufacturing & Supply, Inc.
Po Box 2659
White City, OR 97503 USA

http://www.corbins.com
Printed in the United States of America

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Introduction

This book is intended to serve three audiences:

- People looking for sources of custom bullets
- People who want to make and sell custom bullets
- Writers, editors, and firearms researchers

If you are looking for bullets that are not found in the "mass market" channel (distributed to your local sporting goods store or through mail order from the major high volume producers), this book can be used as a guide to the custom bullet makers who may help you. If you've ever asked one of the large mass producers, such as Sierra, Hornady, Winchester, Remington, Nosler, or Speer, for a small quantity of anything other than what they already produce in the millions, you probably know that mass producers simply cannot help you.

Quantities less than a million are typically not profitable to produce on the high volume equipment they use. Their markets are well defined, low margin and high volume channels. To stop the presses and make a few thousand specials is so costly that they don't even want to quote a price, and you'd be unlikely to pay it if they did. Sometimes, they may weaken and make as few as 50,000 bullets, but they usually regret it and vow never again unless the price was fairly steep (and possibly even then, since the cost of tooling up, shutting down, making all the test runs and wasting the scrap that comes off a high speed production press line until everything is tuned in might not have been covered by even a rather high unit price).

Custom bullet makers produce an existing exotic line of bullets that fills the gaps left by mass producers, but they can often customize the product to suit your needs, or even develop new bullets to match your requirements, at a far lower volume and total outlay than you'd have to pay at a mass production firm.

The price per bullet is usually higher, but the total cost of getting twenty, fifty or a couple of hundred custom bullets is far less than the minimum quantity of much cheaper bullets you'd need to buy to get the attention of a mass producer. It's usually quite affordable, in fact. Nearly anyone can come up with twenty to a hundred dollars to invest in their hobby or firearms related business interest. That might only buy a few bullets, but the total out-of-pocket cost is in the realm of possibility.

Hardly anyone wants to pay for a million bullets for their own use, even at wholesale cost. You are still talking about a very large total bill, even if each bullet only costs you a dime. The cost could be raised by refinancing your home, for instance. Big difference between that and giving up a dinner out, or a couple of nights at the movies, to satisfy the urge to know how some new bullet design might work in your gun. You'd have to be a very curious person indeed, in both senses of the word.

Custom bullet makers are here to serve you, and this book is here to show you who they are, where they can be reached, and a general idea of what they make. It lists the last reported diameters of bullets for which each bullet maker has the dies, but not the styles and weights because those can be almost unlimited even with a single set of dies. If a bullet maker isn't listed as having the diameter of bullet you want, call a few of them anyway and ask if they'd be interested in

getting the tools. Most of them would do it if you want to either buy enough bullets so they can pay for the dies (which may be a few more than you need, but certainly not in the tens of thousands or millions) or perhaps work out some other way of helping them cover the cost of the dies.

Some folks buy the tooling and then the bullet maker pays for it by manufacturing a certain quantity of bullets against the price. Dies can run anywhere from a couple of hundred dollars to a thousand dollars, depending on bullet complexity.

Others buy the tooling and find a custom bullet maker with the press and the time to use it, and pay them for material and labor to use their dies. However you want to do it, there's always a way you can have anything you want in a custom bullet so long as you don't mind paying a reasonable cost for either tooling or bullets that will cover the tooling. Custom bullet makers are usually individuals, with a few exceptions who have become big based on very successful designs and marketing.

The smaller the firm, the more likely it is that you can work out a deal to make things that are not listed in this directory as part of their existing capability. Larger outfits usually have their hands full just filling their own product design orders, even though they are far more accomodating than true mass producers. Some of the firms listed enjoy the challenge as much as the income and will take on nearly anything. Others are trying to develop a specialty line to the exclusion of completely custom work. The best way to find out is to ask them!

If you are a custom bullet maker, or think you might like to be one, this book can help you avoid choosing a company name that is already in use, point you to

the sources of copper and lead that you need to manufacture bullets, and help with other aspects of deciding what to make and how to sell it.

If you are good at reading between the lines, you probably will recognize that this book serves as a market study for the custom bullet field as well as a guide for potential clients. If you would like to be listed, all you have to do is request a listing form and fill it out, sign and return it to Corbin, and your firm will be listed in the next edition. Because we use a loose-leaf format and assemble these books in small batches, it isn't long between editions, and we can revise just the listings without having to re-write the entire book. You could be in print within a few days after submitting the information and permission to publish it.

Without the signed permission granted by the returned survey form, we cannot list you. Phoned in requests and casual notes to "put me in the book" do not give us enough legal grounds to risk invading your privacy by publishing your address and phone number, and we need clearly legible written information so that if we get your number or address incorrect, it's really our fault and not yours for writing something that looked like a "3" and was meant to be an "8".

A major secondary benefit of being listed here is that we also publish this information on our web site at www.corbins.com/bmakers.htm. Thousands of people every week look at this site, searching for bullet makers. It is still free, although the day may come when it isn't. Get your name in now if you have any desire to sell bullets. Free advertising is a rare thing.

If you are a writer, publisher of gun magazines, researcher in the ballistic field or just need to be aware of what is happening at the real cutting edge of bullet design, this book will point you in directions that might otherwise not have been apparent. Very few general

interest gun writers know enough about bullet swaging to even realize that it is the driving force behind the custom bullet market, and that isn't surprising: the makers of custom bullets can easily become swamped with work and decide they don't need to promote themselves very much, especially after the first couple of years.

They are as busy as they want to be, and start to become hard to locate. If you didn't catch their ads when they first were building up, you probably won't see any indication they exist. The majority of custom bullet makers are individuals who are retired, had another line of work or career that became boring or oppressive and decided life was too short not to have more fun. They are not necessarily chasing maximum income, and therefore are content with the fact that a little more effort could be applied on their part to bring in more exposure in the firearms press. If you write about them, they'll appreciate it, but it's not too likely they will seek you out if they have not done it already.

Some of these people are very interested in more exposure, especially those who are not necessarily retired and are seriously interested in supporting their family with custom bullet making, rather than just paying for their hobby and maybe supplementing their 401k checks. These people often have the most exciting bullet designs you've ever come across, certainly more interesting than the two-hundred year old designs constantly being revamped and retouted by mass producers. Some of the designs may be a little on the far side of impractical, but remember, they are capable of shifting weights and styles around the way a blackjack dealer shuffles the deck: if you could provide a little input from the practical side of the business, it might help them fill a niche and feed the family all at

the same time. You could get a warm and fuzzy feeling about doing some good for a struggling new business and at the same time help the rest of us get some new bullets to try, on top of producing a story you don't see every day in gun magazines.

If you are an editor, you might consider showing the list of bullet makers to your advertising manager. It's nice to smooth the sometimes rocky path between the editorial staff and the financial department, and custom bullet makers need to buy advertising just like anyone else. They may not be the biggest accounts, and in fact on average they tend to buy ads by the column inch rather than page, but look at how many different businesses are listed! Just tracking down and calling all these people will keep the ad guys out of your office for weeks...

If you have some regular stringers writing for the magazine, it wouldn't hurt to let the ad man send the list to these custom bullet makers so they could, in turn, send samples for testing and possible write-ups. There are only so many ways to write about the conventional jacketed or plated lead bullet. Readers might enjoy seeing what unconventional bullets can do.

Researchers, you have a vast army of allies when it comes to information about unusual bullet developments. The list of custom bullet makers is a treasure house for finding people with special experience in developing and testing bullets which stretch at the seams of one's imagination. If your purpose is to find a prototype design for some new project, or have someone build the design you have already worked out, you could not find a better place to start.

Who Are Custom Bullet Makers?

Custom bullet manufacturing is one of the fastest growing and most exciting branches of the firearms field. Around the world, thousands of individuals swage special calibers, weights and designs of bullets, far advanced from the standard mass produced offerings. The operative word here is "custom".

There are bullet makers listed in this book who can fill nearly any need for a special caliber, style, weight or design of bullet for almost any purpose. If it doesn't exist yet, a dozen or more of these craftsmen can build it for you.

The day when only conventional, standard bullets—made for everyone in general and no one in particular—were all you could get, is long gone. Mass production firms may still turn a deaf ear to requests for small lots of special sizes or weights, as well they should: they are in business to move large volumes of identical products and cannot afford to spend time making a box of fifty or even a special shipment of ten thousand bullets.

But custom bullet makers are in business to do just that. They have the tools and techniques available that let them make short runs of nearly design of bullet. Even as few as one box of ten or twenty bullets isn't too small for them to handle. They thrive on the kind of order most shooters of twenty years ago only wished they could place. Got a new idea for a bullet? Want to try it out without spending your life savings? Contact a custom bullet maker, and the product can be in your hands at a price that is far less than nearly any other alternative.

Custom bullets are not "cheap" when compared with mass produced ones. The quality of a custom bullet is, of course, up to the person who makes it, but

most custom bullet makers don't stay in business very long unless their quality is high. The average cost of a custom made bullet is in the area of $37.50 for a box of 25, or about $1.50 each. But where else in the world will you be able to get exactly the weight, caliber, and style you want, made to your order, in a single box of 25 bullets?

Some of the custom bullet makers have discovered a unique design that fills a need so well, in some special niche of the shooting field, that they specialize only in that style of bullet. You might argue that they have really become "specialty" bullet makers rather than "custom" bullet makers, and there is merit in your arguement. But regardless of what you call them, they usually offer bullets far advanced over the factory product, when used for the intended purpose.

What keeps the mass producers from simply duplicating one of these ideas, putting it on their high speed production machines and turning it out by the millions (which would bring the cost down considerably)?

The market for such advanced bullets is simply not big enough. Only a few expert shooters understand and appreciate the benefit brought by these new designs. Most average shooters are perfectly matched with average bullets: the price is right, and the performance is good enough for them. They are by definition average product buyers.

At the top of the curve there are people who understand some particular area of shooting so well that they have begun to question the usual bullet designs. They want something better, because they have experienced situations where average isn't good enough.

There are not millions of such people. But there are millions of average shooters who at one time or another see the need for something special, and want

to try it. Just for a brief time, they join the ranks of the experts in toying with the cutting edge of technology, in a very special field. Some elevate their interests and actually become experts. Others are content with to go back to the average product again.

Regardless, the custom bullet maker exists to serve them as well. A good example of a "temporary expert" user might be a person who loves to shoot big game, but has never used anything other than factory or cast bullets. Then one day, he gets the opportunity to take an expensive guided hunt that may not be his to try again in this lifetime. For that brief period, he wants the best bullet available at any price. Cost is not important in this situation, comparing a twenty cent bullet to a dollar or even a two dollar bullet. Who cares, so long as it gives him the edge that might make the hunt a success?

After it is over, and the success fades to a fond memory, he'll probably go back to his old ways and not ask for more than the average bullet again. But for that moment, when the sun was glinting off the water and the record eland or Cape buffalo was barely visible in the morning haze, the custom bullet maker's finest effort was exactly what that person wanted and needed. It worked. A lesser design might have failed. A lifetime opportunity might have turned into agony tracking and losing a noble trophy. But it didn't, because the best possible design was selected, regardless of cost. The typical guided hunt might cost $5,500 today. A two-dollar bullet would be cheap insurance!

Custom bullets are also made for special guns that don't use standard diameters, lengths, or shapes. People who would like to shoot their antique firearms may need a few custom bullets, but not enough to interest one of the big ammo makers. Law enforcement

and military special operations may use bullets that are tailored to a specific circumstance, such as areas where penetration of walls must be avoided (air marshalls, for instance, or guards in a building where the next room might be filled with dignitaries or scientists).

Unless there is a large enough market to sell at least a few hundred thousand bullets a year of a specific weight, shape and caliber, the only source may be the custom bullet maker. But that is nearly the same as saying the only source of air is the atmosphere, because there are hundreds of custom bullet makers willing to develop new designs, or already making something far beyond the ordinary.

Custom bullet makers, unfortunately, do not receive as much publicity as mass producers, because they are primarily one person shops and don't spend much on advertising. Since it is just a fact of life that those who pay the bills get the most editorial coverage, we should not be surprised to learn that so many custom bullet sources around the world have escaped our notice for decades.

The fact that we might not have known about them only underscores the nature of their work in narrow, special areas where they are free to do their very best in pursuit of a tightly focused idea. They may be be preceived as having "mass appeal" to the average readers of gun magazines, so they don't get front page coverage even though their product may be worthy of greater technical praise than the usual magazine cover fare. Custom bullet makers may be forgiven for quietly chafing a bit when they see a minor modification to a seventy year old design touted as the next revolution in bullet development, especially when they have been offering the same idea for years as an afterthought to their more innovative products.

In an interesting development, the mass producers have been purchasing bullets from some of Corbin's custom bullet clients and marketing the ammunition loaded with them as a "premium" grade. Undoubtedly this is more of a mind-share market strategy than an attempt to meet the market demand.

Some of the old line firms would rather not be seen as mass producers of standardized, old-time products. They prefer to be known as the leaders in cutting edge technology, without actually giving up the mass market. Making bullets for the average buyer is what produces high volume, competitive low margin income and pays for the high speed presses, the huge volume buys of copper and lead, and keeps the wheels of commerce turning (as they have for two hundred years, with some of these firms).

The only thing wrong with this picture is the slightly mis-focused cutting edge image: study what is really happening and you will discover that most of the innovation has been with small custom shops, not the mass market behemoths.

For over two decades, Corbin has been at the heart of custom bullet development by working on the tools, materials, and techniques that nearly all custom bullet firms put to use in making their products. Corbin develops tools in a modular way: you can pick and choose from a wide variety of features, combining a little of this and a bit of that, and in the process, develop a new bullet that no one else has put together the same way.

Custom bullet makers develop their products in several ways. Some have specific design they always wanted to try. Others know the kind of performance they want, but don't know how to get the bullet to do it. Corbin provides whatever part of the design, ma-

terials and equipment that is required, while the customer provides the goal, and builds a company based on achieving it.

Still other potential bullet makers only know they like the idea of producing custom bullets for a living, but don't know what product to make or where to market it. This is actually the easiest assignment, since there are so many niche markets unfilled as yet.

Custom bullet makers sometimes come into the field almost by accident, through a hobby interest or perhaps a need to obtain a bullet that no one else is making at the time. Then they decide to sell their bullets, and the entire firearms field is better for it.

Regardless of how a custom bullet maker gets started, the important thing is that so many of them exist. Having a large number of places to look for specialty bullets helps keep the quality up, and assures us all of being able to try a flow of new designs that might never appear in the mass market.

By making themselves commercially available, the custom bullet makers help assure us of a supply of bullets even in troubled times, when production of the mass producers might be diverted due to political decisions, or curtailed altogether as far as civilian markets are concerned. It happened during both World Wars. It could happen again. But this time, you have many other sources.

What Are Custom Bullets?

Custom bullets fall into three categories. They can be bullets that are...

- designed to your specifications and ideas
- offered with a series of optional features
- designed by the bullet maker to fill special needs

The most "custom" of these is the first, where you have an idea and tell the bullet maker what you want, and he develops the bullet the way you want it, including the caliber, materials, shape, weight, and special features. This kind of bullet may require some tooling investment other than what the bullet maker already owns, so there can be arrangements to help cover the cost of the tooling directly or by buying a certain minimum quantity of bullets.

The most common of the custom bullets is the second, where a bullet maker has invested in tools to build a certain caliber of bullet, and offers the variations in this caliber and shape that are easily done without buying more tooling. This keeps your cost down because there is no additional investment needed to make the variations or optional features. In theory you could buy one bullet. Some bullet makers will sell one at a time if you really want to pay the shipping on such a small order.

The least "custom" is the bullet that simply isn't available from mass producers, so the custom bullet maker worked out a design and series of weights that fills the need, as he and hopefully most of his customers perceive it. It is custom in the sense that it is made by hand in small quantities compared to the typical

mass produced bullets, to work in a limited special situation or with a firearm that is just not popular enough to justify wide distribution of bullets for it.

The custom features or differences that custom bullets can offer include:

- Obsolete or unusual calibers
- Special weights and lengths
- Unusual materials
- Interesting jacket designs
- Shapes not found on factory bullets
- Enhanced performance characteristics
- Variations in the center of balance versus length
- Multiple projectiles in one bullet

...and other differences from conventional bullets that are limited only by imagination.

The most obvious two needs in a custom bullet would be for unusual diameter and weights. Diameters that are not readily available from standard sources might include obsolete or discontinued calibers for antique firearms, hard to find foreign calibers, or any caliber that is either so new that supplies are hard to find or so limited in market size that few mass producers offer it.

Special weights can be needed in the most common calibers. There are a limited number of very popular weights in each caliber, yet nothing is wrong with trying lighter or heavier than those the factories arbitrarily decided to build. Some guns simply do not get their best performance with the standard weights. Others would recoil far less and be more pleasant to

shoot year round at targets and small game, when used with a bullet that was half the weight of a conventinal offering.

The custom bullet maker balances the length, twist rate of the rifling, and the weight of the bullet so that ultra light and extremely heavy bullets can still be shot accurately in guns not designed for them. The conventional bullet becomes longer as it is made heavier, shorter as it is made lighter. The rate of spin of a given barrel, in turns per inch, is set for the average weight of bullet intended to be fired, but really it is set for the average length of bullet.

Weight and length only march together in lock step so long as the material density remains the same. If bullets are only made from lead, and copper alloy jackets, the old ideas about spin rate and stability vary apply whether you are talking about weight or length. But change to a core material like powdered tungsten, which has 1.7 times the density of lead, and now you can make a stable bullet of exactly the same length as a conventional weight, having 70% more weight!

The spin rate is set by length of bullet, and the custom bullet maker can separate the weight from the length almost at will, by using combinations of lead and tungsten on the heavy end, and combinations of lead and polymer “bullet ball” fillers on the light end. Whereas a standard lead or jacketed bullet would become too short to be stable if you made a 50 grain .357 Magnum bullet, fill a half-inch long jacket with polymer balls and top it with a little lead nose for balance, and you have a bullet that might go 3,000 fps out of a snub nose revolver, and still hit in the black at 50 yards! (You’d need to use one of the faster burning pistol or shotgun powders, such as Unique or Bullseye, in order to get enough pressure before the bullet popped out the end of the barrel.)

On the other end of the spectrum, a custom bullet maker might assemble a jacketed rifle bullet that had a core of powdered tungsten, topped by a small cap of pure soft lead. This bullet might look exactly the same as a soft point 180 grain .30-30 WCF factory slug, but when you picked it up, you'd notice it weighed far more. A scale might prove that it actually weighed 250 grains!

Normally, a 250 grain .308 diameter bullet would be rather long, over 1.25 inches, which might not feed in the mechanism of some rifles or fit the magazine. And even if it did, guns with a 1-12 twist rate (one turn in twelve inches) probably would not stabilize such a long bullet and it would tumble in flight.

But the custom tungsten core bullet would be the same length that normally is stable in a conventional .30-30 twist rate, so you could fire it confidently. The balance of the bullet could be set exactly where it needs to be, by using a combination of lead and tungsten sections in the core.

That is, if the bullet tends to maintain its attitude (retain the launch angle) instead of following the trajectory with its nose, the weight can be shifted to the rear by using more lead in the nose. If the bullet tends to wobble and wants to turn over in flight, the weight can be shifted more to the nose by using a short piece of lead core in the base before the tungsten is put in, or by using less lead in the nose.

There are many fine old .40 caliber Winchester, Remington, Ballard, Marlin, and other brands of rifles still in good shootable condition. Nothing prevents a modern rifle from being built to shoot the .405 Winchester cartridge, for that matter. The firearms hobby has room for people who enjoy using the early calibers of cartridges. Cases can be made by reforming modern cartridge cases. Powder and primers are universal. But the bullets may not exist.

Custom bullet makers can specialize in providing these sizes of bullets, either in nearly exact replication of the orginals for the history purists, or in vastly improved modern designs for those who like to show what can be done with the older designs. It is amazing just how good a .348 Winchester will perform with modern metalurgy and a well designed bullet.

From time to time, political decisions create a demand for custom bullets. This can happen when a ban on certain styles of guns is passed, and suddenly there is a big demand for that style before the rules go into effect. Often, a foreign government may release a supply of obsolete military guns to take advantage of the sudden interest, and the only problem is finding bullets that bring out the best results from the gun and cartridge.

Military surplus ammunition can have at least three problems that translate into opportunity for the bullet makers and their clients:

- Corrosive or hard-to-reload Berdan primers
- Military FJM style bullets that don't expand
- Deteriorated chemistry that gives erratic speed

For these reasons, a custom bullet maker might have good success offering expanding soft point bullets or high performance hollow points, in weights that function the action but offer improved performance (less recoil, more speed, better accuracy are a few points of improvement).

Custom bullets often find their best markets, however, in applications where the quantity of rounds fired is low, the peripheral costs are high, and the time spent in the activity is short. In other words, the stakes are high and the number of bullets needed are few, provided they work exactly as expected. The two best examples are:

- Big game hunting
- Personal defense

In the field of big game hunting, custom bullets dominate the market now. You can hardly flip the pages of popular gun magazines without seeing ads from several of Corbin's clients, offering high performance hunting bullets.

The specific kinds of improvements in these bullets include the usual special weights and materials (tungsten, polymer, and so forth) but one of the most noticable improvements is the use of Corbin's Core Bond flux to create a bullet where the core won't separate from the jacket, and the use of heavy walled, pure copper tubing for bullet jackets.

In the field of self defense, the market divides into the professional and home users. Civilians protecting themselves legally against break-ins and muggings (in the "right-to-carry" states) shoot very few bullets but when the need arises, it is a life and death matter. No price is too high for a bullet that will work reliably under trying circumstances. The special designs used to achieve this include the ultra-light high speed expanders, multiple projectile bullets, fragmenting designs, hydraulic or pneumatic expanding devices designed into the bullet, special cuts, slits and teeth (such as the "saber tooth" design of hollow point) for better expansion.

In the high power hunting bullet area, some custom bullet makers offer solid copper bullets, but the solid copper bullet typically has these problems compared to a lead or tungsten core:

- Only 3/4 the weight for the same length
- Less stable in the same weights
- Petals break off at high speed after expansion
- Expansion may be too limited
- Over-penetration can be a problem
- Pressure may be higher for the same weight
- Increased stress on the barrel

Not all designs of solid copper bullets have every problem, but all of them are lighter for the same length as a lead-filled bullet. That is just basic physics. Combining this lighter slug with a big enough hollow point to allow good expansion in solid copper can shift the center of gravity far toward the rear, requiring a faster twist to stabilize it. When fired from conventional guns, the solid copper bullet may become less stable than a well-made lead core bullet of the same weight.

For a target bullet, the problem may be overcome by using a lead plug at the tip or by eliminating the hollow point entirely. Copper powder, available from Corbin, can be put into a hollow point cavity, to maintain the "lead-free" design.

The benefit of the solid copper bullet is that there is no jacket to separate, and also no possibility of imbalance because of differences in jacket wall thickness from one side to the other. These are strong points to consider for a target bullet.

For big game hunting, the level of accuracy that is achieved by jacketed bullets with a bit of wall thickness variation is normally quite acceptable, although of course if all the other performance factors can be achieved with the maximum possible accuracy, it is all the better. The point is, using solid copper for increased accuracy over a better performing bonded core bullet is solving a non-problem and picking up other problems that are more important.

Corbin is providing custom bullet makers with atomized copper powder in experimental quantities (as well as production volume), so that a bullet maker can experiment with swaged powdered metal bullets affordably. With suitable binder and lubricant coating the grains, the powder metals flow more easily and swage together to form semi-solids (which can be handled or inserted into jackets but not loaded and shot without first "sintering" or fusing the grains at a temperature short of melting them). Using a jacket filled with copper powder eliminates the need to sinter the bullet. The powdered copper bullets can solve certain problems, such as the need for lead-free projectiles in indoor ranges.

Custom bullet makers have among themselves generations of experience in solving bullet design and performance questions. What seems true at this point may soon become yesterday's situation; a new solution is just around every corner, with so many bullet makers trying ideas that range from the ridiculous to the ingenius, as fast as bullets can be swaged. The sheer volume of digging brings a gem into the light now and then.

What Can You Specify?

Although each bullet maker has a unique plan that determines what can be customized, in general it is possible to specify these parameters when you order custom bullets:

- Weight (within broad limits)
- Nose shape (from a specific selection)
- Tip design (open tip, hollow point, soft point, FJM)
- Jacket thickness (sometimes, up to two or three)
- Exact diameter (sometimes to 0.0001 inches)
- Construction features (such as bonding)
- Materials (such as brass, copper, tungsten)

The easiest thing to specify is a different weight. Bullet swaging, which is the technology used to make custom bullets, is extremely versatile about weight. That is, the same investment in equipment can make hundreds or even thousands of different bullet weights simply by adjusting the depth that a punch goes into a die.

There are some designs where a change in weight means a change in tooling. Very light bullets might require different punch lengths to reach further than usual into the die, or a die with relocated "bleed" holes to extrude the surplus lead at a different column height of the core. Very heavy bullets might require a longer die to get all the materials inside. But within a vast range of weights, you can get what you want without requiring anything other than a change in settings.

Some bullet designs don't look very good if you change the weight in a certain direction without doing some other things to compensate. For example, a bullet maker has a stock of inch long .45 caliber jackets that make a nice looking open tip 350 grain bullet, and you order a 400 grain bullet. Now those jackets might be too short to make an open tip, since the additional lead core will project beyond the jacket, making a lead nose. If you want a lead nose (soft point), this could be fine.

In order to make your 400 grain open tip bullet, the bullet maker would have to make longer jackets, or use a more dense material than lead (such as tungsten powder) in the bullet. Either way, some additional costs would be involved beyond just the 50 grains of lead. If the bullet maker builds copper tubing or drawn strip jackets himself, and the tooling was designed to allow longer jackets, there might not be any significant expense in tooling. Perhaps he might need a different punch to do the final length draw and trim step.

But if the jacket making tools are already building their maximum jacket at one inch, and your bullet requires an inch and a quarter length jacket, it might mean starting over with a different set of jacket dies, perhaps a thicker or wider supply of metal strip also.

For this reason, you might have no problem getting a heavier or lighter bullet from one bullet maker (who has the equipment for the required jacket) but another might balk unless you pay some tooling charges. Some may have no trouble at all up to a certain limit, and then you'd have to change bullet styles to get the weight (or pay for tooling to make new jackets).

Generally, though, a change in weights does not cost more than a possible new punch, from twenty to fifty dollars depending on the kind of press being used,

and often not even that (depending on whether the jacket is tapered or straight inside, and where the punch contacts it at the new core height).

It is not possible to state absolutely that you can or cannot make something without new tooling, until all the factors are taken into consideration. Each time you make a change in the bullet, it affects other parameters. The bullet maker uses his experience and skill to determine what is possible on his equipment (normally, if it is Corbin equipment, he has a good source of information to rely upon).

That is why dealing with a custom bullet maker is something like going to your tailor for a new suit. Your personal tastes are taken into consideration, and if you work with the materials and tools your bullet maker has available, you will get a far better deal than if you are adamant about specific features and weights which, in reality, could shift a bit and not affect anything enough to matter.

Diameter is far more important than weight, when it comes to determining performance. A few grains one way or the other really isn't significant in controlling accuracy or trajectory compared to the changes in ogive shape, base design, and diameter.

Bullet swaging dies are very diameter specific. A die set makes precisely one diameter of bullet with a given material and pressure. The pressure used to assemble the bullet can be varied a little, and the diameter of the resulting bullet may change slightly as a result. For smooth operation, the pressures are kept to a minimum that will do the job. Ejection from the dies usually is easiest at a certain combination of core seating and point forming pressures, so using pressure to control diameter is a limited option.

Materials that are used can have a far greater effect on the final diameter. Every step in making the custom bullet expands it slightly larger. Pressure is applied to the core of the bullet, through a punch. The pressure flows through the malleable lead or powdered tungsten core or combination polymer/lead/tungsten core materials, and expands the jacket like a balloon skin.

When the pressure is released, the bullet jacket shrinks very slightly back toward original diameter. This releases the tight grip on the die walls, so the bullet can be pushed out of the die. Some materials spring back more than others. If you ask for an aluminum jacket or a steel jacket, instead of soft copper, the bullet maker may or may not be able to swage it in the same dies. But if he is able to get the new material to work correctly, it is almost guaranteed that the diameter will not be the same as it would be the material for which the die was designed.

Some bullet makers are surprised at the results when they order a set of dies for a given caliber, such as .512, and don't mention that they plan to machine some jackets out of solid Kryptonite instead of using the copper that was in turn used to develop and test the dies. OK, no one has yet done that, but there have been many instances where dies designed for tubing jacket were used with drawn strip jackets, which are much harder and spring back a different amount.

There is nothing wrong with this, provided the parts don't stick on the punches or in the dies. But the bullets will probably change diameter from .512 to .5119 or .5121 inches. Does it matter, in the real world? Probably not. Most guns have more variation than that along the length of their bores. Having a bullet that fits at one point does not guarantee it fits so precisely

an inch further down. Obviously it must not matter, as records are set every year with guns that have more than .0001 inch "waviness" in the bore size.

What might matter is the reaction of the custom bullet buyer who owns a micrometer and feels the need to use it instead of firing a few groups. Testing bullets is best done in a gun rather than on a bench, because the results can be at variance with what appears to be logical evidence. Consistent size is more critical than exact size.

How does one know that a .309 bullet might not outshoot a .308 bullet in a given gun, unless tests are fired with the same load and gun to compare?

You can order different diameters from some bullet makers because they purchase a slightly larger than standard swage die set, as with the .309 bullet example, and then push the finished bullets through various reduction dies to give you precise parallel sided bullet diameters.

As long as the reduction doesn't exceed about .005 inches, the effect is not noticable. No significant change in accuracy is caused by reductions of .003 or less inches, even in a laboratory test situation. That is not to say that the bullet might not shoot better or less well in a given gun and load, but only that the mechanics of reduction do not significantly impact the accuracy by causing a "loose core" or "banana shape" stress change.

If you do exceed about .005 inch reduction, then the effects may start to compound. The bullet may begin to curve, as the metal springs back slightly more on one side than on the other. The lead core may be left smaller while the jacket pops away from it, so that the core does not spin as fast as the jacket and the bullet is not stable.

This figure of .005 inches is empirical in nature; nothing happens suddenly at that level that is not happening at a greater rate as you reduce further. The elastic modulus of the jacket material effects the reduction allowed. One thing will usually solve the reduction problem, however: bonding the core.

If a bullet maker bonds the jacket and core (melts the core in the jacket, in the presence of Core Bond Flux, and then lets it cool, boils it in a solution of sodium bicarbonate and water, and then seats the core as usual), drawing down the bullet cannot affect the tightness of the core and jacket. Only the curvature of the jacket wall remains as a potential problem.

The custom bullet maker, then, can offer you something no factory will: a series of bullets that are identical in every way except diameter, for the same caliber. This lets you determine for yourself, with no secondary influences, exactly what diameter of bullet shoots the best in your gun with a given load, case, and primer.

Why does this matter? It only matters if you care about accuracy. When you are attempting to put bullets into the same spot with every shot, knowing that a .3085 diameter 168 grain bullet with an 8-S ogive is the one that comes closest to perfection with your favorite load can be a comfort. You can order .3085 diameter bullets from someone who either has a precise .3085 diameter die set, or has a larger .3090 set and a reducing die.

This technique does not extend to reducing a .338 bullet for use in a .318 rifle, by the way. That is far too much. The accuracy will be absent. However, you can use a .323 (standard 8mm today) and reduce it to a .318 (smaller bore German military 8mm of an earlier time). The accuracy is still acceptable.

Bullet makers can also "bump up" your existing bullet a little bit. But if you try to go too far with this, the bullets will become so tapered or shortened that they are not useful. For instance, a .308 bullet can be "bumped up" in the point forming die of a .310, .311, or even a .312 diameter die set. It would be better to make the bullet using a core seating die and apply pressure to the lead core, expanding it and the jacket together.

When you "bump up" a bullet, pressure is applied to the outside and the bullet is shortened. The internal pressure to expand it comes from this external force and does not properly shape the parallel shank section. You get more of a tapered shank, which works within reason.

Like bullet reduction, as you go beyond a small change to a larger one, the bad effects on accuracy go up rapidly until the bullet becomes unusable. But with small differences (which some wit with an engineering background once symbolized with the Greek letters "mu" and "delta" placed side by side, which reads as "micro-change") both external pressure processes work well enough to be useful.

You may draw the conclusion that custom bullet making is a process that requires getting inside the bullet to form it, before it is really a bullet, whereas the more compromising techniques all are performed on a finished bullet by trying to form it from the outside. And that would be correct.

Design parameters such as whether or not the core is bonded, where and how many cannelure grooves are placed around the shank, and whether or not a rebated boattail, cup base, soft point, hollow point, open tip, or full metal jacket is part of the design, are usually listed in the custom bullet maker's brochure and price list, but not always. If you want something

special, ask about it! Just because the bullet maker doesn't list it now, does not mean he wouldn't do it for you. Perhaps no one ever asked before.

Usually, a custom bullet maker won't be able to offer different core hardness, various jacket materials, or arbitrary jacket wall thicknesses, because these factors are designed into a given set of tools and are not easily modified without buying additional equipment.

Some bullet makers build their own jackets from tubing stock, which is commonly available only in certain mill runs of diameter and thickness. These standard diameter tubes are then reduced by drawing individual cut lengths to correct diameter for a given caliber. Not only does the material have to be available from the mills in a thickness that will develop into the desired jacket wall, but the bullet maker needs to have a fairly sophistocated set of precision tools made specifically for the dimensions.

Other bullet makers draw flat strip into complex tapered wall jackets, using high precision Corbin jacket maker kits. This kind of tooling is more versatile, starting with a specific mill thickness of strip but drawing the jacket walls to whatever thinner measurement is desired. Relatively inexpensive punches are all that must be changed, but there can be several such punches matched for a given jacket design. This means a tooling fee or minimum order size for special wall designs not "in the catalog".

The Custom Bullet Market

Custom bullets are sold in a far different way than mass produced bullets, and certainly in a different way than most cast bullets. Because the equipment for casting is relatively simple, hundreds of people make cast bullets for resale. Some of them discover the existence of equipment for swaging jacketed (or lead) bullets, and want to know "how many can I make an hour?" with swaging equipment.

This is the wrong question. The right one is, "How much profit can I make an hour with swaging?"

Unlike mass production and casting, where the profit margins are quite thin and only high volumes can bring in enough to support the business, the custom bullet market is a boutique business. By that I mean that it caters to very sharply defined segments of the market, rather than attempting to generate a wide general appeal. Price is not a major factor: performance is most important to the buyers.

Swaging custom bullets means building the products that have little or no competition from mass producers. This means there is room for a healthy profit margin, and the customer will not go away because of it. Those who would not pay the price were never serious potential customers in the first place. It does no good to try to attract them. They will buy mass produced and cast bullets, at a very low margin. So long as there are either (1) very efficient mass production businesses or (2) people willing to work for little or nothing per hour, the high volume, low profit market will not want for lack of products.

The problem with the high volume market, for a custom bullet maker, is the low margins and tremendous amount of competition from people who may or may not have very good business ability. Although they

eventually go broke or give up, while they are spending their savings down trying to make penny bullets to beat the next fellow's price (or to compete with banks of high speed punch presses run by the major factories, some of which were originally paid for by public taxes during wartime emergencies and are long-since depreciated), they are selling bullets below what it costs to stay in business.

To compete with these people on price alone is worst than standing on the street corner and handing your money out to every passing stranger: at least you get it over with quickly that way, and can start over sooner with something that pays! In an isolated instance, where one or two people were selling below what it cost to survive and didn't know it, you could just wait until they went broke, step in and offer a good bullet at a reasonable price. But there is an endless stream of people who think they know all about bullet casting, and want to throw themselves into the bottomless pit of unprofitable business practices based only on price competition.

There are only a few, limited things you can do to compete reasonably. You can lower your costs by investing larger amounts in machinery and supplies, shop smarter and cut transportation costs for the heavy raw materials and delivery of finished goods. You can try to offer a higher quality product. But the products are all very much the same today. With casting, a bullet is a frozen piece of lead with various kinds of lubricant applied. Other than different diameters, shapes and weights, there is little to differentiate one from another. The basic construction and design are the same. Price is one of the few things left for competitive advantage.

Swaging, on the other hand, can use materials that do not have to be melted. That opens up a vast array of new designs, any of which can by itself present a distinct marketing advantage. Relatively few people swage bullets outside of the mass production plants (where nearly all bullets are swaged, but on very expensive high speed machinery that is not at all versatile, and must be used to make millions of identical bullets to pay for the equipment).

This is because until Corbin developed the wide range of swaging tools available today, the field was barren of equipment except for (1) very cheap handgun swages sold over the counter, for making half-jacket style bullets and (2) very costly benchrest rifle swages made in miniscule quantities by craftsmen who were not primarily in that business, but did it as a sideline. There was no single source for presses, dies, supplies, chemicals, information, and consulting services. Certainly no one was available to advise individuals about the business of custom bullet making. Anyone who tried swaging bullets did it, mostly, alone.

Forty-five years ago (at this writing), the largest manufacturer of swaging equipment in the world consisted of a shop with two people, one of them part-time. Theodore Smith ran the old S.A.S. dies company in North Bend, Oregon. He invented a number of tools, including the powder trickler ("Little Dripper") that were copied and marketed widely by other firms. The S.A.S. motto was "If you want a die, we can help you!" which could almost be a mafia offer one couldn't refuse! S.A.S. stood for "Shooters' Accessory Supply".

About that time, I had just sold my first successful electronics company, Teletron Communication Electronics, Inc., and I was "between jobs", doing a little writing, some photography for the local businesses,

putting together small businesses based on little electronic inventions that I'd build virtually on a kitchen table and then market for a few months to get some history, package the whole thing and sell it as a ready-made small business opportunity.

John Amber was the editor-in-chief of Gun Digest at that time. I had a number of firearms articles, even a column in one of the magazines, and John had asked me to write a story about Ted Smith and his swaging business. I had no idea such a thing was even being done, or how it worked.

When I found Ted, he was recovering from a very bad situation: he had been using gasoline as a cleaner to remove the cutting oils from his swage dies, and his big barn-like shop had wall-mounted electric heaters that sparked when their simple open-contact thermostats operated. His over-alls were saturated with oil and the gasoline vapors set him afire like a torch. His part-time helper did the best thing he could think of, which was to grab one of the big fire extinguishers off the wall and spray Ted down with it.

Unfortunately, it was an old baking soda and sulfuric acid fire extinguisher. The mixture did almost as much skin damage as the fire. Ted spend about a year in the burn ward, he told me. His face and hands were spared, but he had scars over the rest of his body. He was tough and survived it so well that one could not see any after effects in his manner or activity. But the bills had piled up during that time.

Ted's wife had really been overwhelmed with the mail that kept coming in, ordering more swage dies. Around the corner from the kitchen was a little office, and I could see the corner of a desk sticking out from under a mountain of unopened mail. As I got to know Ted better with more visits, I became more and more

intrigued by the bullet swaging idea. Obviously, I wasn't alone: those letters were full of orders with stale-dated checks!

Ted agreed to teach me how to make swage dies, and I agreed to help him get out of debt and sell the products in return. We did this for about a year, with me working for him without pay in order to learn. Then he worked for me, in essence, by filling orders while I wrote catalogs, ads, and handled the shipping, and worked on new ideas to expand the product line. It wasn't long before he was tired of it, and offered to sell the business. I bought it, and expanded the "D.R. Corbin Manufacturing Co." into a full time bullet swage equipment venture, incorporating later with my brother Richard, and my friend N. Bradford Pritchett as the other stockholders.

By the time "Corbin" had become a famous name in the field of swaging, we had seven books to explain the various aspects of the field, including Ted Smith's original "Bullet Swage Manual", kept in its manuscript text to preserve the history and viewpoint of the interesting gentleman, who passed away a few years ago. My interest in bullet swaging has only grown greater with the passing years, because of the constant discovery of new techniques and solutions to challenges that only swaging can provide.

Swaging provides a solution to the challenge of paying for a shooting hobby, for hundreds of shooters. It can do this because of a unique paradox, which I have not seen often in business: the higher the production, the less profit is made!

Of course, if all other factors were equal, this would be patently untrue. You can't sell more and make less. But the factors are locked together with logical bars of iron: when you move one, the others move in unison, and not always in the same direction.

Custom bullets are made to fill the gaps left by mass producers and bullet casters. That is, they provide answers to the boutique buyers' needs. Obsolete calibers, special purpose, high performance, experimental, unusual imports, all the special situations we've mentioned in this book that make custom bullets different, are linked to a high profit margin. It must be so, because one cannot hand-build just a few of anything for the same price as millions can be stamped out.

Now, suppose you decide that instead of seeking those special markets where people are willing to pay more for small lots of unusual bullets, you want to make a copy of a factory bullet. To sell it, you have to compete with the factory price. They have machines already paid for that cost hundreds of thousands of dollars, in order to get the cost per part down to pennies.You can buy similar machinery, or you can work for nothing. Even working for nothing, the materials you buy will either have to be purchased in huge lots, to factory pricing, or they will cost you more than the finished factory product.

It does not sound feasible to compete with the high investment in marketing, production tools, and experience that the factory has built over the years, does it? So, what if you decide to raise the volume of special bullets sold, by making a unique design in a very common caliber, and lowering the price so that even if you are not exactly competitive with the factory, you are barely charging more than a standard bullet?

This is not an either/or situation: it is a sliding scale. As you charge less for the bullet, you may get more buyers. But in order to make the bullet fast enough to supply them, you have to spend more money for machinery speed. As you invest more in machinery, you have a larger overhead to pay back, perhaps a loan to

service or at least the return on your higher investment to consider. That means you need more customers, and since you are not seeking the boutique crowd but are going after the average consumer of bullets with a better quality product, you may find (as most people do) that the average consumer is mostly interested in price.

Factory bullets are reasonable in cost and performance, in the standard applications that most people use. The casual deer hunter, the plinker, the average target shooter all think that factory bullets are just fine. If you want to get their business, you not only have to overcome the tremendous investment in brand loyalty and recognition that millions of dollars in advertising have created, but you have to offer some economic incentive. In other words, make the price better. Doing this brings more sales, but less profit.

To get enough profit to pay for the machinery, you may need to invest in even higher speed machinery, and that will begin to include packaging machinery too, since high volume handling has its own special problems that a low volume operation does not have to consider. Now you are heavily invested in both production and delivery, and will need more people to help you get those millions of bullets into the hands of buyers. More volume! Turn up the treadmill!

It isn't long before you are competing with the factory at some level. The point where you stop will be the point where your bullet's technical advantage and the marketing edge you can milk out of it do not influence the remaining potential clients. The ones who would have bought your bullet at ten times the price have long been adsorbed into your customer base. The ones who would buy it at a modestly profitable amount higher than standard factory bullets have bought all

they can use. Now you run into the hard wall of reality: the remaining people don't care about better performance if it costs them anything at all.

How are you going to weather the dips in sales now that you have your house and future mortgaged to pay for that high speed, low margin business? More sales by lowering the price? At what point do you give away bullets just to keep the machinery turning and your people from going away, in the hopes that the dip is only temporary and better days are around the corner?

Because there is a limited, but viable, market for specialty bullets, price elasticity is quite limited. If you gave away all the .600 Nitro bullets you could make, you'd find no takers after the first month! Obviously, there is an upper limit to what the few .600 Nitro Express gun owners will pay, too. But it isn't nearly as low as what a target shooter will pay for another 9mm clone bullet.

Most custom bullets sell in the $1.50 price range. That is far too high for most target shooters, because they use far too many bullets and there is nothing at stake except the winning or losing of a match. The best shooters win using fairly standard, but good, bullets. The worst shooters will never win no matter what bullet they use. If you offered these people a bullet that cost ten times the standard price but guaranteed that they would win any match when all else was equal (their competition using standard bullets but being no better shooters or having no better equipment otherwise), it would still be a hard sell. That is because a target shooter might fire several hundred bullets in the course of a match, and hundreds more getting prepared for it. Even if he really wanted to win badly enough to pay your price, he probably couldn't afford it.

On the other hand, if this same person were going to hunt elk in Montana, and the trip was going to cost him anywhere from five hundred to ten thousand dollars (certainly in the ballpark for guided hunts these days), he would be foolish not to buy at least a box of your bullets, if they were designed specifically to take down a trophy elk cleanly and humanely at the ranges he planned to hunt. At ten times the standard factory price, they are still nearly the cheapest part of the trip.

If this same person were licensed to carry a concealed weapon and felt the need to do so in order to protect his life, or that of his family, he would not only be foolish but would feel humiliated if he passed up the chance to use the very best self-defense bullet on the market, and his standard factory bullet failed to work. He might, in fact, feel much worse than that. Or nothing whatever, including a pulse, depending on when and how the lower cost bullet failed to perform.

Those who simply cannot obtain the bullet style, weight or caliber they want from the factory either don't shoot their guns or they pay what it costs to make the special bullets. Making the bullets faster and cheaper usually has little or no effect on the sales, other than making them less profitable.

There is a relationship between sales volume and profit margin that people without business experience sometimes overlook when they start their first business. As you increase the price, those people who were just on the edge of buying usually back off and don't buy, but those who were a little further into their economic comfort zone are not affected. So, you lose a few sales but the ones you have become more profitable.

At some point in the curve of sales volume versus profitability, a point is reached where any further loss of sales reduces the over-all profit. But until you hit

that point, you can make more money on less sales. And that is the entire point of custom bullet making as a market segment: as long as you go after the narrowly limited areas where the factories do not find it profitable to work, you will be able to operate free of any serious competition, and can make a very nice profit on your work. But as soon as you decide that the volume is too small, and rather than looking for more of these niches in the market, you turn to the playing field of the mass producers, you are headed for a real fight.

Working with people who know you are making the bullets by hand, one at a time, and doing the very best possible job on each one, means that your customers realize that your price must be high. They are willing to pay it, or they wouldn't be your customers! The biggest mistake a custom bullet maker can make is to think in terms of "bullets per hour". Always consider why you are doing it (other than the satisfaction, of course): the bottom line is "dollars per hour". Keeping that in mind makes it easier to seek new niche markets instead of lusting after the mass producers' clients.

Bullet Testing

In order to know if a certain bullet design has merit, either for production or for your personal use, it is important to know how to test it. Gun magazines publish many tests of bullets, but the circumstances under which most gun writers operate virtually precludes doing a very meaningful test.

I say this, having been a gun writer myself. Fortunately, I had other income and could do a little more than if I had to depend on the salary from writing to support my family. At that time, I had no family to support, and had other business income to buy the guns and supplies needed. Time wasn't a major problem then. Even so, the tests that I did of bullets consumed a vast amount of both time and money. The standard fees paid by magazines for articles did not leave much for the work: I figured I would make about twice as much pumping gas as doing good gun articles that involved bullet testing.

A fairly standard technique is to fire a few bullets into wet newspapers, clay, a plastic milk jug filled with water, or some other target material, and recover the bullets to photograph and measure. Anywhere from three to twenty bullets might be fired in groups of three to five shots to check the accuracy, using a favorite gun fired from whatever rest the author has found satisfactory. And that's the basis for the article.

I've read a few articles where the author fired one or two shots and pronounced judgement on the performance based on what happened at that particular speed and range when the bullet hit a stack of wet phone books. And I fully understand why this is passed off as a bullet test. If I were trying to make a living today writing gun articles, I'd probably have to do something like that in order to stay solvent.

I don't blame the writers or the magazines for not putting enough time and money into the tests to be meaningful. But I do think it wise that a person who is counting on the right bullet design, either for a business venture in making custom bullets or in using the bullet for some important purpose, should conduct a much more thorough testing before making any such decision.

Before discussing the test methods that actually provide meaningful information, I must say that regardless of what artificial target materials are used, there is a large error factor introduced in real life hunting and defense situations which cannot truely be simulated. We are forced to conduct a scientific experiment in which the simulation of reality is far more exact than the reality itself.

No matter what you use to simulate a Cape Buffalo, it probably won't charge you head on and make you take two or three more quick shots at a bobbing, weaving, and rapidly closing menace of horn and skull so thick that full metal jacket military bullets are bent and can be turned to come back at you! That Cape Buffalo has large areas of soft tissue that are similar to a big leather bag full of water, and other areas inches away that are as tough as a five-inch thick oak.

Depending on how it stands, or runs, you may only see horns and head, or you may see any angle of its body. It may be docile one moment and running as fast as it can to gore you in the next. How do you simulate all of that?

Game hunting has another target factor besides the mechanical physics of the materials: the spirit or will of the animal to continue, or give up, regardless of the severity of its wound. Sometimes it will drop like a rock with the same hit that, in another animal of the same species, would allow it to run away.

People are similar in their response to being shot: I spoke with a gentleman who was shot in the leg and only realized it when his boot filled with blood, and he could hear it squishing as he walked. I've read about people who died of non-fatal wounds, from shock and fear, and others who were so emotionally wound up that they were able to survive a fatal wound far longer than anyone would logically presume possible.

I've never been shot, fortunately, so I can't write any personal impressions about it. Speaking with experts in the forensic ballistic field and people who have survived gunshot wounds, though, has given me enough insight into the results of shootings that I would not count on any particular bullet test as being exactly indicative of what would happen.

You would think that being shot point blank in the torso with a .44 Magnum would result in immediate death, would you not? Yet, a woman in Chicago purchased a .44 Magnum for protection against muggers, was mugged while carrying it home from work in a paper bag, pulled it out and shot him point blank, and all he did was stand there looking at the tear in his arm and ribs, and then run away!

If you fired that round into a large block of clay, it would make a most impressive hole. Yet, there you have it. At least one criminal was still on his feet after being hit with one of the most powerful handgun rounds on the market. Testing has severe practical limits, no matter how well we do it. But we must do it anyway, because we can at least rule out some miserable failures, and point in at least a tentative way toward some potential successes.

Before we test anything, we need to establish a base line for what is normal. This is one of the most glaring omissions in so many articles: the writer fails to duplicate the test using a "control" bullet fired at the same

speed, range, and from the same gun into the same media. The control bullet should be one that is commonly available and familiar to most readers or users of that particular caliber. Otherwise, firing two obscure and different bullets doesn't really tell us anything.

The control bullet is used to tell us exactly what a "normal" bullet would do in the same circumstances. But because there are variations in high energy physical impacts (not to be confused with high energy physics, which deals with much lighter projectiles going much faster speeds!), a single round isn't enough. Depending on the amount of variation between rounds, a person should average the results of at least ten shots. If the ten all seem to give nearly identical results, then perhaps the next time, you could get by with five. But never just one.

In an ideal world, you could fire enough rounds both of your control bullet and your test samples to be statistically meaningful, perhaps several hundred. But the reality of the bank account steps in, and insists that five to ten shots probably won't miss that many opportunities for a very different performance. That is what we are looking for: a wildly different result than the previous few shots. If we find it, we have a problem to solve in firing enough more shots so that we can determine if that was just a strange anomoly or part of a pattern. We can't ignore it. So we rather hope it doesn't occur!

Having tested the standard bullet at exactly the same speed and range, into the same material we plan to use for our "unknown" bullet, we have a written record of the penetration depth, the diameter of the entrance cavity, the shape of the cavity, the remaining weight of the bullet and its expanded diameter, and any other factors we are interested in comparing. Then

we fire the "unknown" bullet, so that we might know it better, under circumstances duplicated to the best of our ability.

Immediately a problem is apparent: if our custom bullet is the world's lightest or heaviest for that caliber, or if it simply cannot be matched in velocity or weight with any standard mass produced bullet, what do we use as a standard? What happens if the test bullet is the only brand available, and that is why we are using it?

Creative logic has to be applied. You have to decide what the closest standard bullet would be to the one you are using, even if it is a different caliber. The thing that is different about the custom bullet is what you are testing, so that thing will not be duplicated in the control bullet. Everything else, as far as it is possible, should be.

If you are testing the world's lightest, fastest bullet in a .38 pistol, then you want to see if it penetrates, expands, holds together, gives more or less pressure with the same loads as the nearest standard bullet with which everyone reading the article or considering buying your product will have some possibility of experience. If the bullet you are testing happens to be a round nose shape, then you would probably want to get a standard round nose bullet of normal weight to compare. If it is jacketed, you'd want the control bullet to be jacketed also. But if the special bullet is full of plastic instead of lead, you don't necessarily want your control bullet to be the same construction, since that is the main factor in making the custom bullet different: you are testing whether a plastic filled, light weight bullet that can go very fast is of any benefit when it comes to firing under the same circumstances as a regular bullet of normal construction and weight, of roughly the same shape.

If the thing you are testing is the shape, then you would want to try to get as close to the weight and velocity with your control bullet as possible. You may in some circumstances have to try more than one control bullet or load it to different speeds in order to find out which factors are improved and why .

For instance, if the shape is like a football, and the penetration is twice as great as your round nose control bullet, you may want to find out if the reason is that the base drag is reduced by the other end of that curve, and thus the bullet is simply hitting at a higher rate of speed. To do that, you might have to chronograph the downrange velocity, load a conventional bullet to a higher speed and see if it penetrates the same. If it does, then the nose shape isn't the reason for the superior performance of the new design.

But if the round nose penetrates less at the same speed of impact, then the reduced base drag isn't the whole answer, and comparing the material hardness and nose shapes may reveal the answer: perhaps the new bullet is just harder and expands less, so it goes in further. Bullet testing isn't just a matter of firing one or two shots and proclaiming something about the expansion.

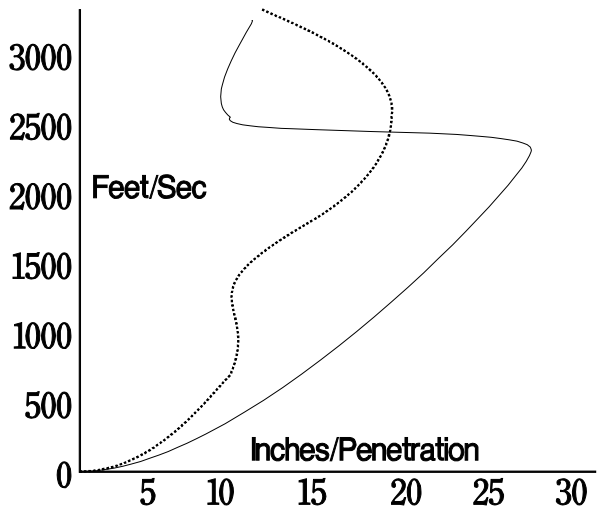
Once you have established how the test bullet differs in performance from the control bullet at one speed and range, you need to repeat the test at several other speeds to see how the performance may change. I usually test bullets at the lowest and highest speed that would typically be loaded in that caliber, and then compare the results. Each test uses at least five shots, since variations can start to occur at one speed that did not occur at another.

If there is a significant difference in expansion and penetration, which there usually is, then I try a speed approximately half way between them. If the penetration and expansion are linear when plotted on a chart against the speed, I figure that any other tests will probably fall close to that line, and can decide whether to shoot any more based on available time and money without a great deal of fear that I might miss something by stopping here.

But if the middle shot plots very far off the line, I need to split the difference on either side of it and fire at least five more rounds at those speeds, to see where the line moves. If it is a log curve, growing ever more sharply at one end and more slowly at the other, I've discovered something useful. If it jumps around, there are mechanisms working in that design that don't fit a conventional pattern, and probably bear further tests.

One interesting situation which comes to light with expanding bullets is a situation where the penetration in certain kinds of target materials changes in a nonlinear manner with velocity. The results at first can be puzzling but ultimately yield to logic.

Here is what happens: a given bullet may not expand at all, or only a small amount, during a series of shots where the velocity is increased from the very lowest practical values to the middle range of speeds. The jacket is maintaining the efficient shape of the bullet at these low energy levels, so it tends to penetrate in a fairly linear way with increasing speed.



Penetration versus velocity: two bullets, one expanding (dotted) and the other solid, fired to destructive impact.

As soon as a certain speed is reached, the jacket is no longer strong enough to resist being torn back, and it starts to expand more rapidly, which increases the frontal area and rapidly slows down the bullet, sometimes expanding so fast with increases in velocity that the curve becomes level or even negative.

What is happening is that the increased speed is being converted to energy sufficient to rapidly expand the bullet, and it offers more drag (friction), which retards its forward momentum, spreading the available energy over a wider area so it penetrates less, or at least doesn't seem to increase its penetration as much with each increase in speed as it did before expansion became so great.

Then suddenly the curve becomes more sharp again, and further increases cause even more penetration. This is the point where the "petals" of expanded jacket and core material are folded back or broken off, reducing the frontal area of the remaining projectile, so it now has the ability to leave bits of itself behind and bore a deeper hole with the piece that is left.

With even further increase in speed, the width of the hole can be come greater but the penetration can once again slow down or become negative, and finally level out at some maximum speed beyond which there is no futher penetration. This is the point at which the energy is so great at first impact that the bullet literally explodes, scattering itself into so many small pieces that none of them have enough kinetic energy to penetrate very far.

You can see that picking one or two velocities, in a given target material, might give you an entirely erroneous picture of what happens when you extrapolate the results to other speeds. For instance, if you happened to choose two speeds well into the negative penetration curve, you might conclude that this bullet penetrates best at slowest speed and less as you increase speed. You'd only be right for a very narrow portion of the curve, possibly for two little segments of it. Anyone choosing to load a lower or somewhat higher velocity would find just the opposite to be true.

You can see that it is important to try a fairly wide range of velocities, with a given target material. It is also important to try more than one media for the target, unless you are only comparing bullets that you know will be used in nearly identical material. For instance, dry magazines or paper may make a convenient target, and you can tell quite a bit by comparing bullets fired into it, but hollow point designs usually

plug up with dry paper and act almost like solids. If you fired the same hollow point bullet into a jug of water, it might mushroom to twice its size, and a solid might not expand at all.

Both of the bullets fired into dry materials could expand nearly the same amount. This is because hollow point designs usually depend on some kind of hydraulic effect to generate pressure that is evenly distributed in the cavity, and dry materials are often just cut and packed into the cavity on impact, which makes them part of the solid bullet rather than an expanding force.

The Oregon State Police told me that they used water to capture bullets, and that it gives them fairly close approximation to bullets recovered from human wounds (assuming of course that bone isn't hit). Firing into a water tank usually doesn't expand most conventional velocity handgun bullets, and neither do they seem to expand much after hitting someone. I can't vouch for it myself except to say that reliable forensic experts have told me it is true.

If so, then it means the idea of recovering a bullet in water to prevent any damage to it is close to what would happen if it were used in defense. Conversely, if you design a bullet that expands well when fired into water (at a specified range of velocities, of course), it probably will do close to the same thing if called upon to defend someone against a violent criminal, assuming that the distance it has to travel is about the same as it would in a person, and it did not encounter any other significant materials along the path.

By the end of the day, we have fairly well used up a supply of whatever target material adsorbed all those hits. Some of them are quite renewable, as with water tanks having a pair of rubber sheets stretched over one end, or Corbin "Sim-Test" that has the con-

sistence of old jello and melts in a double-boiler (lower than 212-degrees F). You can cast this stuff in plastic moulds and use it over and over, so long as you don't over heat it and cause it to "carmelize" or turn stiff and brown.

Water-soaked phone books or tightly-bundled newspapers soaked in water are fairly good test targets, also, but their density can vary with the pressure you use to pack them, the temperature and humidity, and how long they sit around waiting to soak up or dry out. I've heard of people buying a rack of ribs and shooting up a perfectly good meal in an attempt to more closely simulate real game, but the game animal is alive, and its bones and muscle have not nearly the same resistance to a bullet as the meat in the butcher's case.

I'm not outlining a specific way to test or design bullets, but only trying to illustrate how you would have to think about your tests in order to make them meaningful. Always hold your assumptions at arms length. By that, I mean do not take what you think to be true as gospel but only as one of the possibilities. A blind faith in a certain kind of performance, or a given shape or bullet feature just because it appears to have worked well in a few instances, isn't proof that it will always be the best.

Maybe you are assuming, for instance, that a boattail is more accurate than a flat base bullet, when in reality you were comparing some mediocre flat base bullets, with out of tolerance jacket walls, to some very fine boattails with extremely well-drawn jackets. The only way to really find out is to try a number of experiments with different jackets, weights, loads, and calibers, and see if boattails are always more accurate than flat base bullets. They may have less drag, but that doesn't mean they are necessarily more ac-

curate. Bullets can be shot on a very flat trajectory into a big group, or they can be lobbed high into the air and drop into nearly one hole.

Another common assumption is that hollow points expand more than lead tip bullets. Sometimes the opposite is true, if the hollow point uses a fairly small tip and thick jacket, and the lead tip bullet uses a thinner jacket, or even the same jacket not closed down to such a small opening where the lead protrudes from it. The main control of expansion in jacketed bullets is the diameter of the jacket mouth at the time of impact. If two bullets are fired at the same speed into identical media, and one is nearly a cylinder while the other is closed down at the tip, it doesn't matter very much whether soft lead protrudes or not. The cylinder will expand more because it is already expanded more when it hits. The pointed bullet has further to expand just to catch up. And, generally, when you point a bullet more, the tip tends to become thicker, which resists expansion.

Another assumption is that tiny tip openings result in more accurate target bullets. A small tip may contribute to a lower drag, up to some limit, but it also causes the jacket material to be stretched further and thus any differences in hardness or thickness between one side of the jacket and the other are exaggerated, and show up at the tip. I've fired absolute cylinders into nearly one hole from a machine rest, doing just as well as a very pointed bullet, so I know that at least under some circumstances, the point shape doesn't control the accuracy.

When testing bullets, you do not need to simulate reality, because reality itself varies so much from shot to shot.The exact performance is not quite as important as a good comparison with a bullet that we all know well. The fact that our favorite 30-30 bullet happens to penetrate six inches of water-soaked phone books and makes a six-inch diameter hole while retaining eighty percent of its original weight does not translate to any particular results on the next deer we shoot.

If we know that the bullet does a pretty good job on deer, and it makes certain size holes in the phone books, that we can say that if another bullet does the same or better in the phone books, chances are good it will perform the same or better in the deer. We don't know it for a fact, but we can make a tentative assumption, or a working hypothesis, until it is proved otherwise.

Likewise, if we know that a certain standard bullet usually breaks up and damages a lot of meat at a certain speed, and we fire it at the phone books or clay or book-binders' glue, and we find that it makes a wonderful textbook example of a perfect wound cavity, without breaking up, then we know that another bullet that performs just like that in phone books might also break up when we shoot the deer.

We don't know for a fact that it will, but we have an indication. We have to decide what kind of performance would translate to reasonable results in actual use, and that isn't always easy, unless you are sure that a certain design worked more than once, and can try it in your test material to see what happens.

The concept of a control is basic to any scientific experiment. There are some people who would say that since there are so many "unknowns", it doesn't matter if we have one more, and then do their testing with one or two shots compared to... nothing! It may be true that we have a tough job in deciding what is close enough to be a valid control bullet, and exactly what kind of performance we are looking for in a target material, as opposed to performance in actual use.

But as with most things in life, if you can't get all the answers, the least you can do is get all the answers you can.

I was once called to a Federal tax court as a rebuttal witness to give "expert testimony" about bullet testing in a tax case. This was rather interesting because there were two main points the defendant had to prove in order to keep the Internal Revenue Service from collecting fines and penalties of a significant nature.

Here is the background: a custom bullet maker decided to build bullets for hunting dangerous African game, and in order to test them, he went to Africa and actually hunted the game himself. He decided to wait to advertise these bullets until he had perfected the design, based on actual experience, which would give him a very good advertising point.

But this meant spending quite a bit of money before actually selling any products, and that is where the I.R.S. disagreed with his intentions, saying he was just using the business venture as an excuse to have fun and write it off as a business expense. They claimed that he didn't have a business because he wasn't selling any bullets, and even if he did have one, it wasn't necessary to go to Africa and actually shoot Cape Buffalo in order to advertise that the bullets were designed and tested for this purpose.

He had two claims to support this action. First, he claimed that it was an ordinary, prudent business decision to invest in research and development, which meant testing and refining the product in actual use. Second, he claimed that product liability laws would require that he test the bullet in the same manner that his clients were supposed to use it.

He actually made more than one trip, because he said the first trip proved that the design he had tried in the usual test materials, and thought was working well, didn't actually perform well at all in a real hunting situation. So, he adjusted his assumptions about the design, tried different test materials for targets, changed the design, and went back next year to try again.

The I.R.S. had a good argument because he actually had not sold any of these bullets, and therefore it would be a legal question of whether, in two years time, he could actually be said to have had a business. But he brought forth these two claims for the tax court to rule upon, and I was asked to rebut the testimony of the prosecution's expert witness, another custom bullet maker, who said that you did not need to shoot actual game in order to find out exactly what was going to happen with a given bullet design.

This other bullet maker, a famous name in the field who I will not identify, was very nice but also rather "bull headed", I thought, about his contention that wet newsprint or water-soaked magazines would tell you all you needed to know without actually shooting any game.

During a break, I had a chance to talk with him about it, but he was quite stubborn in insisting this was so. I contended that it was not, and that anyone claiming a bullet was designed to stop dangerous game animals had better test it on such an animal before making that claim in print, or the widow and survivors might sue him when it didn't quite work the same way in the Zimbabwe brush as it did in his back yard with a pile of wet phone books.

Who won? I don't know! Both sides presented their cases, the judge accepted written briefs and said he'd rule on it in the future sometime, and everyone went

home! I never found out. But the idea that product liability requires the best possible testing, in as nearly identical conditions as the expected usage, so far as it is practical to do so, should prevail.

I wouldn't advise trying to write off a couple of safaris, however, unless you had good legal and accounting advise before the event, and they said the I.R.S. wouldn't mind. In fact, I wouldn't advise anything remotely connected with law or accounting, not being a lawyer or accountant, and I disclaim any such intentions! I'm just relating what happened. You be the judge—but try to decide a little sooner, please!

This story is presented to show how important bullet testing methods can become in some situations. Another time, I was asked to do some bullet testing for a client who was trying to get permission to build a range, and the building authorities insisted that he prove the ability of his construction plan to stop bullets. The building was to be made of concrete blocks filled with cement and reinforcement steel bar (re-bar), two layers thick at the target end.

The concern was whether a .44 Magnum would penetrate this barrier. We built little sections of wall to that plan and fired many shots at it. Surprisingly, the concrete did fail at certain angles, when hit in the thin web section, but the solid concrete filler withstood several more rounds, and a double row was very tedious to penetrate. It could be done, but a person would need to concentrate his firepower on one spot for long enough to draw attention.

Of course, an adsorbent bullet trap such as the angled cut-up rubber tire bits or sloping sand shelf or even angled steel plates would protect the wall, but the building people wanted the wall alone to stop a stray round, and it would. We sent our bill for cement and blocks and some ammo and time, along with our

independent third party report and the building went forth. So far, I've not heard of anyone taking a stray slug in the alley during a match, so the tests must have been realistic enough.

Another time, we were asked to develop a bullet that would not go through a conventional frame house wall (with a 3/8-inch drywall on both sides), yet would be adequate to stop an intruder. We could not do it. Anything that was powerful enough to cause a criminal to drop in his tracks was also strong enough to blast through the gypsum boards like they didn't exist. We tried very light, fast bullets that had so much energy that they would break up on anything, and very slow heavy bullets made of powdered tungsten in a beeswax capsule or "jacket". Regardless, there was no way to guarantee the safety of anyone on the other side of the simulated room wall. Some goals are mutually exclusive. But if you find an answer, I'd be glad to hear it.

The "Holy Grail" of game bullet design is the bullet that will expand to double diameter at nearly any velocity or range and won't break up at the highest speed nor fail to expand and penetrate to vital organs at the lowest speed. In this application, speed translates to range. A hunter may not know exactly how far the trophy will be when it appears.

If it steps from behind a bush 50 feet away, he's a great tracker or maybe just lucky, but not if the bullet blows to bits on impact with the hide, and the animals runs off to die from the wound.

If it appears on the other side of the valley just before dusk, on the last day of the hunt, and it's a matter of taking a 350 yard shot or letting it go, some people are good enough (or dumb enough) to try it, but their

success will then depend on whether the well placed shot is made with a bullet that can expand even after losing a good deal of its initial velocity.

Rotational velocity, imparted to the bullet by the rifling, varies with the forward velocity. It is always so many turns per inch of travel, controlled by the barrel used, but the centrifugal force is increased as the bullet covers that inch in less time. However, the amount of energy that is released by the spin alone is not a major factor in determining what the bullet will do when it hits. The bullet stops spinning almost as soon as it expands, since the leverage of those petals projecting from the bullet exert a resistance that is greater than the rotational momentum.

After all, any given point on the jacket has the same mass that it did while the bullet was spinning through the air, but it normally pops out to nearly twice the distance from the center of rotation when it strikes, while most of the rest of the bullet stays the same distance from the center. If you think of a single line of radius as a little lever, you can see that the expanded bullet has little levers that are twice as long as the main diameter of the unexpanded portion, pulling on the thick material and trying to move it with them.

You can see the evidence of this by shooting bullets into an oil-based clay, where the tracks left by spinning are generally very short or absent. The clay doesn't tend to shrink back to original size like gelatin or elastic bookbinders' glue, so you can see the spin traces in the way the clay is pulled and twisted. There is just enough to show that it isn't a very big effect.

What this means is that you can get a fairly good idea of what happens at long ranges by loading your cartridges so that the close-range impact velocity is the same as it would be after the bullet had decelerated. You might think this would be obvious, but the

rate of spin doesn't slow down nearly as much as the rate of forward travel. A bullet that travels 2,600 feet per second, for instance, covers one inch in 0.000032 seconds (32 millionths of a second). If it is spun at a rate of one turn for every ten inches of travel, that means when it goes ten inches, a little over 32 millions times ten or 0.00032 seconds will have passed. The rate of spin, in revolutions per second, is one turn in 0.00032 seconds or dividing that fraction out, you get 3125 turns per second.

Sixty times that gives you turns per minute, a measurement we know and love because it is used more often. The bullet is spinning at 187,500 RPM. The motor on your drill press probably turns at 1725 RPM or 3250 RPM, and a high speed rotary grinder like the Moto-Tool might get up to 10,000 RPM.

But the leverage arm from the center of that bullet to the jacket is only half the caliber. On a .308 bullet, which is the diameter of nearly all .30 calibers regardless of what the manufacturer calls them, is .154 inches. That's a rather small arm with which to pry something. Centrifugal force is the energy that is achieved by spinning a certain weight (or mass, really) by a certain lever arm. The effective mass is the combined effect of each point along the lever times its effective speed.

Without delving into the math, the little spinning lever effectively generates a rather small amount of energy, and is slowed down almost instantly when it encounters resistance (actually, it slows completely when it meets matching resistance, which is supplied very soon after impact). This means that while spin does have an effect on the terminal performance of the bullet, it can be ignored for purposes of testing

big game or defense ammo, since the most likely use of the bullets will involve field variables far greater than the error introduced in the tests.

This does not mean there is no effect caused by spin, and that the results will be identical if you shoot 1000 yards or if you load so that the bullet strikes up close at the same rate it would be moving at 1000 yards. It just means that for most practical purposes, the effect isn't big enough to spend much time and effort in an attempt to simulate it.

So it can be with any number of effects: first you must determine if the factor you want to simulate is significant, or just a minor part of the performance picture. Bullet testing consumes so much time, when done correctly, that anything you can do to reduce the work without significant risk of missing something important is a good thing to do. On the other hand, three shots at a watermelon doesn't constitute much of a test!

Business Issues

You can skip this chapter, if you have no interest in the business of making and selling your own custom bullets. If you are interested in selling bullets, maybe some of this will be useful when you are setting up your business. This isn't legal advice, however. It is just my opinion, and I do not claim to be infallible.

Nondisclosure Agreements

Sometimes we are approached by a person who has what he believes is a potential wealth-creating new idea for a bullet design or application, and the first thing he wants is to have us sign a nondisclosure agreement so he can see what we think of it and have us produce some prototypes to show investors. I have to decline for these reasons, some to protect us, some to protect him:

1. We do not know if we may have already worked with this idea until we see it, and if we cannot see it until we sign a nondisclosure agreement, we are saying we won't do something that we may already have done! In fact, if the idea is actually practical, we probably have produced something like it before. After all these years, thousands of inventors and ideas, and hundreds of successful businesses arising from them with our help, it is highly likely none of us can even remember if we saw the idea before or not. I can hardly remember whether I saw my wife's note to bring home a carton of milk or not (at least the handwriting still looks familiar...). After all these years of helping thousands of people with their projects and never stealing any of them, I can only say that if our reputation isn't enough assurance, then our signature on that paper would be equally worthless.

2. A person looking for investors (which is nearly always the motivation behind the nondisclosure paperwork, the patent filings, and so forth) is attempting to sell an idea in a mature (you could say "ancient") market which has achieved a high level of success with the ideas that have already evolved over the past 200 years of firearms history. What we would rather do is help someone turn one of those ideas into a product, and sell the product themselves, proving the idea has an actual market and is profitable in production. Then, if he is inclined to find investors, he has a much more attractive set of options, including selling a business opportunity rather than just a design concept. A going business is far more marketable than an idea for a bullet, no matter how good the idea may be. Everyone has an idea for a better bullet. The only profitable ideas are those that get produced. Very few custom bullets are unprofitable when marketed in a reasonable way, whereas very few bullet ideas—as ideas only—are marketable at all. For us to encourage the whole "intellectual property" marketability concept by participating in the trappings, such as nondisclosures and so forth, is a bit of a sham and I'd rather not do it.

3. We specialize in the custom bullet market and have so many clients who need our help that we cannot afford to waste resources in the field of mass marketing. Firearms is a very conservative, slow-moving field at the mass market level, where the technical merits of a new bullet can be far down the list of desirable features. At the top would be low-cost high-volume production, which means not making significant changes to the tooling or the marketing system. Mass producers have already spent over 200 years, in some cases, building a product line, distribution system, and brand image. It works fine, so why buy outside ideas? (Products, maybe: you may sell a mass producer

100,000 special bullets a year for a niche market, since it might be just the ticket compared to them developing the idea and producing it themselves in such low quantities.)

Again, getting involved in legal paperwork that is primarily of benefit and concern in regard to the mass market, when our specialty and reason for existence is something else, would just complicate our lives unnecessarily and imply support or participation in an area where we really have no expertise to offer. If you think it is likely this idea is original with you, and we've never seen it before, and if we did see it you would need some kind of legal protection to keep us from disclosing it to others, then please don't even bother to bring it around. Take it to a mass producer straight away and let them sign. If they steal it, you can have all the fun of suing them, and your lawyer can have all the fun of billing you by the hour... for years to come!

We don't make bullets for a living: we help others do it, and most likely we have seen anything that is likely to work many times before. We have yet to steal any of them and get rich and retire in the Grand Caymans beyond the reach of the local attorney who drew up the nondisclosure paperwork. If that had happened, would I be writing this now? Here's a flash: people who make custom bullets seldom get rich. They can make a nice living, maybe even better than average. But get rich? The incentive to steal your idea is nonexistent.

See that file cabinet, over behind the reception desk? Yes, that five-foot tall beige one with four drawers. Well, it is full of ideas of our own that have no risk of belonging to a client. I don't have time to work on more than a tiny fraction of them each year. What do we need with more ideas? Give me more die-makers;

those are worth stealing away from you if you happen to bring one along! But ideas? Please, we're overstocked. We give them to clients, free. Here, take a bag!

I have a term for people who put their faith in getting a patent and selling their idea, rather than selling the product itself. I call them "Patent People". It is a term of endearment, not ridicule. Sometimes they are looking for the easy way to riches, but often they are just earnest and misguided. I try to help, but they seldom hear my advice. I repeat: I am not a lawyer and my advice is my opinion only. Perhaps they are right not to listen. Judge for yourself—here it is:

Patent People

I would prefer to work with a person to help them develop their idea. We want to make tooling that is affordable, and can be operated in a profitable way by one or two people, filling the modest but steady need for specialty bullets. The factories may someday purchase or copy the idea, but prospects of them doing so are rather low. Niche markets are fairly safe from mass producers.

I can honestly say the money spent on a patent usually should have been put into advertising and packaging your own product. This is a field that, taken in its entirety, might come up to the financial level of a few McDonald's hamburger franchises. It is an old, mature field with conservative buyers who are, for the most part, happy with what they have. Odds of an exotic idea being copied are slim, economic risk is nil, and if you sell the bullets for a few years before the

idea is copied by someone who can make it far cheaper and faster on their high speed machinery, you are still money ahead.

The same mass producers who might copy your bullet someday are unlikely to have purchased your patent in any case. It is too easy to prove prior art or just thumb their nose at your limited legal budget while their attorneys, who are already on the payroll, bury you with procedural filings. They may dig up Civil War patents not in the computer records, which show the idea has long passed into government or public ownership. Then your patent makes a nice den decoration but is worthless in court.

Yes, it could happen that you patent an idea and eventually find someone to buy it. Do you think it has military application? Guess what: if it does, and they want it, they can get it. You may never see a penny for your trouble. But even if everyone plays nice, unless you are first cousin to someone in procurement or play golf with the general who happens to think his troops need a longer range bullet (or whatever you are selling), the odds of making anything from patenting and marketing the bullet to the military are, shall we say, remote? They are more likely to purchase small quantities of bullets from you for special projects than to pay you for an idea. That actually happens, sometimes.

I would not be foolish enough to say that a patent is always a waste of money in the bullet field. Sometimes you can get by with just a few thousand dollars in attorney fees and searches and official drawings and application fees, and it so happens your patent has something in it that a third party with deep pockets actually wants. But I've seen this happen very seldom. I've talked to many more "patent people" who were still drifting in and out of offices with a tenacious grip on their tattered briefcases, year after year,

dragging their papers out for one bored executive after another, who try to be polite and look interested until their eyes glaze over.

It is sad: patent people want to believe in their idea, and they do believe that a patent is the key to wealth, but they do not understand how to make money with it. I tell them to take a chance, use some savings, and start a little company to produce and sell your product. If it is done well, you can make a reasonable return on your investment, usually two hundred to five hundred percent a year (the investment is very small compared to the margins). If it doesn't work out, there is good salvage value and trying for a year or two should not cost more than a typical vacation or a second hand car.

Not trying means never knowing. I understand that never knowing could imply always keeping hope alive, and that in some people's minds this is an unspoken and perhaps unwitting reason to pursue the infinitely long road to "easy riches" instead of taking that immediate first step on the short path to harder work and revelation of the actual merit of the idea.

In other words, if you don't try, there is no danger of finding out your idea was not good. This is ego insurance. If no one buys the untried idea, then it is "their" fault. If they do, you are out of it and they are the ones who responsible for the success or failure. Either way, there is no ego risk. You are not the one baring your soul, taking a hard-money, real-world capital risk, making a product that must support your business. Maybe that is why so many inventors do not want to try to build their product and sell it. If that is you, then you just saved years expensive therapy, for the price of a small book! Please feel free to send me any part of the savings in large or small bills—I'm not particular.

Another reason could be that they are not business people, and feel no competence in running their own business. That is a perfectly legitimate concern. It may be overcome by making up for certain weaknesses through hiring help for those areas, and focusing on one's strengths in other areas. But sometimes the scope of skills required to run a small business is overwhelming. A person might not know where to begin. There is help for that, also.

A large number of self-help small business books are available. The Small Business Administration has publications basic enough for anyone to grasp. A friend or relative may have experience in the basics of setting up a small home business. And of course, when it comes to getting customers, promoting and advertising your business, Corbin is always here with free or low-cost methods to get the message to the right people, including publicity lists, free website ads, free inclusion in our bullet-makers' directory, a seven step plan included in our Market Information Package (the MIP), and help with advertising, logo design, communications issues, pricing, and much more.

If you start asking and reading, let me throw one warning buoy into your newly found channel: I have found that most college texts written about running a business are written by people who have never been successful small business owners. Some of them have at least been involved in business but usually at a level where they did not have to start at the bottom and build it from nothing (a teaching career would tend to preclude such a business career: a successful business career usually preempts one in teaching). More than a few business texts are written by people who hate capitalism and everything it stands for, as evidenced by the tone of the writing and the nearly complete lack of understanding of the role of profit in business.

So, be wary in your reading. If the first thing the author tells you to do is a market study and casually mentions that it takes a sampling of at least 10,000 people to be statistically meaningful, get another book. This one was written for a much larger business model than we are talking about. In fact, most of the books you find in a college bookstore will be. Their methods and advice probably work fine for General Motors or even for someone who has a half million dollar war chest for starting a "small" business. But for the person working out of their home, preparing to do a mail order business with no help other than a tax preparer, you can cross out entire chapters and write in "skip this, go to next step" because the studies and tests and preparation they are recommending would cost more than the entire business will make in several years.

You can pick up good ideas, possibly faster than from books, by reading some of the magazines written for home business operators. Even these tend to be written for larger businesses, with more money to spend than you may have when starting. Still, basic accounting principles and some knowledge of the way the tax code works, especially regarding deductions and reporting cost of sales, is a good thing to know. You can have someone else do it all (for a price), but it is better to know firsthand what is going on rather than to hear about it after it has.

A great deal of what a small business person does is like flying a plane without instruments. You just feel your way, do the best you can with the limited resources available, and work smarter, harder and longer to get ahead, so you can start phasing in outside help and marketing ideas. Little airplanes without instruments sometimes crash in bad weather, and many small businesses fail when the outlook clouds up. The

authors of business books would say it is because they do not have the resources to pay for the research to support the planning that a larger business would do.

Ah, but then, we have giant businesses filled with people sporting MBA degrees, supplied with huge resources, and these firms apparently get no benefit from some of their massive planning efforts. Otherwise, how did the New Coke fiasco come about? Why are there no current versions of the Edsel? How did the McLean taste-free burger manage to get on the market? I've never met anyone who said they liked it. I won't even waste time discussing the "new business model" that was collectively debunked by the dot com crash (you remember the mantra: the "old" ideas of the "brick and mortar businesses" are dead and profit is of no immediate concern, only "eyeballs measured by hits" represent the "market" capturing the "hearts and minds" of the new, hip "visitor"). People were willing to risk money just to advertise the vague promise of great profit at some unspecified future time, rather than taking the more traditional risk that an idea which has already been proven profitable on a small scale could be "scaled up" to make more profit. But at least the dot-com era had one thing right: you do want to show your new ideas to as many potential buyers as possible.

However, it is more practical to reach people using free publicity as frequently as possible, than it is to spend all your money on advertising. So you send out press releases to the right people in the firearms media, to writers, editors, publishers, and even to manufacturers of guns that might benefit from their customers using your bullets (to make their gun perform better). You scrape up as much as you can afford and put together a good color brochure that explains the

benefits of your bullet, telling people why they will be better off shooting it than a cheaper, mass produced bullet. You use as many low cost or free resources to spread the word as you can find, such as the internet, trades with other manufacturers in their shipping literature, cross-advertising deals, whatever gets your bullet information in the right hands without costing too much. And you write, e-mail, call, and send samples to the people who most influence your ultimate customers. That would be gun writers. This is in addition to the impersonal press releases.

Yes, it is a lot of work. But it isn't difficult work. Some people even find it quite enjoyable. You get to read every gun magazine you can find, and locate more that you didn't know existed. You get to keep track of what different writers seem to like in bullets, what they wish existed, what they lament about the current offerings, or what kind of guns and calibers they write about most often. After a while, you have a nice card file dossier on most of the popular writers and magazines. You know who is most interested in the calibers you make, and what they like or do not like about existing bullets. Then you can send them a sample of something that you already have a good idea they will find noteworthy.

Maybe someone wants a very heavy 308, and wishes there are more round nose game bullets in the 200 grain and up range. Maybe someone else wants a bullet that breaks up as soon as it hits the ground so their 224 caliber bullets won't whine away over the next hill when they are shooting ground hogs. So what if your original idea was to make a fragmenting 308 for police and a military 224 that would penetrate armor? The equipment can do the opposite, as well. And here is an opportunity staring you in the face.

Often, the key to business success is the ability to recognize such opportunities, and to use what you have in a slightly different way than you originally intended. Perhaps you will get back to the original idea later, but right now, this is a way to bring in some free publicity and probably some income. Yes, yes... your original idea was to make the world's fastest 308 for 1000 yard competition, but who cares about it right now?

Here is an opportunity to sow the seeds of publicity, which in turn may sell something you can make right now, which in turn will bring income that lets you do your own thing, later. How many people are so stubborn about what they intend to do, that they ignore these opportunities? Believe me, a lot of people are. It is nearly impossible to get them to deviate from their original path. Too much ego is on the line, perhaps? You need a good opinion of yourself to have confidence in your ideas. But you have to balance it with a little humility and reality, when it spells the difference between going broke and making an immediate profit.

On a scale that ranges from hopelessly timid to shamelessly arrogant, there is a middle section where successful people can find a comfortable mix between being too indecisive and being too irritating. There are people who fail in business because they can't toot their own horn, and others who fail because they drown out everyone around them with their tooting, including the very suggestions and questions that they need to know and answer.

Like almost everything in physics and in life, you can go too far either way. The right balance is hard for some to find. But look for it and try to maintain it. You can be too strict or too lenient with credit, too meek to close a sale or too overbearing in trying to

make one. You can be too convinced of your own rightness to learn or too lacking in self-confidence to even try.

But you can't be too honest, too polite, or too wealthy... like the song says, "I ain't never had too much fun". Being polite doesn't mean being weak, as bullies have discovered to their ultimate sorrow. You can smile and say thanks when your competition gives you the shovel to bury them. And if you are always honest, it's a lot easier to remember what you said.

Liability

Last, what about liability insurance? How risky is it to offer custom bullets, and what protection do you need? To answer that honestly, I have to say that in any dealing with the public, you run a risk of someone deciding you have caused them some real or imagined harm. You run the risk of dealing with a person who is anxious to sue anyone for anything.

On the other hand, if you didn't really do anything wrong, you probably won't lose in such a suit, other than the time and money to defend yourself. Can you get general business liability insurance? Probably, and it may be worth having. Can you get completed product liability coverage? Probably not for any reaonable cost compared to the true level of risk involved.

In over four decades, I have seen this many instances of a law suit involving one of my custom bullet making clients by one of their customers: zero.

Does that mean it can't happen? Of course it can. But then again, just because an ice cream truck hasn't run over you as you picked up the morning paper, doesn't mean it won't happen tomorrow. To live is to take risks. I think this one is well worth taking.

Sources of Bullet Materials

The following pages contain the names and addresses of suppliers for primary and secondary (reclaimed) lead in ingot, powder, and wire form, and mills furnishing copper tubing, rod, and sheet (strip) as well as various alloys such as gilding metal, commercial bronze, and brass.

In most cases, the sources are primary mining, refining, or milling industries and will not sell small quantities directly to bullet makers, but they can direct you to distributors or sales outlets. Some of the world's largest raw materials producers are listed even though they do not sell the finished products. Don't be hesitant about contacting large mining or refining companies and asking them for a list of "fabricators" for the finished products you seek.

Some of the names are associate members of copper or lead industry associations, and may be end users of the materials rather than producers, but are listed because you may find them helpful in locating a near-by outlet that will sell small quantities. A purchase of at least 2,000 pounds of lead, or 500 pounds of copper tubing or strip is generally the threshold for dealing with the smelters and mills.

Another good source of information is the yellow pages of any large city telephone directory. Look under "Lead" or "Copper", "Metals", or "Manufacturers". Please bear in mind that if you cannot find a suitable supplier, you can count on Corbin for smaller quantities of standard dimensions as well as reasonable prices on larger lots of special sizes.

Lead Facts

Primary Lead. The world produces close to 6,250,000 tons of lead every year, mined in 48 countries. In the USA, Missouri provides over 90% of the lead mined, with Arizona, Colorado, Idaho, New Mexico, and Washington supplying the rest. The Doe Run company is one of the largest lead mining firms in the USA.

Secondary Lead. The largest percentage of lead is used in storage batteries. In the USA, about 78% of the lead consumed in 1988 (1,053,000 tons) went into battery manufacture. Additional uses for lead include telephone and power cable sheathing, glass coating for electronic components, leaded glass for crystal and for video display terminal screens, medical and industrial X-ray shielding, roofing, solder, moisture seals, earthquake dampers for buildings, nuclear materials containers, and industrial scrubbers for removing sulphur and sulphuric acids from exhaust gas.

Lead is also formulated with other elements to form chemicals used in corrosion-resistant paint and in ultrasonic transducers. Stable memory chips for computers based on lead compounds are being suggested as a replacement for silicon-based RAM. The common forms of scrap lead are wheel-weights, battery plates, telephone cable sheathing, lead pipe and solder, sheet lead used in radiation shielding, and nuclear medicine shields, as well as fired bullets and shotgun pellets.

Chemical Symbol:	Pb
Melting Point	327.5° C.
Boiling Point:	1740° C.
Atomic Number:	82
Atomic Weight:	207.19
Density:	.4079 lb/cu.-in. (11.35gm/cc)

Sources of Lead

The primary information source for lead suppliers in the United States is the Lead Industries Association, Incorporated, 295 Madison Avenue, New York, NY 10017. Call 212-578-4750, or send a telefax message to 212-684-7714, to obtain a current membership list, safety and health information about handling lead, and the uses and sources of lead.

Lead is the most recycled metal in the world today, with about 90 percent of the lead in use coming from secondary (recycled) sources. Lead recyclers are actually providing more new lead on the market than lead mines. Your best sources for all forms of lead (ingots, powder, and wire) will originate at a recycling plant or smelter.

Lead prices typically vary from a low of about 19 cents per pound in large quantities (tons) in pig form, to a high of over $8 per pound in specialized, extruded forms such as lead came (for stained glass assembly). You would normally want either lead wire (for bullet cores) or pre-cast cylinders to fit your lead extruder body. These range from about $2 to $5 per pound, depending on packaging, quantity, and quality (cleanliness, precision, and reliability of the source).

Straight or pure lead is typically 99.95% lead with a trace of silver. This is the best kind for bullet swaging. Harder alloys containing tin or antimony are often used for casting, and may also be swaged using sufficiently large dies to hold the extra pressure. Adding 3% antimony to lead can double the required swaging pressure, far exceeding the limits of the die walls in large calibers used in smaller presses where the die diameter is under 1.5-inches. Any lead alloy can be swaged, however, if the equipment is specially designed for the job.

ALLECO INCORPORATED
17100 FRANCIS
MELVINDALE MI 48122

ALPHA METALS, INC.
600 ROUTE 440
JERSEY CITY NJ 07304

AMES METAL PRODUCTS CO.
4323 SOUTH WESTERN BOULEVARD
CHICAGO IL 60609

ASARCO INCORPORATED
180 MAIDEN LANE
NEW YORK NY 10038

BRITANNIA REFINED METALS LT.
BOTANY ROAD
GRAVESEND KENT DA11 9BG ENGLAND

CANADA METAL COMPANY, LTD.
721 EASTERN AVENUE
TORONTO ONT M4M 1E6 CANADA

CARTERCHEM CANADA INC.
1295 AVENUE DE LORIMIER
MONTREAL QB H2K 3V9 CANADA

CHATHAM METALS, INC.
P.O. BOX 534, 101 CHURCH ST.
MATAWAN NJ 07747-0534

CROWN NOVELTY WORKS CORP.
86-15 LIBERTY AVENUE
OZONE PARK NY 11417

DELCO REMY
2401 COLUMBUS AVENUE
ANDERSON IN 46018

DIVISION LEAD LTD. PARTNERSHIP
7742 WEST 61ST PLACE
SUMMIT IL 60501 UAS

DRESSER INDUSTRIES,INC.
P.O. BOX 6504
HOUSTON TX 77265-6504

EAGLE-PICHER INDUSTRIES, INC.
P.O. BOX 550
JOPLIN MO 64802

EAST PENN MANUFACTURING CO,INC
DEKA ROAD
LYON STATION PA 19536

ETHYL CORPORATION
330 SOUTH FOUTH ST.
RICHMOND VI 23271

FEDERAL-MOGUL CORPORATION
P.O. BOX 1966
DETROIT MI 48235

FEDERATED-FRY METALS
4100 SIXTH AVENUE
ALTOONA PA 16602

GARDINER METAL COMPANY
4820 SOUTH CAMPBELL AVENUE
CHICAGO IL 60632

HAMMOND LEAD PRODUCTS, INC.
P.O. BOX 6408
HAMMOND IN 46325

HOCHSCHILD PARTINERS
250 PARK AVENUE
NEW YORK NY 10177

HORNADY MANUFACTURING CO.
P.O. BOX 1848
GRAND ISLAND NE 68802

INDIUM CORPORATION OF AMERICA
P.O. BOX 269
UTICA NY 13503

AARVAL LEAD PRODUCTS
INTERCHANGE TOWER, SUITE 875
600 SOUTH HIGHWAY 169
MINNEAPOLIS MN 55426

JOHNSON CONTROLS, INC.
5757 NORTH GREEN BAY AVENUE
MILWAUKEE WI 53201

K W BATTERY COMPANY
3555 HOWARD ST.
SKOKIE IL 60076

KENNETH LYNCH & SONS
P.O. BOX 488
WILTON CT 06897-0488

KESTER SOLDER COMPANY
515 EAST TOUHY AVENUE
DES PLAINES IL 60018-2675

LONE STAR LEAD CONSTRUCTION CO
P.O. BOX 24038
HOUSTON TX 77229

M.C. CANFIELD SONS
BOX 3100
UNION NJ 07083

MASTER METALS, INC.
2850 WEST THIRD STREET
CLEVELAND OH 44113

MAYFIELD MANUFACTURING CO.
P.O. BOX 19397
BIRMINGHAM AL 35219

METALLIC RESOURCES, INC.
P.O. BOX 177
TWINSBURG OH 44087

NEW ENGLAND LEAD BURNING CO.
P.O. BOX 607
WOBURN MA 01801

NORANDA SALES CORPORATION, LTD
ONE ADELAIDE ST, EAST STE 2700
TORONTO ONT M5C 2Z6 CANADA

O & C CORPORATION
P.O. BOX 681380
INDIANAPOLIS IN 46268

O.G. KELLEY & COMPANY
BOX 660
JOHNSON CITY TN 37601

PASMINCO METALS
GPO BOX 1291K
MELBOURNE VIC 3001 AUSTRALIA

PENOLES METALS & CHEMICALS INC
80 BROAD ST.
NEW YORK NY 10004-2203

QUENELL ENTERPRISES, INC.
5909 EAST RANDOLPH ST.
CITY OF COMMERCE CA 90040

REPUBLIC LEAD BURNING & EQUPT.
P.O. BOX 05070
CLEVELAND OH 44105

RSR CORPORATION
1111 WEST MOCKINGBIRD LANE
DALLAS TX 75247

SPORTING ARMS & AMMUNITION MFG
555 DANBURY ROAD
WILTON CT 06897

STAINED GLASS ASSN OF AMERICA
SIX S.W. SECOND STREET, #7
LEE'S SUMMIT MS 64063

SYNTHETIC PRODUCTS CO., INC.
20600 CHAGRIN BLVD. SUITE 801
SHAKER HEIGHTS OH 44122

THE DOE RUN COMPANY
11885 LACKLAND ROAD
ST. LOUIS MO 63146

THE G.A. AVRIL COMPANY
P.O. BOX 12050
CINCINNATI OH 45212

TROJAN BATTERY COMPANY
12380 CLARK STREET
SANTA FE SPRINGS CA 90670

VULCAN LEAD PRODUCTS
1400 WEST PIERCE STREET
MILWAUKEE WI 53204

Copper Facts

Copper is mined in many parts of the world, with the largest suppliers being Chile, the United States, the former USSR, Peru, Poland, Zaire and Zambia. There are more than 160 minerals known to contain copper. In the late 1990's, the annual world production was about 8 million metric tons.

Copper is used in electrical and plumbing applications, where its high resistance to corrosion and excellent electrical and thermal conductivity make it useful for wiring, pipes, condensers, radiators, and electrical components. The chemical uses include fungicides, textile dyes, timber preservatives, and as a catalyst in producing formaldehyde from methanol.

One of the largest open-pit mines in the world, the Berkeley Pit in Butte, Montana, was closed in 1982. However, an upturn in the economy starting in 1984 caused a partial reversal of the trend: by 1988, copper consumption in the U.S.A. had reached its highest point in a decade. Nearly 50% of the copper is reclaimed (recycled).

"Pure" copper generally has less than 1% of other elements, but even trace amounts can change the characteristics. Tough pitch ETP copper has a small amount of oxygen, which makes it slightly tougher but can cause it to become brittle when heated. De-oxidized copper, or silver-bearing copper, both withstand higher temperatures without becoming brittle. Copper has a tensile strength of about 32,000 psi, nearly 32 times greater than lead. The addition of small amounts of zinc, to produce a brass alloy, can increase the tensile strength to as much as 130,000 psi. Copper is made harder by mechanical work hardening (drawing, etc.).

Sources of Copper Alloys

Copper and its alloys are identified in North America by the Unified Numbering System (UNS), a five-digit number prefixed by the letter C, and managed by the American Society for Testing and Materials (ASTM) and the Society of Automotive Engineers (SAE). There are two broad classes of copper alloys: wrought (meaning, mechanically formed by drawing or rolling, as with tubing and sheets), and cast (as with pipes and ingots).

The UNS numbers from C10000 to C79999 are wrought alloys, while numbers from C80000 to C99999 are cast. Wrought products are those formed by mechanical methods such as rolling or drawing, such as tubing and sheet metal. These are the alloys used by bullet makers.

Copper No. C11000 (formerly CDA-110) or C10800 (MIL-B-20292) is a good starting point for tubing to be used for bullet jackets, although virtually any of the drawn tubing or rolled sheet products including gilding metal (C21000) or commercial bronze (C22000) are routinely used for jacket-making.

Straight, half-hard lengths of copper tubing are more easily cut to small pieces in a lathe, but annealed (soft) coiled copper tube can be used provided that the coils are large enough so the tubing isn't permanently kinked. Sheet copper should be the "non-earing" grade (an even, annealed temper with uniform grain) to reduce waste in deep draws.

Tubing is generally purchased direct from drawing mills and specialty tubing suppliers, generally in 200 to 500 pound lots, in 12 to 20 foot lengths, with walls of 0.025 to 0.125-inch thickness. Sheet strip is generally furnished in pancake coils, from 0.5-inch to 1.5-inch in width and from 0.030 to 0.080-inch thickness, 100 pounds per coil, in 500 pound shipments.

The Copper Development Association (CDA) is the principal trade association for the copper industry in the USA. A Standards Handbook can be purchased from the CDA at a nominal cost. Their address is: Copper Development Association, Inc., 2 Greenwich Office Park, PO Box 1840, Greenwich, CT 06836, phone (203)-625-8210, fax number (203)-625-0174.

Chemical Symbol:	Cu
Density:	.321 lbs/cu.-in. (8.96 gm/cc)
Melting Point:	1083.4° C.
Boiling Point:	2567° C.
Atomic Number:	29
Atomic Weight:	63.546

A.J. OSTER COMPANY
50 SIMS AVENUE
PROVIDENCE RI 02909

ACCURATE FORGING CORPORATION
201 PINE STREET
BRISTOL CT 06010

ADMIRAL METALS SERVICENTER CO.
P.O. BOX 349
TAUNTON MA 02780

ALASKAN COPPER WORKS
P.O. BOX 3546
SEATTLE WA 98124

AMPCO METAL INCORPORATED
P.O. BOX 2004
MILWAUKEE WI 53215

ANCHOR-HARVEY COMPONENTS INC.
600 LAMM ROAD
FREEPORT IL 61032

ANSONIA COPPER & BRASS, INC.
P.O. BOX 109
ANSONIA CT 06401

BRUSH WELLMAN INC.
17876 ST. CLAIR AVENUE
CLEVELAND OH 44110

CAMDEN WIRE COMPANY, INC.
12 MASONIC AVE.
CAMDEN NY 13316

CERRO COPPER PRODUCTS CO.
P.O. BOX 66800
ST. LOUIS MO 63166

CERRO METAL PRODUCTS CO.
P.O. BOX 388
BELLEFONTE PA 16823

CHICAGO EXTRUDED METALS CO.
1601 SOUTH 54TH AVENUE
CICERO IL 60650

COULTER STEEL & FORGE CO.
P.O. BOX 8008
EMERYVILLE CA 94662

CRITERION METALS INC.
44 QUAKER LANE
WARWICK RI 02886

EAGLE BRASS CO.
R.D. #1, BOX 1377
LEESPORT PA 19533-9605

ELKHART PRODUCTS CORPORATION
P.O. BOX 1008
ELKHART IN 46515

EXTRUDED METALS
302 ASHFIELD STREET
BELDING MI 48809

HALSTEAD METAL PRODUCTS
300 N. GREENE ST., SUITE 400
GREENSBORO NC 27401

HAMILTON PRECISION METALS
P.O. BOX 3014
LANCASTER PA 17604

HANDY & HARMON
P.O. BOX 610
FAIRFIELD CT 06430

HEYCO METALS INC.
P.O. BOX 620
READING PA 19605

HOWELL METAL COMPANY
P.O. BOX 218
NEW MARKET VA 22844

HUDSON INTERNATIONAL CONDUCTOR
62 WATER STREET
OSSINING NY 10562

HUSSEY COPPER, LTD
100 WASHINGTON STREET
LEETSDALE PA 15056

INCO ALLOYS INTERNATIONAL, INC
P.O. BOX 1958
HUNTINGTON WV 25720

KEARNY SMELTING & REFINING CO.
936 HARRISON AVENUE
KEARNY NJ 07029

LITTLE FALLS ALLOYS, INC.
171-191 CALDWELL AVENUE
PATERSON NJ 07501

LUCAS-MILHAUPT, INC.
5656 S. PENNSYLVANIA AVENUE
CUDAHY WI 53110

MCINNES STEEL COMPANY
441 EAST MAIN STREET
CORRY PA 16407-0901

MODINE HEAT TRANSFER INC.
415 EAST PRAIRIE RONDE
DOWAGIAC MI 49047

MUELLER BRASS COMPANY
1925 LAPEER AVENUE
PORT HURON MI 48060

NATIONAL COPPER & SMELTING CO.
3333 STANWOOD BLVD.
HUNTSVILLE AL 35811

NEW HAVEN COPPER COMPANY
P.O. BOX 455
SEYMOUR CT 06483

NGK METALS CORPORATION
P.O. BOX 13367
READING PA 19612-3367

NIBCO INC.
P.O. BOX 1167
ELKHART IN 46515

NORTHERN WIRE & STRIP MILLS
3333 SOUTH CENTRAL AVENUE
CHICAGO IL 60650

OLIN BRASS
427 NORTH SHAMROCK STREET
EAST ALTON IL 62024-1174

OUTOKUMPU AMERICAN BRASS CO.
P.O. BOX 981
BUFFALO NY 14240

OWL WIRE & CABLE, INC.
ROUTE 5, SENECA TURNPIKE
CANASTOTA NY 13032

PHELPS DODGE BAYWAY OPERATIONS
P.O. BOX 648
ELIZABETH NJ 07207

PLUME AND ATWOOD
235 EAST MAIN STREET
THOMASTON CT 06787

PRECISION TUBE COMPANY, INC.
WISSAHICKON AVE. & CHURCH ST.
NORTH WALES PA 19454

RATHBONE PRECISION METALS, INC
241 PARK STREET
PALMER MA 01069

READING TUBE CORPORATION
P.O. BOX 14026
READING PA 19612-4026

REVERE COPPER PRODUCTS, INC.
P.O. BOX 300
ROME NY 13440

SCM METAL PRODUCTS
11000 CEDAR AVENUE
CLEVELAND OH 44106

SCOTT BRASS, INC.
1637 ELMWOOD AVENUE
CRANSTON RI 02910

SEYMOUR SPECIALTY WIRE CO.
15 FRANKLIN STREET
SEYMOUR CT 06483

SMALL TUBE PRODUCTS, INC.
P.O. BOX 1674
ALTOONA PA 16603

SOMERS THIN STRIP
P.O. BOX 270
WATERBURY CT 06720

TALCO METALS CO.
5201 UNRUH AVENUE
PHILADELPHIA PA 19135

THE DRAWN METAL TUBE CO.
P.O. BOX 370
THOMASTON CT 06787

THE ELECTRICAL MATERIALS CO.
P.O. BOX 390
NORTH EAST PA 16428

THE LINDERME TUBE COMPANY
1500 EAST 219TH STREET
CLEVELAND OH 44117

THE MILLER COMPANY
99 CENTER STREET
MERIDEN CT 06450

THE NIPPERT COMPANY
801 PITTSBURGH DRIVE
DELAWARE OH 43015

THE WILKINSON COMPANY
P.O. BOX 4558
THOUSANDS OAKS CA 91359

TROJAN TUBE CO., INC.
P.O. BOX 496
FARMINGDALE NJ 07727

ULLRICH COPPER INC.
2 MARK ROAD
KENILWORTH NJ 07033

UNIFORM TUBE INC.
200 WEST SEVENTH AVENUE
COLLEGEVILLE PA 19426

VALLEYCAST INC.
P.O. BOX 1714
APPLETON WI 54913

WALTEC AMERICAN FORGINGS INC.
P.O. BOX 35
WATERBURY CT 06725-0035

WATERBURY ROLLING MILLS, INC.
P.O. BOX 550
WATERBURY CT 06720

WELDALOY PRODUCTS COMPANY
11551 STEPHENS DRIVE
WARREN MI 48089

WOLVERINE TUBE (CANADA), INC.
P.O. BOX 420
MONTREAL QB H1BSK4 CANADA

YOUNGSTOWN WELDING & ENG. CO.
P.O. BOX 2461
YOUNGSTOWN OH 44509-0461

Using the Bullet Maker List

Custom bullet makers may list specific calibers for dies which were owned at the time their listing was added, but most of them will consider making almost any caliber -- if you either cover the cost of tooling up for it, or need enough bullets to justify the investment.

Bullet makers can generally make almost any reasonable weight. Weight is a matter of adjustment, but it can also depend on available jacket lengths or tooling to produce them.

Custom shapes or diameters of bullets require different bullet swage dies. This can usually be adsorbed by the cost of a large enough order for bullets, but you might need to pay a tooling fee if your bullet isn't likely to be immediately marketable to other customers of the bullet maker. Alternatively, you could purchase the tooling for the bullet maker, and in exchange, he might make a certain quantity of bullets which would pay you for the tooling.

There are many creative ways you can work with small shops to get what you want. But it is always best to have a written agreement, not just a quick conversation, to pin down the details. Both parties need to understand clearly what will happen, and have some contingency plans to cover unexpected events so that the deal isn't left hanging with no clear resolution.

Agree in writing on the monetary value of goods and services being exchanged. That way, if something should happen that delays or stops the deal from happening the way it was supposed to, you both have good understanding and agreement of how to handle it from that point forward.

If you are ordering a bullet to try out an idea or for your own use, the quantity and future volume expectations are different than if you are ordering for resale in a business, where you expect that the market will grow so you can repeat the same orders into the future.

For your own use, you might buy one box, and possibly order another box once or twice a year. The bullet maker wants your order, of course, but he cannot afford to invest in special tooling and extensive development time to try and work out issues a custom design might raise. There are some custom features which are easy to do in small lots, and some which are not. You can always ask!

If you are developing a gun or ammunition in a business venture, then there may be good reason to hope that there will be future orders large enough to justify some tooling and development time. So in one case, your best option is to see what the bullet maker could produce that is close to what you want, even if not exactly the same. That will get it to you faster and cheaper than if you require specific features which may be just beyond the capability of current tooling or might require some development time to figure out just how to make the bullet as you specify it.

Another bullet maker might, perhaps, already be making a bullet quite similar to what you want, and would not have to ask for the additional amount of time or money to develop it. It can pay to ask more than one source.

So how do you find the right bullet maker? The answer is usually the telephone and the internet. Be up front and honest about what you want, and why. Maybe the bullet maker can suggest an alternative way to achieve your goal that is quicker and less expensive.

It helps if you can provide information about what you want the bullet to accomplish. If it is for hunting heavy boned, thick skinned game at close range, the bullet maker may have a better design for that purpose than if it is for shooting targets at long range. If it is for use in a high velocity, high pressure handgun rather than for the same caliber in a lightweight pocket pistol, the bullet maker can save time and provide better results by knowing that up front.

The range and velocity at impact has a lot to do with performance. The most important thing, of course, is whether or not the bullet will even fit, feed, and stabilize using the particular gun and cartridge you intend to load. The best design in the world is useless if it is too long for your firearm's action or rifling twist. You may have it all figured out, but it never hurts to get a second opinion in case there is something you forgot!

Many custom bullet makers don't do much advertising. They can be hard to find. It is surprising how fast social media can put you in contact with the right person. Also a bit surprising how much wrong information based on nothing but hearsay and unfounded opinion is offered as if it were proven fact, so be sure to check before believing everything you find on blogs and chat boards.

Some bullet makers list calibers offered, others make almost any caliber if the order is sufficient to cover the tooling. Bullet makers often add more calibers. Some move without updating their info, or change careers, or even pass away, so a printed list gets out of date before the ink is dry. But this list will have enough current contacts to help you in most cases. If not, call and ask Corbin for a new name or two. New bullet makers are constantly setting up business every week. Check Corbin's web site for what may be a more up to date listing (easier to add names, sooner, than in printed materials).

BILL BOND
007 CUSTOM BULLETS
1824 EVERGREEN AVENUE
MODESTO CA 95350-3766
USA
Phone: 209-577-1249

BRENT HUNSUCKER
406 BULLETS
PO BOX 476
5348 FLORENCE CARLTON LOOP
FLORENCE MT 59833
USA
Phone: 406-880-2901 Fax: 406-273-6405
E-Mail: forilla1@gmail.com
Calibers offered:
308 458 510

JONATHAN ABERLE
ABERLE BULLETS
16121 RANGE ROAD 13
CYPRESS COUNTY ALTA T0J 3B0
CANADA
Phone: 403-952-5942
E-Mail: jonathanaberle@hotmail.com
Calibers offered:
3079 308 338

AL LUNDY
ABLE BULLET CO.
1025 N INSTITUTE PLACE
PEORIA IL 61606
USA
Phone: 309-339-1652
E-Mail: burelsonlundy@hotmail.com
Calibers offered:
224 308 338 348 352 510

PETER RIZZI
ACCURATE BULLET CO
1290 70TH ST SE
PO BOX 573
SALMON ARM BC V1E 4N7
CANADA
Phone: 250-803-1762 Fax: 250-832-8717
Calibers offered:
512

MARK REDMAN
AIM BULLETS
PO BOX 8675
IMPANGENI RAIL 3910
SOUTH AFRICA
Phone: 27824528555
E-Mail: dactaloid@gmail.com
Calibers offered:
355 400

JAY MCCORMICK
AJAY BULLETS
115 MAIN ST W
EAGLE POINT OR 97524
USA
Calibers offered:
308 357 416 452

MIKE MURRAY
ALASKA BULLET WORKS
9978 CRAZY HORSE DR
JUNEAU AK 99801
USA
Phone: 907-789-3834 Fax: 907-789-3433

KEITH SAWYER
ALASKA BULLET CO
10201 JAMESTOWN ST #101
ANCHORAGE AK 99507
USA
Phone: 907-249-7071

BILL SHEPEK
ALCO BULLETS
4377 EAST SERENADE PLACE
SPRINGFIELD MO 65809
USA
Phone: 417 331 2100
E-Mail: bill.shepek@alcobullets.com
Calibers offered:
224 264 284 308 338 452
509

ALAN ROLAND
10325 W. CHERYL DRIVE
SUN CITY AZ 85351
USA
Phone: 253-606-7444
E-Mail: swage62@hotmail.com
Calibers offered:
224 264 284 308 338 375
429 452 458

BRADLY HUNT
ALKALI INTERNATIONAL CORP
600 HARRY DR
WINNEMUCCA NV 89445
USA
Phone: 775-625-2413 Fax: 775-625-2413
Calibers offered:
224 452 50

JEFF MULLINS
ALLEGIANCE AMMUNITION
182 CAMP JACOB
CLINTWOOD VA 24228
USA
Phone: 276 639 6884 Fax: 276-926-5565
E-Mail: jm.allegiance@gmail.com
Calibers offered:
1256 181 1815 218 219 2220
2225 2230 2235 2239 224 2240
2245 225 277 308 3080 311
312 352 3545 355 357 363
375 40 400 401 429 450
451 452 458 510

TERRY ALLRED
ALLRED BULLET COMPANY
932 EVERGREEN DRIVE
LOGAN UT 84321-3611
USA
Phone: 801-752-6983

ROELF VORSTER
PATRIOT ARMS
AMBLEDOWN 2
25 CEDARBERG WAY
DURBANVILLE HILLS
CAPE TOWN 7550
SOUTH AFRICA
Phone: 27833990843
E-Mail: vorster.roelf@gmail.com
Calibers offered:
217 218 2510 3015

WILLIAM H. WALTER, JR.
AMERICAN AMMO CRAFTERS
PO BOX 1992
GRANTS PASS OR 97527
USA
Phone: 503-474-1808
Calibers offered:
355 400 429 452

PETER DOMBKOWSKI
AMERICAN BULLET COMPANY
191 FELDMAN STREET
PALM BAY FL 32909
USA
Phone: 321-506-8059 Fax: 888-552-9586
E-Mail: dakota32908@yahoo.com
Calibers offered:
224 357 40 452

TOM RONNBERG
ARCHIPELAGO BULLETS LTD.
HUMALAKORVENTIE 277
SYSMA SF-19700
FINLAND
Phone: 358-414353620 Fax: 358-3-7176363
E-Mail: tom.ronnberg@phnet.fi

JOHN HARRIS
ARIZONA BULLET CASTERS
1375 E. OXBOW CIRCLE
PAULDEN AZ 86334
USA
Phone: 928-710-4246 Fax: 928-636-0851
E-Mail: annjhn3@aol.com
Calibers offered:
243 264 308 338 452 510

FLORENCIA DI PASQUO
ARMERIA
FITZ ROY 2011
CAPITAL FEDERAL 1414
ARGENTINA
Phone: 54-773-7613

JIM ARMFIELD
ARMFIELD CUSTOM BULLETS
10584 COUNTY RD 100
CARTHAGE MO 64836
USA

DOUGLAS HUNTER
AUTOMATIC EQUIP SALES
627 E RAILROAD AVE
SALISBURY MD 21801
USA

CHARLES D AVERY
AVERY BULLETS
PO BOX 784
SUPERIOR MT 59872
USA
Phone: 406-822-3889

RICHARD DENN
B&R BULLETS, LLC
8098 THUNDERHEAD AVE
WHITE CITY OR 97503
USA
Phone: 831-6977
Calibers offered:
204 224 308 338 355

BARNES BULLETS
38 N FRONTAGE RD
MONA UT 84645
USA
Phone: 435-856-1109 Fax: 801-756-2465
E-Mail: sales@barnesbullets.com

LINDY BARREN
BARRON BULLEYE BULLETWORKS
PO BOX 181
UNIDILLA GA 31091
USA
Phone: 912-627-3001 Fax: 912-987-3335

ROGER BAUMGARTNER
BAUMGARTNER BULLETS
3011 S ALANE ST
WEST VALLEY CTY UT 84120
USA
Phone: 801-969-6704

OSCAR H. WILLIAMS, JR.
BEAR PAW MFG. CO., INC.
PO BOX 0465
NEWPORT WA 99156-0465
USA
Phone: 509-447-5278
Calibers offered:
355 357 366 375 400 429
452 470 475 500

TED BELL
BELL RELOADING INC.
1725 HARLIN LANE RD
VILLA RICA GA 30180
USA
Phone: 404-459-6624

BEN DYBALA
BEN DYBALA GUN SHOP
PO BOX 1024, FM3156
BAY CITY TX 77414
USA
Phone: 409-245-0866

WALT BERGER
BERGER BULLETS LLC
4275 NORTH PALM STREET
FULLERTON CA 92835
USA
Phone: 714-441-7200
E-Mail: sales@bergerbullets.com

LES BACON
BIFFS BULLETS
7 KERN GREEN, STONEHAUGH
HEXHAM
NORTHUMBERLAND NE48 3DZ
ENGLAND
Phone: 441434230401
Calibers offered:
284

DOUG VAN WINGERDEN
BIG BORE BULLETS OF ALASKA
PO BOX 521455
BIG LAKE AK 99652
USA
Phone: 907-892-3684
E-Mail: doug@mtaonline.net

SCOTT BOGER
BIG DAWG BULLET CO.
2032 MARTHA ELLEN ROAD
YADKINVILLE NC 27055
USA
Phone: 336-463-2323
E-Mail: gundoc5866@hotmail.com
Calibers offered:
451

JAMES J. REARDON
BIG DOG BULLETS
PO BOX 1270
GRANDVIEW TX 76050
USA
Phone: 972 342 9136
E-Mail: jjr@pcs-pressdata.com
Calibers offered:
264 308

RICK CHAMBERS
BIG PAW BULLETS
6172 QUINELLA WAY
CENTERVILLE OH 45459-2422
USA
Phone: 937-436-0395

DEREK BINGHAM
BINGHAM BROS. BULLETS
41114 SOUTH 540 RD
EUCHA OK 74342
USA
Phone: 918-253-4444
E-Mail: binghambullets@yahoo.com
Calibers offered:
40

WILLIAM CASSETT
BISON BULLETS
1727 HWY 32
BOLIVAR MO 65613
USA
Phone: 417-326-8176

BLACK HILLS AMMUNITION INC.
PO BOX 3390
RAPID CITY SD 57709-3090
USA
Phone: 605-348-5150 Fax: 605-348-9827
E-Mail: sales@black-hills.com

BLACK WIDOW BULLET CO
6373 BILL LUNDY RD
LAUREL HILL FL 32567
USA
Phone: 256-453-0746 Fax: 256-835-9124

JACK DEROSIER
BLUE MOUNTAIN BULLETS
64146 QUAIL LANE
JOHN DAY OR 97845
USA
Phone: 541-820-4594
Calibers offered:
224 243 257 264 270 277
284 308 338 358 375

GORD WILSON
BLUE POINT MFG. CO.
RR 1 BARB RD
VAN KLEEK HILL ONT K0B 1R0
CANADA
Phone: 613-674-2550

JACK COLEMAN
BLUEBONNET SPECIALTY
PO BOX 737
PALESTINE TX 75802
USA
Phone: 214-723-2075

WILLIAM LEFEBVRE
BOUNDARY BULLETS
6437 WESTSIDE RD
BONNERS FERRY ID 83805
USA
Phone: 208-255-9304
Calibers offered:
257 264

BILL BRAWAND
BRAWAND BULLETS
2529 RASSELAS RD
WILCOX PA 15870
USA
Phone: 814-929-5424 Fax: 814-929-5245
E-Mail: william@brawand.com
Calibers offered:
264

BRUCE WM. SHAY
BRUCE WM. SHAY'S GUNSMITHING
931 MARVIN AVE
LEBANON PA 17042
USA
Phone: 717-272-0735
ANDREAS HUEGEL

BSE BULLET SWAGING ENTHUSIASTS
IM SCHLEUSENFELD 5
GROSSENWOERDEN 21712
GERMANY
Phone: 477-589-1102 Fax: 477-589-1101
Calibers offered:
222 243 2435 308 314 355
356 357 358 433 4505 451
452 454

HELMUT SAKSCHEK
BUCK-STIX— SOS PRODUCTS
PO BOX 3
NENAH WI 54957-0003
USA
Phone: 920-450-0723
E-Mail: buckstix@aol.com
Calibers offered:
2895 416 424

GREG MARTZ
BUCKEYE CUSTOM BULLETS
6490 STEWART RD
ELIDA OH 45807
USA
Phone: 419-641-4463

HAROLD STIENKE
BUCKHORN BULLETS
406 W BROADWAY ST
GAINESVILLE TX 76240
USA
Phone: 940-665-2289

J. LOWE BARTON
BUCKSKIN BULLET CO.
PO BOX 1893
CEDAR CITY UT 84721
USA
Phone: 801-586-3286

RON DAHLITZ
BUFFALO BULLET CO.
12637 LOS NIETOS RD, UNIT A
SANTA FE SPRINGS CA 90670
USA
Phone: 562-944-0322 Fax: 562-944-5054

MICHAEL S BOAZ
BULLDOG BULLETS
537 N 6TH ST
MIDDLETOWN IN 47356
USA
Phone: 317-354-6625

PRESTON CARR
BULLETS BY CARR
PO BOX 214
DALLESPORT WA 98617
USA
Phone: 509-767-1687

R G HENSON
BULLETTS BULLETS
893 GRIFFIN RD N W
CARTERSVILLE GA 30120
USA
Phone: 770-366-4846
E-Mail: bullett33@gmail.com
Calibers offered:
338

ROSS J. BUSCH
BUSCH BULLETS
2 FORTH CRESCENT
HAMILTON
NEW ZEALAND

CARL DODSON
C&J AIR PELLETS CO.
259 KELLOGG STREET
DELTA CO 81416
USA
Phone: 970-216-7017
E-Mail: biker_2@g.com
Calibers offered:
174 177 178 216 217 218
22 220

C BANACZKOWSKI
C.B.EXPLOSIVES ENG. SERVICES
56 VICTORIA RD
MOUNT BARKER SA 5251
AUSTRALIA

ROY CAMPBELL
CAMPBELL CUSTOM BULLETS
16133 N SADDLEWOOD
9 MILE FALLS WA 99026
USA

JAMES CANNINGTON
CANNINGTON CUSTOM BULLETS
4110 ACACIA DRIVE
COLUMBUS GA 31904
USA
Phone: 706-327-6949

EDWARD BECKER
CAPSTAN BULLETS
KATSPRUIT
DE DOORNS, WESTERN CAPE 6875
SOUTH AFRICA
Phone: 023-356-3425
Calibers offered:
277 284 30

DON CARNAHAN
CARNAHAN BULLETS
17645 110TH AVE SE
RENTON WA 98055
USA
Phone: 206-255-1204

GENE LEWIS
CASCADE BULLET CO
413 MAIN ST
KLAMATH FALLS OR 97601
USA

CHARLES BURLING
CHARLES W. BURLING CO.
306 RANGE ST
ELIZABETHTON TN 37643
USA
Phone: 615-542-8162

H C PURCELL
CHETS CUSTOM CARTRIDGES
2915 SUSSEX AVE PO BOX C
TENINO WA 98589
USA

KEN CHIASSON
119 DOYLEVILLE RD
LORNE NB E8G1H2
CANADA
Phone: 506-237-2933
Calibers offered:
224 243 308 400

WAYNE MCLEMORE
CHILLAWACK BULLET CO
2209 E MARYLAND ST
BELLINGHAM WA 98226
USA
Phone: 206-676-9717

DALE JANZEN
CHINCHAGA BULLETS
5914-58 AVE
PONOKA ALTA T4J 1L9
CANADA
Phone: 780-618-8896 Fax: 780-618-2038
E-Mail: chinchagabullets@hotmail.com
Calibers offered:
224 243 25 257 264 277
284 308 311 338 357 375
510

LARRY MARLAR
CIRCLE M CUSTOM BULLETS
2718 BUTTON WILLOW PKWY
ABILENE TX 79606
USA
Phone: 915-698-3106

JOE ALBRIGHT
CLEARWATER CUSTOM BULLETS
PO BOX 1487
KAMIAH ID 83536
USA
Phone: 208-935-1024
E-Mail: joekmo310@hotmail.com
Calibers offered:
308

CLIVE WILLIAMS
CLIVEJAN INVESTMENTS
3 PARFAIT COURT
WANTINA SOUTH VICT 3152
AUSTRALIA
Phone: 613-221-7024

JOHN ALTIZER
CMA CUSTOM AMMUNITION LLC
1302 FORRESTAL DRIVE
FORT COLLINS CO 80526
USA
Phone: 970-310-1794 Fax: 970-797-4736
E-Mail: john@cmacustomammo.com
Calibers offered:
224 355 401 405 428 429
452 50 510

C.H. PERDUE
COLORADO BONDED BULLETS
7910 BLUE GILL
FALCON CO 80831
USA
Phone: 719-683-3575
E-Mail: chperdue@elpasotel.net
Calibers offered:
224

CHARLES MATEJKA
COMPANY FIREWOOD AND BULLETS
18721 EAST EVANS CREEK
ROGUE RIVE OR 97537
USA
Phone: 503-826-9526

BARRY ATWOOD
CONDOR BULLETS LLC
44277 ARAPAHO TERRACE
ASHBURN VA 20147
USA
Phone: 703 723 9395 Fax: 540 436 8337
E-Mail: barrydatwood@verizon.net
Calibers offered:
264 308 401 4010 403 4512
4515

GEORGE MORTIMER
CONDOR BULLETS
116 N PLAYERS CLUB DR
TUCSON AZ 85745
USA
Phone: 520-260-9739 Fax: 928-638-7874
E-Mail: geomort@cox.net
Calibers offered:
224 308 315 355 357 358
400 429 452

GORDON COOK
COOK ENGINEERING SERVICE
891 HIGHBURY RD
VERMONT SOUTH VICT 3133
AUSTRALIA
Phone: 643-803-6957
Calibers offered:
354

KEVIN MAZZA
COPPER BOND BULLETS
12834 W. REDONDO DRIVE
LITCHFIELD PARK AZ 85340
USA
Phone: 623-536-9682
E-Mail: k.mazza@att.net

TOM KIZIS
COPPERHEAD CUSTOM SWAGING
2187 S PALO VERDE DR
APACHE JUNCTION AZ 85120
USA
Phone: 480-983-3202
E-Mail: apchjctkizis@hotmail.com
Calibers offered:
264 448 452 459 500 510

COR-BON CUSTOM BULLETS
1311 INDUSTRY RD
STURGIS SD 57785
USA
Phone: 800-626-7266 Fax: 605-347-5055
Calibers offered:
500 10mm 264 270 284 308
312 338 357 358 375 416
423 429 4290 451 452 4520
458 475 50 512 7mm

GARY CORBIER
CORBIER CUSTOM BULLETS
309 E WASHINGTON
O'FALLON IL 62269
USA
Phone: 618-632-4524

V CORNELL
2 PARKSHIEL,CLEADON PARK
SOUTH SHIELDS
TYNE & WEAR NE348BU
ENGLAND
Phone: 091-455-4300

RALPH COUNCIL
COUNCIL BULLETS
30611 MCKINNEY
TOMBALL TX 77375
USA
Phone: 281-351-2349

RALPH CUMMINGS
PO BOX 1032
WINSTON OR 97496
USA
Phone: 619 871 4211
E-Mail: ralph1325cummings@gmail.com
Calibers offered:
224

GEORGE HOFFMAN
CUSTOM BULLETS BY HOFFMAN
2604 PECONIC AVE
SEAFORD NY 11783
USA

DANIEL J. SMITCHKO
CUTTING EDGE BULLETS
75 BASIN RUN RD
DRIFTING PA 16834
USA
Phone: 814-345-6690 Fax: 814-345-6506
E-Mail: djsmitchko@cuttingedgebullets.

BROOKE VAUGHAN
CX BULLETS
3039 TRELLE CRESCENT
EDMONTON ALTA T6R 3M9
CANADA
Phone: 780-934-9860
E-Mail: cxbullets@hotmail.com
Calibers offered:

224	284	308	311	312	355
357	375	430	452		

BUTCH HAIRFIELD
DBCS
PO BOX 947
ANTLERS OK 74523
USA
Phone: 214 608 5111
E-Mail: butchhdh@ix.netcom.com
Calibers offered:

172	177	2030	2155	218	250
251	2510	338	3575	4105	452
454	458	509	510	5105	5110

PAUL DEGOL
SLANGBEEKWEG 43
ZONHOVEN B-3520
BELGIUM
Phone: 321-122-9510 Fax: 321-122-9510

JON BRETAG
DELTA CO. AMMO BUNKER
1209 16TH PLACE
YUMA AZ 85364
USA
Phone: 602-783-4563

JOHN R. BAINER
DELTA FRANGIBLE AMMUNITION LLC
PO BOX 2350
STAFFORD VA 22555-2350
USA
Phone: 703-416-4928 Fax: 540-720-5667

DAVID HOLTZ
DHX BULLETS, LLC
6479 INLAND SHORES DR
MENTOR OH 44060
USA
Phone: 440-391-3216 Fax: 440-398-0307
E-Mail: dholtz@yahoo.com
Calibers offered:
224

JAMES BOHLER
DIAMONDBACK CUSTOM BULLET FAB.
761 PINTO CIRCLE
GARDNERVILLE NV 89410
USA
Phone: 775-410-0947 Fax: 775-267-5386
E-Mail: diamondbackcbf@gmail.com
Calibers offered:
308 429 452

CHUCK RICHARDSON
DKT INC.
14623 VERA DRIVE
UNION MI 49130
USA
Phone: 800-741-7038 Fax: 616-641-2015

DONALD BURKLOW
DOUBLE EAGLE BULLETS
3129 CALLE ABAJO RD # 108
SAN DIEGO CA 92139
USA

BILL CASH
DOUBLE-TAPP BULLETS
205 WISSAHICKON TR
BROWNS MILLS NJ 08015
USA
Phone: 609-893-4554
Calibers offered:
284 458

DANIEL DOUGHTON
DOUGHTON BULLETS
2520 WEBER RD
PALM BAY FL 32905
USA
Phone: 305-723-5437

TOM DREYLING
DREYLING CUSTOM BULLETS
1630 PAYNE AVE
ST PAUL MN 55130
USA
Phone: 651-774-8222

MIKE STEVENSON
DUGGA BOY BULLETS, LLC
154 TIMBER COVER
POPLAR BLUFF MO 63901
USA
Phone: 573-429-0887 Fax: 573-778-7137
E-Mail: mjstevensondo@yahoo.com
Calibers offered:
224 243 264 277 308 338
348 358 366 375 416 423
429 440 448 452 458 475
490 505 510

LYNN GODFREY
ELK MOUNTAIN
1600 N. MAVERICK CIRCLE
PAYSON AZ 85541
USA
Phone: 928-863-0123
E-Mail: lynnandag@gmail.com
Calibers offered:
308

ANTONY MULVIHILL
EUREKA BULLETS
HILL HOUSE
TAYLORS ARM. NSW 2447
AUSTRALIA

GERALD SPRINGER
FAR NORTH OUTFITTERS
BOX 1252
BETHEL AK 99559
USA

DARRYL MESSNER
FAT BODY BULLETS
535 CENTER ST
LYKENS PA 17048
USA
Phone: 570-573-4595
E-Mail: gmhaven@comcast.net
Calibers offered:
308 375 410 429 510

PABLO FIERRO-CANSECO
CALLE BANOS 45-70
ALBACETE 02005
SPAIN
Phone: 612-673-9459 Fax: 346-750-3988
Calibers offered:
357

HARRY M. LOGAN
FIRE MOUNTAIN BULLETS
PO BOX 745
HONOKAA HI 96727
USA
Phone: 808-776-1644 Fax: 808-776-1731

DAVID WILLIAMS
FOUR-W INC.
RT 1 BOX 313
TIOGA TX 76271
USA
Phone: 817-437-2228 Fax: 817-437-2458

LUKAS FOUCHE
FRONTIER BULLETS
46 EYBERS STREET
KLERKSDORP, NORTH WEST PROV. 2570
SOUTH AFRICA
Phone: 0713429116 Fax: 0835175858
E-Mail: andries.niemandt91@gmail.com
Calibers offered:
308

DENNIS KAUTZ
FURY BULLET CO
2728 GARDNER LINE RD
CROSWELL MI 48422
USA
Phone: 810-404-2973
E-Mail: dtll@greatlakes.net
Calibers offered:
312 355 357 358 366 40
400 4005 402 410 426 430
450 452 458 475 500 510
570 600 615 729 900

ELI CRANDALL
GALLANT BULLETS
2675 WEST 2365 SOUTH
SUITE 4
WEST VALLEY CITY UT 84119
USA
Phone: 801-970-2600 Fax: 801-792-5106
E-Mail: eli@gallantbullets.com
Calibers offered:
264 284 308 357 40

ED J GARDINER
GARDINER PRECISION
65 DONNINGTON ST
CARINDALE QSLD 4152
AUSTRALIA
Phone: 07-398-2027

JOE GATES
1109 NEANS DRIVE
AUSTIN TX 78758
USA

GARY BRENNER
GEB CO. FIREARMS
1428 PAULETTE AVE
MODESTO CA 95355
USA

N W GENNETT
GENCO SPECIALTY AMMUNITION INC
8 BROOK FOREST DR
ARDEN NC 28704
USA
Phone: 828-684-5797 Fax: 828-684-5748

JOHN GANNAWAY
GENERAL LEAD INC.
1022 GRAND AVENUE
PHOENIX AZ 85007
USA
Phone: 602-271-4964

LEE LANDICE SR.
GOLDEN BEAR BULLETS
3065 FAIRFAX AVE
SAN JOSE CA 95148 3522
USA
Phone: 408-238-9515 Fax: 408-988-2659

BARRY G GREEN
GOLDEN EAGLE BULLET WORKS
PO BOX 11
LONE BUTTE BC V0K1X0
CANADA
Phone: 250-395-3081
E-Mail: barry@goldenEagleBulletworks.c

J HOLLINGSWORTH
GRANITE CUSTOM BULLETS
BOX 190
PHILIPSBURG MT 59858
USA
Phone: 406-859-3245

SEMEN GRITSA
PIROGOVA 1B/13
KHUST, TRANSKARPATION REGION 90400
UKRAINE
Phone: 380 982998395
E-Mail: activsonar@gmail.com
Calibers offered:
308 311

MIKE RINTOUL
GRIZZLEY BULLETS
30201 CARMEL ROAD
RAINIER OR 97048
USA
Phone: 503-556-1642

BRUCE MCMILLAN
GRIZZLY VALLEY BULLETS
BOX 21179
WHITEHORSE YUKN Y1A 6R1
CANADA
Phone: 867-633-3602
E-Mail: brucemcmillan@mac.com
Calibers offered:
17 257 308 358 408 454
457 458 510 585

JOSEPH SKELTON
GUNNUTJOE
1618 CRANBERRY ROAD
GALAX VA 24333
USA
Phone: 276-233-8779
E-Mail: gunnutjoe@gmail.com
Calibers offered:
264 308 452

DUKE HAYES
H & B BULLETSMITHS
PO BOX 725
229 HUCKLEBERRY MTN. LANE
RIDDLE OR 97469-0725
USA
Phone: 541-784-5106
E-Mail: duke.hayes8@gmail.com
Calibers offered:
224 308 356 452 458 503
510 678

MARK HANSEN
HANSEN CUSTOM BULLETS
3221 SHELLEY ST
MOHEGAN NY 10547
USA

DAREL HANSEN
HANSEN'S BULLETS
602 ADDISON SQUARE
KALISPELL MT 59901
USA

STERLING HARRIS
HARRIS ENTERPRISES
4318 WINTER AVE
KLAMATH FALLS OR 97603
USA
Phone: 541-891-1176
Calibers offered:
243

ALEXANDER E HARRISON
HARRISON BULLET WORKS
7570 E SPEEDWAY BLVD 149
TUCSON AZ 85710
USA
Phone: 520 991 2125
E-Mail: azharrison@gmail.com

BOB FULTON
HAWK LABS INC.
PO BOX 1843
GLENROCK WY 82637
USA
Phone: 307-436-5561

OLAV JOHAN HEIDENSTROM
DALGATE 8 C
RJUKAN 3660
NORWAY
E-Mail: olav.jon@online.no
Calibers offered:
218 224 257 308 312 357
452

TED DAVIS
HELLS EXPRESS BULLETS
655 SOUTH 400 EAST
OREM UT 84058
USA
Phone: 801-255-0285

MARK NOTTER
HIGH SCORE BULLET CO
5845 TIMBER LAKE BLVD
INDIANAPOLIS IN 46280-0271
USA
Phone: 317-783-4838 Fax: 317-783-3909
E-Mail: marknott@aol.com
Calibers offered:
224 308

REX MILLER
HITECH BULLETS INC
2033 HAMILTON ROAD
COLUMBUS GA 31904
USA
Phone: 706-322-3756 Fax: 706-596-8552
E-Mail: ramiller@knology.net

ROBERT HOBSON
HOBSON CUSTOM BULLET MFG
RT 1 BOX 220-C
BRENT AL 35034
USA
Phone: 205-926-4662

HUGO HSU
218 MORLYN RD RD
BRYN MAWR PA 19010
USA
Phone: 610-525-7183

J.T. WHEELER
HURRICANE, INC.
10521 JARDINE AVE
SUNLAND CA 91040
USA
Phone: 818-859-4412 Fax: 818-352-2927
E-Mail: jtwheeler@deadfishlead.com
Calibers offered:
217 2485 250 251

RICHARD WILLIAMS
J R WILLIAMS BULLET CO
2008 TUCKER RD
PERRY RD GA 31069
USA
Phone: 912-477-2050

TOM TURTON
J.G. & J. TURTON
134 PUTTY RD
WILBERFORCE NSW 2756
AUSTRALIA
Calibers offered:
314 320 366

STEVE JESTER
JESTER BULLETS
RT 1 BOX 27
ORIENTA OK 73737
USA

JAMES KNOX
JIM'S RELOADS & SUPPLIES
2616 WESCO DR
MADISONVILLE KY 42431
USA
Phone: 502-821-4136

JOHN GOTZ
JOHN L. GOTZ BULLETS
7313 ROGERS ST
ROCKFORD ILL 61111
USA

RANDALL MORGAN
K3R PRECISION BULLETS LLC
31 LEWALLEN DR
NEWPORT NEWS VA 23608
USA
Phone: 757 969 1455
E-Mail: morgan3@cox.net
Calibers offered:
224 284 308 355 357 452

JOHN KASMARSIK
4017 7TH ST SW
APT B
PUYALLUP WA 98373-5942
USA
Phone: 253-848-0524
Calibers offered:
224 452

GEOFFREY BAKER
KATS BULLETS
PO BOX 1652
CARINDALE QSLD 4152
AUSTRALIA
Phone: 61733424842
E-Mail: g.baker@qmi.asn.an

KEN FOLTZ
KEN'S KUSTOM KARTRIDGES
331 JACOBS RD
HUBBARD OH 44425
USA
Phone: 216-534-4595

D AURAND
KEYSTONE BULLETS
RD 1 BOX 312
NEW BLOOMFIELD PA 17068
USA
Phone: 717-582-8347

MERRLIN KITZMILLER
KITZMILLER'S KUSTOM BULLETS
360 2ND AVE
GALION OH 44833-2810
USA
Phone: 419-468-5219

BRIAN SOUTHARD
KODIAK CUSTOM BULLETS
8261 HENRY CIRCLE
ANCHORAGE AK 99507
USA
Phone: 907-349-2282

BRIAN NAKASHIMA
KONA RELOADS
PO BOX 1178
KEALAKEKUA HI 96750
USA
Phone: 808-323-2757
E-Mail: bnakashima@hawaii.rr.com
Calibers offered:
308

COLIN LAMPSON
KRAKEN BALLISTICS, LLC
2136 GOLFVIEW AVE
KALAMAZOO MI 49001
USA
Phone: 269-366-5621 Fax: 269-569-0558
E-Mail: c.lampson@krakenballistics.com
Calibers offered:
264 308

JAMES LA COUNT
KUSTOM KAST BULLETS
18533 ROSCOE BLVD S.137
NORTHRIDGE CA 91324
USA
Phone: 818-705-8497

DAN WAGLER
LAKE HILL CUSTOM BULLETS
3328 HIGHLAND DR
ISLAND LAKE IL 60042
USA
Phone: 847-935-5997 Fax: 847-487-2114
E-Mail: dwagler.wac@worldnet.att.net

PETER TARAN
LEAD AND BRASS BULLETS
9165 LEDGEMONT DR
BROADVIEW HTS. OH 44147
USA
Phone: 440-263-6180 Fax: 440-590-1213
E-Mail: peter@leadandbrass.com
Calibers offered:
308 355 500 510

DOUGLAS DRENTH
LEADFISTSLUGS LLC
4831 STONE GATE BLVD.
AKRON OH 44333
USA
Phone: 330 687 2200
E-Mail: leadfistslugs@gmail.com
Calibers offered:
217 250 300 457

LEHIGH DEFENSE
130 PENN AM DRIVE
SUITE D
QUAKERTOWN PA 18951
USA
Phone: 215-536-4100 Fax: 267-373-7876
E-Mail: jsm491@yahoo.com
Calibers offered:
308

STEVE HART
LONG RANGER BULLET CO.
PO BOX 1656
PENDLETON OR 97801
USA
Phone: 541-377-1174
E-Mail: sands32@oregontrail.net

CRAIG LYMAN
14708 W PECOS LANE
SUN CITY WEST AZ 85375
USA
Phone: 360 608 0085
E-Mail: clyman45@gmail.com
Calibers offered:
224 308 357 358 400 401
410 411 429 448 452 454
458 510 511 585

ARTHUR MCCOY
M & M CUSTOM BULLET CO
BOX 327
ELMORA PA 15737
USA
Phone: 814-948-7328

COLIN MACBETH
MACBETH PROJECTILES
PO BOX 105
COROMANDEL
NEW ZEALAND
Phone: 647-866-6766

JAMES MACKENZIE
PO BOX 1519
MERLIN OR 97532
USA
Phone: 541 479 3170

BILL OHLIGSCHLAEGER
MAESTRO BULLETS
4112 E. WINSLOW AVE.
PHOENIX AZ 85040
USA

KENNETH RHOADES
MANTIS BULLETS & ARMS
8106 S ARTESIAN
CHICAGO IL 60652
USA
Phone: 312-476-0892

RON MARCHMON
MARCHMON BULLETS
123 TIMBER LANE
KUTTAWA KY 42055
USA
Phone: 270-388-5687
E-Mail: ronmarchmon@yahoo.com
Calibers offered:
264

STEVE BAARDSEN
MATRIX BALLISTICS LTD
895 DEVER DRIVE
KAMLOOPS BC V2B6P9
CANADA
Phone: 250-579-0181
E-Mail: avanti@shaw.ca

TIM MCCANDLESS
93 ASH SWAMP RD
SCARBOROUGH ME 04074
USA
Phone: 207-883-5350
E-Mail: blackwatch54@hotmail.com
Calibers offered:

224	357	358	450	453	500
503	512	540	543	580	683

MIKE MCCARTY
MCCARTY BULLETS
2812 N 3RD TERRACE
BLUE SPRINGS MO 64015
USA
Phone: 417-623-8907

RON MILLER
MILLER ENTERPRISES INC
1557 E MAIN ST
BROWNSBURG IN 46112
USA
Phone: 317-852-8187

AMIR JAFFER
MONGASO WILD LIFE SAFARIS
PO BOX 67641, STATION O
VANCOUVER BC V5W 3V1
CANADA
Phone: 604-433-4748

RUSSELL M. DUGDALE
MONTANA PRECISION SWAGING
PO BOX 4746
BUTTE MT 59702-4746
USA
Phone: 406-494-0600
E-Mail: MtPrecSwaging@bigskyhsd.com
Calibers offered:

399	406	430	440	450	451
475	500	510			

ANDREW WADSWORTH
MONTANA PROJECTILE
121 BELAIR DRIVE
PINEHURST ID 83850-9781
USAFax: 620-680-1335
E-Mail: montanaprojectile@msn.com
Calibers offered:

224	243	277	284	308	338
355	357	375	400	410	429
452	458	500			

JOE MYRICK
MYRICK CUSTOM BULLETS
10834 UNION STREET
CHERRY VALLEY CA 92223
USA
Phone: 714-845-2901

KENNETH E. NAGEL
NAGEL'S CUSTOM BULLETS
100 SCOTT AVENUE
BAYTOWN TX 77520
USA
Phone: 713-428-2086
Calibers offered:
284 308 429

KEN BAYKO
NATIONAL BULLET COMPANY
1585 E. 361 STREET
EASTLAKE OHIO 44095
USA
Phone: 216-951-1854

L E HULL
NAVAL ORDNANCE WORKS
467 KNOTT ROAD
SHEPERDSTOWN WV 25443
USA
Phone: 304-876-0998
E-Mail: ida_edhull@yahoo.com
Calibers offered:

222	224	228	243	257	
264	284	288	299	308	311
316	318	319	320	321	323
326	333	338	348	351	355
357	358	364	3650	366	375
377	398	40	401	405	406
4085	410	412	416	423	435
451	452	458	475	510	520
562	577	578	58	585	5895
622	687	700	975	980	9805
998					

PETER POWLES
NEW ENGLAND CUSTOM BULLETS,INC
13 MAYWOOD RD
NEWBURGH NY 12550-2345
USA
Phone: 845-391-7679
E-Mail: pete@newenglandcustombullets.com
Calibers offered:

172	224	264	308	338	429
452					

KEITH T. WILLIAMS
NEWTEC SERVICES GROUP, INC.
PO BOX 643
333 HART STREET
EDGEFIELD SC 29824
USA
Phone: 803-637-0898 Fax: 803-637-0850
E-Mail: newtec1usa@aol.com
Calibers offered:

308	338	355	357	429	452
510	512				

NICK NIELSEN
NIELSEN SPECIALTY AMMO
1933 WEST 11TH STREET
SUITE L
UPLAND CA 91786
USA
Phone: 909-599-4711 Fax: 909-303-0159
E-Mail: nielsenSpecialtyAmmo@Yahoo.com
Calibers offered:

178	217	218	219	2232	224
2495	250	251	253	254	257
300	302	308	309	338	355
356	357	358	375	401	408
452	4525	454	457	458	498
507	510				

JOHN BOICH
NO. AMERICAN BONDED BULLET CO.
672 WORTHAM CIRCLE
MUNDELEIN IL 60060
USA
Phone: 847-949-9569 Fax: 847-949-9570
Calibers offered:
277 284 308 323 338 375
416 458

SCOTT BRANDIS
NO.16-279 TREASURE ROAD
WELSHPOOL
PERTH W.A. 6106
AUSTRALIA
Phone: 618-93566960
E-Mail: sundace@iinet.net.au
Calibers offered:
160 224 308 314 320 358
454 457

OLLE NILSSON
NORDIK PREMIER BULLET MFG.AB
BOX 133
AMMARNAS 92075
SWEDEN
Phone: 460-952-6037
E-Mail: olle.nilsson@ammarnas.net

DAVID NORMAN
NORMAN BULLETS
BOX 2532
OROFINO ID 83544
USA
Phone: 208-476-5046

WALLY POLLOCK
NORTH 49 PRECISION SUPPLY
27 HIDDEN RANCH RD N W
CALGARY ALTA T3A5S5
CANADA

JIM HAAK
NORTHERN ARIZONA MUNITIONS
1294 W VOCK CANYON RD
KINGMAN AZ 86409
USA
Phone: 928-692-1471
E-Mail: haakster48@gmail.com
Calibers offered:
308 355

WILLIAM NOODY
NORTHERN PRECISION
329 SOUTH JAMES ST.
CARTHAGE NY 13619
USA
Phone: 315-955-8679
Calibers offered:
308 452 429

ROBERT SAUTER
NORTHWEST CUSTOM PROJECTILE
PO BOX 0127
BUTTE MT 59703
USA
Phone: 406-723-8683
E-Mail: info@customprojectile.com

ARNOLD LACOVIELLO
NPEE LC
451 E 10TH COURT
HIALEAH FL 33010
USA
Phone: 305-283-5766 Fax: 786-295-6822
E-Mail: dmoose@npee.org

DON SWAD
OCS CUSTOM BULLETS
18085 EMPIRE
EAST POINTE MI 48021
USA
Phone: 586-772-6136
E-Mail: ocsbullets@WideOpenWest.com

M BLAKE GREENLEE
OLD WAGON BULLET CO.
32 OLD WAGON ROAD
WILTON CT 06897
USA
Phone: 223-762-8580

MALCOLM SELLER
ORCHARD HOUSE, LEYS LANE
HAMPOLE
DONCASTER DN6 7ES
ENGLAND
Phone: 130-233-0726
E-Mail: mseller208@aol.com
Calibers offered:

263	264	310	311	313	425
435	440	442	445	448	450
453	457	4570	458	465	576
594					

ADAM GANTIDES
ORION CUSTOM BULLETS
125 SANDYCOMBE RD
KEW, RICHMOND
SURREY TW92EN
ENGLAND
Phone: 44-2082553413
Calibers offered:

224	300	312	313	314	355
357	358	430	450	452	454
456					

LEE ODOM
OUTDOOR SHOOTER SUPPLY
10751 E 122 ST. N
COLLINSVILLE OK 74021
USA
Phone: 918 510 7648 Fax: 918 619 3414
E-Mail: felicia@outdoorshootersupply.c

JOSEPH CULLISON
OUTLAW BULLETS
28988 BERLIN ROAD
SWEET HOME OR 97386
USA
Phone: 541-408-6140
E-Mail: jcunclejoe@aol.com

SCOTT WOODWARD
OUTLAW STATE BULLETS LLC
5236 DEER RIDGE TRAIL
HOUSE SPRINGS MO 63051
USA
Phone: 314-249-3327
E-Mail: swoodward0430@hotmail.com
Calibers offered:

224	264	277	308	3082	3084
310	311	3645	458	510	

JOHN W. PAGE
PAGE CUSTOM BULLETS
PO BOX 25
PORT MORESBY PAPUA
NEW GUINEA
Phone: 675-254-907 Fax: 675-250-746

S G PATRICK
PATRICK BULLETS
PO BOX 172
WARWICK QSLD 4370
AUSTRALIA
Phone: 503-253-1156

WALT PRICE
PATRICK W PRICE BULLETS
16520 WORTHLEY DR
SAN LORENZO CA 94580
USA
Phone: 415-278-1547

RICHARD LAVOIE
PATRIOT BULLETS
9516 108TH ST
MORINVILLE ALTA T8R1E3
CANADA
Phone: 780-939-2258 Fax: 780-939-6146
E-Mail: patriotbullet@telusplanet.net
Calibers offered:
308

FLOYD HAGGERTY
PATRIOT MFG & SALES
701 N E 42ND ST # 3
POMPANO BEACH FL 33064
USA
Phone: 813-655-1798

PB CUSTOM BULLET MFG
796 MC PHILLIPS ST
WINNIPEG MAN R2X 2J5
CANADA
Phone: 204-586-1599 Fax: 204-586-1608

MATTHEW PIELECHA
9190 E NEPTUNE DRIVE
FLAGSTAFF AZ 86004-3195
USA
Phone: 315-527-5657

R B GASSE
PINE TREE BULLETS
133 SKEENA ST
KITIMAT BC V8C1Z1
CANADA

KYLE S. PITTMAN
PITTMAN BULLETS
PO BOX 48
SEYMOUR TN 37865
USA
Phone: 865-776-6087
E-Mail: kyle.pittman@pittmanbullets.co
Calibers offered:
402 452

ROBERT L. APPLEGATE
PO BOX 357
358 DOUGLAS
YONCALLA OR 97499
USA

CECIL EPP
PRECISION RIFLE
35088 CEDAR LAKE ROAD
BOX 340
ANOLA MB R0E0A0
CANADA
Phone: 204-996-4868 Fax: 204-866-2269
E-Mail: bullet23@mts.net
Calibers offered:
355 357 450 451

DEAN STULL
PRECISION CUSTOM BULLETS
718 TIMBERLAKE CIRCLE
RICHARDSON TX 75080
USA

P J DU TOIT
QUEST BULLETS
PO BOX 198
KOEKENAAP 8146
SOUTH AFRICA
Phone: 027-217-2166 Fax: 27-86-6115264
E-Mail: petrus@kingsley.co.za
Calibers offered:
243 308 312 323 338 366
375

RICHARD C PEARSON
R & R BULLETS
PO BOX 305
5 OAK STREET
MAITLAND ONT K0E1P0
CANADA
Phone: 613-340-6043 Fax: 613-340-6043
E-Mail: randrbullets@gmail.com
Calibers offered:
314 357 452 459

KEITH GREINER
R&KG INDUSTRIES, LLC
7501 N 41ST AVE
PHOENIX AZ 85051
USA
Phone: 480-980-5266
E-Mail: kgreiner1@cox.net
Calibers offered:
355 40 452

GUS RIOS
R.CANADIAN CTG/MUNITIONS
1262 COLEMAN CLOSE
NO. VANCOUVER BC V7K 3C2
CANADA
Phone: 604-985-7467

RON J PERRY
R.J. PERRY ENTERPRISES
4785 NORTH PIONEER DRIVE
ENOCH UT 84720
USA
Phone: 801-586-5252

MICHAEL COLLINS
RAPTOR ARMS
412 1ST AVE S
GREYBULL WY 82426
USA
Phone: 307-765-4496 Fax: 281-558-1928
E-Mail: mcollins@midf.com

MICHAEL HOSSACK
RAT SNIPER SLUGS
5 TWILIGHT DRIVE
OROFINO ID 83544
USA
Phone: 208-827-0752
E-Mail: trchoss@gmail.com
Calibers offered:
217 250 300 358

F.C. REARDON
REARDON BULLETS
APT 107
36 W RIVER ST
CHIPPEWA FALLS WI 54729
USA
Phone: 715-288-6439

LARRY WOOD
REBEL JACK CUSTOM BULLETS
11622 EDGEWOOD RD
AUBURN CA 95603
USA
Phone: 530-863-9145
E-Mail: rebeljack@wavecable.com
Calibers offered:
308 3085 358

TONY KUKLIS
REDWOOD BULLET WORKS
3559 BAY ROAD
REDWOOD CITY CA 94063
USA

TIM CLARK
RHINO BULLETS
PO BOX 787
LOCUST NC 28097
USA
Phone: 704-753-1906 Fax: 704-753-2198
Calibers offered:
358 375 416 429 430 452

JACOBUS VAN DER WESTHUIZEN
RHINO BULLETS
PO BOX 5420
11 RIPLEY RD GREENFIELDS
EAST LONDON 5201
SOUTH AFRICA
Phone: 431-438343

RICHARD LOWETH
RICHARD H.A. LOWETH
MAYFIELD HOUSE, KIRBY
MUXLOE LIEC L39 9EN
ENGLAND
Phone: 053-338-6295

MICHAEL SERIO
ROCKY FORK BULLET CO
7350 NOLENSVILLE RD
NOLENSVILLE TN 37135
USA
Phone: 615-776-5534
Calibers offered:
308 400

GEORGE COSTELLO
ROCKY MOUNTAIN BULLETS
224 WATER ST
DARBY MT 59833
USA
Phone: 406-498-1934
E-Mail: george@rmbullets.com

JAMES A ROHACEK
201 PENNSYLVANIE AVE
MADISON AL 35758
USA
Phone: 256-289-1985
E-Mail: jim.rohacek@knology.net

WALT STEPHENSON
S & S PRECISION BULLETS
22963 LA CADENA
LAGUNA HILLS CA 92653
USA

JOSEPH D ARRINGTON
SAFARI CLASSIC BULLETS, LTD.
PO BOX 665
JONESBORO GA 30237
USA
Phone: 404-603-1511

TED SANSOM
SANSOM BULLETS
2506 ROLLING HILLS RD
GREENVILLE TX 75401
USA
Phone: 214-455-1198

JOSEF SCHNEIDER
SCHNEIDER BULLETS
HOHENBERG STR 10
PRIEN BAV 8210
W GERMANY
Phone: 080-512-152

R E SCHUHKRAFT
SCHUHKRAFT BULLETS
13 ESTHER ST
TATHRA NSW 2550
AUSTRALIA
Calibers offered:
14

TONY TOLOCZKO
SCORPION BULLET CO.
36 GLENN ST
DOUGLAS MA 01516
USA
Phone: 508-476-7009

JOHN MATTHEW WILKES
SEISMIC AMMO
1661 EXCHANGE AVE
OKLAHOMA CITY OK 73108
USA
Phone: 405 650 2475
E-Mail: matt@seismicammo.com
Calibers offered:
351 355 448 452 510 660
680

TOM THURMAN
SEMINOLE BULLETS
6635 LANDOVER BLVD.
SPRING HILL FL 34608
USA
Phone: 904-688-1207

BOB SHELL
SHELL RELOADING
1485 SOUTH LAWSON DR.
APACHE JUNCTION AZ 85220
USA
Phone: 480-983-7078

FRED MCCRUMB
SHOOTING OPTIONS LLC
621 BOUGHTON HILL RD
HONOEYE FALLS NY 14472
USA
Phone: 585-582-1039 Fax: 585-582-3202
E-Mail: docsbullets@gmail.com
Calibers offered:
410 224 308 357 416 423
429 435 441 452 458 468
475 50 505 510

JAMES BLEVINS
SHOOTIST SUPPLY
314 NW 1ST BOX 561
LAVERNE OK 73848
USA

SIERRA BULLETS
1400 W HENRY ST
SEDALIA MO 65301
USA
Phone: 660-827-6300 Fax: 660-827-4999
E-Mail: craig@sierrabullets.com

SILVER BULLET
RR1 BOX 241
NEW BERLIN IL 62670
USA

STEPHAN W MINNER
SMI
532 EDWARD ROAD
WEST MELBOURNE FL 32904
USA
Phone: 407-969-6137

RANDY AMANN
SPRING PRAIRIE BULLET CO
W 1384 POTTER RD
BURLINGTON WI 53105
USA
Phone: 414-767-0549

RONALD STAFFORD
STAFFORD BULLETS
1920 TUSTIN AVE
PHILADELPHIA PA 19152
USA
Phone: 215-745-6673

ALAN STANLEY
STANLEY BULLETS
2085 HEATHERIDGE LN.
RENO NV 89509
USA
Phone: 702-322-5538

BILL MCBRIDE
STAR CUSTOM BULLETS
9241 UPPER BEAR RIVER ROAD
FERNDALE CA 95536
USA
Phone: 707-786-4279 Fax: 707-834-1758
Calibers offered:

177	257	264	270	284	288
308	312	318	323	330	338
355	357	358	366	375	416
423	440	454	458	470	475
510	577	585	600	8MM	960

CLINTON STARKE
STARKE BULLET CO
BOX 400 605 6TH ST. N.W.
COOPERSTOWN ND 58425
USA
Phone: 888-797-3431 Fax: 701-797-3433

KEN STEWART
STEWART'S GUNSMITHING
PO BOX 5854
PIETERSBURG N. 0750 N.TRANSVAL
SOUTH AFRICA
Phone: 015-218-9401 Fax: 015-237-1161

JOSE GO
STRONGHAND, INC
21001 E WINDROSE DR
WALNUT CA 91789
USAFax: 714-598-3061
Calibers offered:

355	356	3565	357	3575	358
451	452				

RON SZCZEPANSKI
SZCZEPANSKI BULLET SWAGING
PO BOX 697
JUSTIN TX 76247
USA
Phone: 940-300-5524
E-Mail: rszczepanski@dellepro.com

TRACY VANNOY
T&T ENTERPRISES
PO BOX 182
QUINTON NJ 08072
USA
Phone: 856-935-4862
E-Mail: tvannoy@comcast.net

R E BARNARD
TARGET HANDLOADER'S BULLET
PO BOX 103 KURMOND
NEW SOUTH WALES 2757
AUSTRALIA
Phone: 045-761-293

ROBERT OLSON
TETON BULLET CO.
BOX 324
MIDWEST WY 82643
USA

K. W. DAUGHERTY
TEXAS BULLETS
505 PALDAO DR
MESQUITE TX 75149
USA
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THAILAND
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E-Mail: tcats2000@hotmail.com

KEN KUHN
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RFD 1 BOX 1755
BROOKS ME 04921
USA
Phone: 207-722-3341

TERRY MILLS
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E-Mail: kc3ak@arrl.net
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WILLIAM GASS
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14021 VICTORIA LANE
ELK RIVER MN 55330
USA
Phone: 612-441-7761

JOHN CRIPE
THE PELLET GARDEN
8025 ETIWANDA AVE
RESEDA CA 91335-1319
USA
Phone: 310-466-2608
E-Mail: johninthecamper15@gmail.com
Calibers offered:
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250 251 257 300 308 357
375 452

BOB CAPERTON
THE WORKS GUNSHOP
2011 CENTRAL BLVD.
RAPID CITY SD 57702
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Phone: 605-341-5941

DEWAYNE CLIFFORD
THINGS UNLIMITED INC
235 N KIMBALL
CASPER WY 82601
USA
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E-Mail: kitfox@bresnan.net
Calibers offered:
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WARREN GABRILSKA
TIMBER BEAST PRODUCTS, INC.
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BERLIN WI 54923
USA
Phone: 414-987-5052

MICHAEL MCBROOM
TITAN BULLET MFG.
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OLNEY MT 59927
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Phone: 406-881-2701
E-Mail: mmcb@centurytel.net
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ROBERT ELLIS
TKINE INC
25913 75TH AVE SW
VASHON WA 89070
USA
Phone: 206-259-0462
E-Mail: rhinoproductions@icloud.com
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PETE FINCH
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GONZALES LA 70707
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FERDI VAN ZYL
TROPHIES AFRICA
18 FLYING CLOUD RD
PLETTENBERG BAY
WESTERN CAPE 6600
SOUTH AFRICA
Phone: 27827816732 Fax: 616 257 1318
E-Mail: huntafrica100@gmail.com
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3080 338 375 416 510

TERRY SIMAS
TRUE SHOT
1408 ROCKY GULCH ROAD
YREKA CA 96097
USA
Phone: 530-643-3455
E-Mail: portagee25@sbcglobal.net
Calibers offered:
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RANDOLPH VALENZUELA
TUCSON AMMO CO.
2920 W VERONA PLACE
TUCSON AZ 85741-3010
USA
Phone: 520-977-6170
E-Mail: tucsonammo@comcast.net
Calibers offered:
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459

LARRY E MOORE
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2430 HEINE RD
CHEWELAH WA 99109-9514
USA
Phone: 509-935-6536

VALENTIN'S BULLETS SARL
CHEMIN DU POMPAGE
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CANET F-34800
FRANCE
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E-Mail: V.BULL@FREE.FR
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1315 SHEPHERD ST
DURHAM NC 27707
USA
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E-Mail: russellpodom@yahoo
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VANN CUSTOM BULLETS
330 GRANDVIEW AVE
NOVATO CA 94947
USA

DALE RIGGERT
VARMINT KNOCKERS
2035 PIERINO DRIVE
SAN DIEGO CA 92114
USA
Phone: 858-335-0457
E-Mail: driggert25@gmail.com
Calibers offered:
172 178 217 2172 2228 250
2502 300 308 357

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VILJNDI MK
VILRATSI VALD
TALLIKAEVU
70109
ESTONIA
Phone: 3725212345
E-Mail: mart.tasane@tcb.ee
Calibers offered:
224 308

TONY POWELL
VINDICATOR RESEARCH
PO BOX 617
GOULBURN NSW 2580
AUSTRALIA
Phone: 048-222-965

R W ALEXANDER
VIPER BULLET AND BRASS WORKS
PO BOX 582
NORWICH ONT N0J1P0
CANADA
Phone: 519-863-2281 Fax: 519-863-2289

LESLIE VOLLMER
VOLLMER PRECISION
573 CAMINO CABALLO
NIPOMO CA 93444
USA
Phone: 817-408-0433
E-Mail: works4us1@yahoo.com
Calibers offered:
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360 361 375 376 377 378
380

ALEX WALRATH
WALRATH BULLETS LLC
902 N CENTRAL AVE
CRANDON WI 54520
USA
Phone: 715 889 3002
E-Mail: keaton602@frontier.com

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3560 NW VAN BUREN AVE
CORVALLIS OR 97330
USA
Phone: 541-915-4317
E-Mail: bobwatson@...
Calibers offered:
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DAVE RUTLEDGE
WAYNE SPECIALTY SERVICES
260 WATERFORD DR
FLORISSANT MO 63033
USA
Phone: 314-831-7083

KENEDY ROJAS
WELL DONE BULLETS
7315 NW 56 STREET
MIAMI FL 33166
USA
Phone: 305-969-9465 Fax: 504-990-3577
E-Mail: makenroj@gmail.com
Calibers offered:
224 243 251 308 309 312
355 357 363 40 429 450
452 615 662 720

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WEST COAST BULLET CO.
25 STOKES DR
CARSON CITY NV 89706
USA

JON VIVAS
WESTERN BULLET COMPANY
BOX 998
MISSOULA MT 59806
USA
Phone: 406-721-4637

RICHARD WOMACK
WILDCAT CUSTOM BULLETWORKS
1104 COURT STREET
ELKO NV 89801
USA
Phone: 702-753-8576
Calibers offered:
284 308 338

REGGIE WILSON
WILSON GUNWORKS AND DESIGN
PO BOX 24
SAPPHIRE NC 28774
USA
Phone: 828 989 8130
Calibers offered:
243

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WINKLE BULLETS
PO BOX 163
COOKSVILLE IL 61730
USA
Phone: 309 838 4337
E-Mail: scottowinkle@gmail.com
Calibers offered:
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WM EICHELBERGER BULLETS
158 CROSSFIELD RD
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USA
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638 WOODLAND DR
MANHEIM PA 17545
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Phone: 717-665-4332

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WYOMING BONDED BULLETS
PO BOX 91
SHERIDAN WY 82801
USA
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HARVEY RIEDEL
WYOMING CUSTOM BULLETS
1626 21ST STREET
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