The Development of the Powerful Big-Bore Revolver in General and the .500 S&W Magnum in Particular

And

The Development of the John Ross/Performance Center 5” .500 S&W Magnum

With

Suggestions and Recommendations For Owners of These Guns

By
John Ross

Acknowledgements

I'd like to recognize three people without whom the .500 S&W Magnum would likely not exist in *any* form:

Elmer Keith This Idaho hunting guide, inveterate arms experimenter, and gun writer discovered in 1926 that the S&W .44 Special could be safely loaded to levels far in excess of factory offerings. Keith urged the ammo companies to introduce a heavy-loaded .44, and almost three decades later they finally relented and the .44 Magnum was born. Keith's efforts and his writings are largely responsible for starting what has now become the continued interest in powerful handguns, the sport of handgun hunting, long range handgun shooting, and by extension, metallic silhouette competition.

Elmer Keith also welcomed into his home and shared his wisdom and experience with a teenage kid from St. Louis who loved big guns and what they could do, and that had some effect on what came later.

John Linebaugh John is the custom gunsmith that first showed the world that high-pressure loads in calibers larger than .45 could be safely contained in normal-sized revolvers. Without John, it is likely that the holster handgun with rifle energy and accuracy would today still be just an idle fantasy.

Brett Curry This Smith & Wesson engineer is the man who took the concept of a double action revolver chambered for a .50 caliber cartridge and, in a matter of months, turned it into (and put into mass production) what is in my opinion the finest sporting handgun on the planet: The .500 S&W Magnum.

The limited edition John Ross/Performance Center 5" .500 would not exist were it not for four additional people who have profoundly influenced my life:

Walter Ross My father gave me my first guns, taught me woodworking and machining skills, and provided me with a constant supply of encouragement (and ammo!) up until his death when I was thirteen.

Graves Gladney After my father's death, my uncle (a champion in all three shooting disciplines) encouraged my shooting efforts from junior high onwards, gave me my first three Model 29s, my first elephant rifles, and, when I was fifteen, gave me the Star progressive reloading tool which has allowed me to shoot over 10,000 rounds of .44 Magnum a year ever since.

Lucianna Gladney Ross Upon the death of her brother (above) when I was 18 years old, my mother (then 60) got a Federal Firearms License to facilitate my continued shooting development and firearms experimentation, since I would not be old enough to have an FFL in my own name for three more years.

Kent Lomont This Indiana (now Idaho) firearms expert has been my best friend since I was seventeen. If I had never met Kent, I would never have been inspired to shoot as much as I do, experiment the way I have, or write about my experiences. By comparison, Kent makes me look like an utter slacker.

History

Introduction

People who carry a large caliber revolver on a regular basis as insurance against unexpected events have always been looking for an extra margin of safety for those circumstances where there is no such thing as too much power. Such situations usually involve a large, adrenaline-charged animal, perhaps wounded, and a big rifle is called for but, because this wasn't planned, the only weapon available is the one that's always on your person.

Gun writers and firearm marketing departments cite the need for protection against bear attacks, and sometimes a gun company will go so far as to provide a book chronicling the stories of the victims of these fatal encounters. The specter of being eaten alive by a grizzly produces vivid mental images and captures the imagination, but danger usually arrives in a much more mundane wrapper.

I'll probably never forget the night I was having dinner at a good friend's house one June evening in 1976 when we were both back for the summer after our freshman year in college. We were full of the energy and enthusiasm common to 19-year-old males, and that night my friend and I were entertaining his parents and sisters with stories of our college exploits, all while wolfing down his mother's delicious cooking. His younger sisters were giggling and his father's eyes were crinkled up with mirth as we related our adventures of the past semester. It was the kind of evening I knew that after we became old men we'd remember with smiles on our faces.

That was before the phone rang.

My friend's mother picked up, and the laughter in her voice soon died and was replaced with stunned silence as she listened to the caller. The silence was quickly followed by heart-wrenching sobbing. It was her sister-in-law in Indiana. She and her husband had a farm there. She was calling to say her husband, my friend's uncle and his mother's brother, had just been killed by a bull.

Whether the threat comes from a Kodiak bear near a fishing camp in Alaska, a hungry lion or wounded Cape buffalo near a hunting camp in Africa, or an enraged farm bull in a pasture in Indiana, there is a need for an outdoorsman's gun that can be carried on the belt at all times and that can stop an attack decisively. The requirements for such a gun are a mass of conflicting challenges: It must be light enough to carry at all times, powerful enough and with enough penetration to stop or at least slow down an attack, even from unavoidable shot angles that no hunter would intentionally take, and it must deliver on-target performance in the worst situations.

The best innovations and improved development of manufactured goods often come not from the R&D department of the manufacturing company, or from the marketing department's use of focus groups, but rather from individuals with a passion, working alone to create something better for their own use. The present personal computer industry has been created almost entirely by passionate individuals driven to create something that didn't exist before, and they had an idea about how to make it happen.

The development of small arms has also been driven by the efforts of men with a passion, in this case for guns and shooting. Perhaps even more so than their tech-head counterparts in the computer industry, these men created what they did because they wanted to have something better for themselves.

Early efforts
The push to develop an ideal outdoorsman's holster gun started in the 1920s, with the efforts of a young hunting guide, firearms experimenter, and gun writer named Elmer Keith.

I read all of Keith's writings I could find when I was young, and the two of us became friends, got together, and shared our thoughts on firearms development during the last decade of his life. Hamilton Bowen summed up the environment that shaped Keith's life and thinking in his book *The Custom Revolver*. I can't improve on it, so I'll quote it here:

> "Elmer Keith was born in Missouri in 1899 and moved with his family to Montana while still a child just as the real frontier was closing. Even so, the American West was still wild and sparsely settled. The Indians may have been largely suppressed, but a certain degree of pioneering resolve was still necessary to inhabit and develop the more remote regions of the interior. The land still could and did fight back with its fearsome climate, rugged terrain, and often depressing isolation. Of greater significance to Keith's development were the real pioneers, many of whom were still very much alive and kicking. He knew a great many Civil War veterans, settlers, Indian fighters, lawmen, and cowboys, all of whom worked their influence on him with their stories, tales, and accounts of frontier life and irredeemably marked him as a product of the 19th Century even though he died in 1984. Since arms played such pivotal roles in the lives of these characters, it is small wonder that guns fascinated Keith from an early age. They were an integral part of his daily life as a cowboy, rancher, trapper, and hunting guide, and consequently he acquired a tremendous amount of invaluable shooting experience."

Keith loved shooting, and was always working to improve both his own skills and the efficacy of his guns. With such hands-on experience, he came to hold strong opinions as to what worked and what didn't, a trait I share. By the mid-1920s Keith was writing about his experiences for various outdoor publications and the *American Rifleman*, and these articles brought him into contact with others of like mind. This was how I first got to know him in 1975 when I had just finished high school, and we remained friends for the last nine years of his life.

In his search for better penetration on big animals from a handgun, in the 1920s Keith began experimenting with heavy loads and heavy bullets in the .45 Colt Single Action Army revolver. At one point, he assembled some loads using .458" diameter 300 grain bullets intended for the .45-70 rifle round, which he sized down to .452" or thereabouts and loaded into the .45 Colt case atop a charge of black powder.

Keith fired this load regularly for a number of weeks, but then he had a catastrophic failure of the cylinder, which took off the top three chambers and the gun's top strap. Keith correctly concluded that the .45 Colt cylinder with its thin chamber walls was inherently too weak for what he wanted, and he turned his attentions to the same type of gun firing the slightly smaller .44 Special cartridge, whose cylinder had thicker chamber walls. Keith found the .44 Special could be safely loaded to the power levels he was looking for, and he settled on a load that would give a 250 grain bullet (with a big, wound-inducing flat point) a muzzle velocity of 1200 feet per second. His first efforts were with Colt single actions in this caliber. Ultimately, after WWII, he settled on the large frame Smith & Wesson double action revolver in .44 Special as best suiting his needs.

Over the next several decades, Keith urged the ammunition companies to load the .44 Special to his levels for use in S&W and Colt guns, but they continued to produce anemic .44 rounds which gave a poorly-shaped round-nosed bullet only about 740 FPS.

Finally, in 1955, Remington agreed to lengthen the .44 case .100" and load to .357 Magnum pressures, and S&W agreed to build guns for the new cartridge. Thus was born "The World's Most Powerful

Handgun," the .44 S&W Magnum, which gave a 240 to 250 grain bullet some 1400-1500 FPS, exceeding Keith's initial wishes by several hundred feet per second.

The rocky quest for more power continues

Just before the .44 Magnum's introduction in late 1955, a self-taught metallurgist and designer named Dick Casull and his friend Jack Fullmer had been trying to get 1800 FPS velocities from the .45 Colt with a 230 grain bullet. They tried re-heat treating the factory cylinders and Colt SAA frames for more strength but this didn't work and guns kept blowing up. They then decided to fabricate 5-shot cylinders (to make for thicker chamber walls) of high-strength steel, and according to a glowing 1959 magazine article in *Guns & Ammo* written by gunsmith P.O. Ackley, this worked. The article claimed the two men would modify your gun and install the stronger cylinder for $150, but with the advent of the S&W .44 Magnum (which had a retail price of $140 in 1959), they wanted to get 2000 FPS with the same bullet, so they were planning to build complete guns with heavier frames.

In the late 1950s, handloaders didn't have the selection of powders available that we have now come to rely on for magnum handgun rounds, such as H110, 296, Li'l Gun, and WC680. According to the article, to get this 2000 FPS performance, Casull used a layered charge of Bullseye, 2400, and Unique, on the "Hey, it sounds good" theory that a little Bullseye against the primer would assist the ignition of the large middle charge of 2400, and the modest top layer of Unique would extend the pressure curve where it would normally be in steep decline.

In any event, these late '50s experiments were interesting to read about, but I doubt the project ever really got off the ground as I never heard of anyone owning one of these guns, and I never saw a working example of a .454 Casull for many years. That changed in 1976 at the NSGA Show.

There, a newly formed company showed off examples of a .454 it said it intended to produce. There were some financial startup problems, but a few years later in 1979 Freedom Arms was on its feet and they were soon producing 5-shot single action revolvers chambered for the .454 Casull (a .45 Colt case lengthened .100" to prevent the round from being used in weaker .45 Colt guns and blowing them up). These guns were (and are) built with tolerances and materials necessary for a cartridge operating at 60,000 PSI of chamber pressure. As such they are a limited production piece with a necessarily high price tag.

Because of the limited production and the fact that until recently the .454 was only available in single action guns, the .44 Magnum was still widely regarded as "The World's Most Powerful Handgun," even though this was no longer accurate. The high intensity .454 produces about 50% more energy than the .44 Magnum, a substantial increase. I fired the Freedom Arms .454 in the early 1980s, and it is beautifully made, but I never bought one because I dislike the feel of single action guns in heavy-recoiling calibers. I much prefer the feel of the double action frame and grip, and always wished S&W would scale up their N-frame enough to build a .454.

Meanwhile, during this period in the mid 1980s, several other developments were taking shape. Metallic Silhouette competition was gaining traction, and participants in this sport wanted handguns that would shoot flatter and still have enough energy to knock down the heavy steel targets at long range. Ruger lengthened the frame and cylinder of its Super Blackhawk single action and came out with the .357 Maximum, a long .357 case designed to shoot heavy (for .357 caliber) bullets at high velocity, for the same striking energy as the .44 Magnum but with flatter trajectory.

At the same time, the Dan Wesson firm was getting an enviable reputation in Silhouette circles for building accurate, bull-strong .44 Magnum DA revolvers that would stand up to the silhouette shooters'

continued use of heavy loads using heavy bullets. This small firm decided to also lengthen the frame and cylinder and chamber the new, longer .357 round.

As soon as this gun came out, I imagined rechambering it and rebarreling it for a lengthened .44 round. Soon thereafter, someone did just that, but the results were not enough improvement over the standard .44 Magnum for me to justify hand-making the large quantities of special brass I would require for my high-volume shooting. Eventually Dan Wesson came out with these guns chambered in not only .357, but also .375, .41, and .44 calibers, all with long cylinders to take cases 1.600" in length. The long brass is available from StarLine.

Raising the bar

In 1988, custom gunsmith John Linebaugh gave us what I consider to be the breakthrough caliber. Linebaugh knew a normal-sized single action could be made that would tolerate 55,000-60,000 PSI loads, because Freedom Arms was doing it with their .454 Casull. Linebaugh just wanted to do it with a larger caliber than .45. John Linebaugh points out that velocity declines with range, while caliber and bullet weight remain constant. He likes big, heavy bullets. I do, too.

No physically larger modern rimmed handgun case than .45 existed, but like any good wildcatter, John got out his micrometer and calipers, and started measuring rifle brass in search for a parent case. He determined that .45-70 rifle brass could be shortened and re-formed to take a .475" diameter bullet. He also found that .348 Winchester rifle brass could be similarly used as the basis for a straight-walled, .510" caliber revolver cartridge.

Linebaugh fabricated special oversized 5-shot cylinders, fitted them to Ruger Super Blackhawk frames, and fitted custom barrels in .475 and .500 (actually .510") calibers. Thus were born the .475 Linebaugh and the .500 Linebaugh. The .475 Linebaugh would send a 400 grain bullet out at 1400 FPS, while the .500 would give a 450 grain slug some 1350 FPS.

Almost immediately, it became obvious that if you used the now-discontinued Ruger Maximum frame, you could fit an even longer 5-shot cylinder chambered for even longer .475 and .500 cartridges, and soon John was doing just that for power-hungry customers. The .475 Linebaugh Long and .500 Linebaugh Long (sometimes called .475 and .500 Maximums) added about 150-200 FPS to the already impressive ballistics of the original versions. With Linebaugh's .475 and .500 calibers in two different lengths, all operating at around 50,000 PSI chamber pressure, the era of the Super Magnum holster gun was here, albeit on a custom-only basis, and only in single action arms. Somewhat amusingly, Hamilton Bowen has this to say about the longer cartridges, again from his 2002 book *The Custom Revolver:*

> "One road that would probably have been best untraveled led to the five-shot .475 and .500 Maximums…[they] have the dubious distinction of the most favorable power-to-weight ratio of any revolver made. [In 2002--JR] The .475 would launch 425-grain bullets to 1500 FPS; the .500 would do the same with 450-grain bullets. Recoil was catastrophic, especially in the .500 since the guns only weighed three lbs. Shooting either would leave the palm of the shooting glove smoldering. Shooting 5 to 10 rounds was sufficient to destroy years of flinch-control discipline. At this writing, John Linebaugh still builds these guns, while Bowen Classic Arms does not…"

Double action developments

After John Linebaugh developed his original .475 and .500 cartridges and guns, Hamilton Bowen started building custom guns in these two calibers also. Whereas John Linebaugh concentrates on Ruger Single actions, Hamilton Bowen also uses other types of handguns for his custom creations, including the stoutly built double action Ruger Redhawk which had been introduced in 1980.

Bowen had been refitting Ruger Redhawks with 5-shot .454 Casull cylinders to make a good DA revolver in this caliber. Now he started fabricating oversize 5-shot cylinders for the Redhawk in .475 or .500 Linebaugh, and had the factory barrels rebored and rerifled to the proper dimensions for the new calibers. Here, finally, was a double action revolver that could be carried all day, in a true Super Magnum caliber. Even more so than the Freedom Arms single actions, these guns were an expensive proposition, and while I planned to order a .500 Linebaugh Bowen Redhawk, the breathtaking expense of having just taken on a wife, coupled with the specter of making all that new brass (and not having a progressive loader to handle it) conspired to make me put off that purchase and content myself with my trusty .44s.

A major manufacturer weighs in

The .475 Linebaugh (original shorter version) eventually became available in the exquisite Freedom Arms single action, and Hornady started loading .475 Linebaugh factory ammo. This set the stage for Ruger and Hornady to begin discussions of creating a proprietary big bore gun/cartridge combo.

Ruger could have done what Hamilton Bowen was doing, and made 5-shot Redhawks in .475 or .500 Linebaugh, and if they'd asked me (which they didn't), that's what they should have done. For some reason, though, Ruger insists that its full-size revolvers all be six-shooters. Taurus was building a decent DA .454 by using a 5-shot cylinder. When Ruger chambered the Super Redhawk in .454 Casull, they insisted on six shots, and had to get Carpenter Steel to come up with a special alloy, Carpenter 465, for the cylinder. They needed a steel that was strong enough to take .454 pressure (60,000+ PSI, plus a safety margin) in the thin walls that result from a 6-shot cylinder. Reducing the wall thickness further by chambering the fatter .475 Linebaugh in the same six-shot gun was not going to work.

Ruger decided to shorten the Linebaugh case to 1.285", the same length as the .44 Magnum, and load the resultant round to .44 Magnum pressures of about 38,500 PSI. The Super Redhawk cylinder was plenty strong for this new lower-pressure caliber, which was christened the .480 Ruger and introduced in 2001.

Despite the name, the .480 Ruger actually fires a .475" diameter bullet, and can be thought of as a ".475 Special." Any .475 Linebaugh gun can safely chamber and fire this lower-powered round, just like a .44 Special round can safely be fired in a .44 Magnum, or a .38 Special in a .357. The .480 Ruger gives a 325 grain bullet 1335 FPS, which is a little bit better than what the .44 Magnum can do when loaded to the same pressures. More importantly, the .480 Ruger cuts a bigger hole than the .44.

Getting the distracted giant's attention

In 2001, Smith & Wesson became an American-owned company again after having been part of the British conglomerate Tompkins PLC that had signed the disastrous "Agreement" with the Clinton administration.

The newly energized firm was busy bringing out new semiauto models, developing more lightweight revolvers with titanium cylinders and scandium/aluminum alloy frames, and trying to placate former customers who felt betrayed by the previous owners. Internal sources at Smith & Wesson tell me privately that the introduction of the .480 Ruger caught management completely by surprise, and was a real wake-up call.

Having a low-volume manufacturer and a few custom makers producing powerful single actions was no big deal. Even having Ruger and Taurus producing double actions in .454 was tolerable, as S&W made .45 caliber guns, albeit ones of lower power. But a major manufacturer producing a DA revolver in a new, proprietary caliber *larger* than .45 was something else altogether. It was time for S&W to once

again manufacture "The World's Most Powerful Handgun," just as they had in late 1955, almost 50 years before.

S&W decided on a true .50 caliber gun, firing bullets .500" in diameter. My suspicion is that they were aware of some antigun rumblings from our enemies (in Washington, not the Middle East) that handguns with bores of over a half inch are somehow "non-sporting" and thus "Destructive Devices," subject to NFA 1934 regulation. The .500 Linebaugh uses the .510" groove dimension and .499" bore common to other .50 caliber sporting arms such as the .50-70 and .50-110 Winchester rifle rounds, J.D. Jones builds .50-70 single shot Contender pistols, and Lee Jurras built some .577 caliber black powder Contenders around 1980, and no one has ever bitched about any of them. However, the first modern production .50 caliber repeating handgun, the semiauto IMI Desert Eagle in .50 Action Express, has a barrel with a .500" groove and .488" bore. S&W elected to follow IMI's example by producing a gun where a half inch gage could *never* drop down the bore, even if the gun had been shot a lot and the rifling was worn.

In any event, S&W decided on a .500" groove diameter, and arranged for Cor-Bon, an ammo manufacturer known for innovation, to develop a .50 caliber cartridge case 1.615" long that would operate at .454 Casull pressures of 60,000 PSI.

Serendipity strikes

The task of designing a new DA revolver, with an entirely new frame size, capable of handling pressures typical of a bolt action rifle, fell largely to S&W engineer Brett Curry. Before Curry was turned loose on what would come to be known as the X-frame, however, he was given an instruction that would ultimately make the .500 S&W Magnum even more formidable than the company intended.

Herb Belin, the head of S&W revolver product development at the time, was thinking that any new frame size should, like that of all other S&W revolvers, be usable for a variety of calibers, not just one. Belin (or one of his team) thought that it might be possible, sometime in the future, to build an X-frame revolver that would shoot the .223 rifle round. Belin told Curry to make the new gun's frame and cylinder long enough to swallow a .223 round without modification. Then, without thinking about the implications of what he had just done, Belin sent Curry on his way and went back to his desk to tackle his in-box. (I wasn't there, but that's how I imagine it happening.)

The "Oh, my God" moment

Smith & Wesson unveiled their .500 Magnum to a stunned shooting world in early February 2003 at the SHOT Show. The gun was a five-shooter, which put the cylinder stop notches between the chambers for greatest cylinder wall thickness and thus strength. The gun also had a long 8 3/8" barrel with a compensator and a full underlug, and it weighed four and a half pounds, which removed it from any consideration as a daily working gun. That didn't matter to me, as barrel lengths and contours are easily changed; it's the frame and cylinder that are the hard part.

When I saw the .500 lying on the table, my jaw dropped. I reached for my dial indicator calipers (yes, I really do carry a set at trade shows), and found to my astonishment and delight that the gun's cylinder was 2.300" long! This was a *lot* longer than the defunct Ruger Maximum cylinder on which John Linebaugh and Hamilton Bowen had based their most powerful creations.

Cor-Bon factory .500 ammo was listed in several bullet weights, with a 440 grain cast slug at 1600-plus FPS being the stoutest. This eclipsed the .500 Linebaugh Long's best efforts. But this factory ammo was loaded to an overall length of only 1.995" to 2.050", depending on bullet weight. They were giving up a *quarter inch* of powder space in a .50 caliber case! I knew if I loaded ammo with an overall length of 2.300" at the same factory pressures of 50,000-60,000 PSI, I'd get truly breathtaking results.

(As an aside, Taurus unveiled a .500 Magnum prototype a year later at the 2004 SHOT Show, and I noted that the cylinder was shorter by about .200". On a S&W discussion board on the Internet I pointed out that the Taurus would be giving up 500-600 foot-pounds of energy to the S&W when using top handloads, and that Taurus would never be able to copy S&W's potential future .223 X-frame, if it ever got built.

That Taurus .500 never showed up on dealer shelves. At the 2007 SHOT Show there was a new Taurus .500 prototype with a cylinder 2.300" long, as well as a hideously heavy .223 prototype built on the same frame. Do the boys from Brazil listen to *me?* Hmmm...)

The S&W guns at the 2003 SHOT Show were made on production tooling, but production of .500s for entry into the retail distribution system had not yet started. These first .500s were being put in the hands of print writers so that magazine reviews would coincide with guns hitting the distributors; I was told I could not get a .500 until late spring or early summer.

Time to get to work

While waiting for a gun to arrive, I acquired a thousand cases from StarLine, ammo from Cor-Bon, dies and shellhoders from RCBS (and later Hornady and Lee), Star lubrisizer dies from BallistiCast, and a swage die from C-H to bump up .45-70 rifle bullets to .500" diameter. Then I created drawings for a custom mold maker to make cast bullet molds for a variety of bullet weights and styles, all with a nose length (nose to crimp groove dimension) of .700". This would allow an overall length of 2.320", which would give me maximum net case capacity for any given bullet weight.

My first custom mold soon arrived, and it was for a flat-pointed design with a 70% (.350" diameter) meplat and a total weight of 640 grains. I used a computer program, one that had given me excellent results in the past, to come up with a 50,000 PSI load for this heavy bullet. The program predicted I'd be able to get over 1200 FPS out of an 8" barrel at this pressure level, using WC680 powder. WC680 is a ball powder somewhat slower than H110 or WW296. It was originally designed for loading the 7.62x39 Combloc AK and SKS rifle round.

I now had bullets, cases, powder, primers, factory ammo, and handloads. All I lacked was a gun. A call to Herb Belin got me put on a short list, as production .500s were now shipping. I received one on June 17 (my birthday!) 2003, and I immediately went down to my mother's place on the river in rural Missouri to shoot it.

Initial discoveries

The first rounds out of my .500 that day were my own 640 grain handloads. Recoil was substantial but manageable. Several times, I would fire a round, and then would get a "misfire" on the next chamber. Inspection revealed that the second trigger stroke had caused the hammer to fall on the same fired case in the first chamber. I was all but certain I knew what was happening: Under recoil, the cylinder stop was compressing the spring under it and allowing the cylinder to unlock (*not* unlatch). As the entire gun rose and twisted with my right-handed hold, the unlocked cylinder was (rotationally speaking) standing still, and the frame was rotating around it counter-clockwise 1/5 of a turn. The cylinder ended up with the just-fired chamber in the one o'clock position from the shooter's viewpoint. The Cor-Bon factory 440 grain loads did not do this for me. Their recoil was not as stout as my heavy bullet handloads.

I chronographed both loads and found my 640 grain handloads were giving 1280 FPS and the 440 grain Cor-Bon factory ammo produced 1640 FPS. The other immediate discovery was that the 440s shot high, and the 640s shot REALLY high, like about eighteen inches high at 50-60 feet. Plinking at rocks with

both loads at long range (500+ yards) immediately told me two things: The .500 shot much flatter than any .44 Magnum load I'd ever fired, and the .500 was noticeably more accurate. I was hooked.

I intended to shoot up all my ammo that day, but the gun quit firing. I soon discovered the reason: The firing pin was gone. I looked around and finally found it on the ground, undamaged. Then I sorted through my can of fired brass and found the culprit: A pierced primer on the last shot out of the previous cylinder of Cor-Bon ammo. High-pressure gas had blown the firing pin out of the frame.

Herb Belin was intrigued when I told him of the firing pin blowout. He had me overnight the gun to him for analysis and repair/replacement. I told him that back in the '70s when Kent Lomont and I were loading the .357 and .44 Auto Mags and using the Super Vel ballistics lab in Indiana, Kent discovered that most pistol primers pierced at around 55,000 CUP.

I also described the reverse-rotation cylinder phenomenon, and offered my analysis. Herb said he was getting other reports of this, and that my analysis was exactly right. He said that it did this for some shooters but not others, depending on amount of palm fat, grip strength, and other shooter variables. The fix was a heavier cylinder stop spring. He said, "It happened with the heavy 440 grain Cor-Bon load, right?" I told him, "No, not those. Just sometimes with a 640 grain cast bullet going 1280." There was a long pause. "We didn't design this gun to shoot 640 grain bullets." I immediately said, "Then you shouldn't have made the gun with a cylinder 2.3 inches long. It's got room for even more bullet weight, and it shoots those big ones great." Herb said he'd send a new gun with a heavier cylinder stop spring out that day. I told him rifle primers might be the answer, and I'd see how they worked.

A new .500 arrived the next day, and I shot up the rest of my handloads in it, discovering that they would penetrate three feet of oak, and exit. The "reverse rotation" phenomenon was gone. I also primed a hundred of the StarLine cases with a variety of large rifle primers, to see if the gun would reliably fire them. All of the primed cases fired without a hitch. This surprised me. My experience from the '70s with Model 29s was that S&W revolvers will seldom ignite rifle primers. This, I came to learn, is true only of guns with traditional hammer-mounted firing pins. All new K, L, N, and X frame guns with floating, frame-mounted pins are 100% reliable with rifle primers.

I called Herb and reported my finding. He said that Cor-Bon had just received reports of other people getting pierced primers. Cor-Bon soon went to rifle primers in the .500, and StarLine went to slightly deeper pockets for rifle primers in the brass they sold. In early cases made for pistol primers, I just seat rifle primers a little more firmly. You only need to squoosh the primer another .004" to get it below the case head.

Further experiments

I have always preferred the looks and balance of the traditional S&W Magnums of the pre-stainless era over the full underlug designs that came into favor with the 686 and after. I also prefer plain muzzles on revolvers to those with compensators. The greatly increased blast and concussion to my whole nervous system is not to me worth the slight recoil reduction to my hand. I say slight because of the laws of physics. Let me explain.

Recoil is generated by the weight and speed of the bullet, and the weight and speed of the burning powder. Compensators or brakes are ineffective on guns where the powder charge is a small percentage of the bullet weight (most handgun ammo). Brakes work their best in high pressure bottlenecked rifle cartridges like the .300 Weatherby, where the powder charge can be 50% or more of the bullet weight. The ultimate example of this is the recoilless rifle, where enough powder is used (and directed rearward) that the gun doesn't recoil at all.

In the .500 S&W shooting 640 grain bullets, the powder charge is less than 5% of the bullet weight, and redirecting part of this small charge cannot possibly reduce total recoil to any large degree. It is my very strong opinion that factories such as S&W and Taurus put compensators on so many of their magnum revolvers because the general public for some reason thinks they are desirable, and not because of any actual objective tests that demonstrate their efficacy.

To address the issues of balance and blast, I took two .500s and machined off the front of the full underlugs and removed the compensators. The resulting balance was, in my opinion, a big improvement. Recoil went up somewhat due to the lowered weight (the 8 3/8" gun lost 9 ounces). Since the blast went down a lot, I felt the overall experiment was a big success.

On one gun, I shortened the barrel and shroud to 6" and used a muzzle nut so that I could set the barrel-cylinder gap to the dimension I wanted, which was .004". The shortened factory barrel with .004" gap gave more velocity than the same barrel did when it was 8 3/8" long with the factory spec .008"-.010" gap. I couldn't detect a difference in accuracy; it certainly didn't get worse.

By now I had acquired the rest of my custom bullet molds, all with .700" long noses and bore-riding sections .100" to .150" long in front of the front drive band for better initial bore alignment. The lightest were 400 and 450 grain designs, with one and two thin grease grooves, and a semi-pointed nose with a 40% (.200" diameter) meplat. I also had 550 grain and 650 grain versions of this slug, the only difference being shank length and the number of grease grooves. I think of these as my long range designs. Their lengths are .900" for the 400, 1.000" for the 450, 1.200" for the 550, and 1.395" for the 650.

I had duplicates of all these molds made and sent them to Kent Lomont, who wasted no time in casting thousands of bullets and testing them in all possible situations. Kent used my 450 grain long range design over a powder charge that gave 1400 FPS, a comfortable load to shoot. With this load, using a rest and in front of witnesses, he put ten cylinders (50 shots) on a 55 gallon oil drum at a range (measured with a laser rangefinder) of *700 yards.*

I also had two molds made with a 93% meplat (.465" diameter flat nose), making bullets that were very nearly full wadcutter in shape. These bullets weigh 510 grains and 725 grains. The lengths of these two bullets are 1.000" and 1.395", respectively. I think of them as my close range sledgehammers. (Note: I believe "The Sledgehammer Solid" is or was a trademarked name for the dangerous game jacketed rifle bullet made by Jack Carter's *Trophy Bonded Bullets* company in Texas. I have no affiliation with them and use the term generically this one time.)

Since muzzle energy at a given pressure is roughly proportional to net case capacity (the case volume underneath the seated bullet), the 400-450 grain bullets with their short shanks will always be able to give greater energy than the long, heavy ones that use up a lot of the powder space with their long shanks. This fact is especially evident in fat, straight-walled handgun cartridges, where the length of a heavy bullet's shank can cut the case capacity by one-third compared to a lighter bullet with a very short shank.

Long nose bullets give impressive results

Using these bullet designs with .700" long noses, and thus the shortest possible shanks, resulted in some startling ballistics. The 400 grain long range bullet with its stubby .200" shank can be driven 2000 FPS from a .500 with a tight cylinder gap. This yields over 3500 foot-pounds of muzzle energy, which eclipses anything ever achieved from a repeating handgun by a *very* large margin.

At the opposite end of the bullet weight spectrum, the 725 grain slug that puts .695" of shank in the case can be sent on its way at 1200 FPS, for over 2300 foot-pounds of muzzle energy, which is still none too shabby.

Perhaps the most devastating close range load is the 510 grain slug with its .465" diameter meplat and .300" long shank that can be driven over 1700 FPS. Shoot this load through the trunk of a dead tree and you will get massive amounts of wood blown out the exit point. By comparison, the semi-pointed long range bullet design exits the same tree with very little evidence of its passage.

It has been almost 30 years since I chronographed any factory .458 Winchester rifle ammo, but in the late 1970s, because of the fact that German and Austrian gunmakers were chambering break-open double rifles in .458, and these guns would not tolerate bolt action pressures, the ammo companies at that time loaded 500 grain .458 ammo to slightly under 1900 FPS. I'd bet money that my 510 grain .500 handgun load, with its flat point bullet, going over 1700 FPS from a tight-gap 5" .500, would offer at least as much killing power as the 500 grain round nose .458 rifle round at 1880. Think about *that* the next time you slide your 3 lb. 9 oz. 5" .500 out of its holster…

Ballistic reality check

I have spent much time discovering the tremendous power the .500 is capable of producing when loaded so as to take advantage of both its 2.300" long cylinder *and* its ability to accept 60,000 PSI pressures, which is something the ammo companies have not yet done. (Steve Hornady was very receptive to my suggestions and his company should have a 500 grain load with 2.300" OAL out by the time you read this.)

I have done this development work and shared this research to show what you *can* get, for stopping a grizzly attack, hunting buffalo and elephant, or for showing off by reducing a menacing rock to gravel or blowing evil dead trees apart.

What I haven't yet mentioned is that the long cylinder also allows you to load ammo to more shooter-friendly pressure levels that will still *far* outperform any other DA revolver on the planet. My experience is that muzzle pressure and the resultant concussion have a far greater effect on shooter discomfort than raw recoil numbers.

You can get 1850 FPS with my long range 450 grain bullet, using powders such as 296, H110, Li'l Gun, or WC820, but if your .500 has a compensator, your whole body is going to feel as if someone detonated a stick of dynamite three feet in front of you every time you pull the trigger. The shock to your whole body, in my experience, is much more noticeable than the thump on your shooting hand.

If you can be content with only 1400 FPS using this same 450 grain bullet, switch your powder charge to 50 grains of H322 rifle powder. You will be rewarded with a standard deviation of *four* feet per second and a comfort level that let Kent Lomont hit a 55 gallon drum at 700 yards *fifty shots in a row.* This milder load has *twice* the energy of a factory .44 Magnum round, shoots flatter than the .44, yet the pressure (and resultant blast) is slightly lower than the .44, because you get that energy with massive net case capacity and not Casull-like pressure.

Load 500 grain bullets to 1000 FPS or 650s to 800 FPS and I think you'll be pleasantly surprised at the long shooting sessions you can have with this gun. The forcing cone will last a lot longer, too, with these lower pressure cast bullet loads.

Twist experiments

The twist rate of 1:18¾" in the mass production .500 is an excellent choice for factory ammo and most handloads. However, when you start shooting very heavy bullets at long range or at less than maximum velocities, these long bullets don't group nearly as well as they ought to.

I did some calculations and determined that a 10" twist ought to stabilize a 1.395" long 725 grain bullet at a muzzle velocity of 800 FPS. I ordered an unfinished .500" barrel blank with 1:10" twist from Pac-Nor and had it fitted to one of my .500s.

I should have done a little more homework, as a revolver that operates at 60,000 PSI has different barrel steel requirements from a bolt action rifle operating at the same pressure. The forcing cone area of a revolver barrel is unsupported for the rearmost 1/8" or so of its length. On a .500, the barrel needs to have a hardness of around 42 on the Rockwell C scale in order for the forcing cone to hold up when the bullet comes out of the cylinder and the 50,000-60,000 PSI pressure hits this unsupported area.

I did not know this when I pulled the trigger of my rebarrelled gun. I had loaded the cylinder with a well-proven cast bullet load that I'd fired thousands of in the factory gun, and the *first shot* took out both sides of the forcing cone entirely, folded the top and bottom of the cone up against the gun's top strap and cylinder bearing, and cracked the barrel lengthwise for the entire section where it threaded into the frame. Now I knew how Elmer Keith and Dick Casull must have felt…

A subsequent test determined that the hardness of my blank was Rockwell 26. I fitted a second barrel (from a different supplier) with the proper hardness of 42 to the same frame, and confirmed that the 10" twist was the way to go for heavy bullets.

Does the faster twist hurt accuracy with light bullets? My experience is that with good jacketed bullets, such as Hornady's superb 350 XTP or 300 Evolution, not at all. Scoped and from sandbags, a 10" twist .500 shoots high velocity jacketed loads just as well as the 18¾" twist gun.

With lightweight cast bullets, it depends. The 10" twist is probably more prone to leading if the alloy isn't right. I haven't shot enough of my long nose 400 grain, 2000 FPS thunderbolts through the faster twist to tell if long range accuracy suffers with this load, but at this point I'd say it doesn't appear to.

The final(?) result

In 1928, Elmer Keith, drawing on the machining and gunsmithing abilities of several experts in their fields (most notably R.F. Sedgley), created a Colt SAA that he felt was the best rendering of a working revolver that could be made using parts and materials available at the time. This gun, the Keith Number Five in .44 Special, was described in an article appropriately entitled "The Last Word" in the April 1929 issue of the *American Rifleman.* It is arguably the most famous custom revolver ever made, and both its genesis and the recreation of a duplicate are explained in detail by Hamilton Bowen in his fascinating book *The Custom Revolver.*

At one point Keith offered the Number Five to the Colt factory for them to inspect and measure so that they could put a duplicate into production. In spite of the fact that Keith wanted no royalties or any other kind of financial reward for his efforts, Colt had no interest in producing his gun, and the shooting community is poorer for that.

Fast forward eight decades

The 5" .500 before you represents my idea of the best rendering of a working revolver that can be made

using parts and materials available in 2007. My definition of "working revolver" includes the ability to dispatch large, angry, aggressive, and possibly wounded animals up to and including not only farm bulls and grizzly bears but also dangerous African game.

Like Keith, I am a shooter and not a top level custom gunsmith, and like Keith, I relied on the best craftsmen of my time to translate my ideas into working form. Initial proof-of-concept prototype work was done by the late Art Freund, whose competition benchrest rifles hold scores of world records. Ultimate production details were finalized by Dick Mochak of the Smith & Wesson Performance Center. The only gunsmithing that I personally performed on the prototypes was non-critical work such as machining the outside contours of barrel shrouds and the like.

Elmer Keith designed his holster gun to excel at the shooting activities he enjoyed. He knew that the gun you like, are good with, and that makes you feel happy just holding it, is the gun you'll practice with for hours on end. You'll become skilled enough with it that if you ever do need to use it to save yourself, you'll prevail.

For the same reason, my gun excels at the things I like to do, like plinking rocks and drums at varmint rifle ranges and cutting dead trees down, in addition to having enormous close-range stopping power.

Let me say up front that I'd never consider myself Elmer Keith's equal, let alone his successor, for I'll never have more than a tiny fraction of his real-world experience with North American game animals and other relevant outdoorsman concerns. I've also never managed to equal the rapidity at which Keith could hit distant targets with a handgun, let alone match his ability to manipulate a slip gun.

However, Keith and I were in complete agreement that for big animals, big bullets give better results than smaller ones, and we both tested our theories extensively in Africa. Further, I enjoy the advantages of having computer simulation and modeling, ballistic lab equipment, CNC machining, and modern steels and gun designs at my disposal, things that were unavailable to him or anyone else in 1928. These advantages allowed me to save countless hours of trial and error, and also meant I didn't have to blow up any guns to find out what wouldn't work. (One little forcing cone doesn't really count...)

The advantages enumerated above, along with my Internet presence, have caused me to become the leading provider of experimental information on the .500 S&W Magnum. I do not claim to know more about the .500 than anyone else. There are other people (my friend Kent Lomont, for one) who shoot the .500 more than I do, but they aren't putting the results of their work on the Internet for everyone else to see. I am only one guy, and I certainly haven't found out all there is to know about the .500. If you've got information from your own .500 development work, please share it so that we can all benefit.

The work I have done so far with the .500 has brought me to the point where I believed I knew exactly what I wanted in a working revolver. I had a prototype built, my own "Last Word," and the prototype confirmed my beliefs.

I didn't try to convince Smith & Wesson of the virtues of my design, as Keith did with Colt. I didn't need to. The Smith & Wesson Performance Center will make anything you want (that uses a standard dimension frame and cylinder) if you will make arrangements with a distributor and buy five hundred units.

So that's what I did.

Here, then, are the relevant design features of the John Ross/Performance Center 5" .500 S&W Magnum that set it apart from other guns in this caliber, and make it what I believe is the best working revolver currently available at any price.

Barrel length and shroud contour
For all firearms, there is a "sweet spot" for the balance point (the gun's center of gravity, for you physics majors) that makes the gun feel better in the hands than if the balance point were either farther forward or farther back. For my money, the people who have always understood this best are the English makers of double shotguns and double rifles. My Rodda 4-bore double rifle (built in 1882) weighs 24 pounds and is livelier feeling than you would ever think were possible for a 24 pound shoulder weapon.

In my hands, the .500 feels better with a half-lug 5" barrel than with any other length or contour. Happily, a five inch barrel is long enough to wring out almost all the ballistic performance that the .500 cartridge has to offer, and short enough to not get in the way of things when carried in a good belt holster. A five inch barrel gives a long enough sight radius for good long range shooting, yet it is short enough that you don't have to hold up as much front sight for the really long shots, as with the 8 3/8" guns. This barrel length with half-lug shroud gives a gun weight of 57 ounces. This is a tolerable heft for a holster gun, and only one ounce more than the production 4" .500 with the blast-inducing compensator, wider cylinder gap, and only 3 1/8" actual barrel length.

Twist rate
The 1:10" twist rate will stabilize long, heavy bullets at long range and/or moderate velocities, while 1:18¾" twists fall short in this area. The faster twist hurts very little if at all on lighter bullets, so you have the ability to shoot 300 grain Hornady polymer-tipped spitzer bullets at 2100 FPS, 725 grain cast flatpoints at 800 FPS, or anything in between, and the gun will shoot them all well. No other repeating handgun enjoys this wide a range of usable bullet weights and velocities.

One idea that bears further investigation is using nylon sabots and shooting .308" rifle bullets in this gun. The 10" twist should stabilize them. My computer says .30-06 velocities might be possible out of a 5" barrel. And I've got some surplus .308 incendiary rounds…

If you elect to experiment with saboted rounds, *DO NOT* fire them in any gun with a compensator. You will blow the compensator off your gun on the first shot and the factory will not warranty this obvious case of misuse.

Barrel attachment method
The realities of S&W's production facility dictate that if you want a tight (.0035"-.0045") cylinder gap on every gun in a run of five hundred units, you are going to have to use a three-piece barrel assembly with a barrel, barrel shroud, and a muzzle nut. I originally wanted an internal muzzle nut like the one used on the 5" 327 Miculek model .357 Magnum (and all Dan Wessons), but there is not enough room to do this on a gun with a half-inch bore. The internal nut has to be so thin that the engagement lugs on the tool you use to tighten it break off before you can get enough torque. Dick Mochak experimented with a number of possible alternatives, and an external muzzle nut with eight flats on the front quarter-inch of its length was far and away the most robust design. Like Keith, I want what works best, and this is it. The look grows on you.

Front sight
I originally wanted S&W's excellent quick-interchangeable front sight (standard on 8 3/8" production guns), so that the shooter could change front sight heights for loads that shoot to widely different elevations. Dick built a prototype 5" gun this way, but the greater muzzle flip of the lighter, shorter barrel

caused the locating notches of the insert to quickly become battered and unserviceable. The Millet dovetail sight is the most robust design available. A gunsmith can fit a sight of appropriate height for any load, and it will stay put. It is not possible to make a quick-change sight for a .500 with a barrel shorter than 8" and have it work long term. If you have multiple favorite loads, do what I do and have multiple guns. I am hoping to get some front sights made with Keith long range gold bars, which may help the situation of shooting different bullet weights with the same rear sight setting.

The reality is that if you are shooting a true Super Magnum like the .500 and exploring its capabilities, you are on the absolute frontier of handgun development. This frontier has been tamed quite a bit, in that factory brass, dies, bullets, molds, holsters, and even progressive loaders are now commercially available with a phone call and a credit card, unlike when John Linebaugh was first building his .475 for intrepid customers. But front sights of proper height are something you're going to have to sort out yourself if you stray too far from loads that are equivalent to Hornady 500 grain factory ammunition.

Finish

I had originally wanted my gun to have the black Melonite finish that S&W puts on some of its semiautos, both because of its attractive color and the fact that it is extremely hard. Unfortunately, Melonite is not suitable for a revolver cylinder that sees 60,000 PSI on a daily basis, and the order in which S&W performs the machining operations on the .500 frame prevent Melonite from being a possibility there, as well. I think the two choices we ended up with are almost as good as what I originally wanted. The satin stainless finish is classier (and more appropriate for a working gun) than the shiny production finish, and the black oxide with satin cylinder version of the gun is sexy as hell.

Trigger

The DA trigger pull on all X-Frame guns will always be heavier than that of other S&W models because the cylinder itself has much more mass than a typical 6-shot .44 Magnum N-Frame or 7-shot .357 L-Frame. It takes more finger effort on the trigger to index the heavy cylinder on double action--you can't get around basic physics. I had the Performance Center give me the best DA pull that they could put on the gun. The SA pull *could* be lighter, but they will not put as light a single action pull on a .500 as they will on smaller calibers because this is one gun you *really* don't want going off before you have it in a firm grip.

Before I had the October 2000 stroke that greatly affected the speed of everything on the right side of my body, I could fire six shots of full-strength .44 Magnum ammo in 1.1 seconds from an 8 3/8" Model 29. Jerry Miculek can fire *eight* rounds of .357 from an 8-shot 5" Model 627 in one second flat. By now he may have improved on this time. Jerry tells me he dislikes shooting revolvers with heavy recoil, so I'd like to load up some 300 grain bullets at a modest 1000 FPS or so for him and see what kind of times he can produce for five shots out of my .500. My guess is one second or better.

Grips

Grips are the most subjective part of a revolver, particularly one with heavy recoil. It would make no sense to fit five hundred guns with the grips *I* like best, only to have the vast majority of customers want something else. The Hogue Sorbothane grips shipped with my guns (and all other .500s) soak up recoil better than other choices, but if you shoot a lot, they split (though they still work after splitting), and if you shoot a lot in one session without gloves, they start to feel like they are pulling the skin off your palm. Finally, the front of the grip doesn't go all the way down to the bottom of the trigger guard as it should, and my middle finger gets hammered 'til it's numb on long shooting strings.

For general use with milder loads, I like Jim Badger's round-to-square butt conversion grips. They cover down to the bottom of the trigger guard, their finger grooves are perfectly spaced for me, and they lock

my hand into the gun the way no rubber grip ever will. They are also beautiful in the rosewood laminate I prefer, and so far they haven't broken. If you are willing to pay for a set of full custom grips that are made specifically for you, I'd suggest the Jordan Trooper finger groove stocks that Rod Herrett makes on a custom basis. See Herrett's website for details. They need an outline of your gun hand.

Handloading

The .500 benefits from handloading more than any other handgun, particularly if you cast your own bullets and use long-nose mold designs. You can construct loads that will do exactly what you want, at the recoil level that you find acceptable.

I know that shooting non-factory ammo allegedly voids the warranty. I'll go on record as saying that in practice, this is only true if the gun is actually damaged by the handload and not just worn. Shooting a lot of full power factory jacketed bullet ammo will wear out the forcing cone. Shooting cast bullet handloads will do this, too, but it will take a lot longer.

The secret to safely handloading the .500 (or any gun, for that matter) can be expressed in one sentence: *Never use a powder that can create a proof load with the bullet you are using.* For example, if you want my 510 grain hammer bullet at around 1000 FPS, don't even think of using Bullseye, Unique, Titegroup, or any other fast-burning pistol powder, where you could accidentally load a double charge and ruin the gun.

Instead, try a rifle powder normally suited to the .223 Remington. Forty-five grains of 4198 is all that will fit with my 510 grain bullet, and that's a compressed load that gives a little over 1240 FPS with very low standard deviation. Try 38 or 40 grains and see if you like the results you get. Be very wary of any powder faster than WW296 or H110.

4759 is a great powder in the .500. Load it to 100% loading density (full but not very compressed) with *any* bullet weight and you will get a powerful load that is still well below maximum. Loaded thusly, 4759 gives my 510 grain hammer bullet 1400 FPS, the 550 long range slug 1320 FPS, and my 725 hammer 975 FPS, all very powerful but all well below max. You cannot hurt your gun with 4759.

A word about detonation

Detonation is what allegedly can happen when *too little* of certain powders is used. I say allegedly because the powder companies insist that detonation is a myth, they have never been able to make it happen in the lab, and all purported examples of detonation are actually double charges or other human errors such as mistakenly using the wrong powder.

The theory (espoused by those that believe detonation actually happens) is that with too little powder and too much air space in the case, the powder sometimes doesn't burn progressively, but rather the primer ignites every grain in the entire charge at the same time and it goes boom all at once, like dynamite or some other high explosive.

I have seen one .500 with its cylinder deformed and flattened against the top strap. The shooter was a very experienced reloader with hundreds of thousands of rounds experience. He said his load was a charge of Titegroup that was a few grains *below the starting recommendation* with a lightweight cast bullet. He believes he got detonation. Hodgdon says that's impossible, and that he loaded a double charge. Smith & Wesson understandably would not replace the gun under warranty. Which was it, detonation or double charge?

In my opinion, there have been far too many reports of weird things happening when extra-light charges are used (most of them by cowboy action shooters) to dismiss them *all* as reloading error. Again, there's a simple way to avoid any possibility of detonation ever happening to you: Stick with loads that fill most or all of the available case capacity. Want a lighter load? Use a slower powder. If the load still kicks too much, the .500 isn't the gun for you.

What's wrong with my gun

Are there any things I would want changed about this gun, but they couldn't be done? Yes, there are. One for sure, and another, maybe.

The cylinder latch

First, the one feature of my gun that can be fairly easily changed on an individual basis but would have been prohibitive on a run of five hundred pieces is the cylinder latch. The latch S&W puts on all new guns is a hollow metal injection molded (MIM) part with a sort of triangular shape designed, I believe, to facilitate the use of speed loaders on those revolvers that use them. The point of the triangle sticks way out to the left and on the .500 will cut your right thumb under heavy recoil if you shoot the gun one-handed or if you don't push your right thumb out of the way with your left thumb when you grip the gun in a two-handed hold. You cannot reshape the latch to a better contour on a belt grinder because the part is hollow and you will grind through it and create a knife edge, which is the last thing you want.

Master pistolsmith Ron Power had the best solution in the 1970s when he was building competition revolvers. He took the original style latch, ground the bottom of it off even with the base of the front section, and then ground all sharp areas into rounded shapes. His latch worked with all speed loaders and would never cut you. I am going to fabricate latches like his for my own .500s, and you can too.

The "too much" factor

The .500 balances and performs best with a 5" half lug barrel that gets the weight way down from the original by a full pound, but it's still nine ounces over the somewhat arbitrary three pound standard for a working revolver, due to the length of the frame and cylinder. That long cylinder permits astonishing ballistic performance, and a parallel story is in order:

My friend Delmar Benjamin is an air show pilot who is best known for his performances in the 1930s Gee Bee racer replica that was built by Steve Wolf and is now in Kermit Weeks' *Fantasy of Flight* museum in Florida. Delmar has often and for many years said that for an air show airplane, there is no such thing as too much power. Air show pilot Jimmy Franklin (who was killed in a midair collision in Canada in June 2005) had always agreed with Delmar's assessment.

Then, around 1998 or 1999, Jimmy mounted a military surplus jet engine with 3000 pounds of thrust between the landing gear legs of his 1937 Waco open cockpit biplane, which already had a 450 HP Pratt & Whitney Wasp Junior radial mounted on the firewall, producing over 1600 pounds of prop thrust.

After performing several test flights to make sure the biplane flew well with a jet engine mounted underneath the fuselage and that everything was working okay, Jimmy lit up both engines, gave the radial full throttle, and did a normal takeoff. He then pulled the airplane vertical and gave the jet engine full throttle as well.

With over 4600 pounds of combined thrust and an all-up flying weight of around 3000 pounds, the 60-year-old biplane had the highest thrust-to-weight ratio of any aircraft on the civilian registry, and it soon accelerated to its never-exceed design speed *while going straight up.* After easing off the throttles,

leveling off, descending, and landing the aircraft, Jimmy got out of his plane, went to a phone, dialed the number of his old friend, and uttered three words:

"Delmar, *we're close.*"

Hamilton Bowen noted in 2002 that a three-pound .500 Maximum single action that would send a 450 grain bullet out at 1500 FPS had the dubious distinction of having the most favorable power-to-weight ratio of any revolver made. A 450 at 1500 in a three-pound gun is 750 foot-pounds of energy per pound of gun weight.

In 2002, 750 foot-pounds of energy per pound of gun weight may have set the standard, but that was then and this is now.

I tested my long nose, short shank thunderbolt loads in my three-pound, nine-ounce 5" S&W gun with tight .0035" barrel-cylinder gap and got 2020 FPS with the 400, which is over a thousand foot-pounds of energy per pound of gun weight. The 450 at 1860 FPS and the 510 at 1740 FPS are a little lower with over 950 foot-pounds of energy per pound of gun weight. Delmar, *we're close.*

The obvious answer is to go the other way and shorten the frame and cylinder .400" and chamber the gun in .500 Special, a round that already exists, is SAAMI-certified, and that Cor-Bon is currently loading. In February of 2004 (see my website) I urged Herb Belin to do just that, as well as also chamber the new frame size in .475 Linebaugh, .454 Casull, and 7-shot .44 Magnum.

It is my understanding that in 2005 the shorter frame was tentatively given the green light in .500 Special and 7-shot .44 Magnum, with the latter caliber also planned in a Ti/Scan version as well as stainless steel, and Brett Curry got all the design work done and made or procured the tooling.

When I found this out, I lobbied heavily for a Ti/Scan .500 Special as well. The .500 Special has a SAAMI spec of 38,500 PSI maximum pressure, which would tax a Ti/Scan X-frame less than the .44 Magnum does the 329. A 36-ounce Ti/Scan .500 Special firing a 400 grain bullet at 1300 FPS would give 1500 foot-pounds of energy, which is 665 foot-pounds energy per pound of gun weight, a nice level. I thought it was going to happen.

Then, before the CNC equipment started cutting metal on the new XS ("X Short") frame, there were some management changes and Herb Belin got moved over to the handcuff division. As I understand it, all or almost all the needed work on the XS project is already done, but no one has pushed the "START" button. I offered to order 500 guns to get the new model rolling but only the Performance Center will do runs that small, and they have to get frames and cylinders from the main factory.

For now we'll have to be content with a working revolver that's a bit heavier than we'd like and that we might have to load down just a bit. There are worse fates…

A final warning about recoil

There is no denying that the .500, in particular my version, has heavy recoil. It has especially heavy recoil if you handload it to its full potential with heavy, long-nose bullets, but many factory loads, such as Hornady's and Cor-Bon's offerings, will get your attention too.

During the Linebaugh seminars in Cody, Wyoming, where several of John's clients had .500 Linebaugh Maximum revolvers that weighed three pounds, some of these shooters were getting hit in the head by

their gun's barrel. One shooter was wearing a helmet. I attributed this phenomenon to the single action's grip shape, which guarantees it will rotate in your hand when fired. The grip shape of the S&W .500 prevents the gun from twisting through the web of your hand and ending up with the barrel past vertical over your head.

Then, last year, I got an email from a man who had been hit in the top of the head with a .500 S&W barrel. He had been shooting the standard version off sandbags at a bench, with his arms relaxed.

Recently, a gun writer with lots of .44 Magnum experience (but none with any more powerful handgun round) managed to have the barrel of my 5" .500 hit him on the top of the head while firing a factory 275 grain Cor-Bon DPX round from a standing two-hand hold, and he bled all over his shirt. Fortunately, he was wearing a hat, so no blood got on my gun. It was about the 15th or 20th round he had fired that session. Maybe he was getting tired, or got complacent.

The next time I was at the range, I asked others to stand to my right side while I shot my 57 ounce 5" gun with various loads, and tell me how far the gun rose. Factory ammo caused the barrel to rise to an angle of 30 to 40 degrees. The heaviest-recoiling loads I've ever shot are my 510s at 1740 FPS and 725s at 1200. When I shot some of these, they made the angle steeper, maybe 70 or 80 degrees, but not quite vertical. The observers told me the gun never got closer than a foot and a half or so from my head.

This man who got hit is in good physical condition, but weighs 135 pounds to my 240. His arms are correspondingly lighter than mine, and one's arms have to be shoved along, too, if the gun is to go back far enough to hit you in the head.

Be careful out there. Work up to the recoil gradually. Start with .500 Special loads. If you have any doubts at all, wear a helmet until you know for sure.

Final thoughts

If you have any experimental data on the .500, please share it on the Internet or send it to me in an email. Of especial interest would be penetration tests in a repeatable medium more scientific that my own practice of using oak logs, dead trees, and the ground. John Linebaugh tells me that non-deforming bullets can in some cases have greater penetration (in flesh, I assume) at *lower* muzzle velocity than the same slug fired at a higher speed. I would like to hear if anyone else can confirm this in a repeatable test.

I would also like for any of you who use my 5" .500 in interesting ways to email me about it. Tell me about the game animals you've taken with it, groups you've shot, bets you've won, people you've astounded, etc. Give some detail. If I get some good stories, I'll set up a web page and put them on it with credit given.

I hope you enjoy this amazing gun as much as I do. I think it would have made Elmer smile...

John Ross St. Louis, MO 7/29/2007

Loading the .500

Here are some observations that I've made while working with the .500. Many are applicable to other calibers.

Worst powders: I don't like light charges of fast powders in *any* cartridge. In general, I like using the slowest powder that will give the desired velocity. You cannot get a dangerous overload with this practice. Leading is less likely, for reasons I'll explain later.

The single best powder for full .500 loads with long-nose bullets over 450 grains in weight is WC680 or other surplus equivalent. This ball powder was designed for the 7.62x39 AK round. Barring that, WW296, H110, WC820, or Li'l Gun will give almost as much performance.

Cast bullet issues
You do not need gas checks for most normal loads under 1400 FPS in the .500 (or any other revolver) unless you are trying to correct a condition and you aren't willing to actually address the root cause of the problem.

Leading is most often caused by gas cutting. Gas cutting happens when your bullet is smaller than your chamber throat (front of the cylinder or the throat section in a rifle.) When the round is fired, hot gas gets around the bullet as it exits the case and enters the throat and bore, ruining the desired gas seal and causing leading, especially at the back of the barrel. Sometimes, leading will be made worse by going to a harder bullet (since it won't deform at all) and may be actually be improved by a softer alloy that "slugs up" and seals off the gas. I don't shoot the super-hard alloys in most revolvers as most revolver loads don't generate enough pressure to slug up an extra-hard bullet.

However, IF you like faster powders, you may get leading and think you need a harder alloy, which may or may not cure the problem. This often happens in the .44 Magnum with powders like Unique at moderate velocities. Such loads can lead badly, because (I believe) of the fast pressure spike of the expanding gas ball in the mostly empty case hitting the base of the bullet. Before changing the alloy, change the powder. In the .500, try a case full of much slower rifle powders like 4198, 3031, 4895, H322, H335, or BLC-2 These much slower powders fill the case entirely and the pressure builds more slowly. Leading will disappear, unless something is really wrong.

In the 500, you get almost 1400 FPS with a case full of some of these rifle powders and a long-nosed 450 grain bullet. Although this is 500 FPS below maximum, a 450 @ 1360 (or even less) still might be all you want. If the load is uniform and of the velocity you seek, try it on paper. Uniform loads tend to be accurate ones.

Find a machinist with a set of plug gages or better yet buy a complete set for $85 or so from a machine tool supplier. Buy a micrometer while you're at it. Measure your chamber throats. They probably go .500". Ideally you want a bullet sized such that you can push it through your tightest throat with moderate finger pressure. I size my bullets to .500" diameter. Sizing any smaller, in my experience, reduces accuracy and results in more bullet pull due to less neck tension.

Try some NECO P-wads. These are .065" PVC discs you put in the case before you insert the bullet. Buy them for about $7 a thousand in other calibers—I don't know if they make them yet for the .500. I make my own with a .500" hand punch and sheet PVC for $2/thousand. P-wads form a gas seal and are

effective to some extent at reducing gas cutting with undersized bullets. So are slower powders, as mentioned above.

Neck Tension
Heavy loads need high neck tension and heavy crimp. Polish down the expander plug until it does not expand the neck AT ALL after sizing. Adjust it so that the case mouth is belled just enough to start the bullet in the case and no more. This keeps the brass from being overworked. Use a heavy crimp. You may need to try different make crimp dies to find a good one. I use unmodified RCBS and Lee crimp dies with good results.

Compressed loads
While compressed powder charges are usually okay in most calibers, in the .500 they can mean bullet pull if the load generates a lot of recoil, and in the .500, most loads do. Aim for 100% loading density without compression.

If you choose to use DuPont's bulky Trail Boss powder in the .500, *make sure you don't compress it at all.* Trail Boss has a donut-shaped grain that can fracture when compressed, raising the burning rate to dangerous levels.

Jacketed bullets
Some people wish to shoot less expensive 325 grain Speer JHPs originally designed for the .50 AE. At 1800-2000 FPS they blow up pests (and watermelons) like a stick of dynamite. These bullets don't have a cannelure. Rather than use a tool and put one on, I crimp right into the jacket with an RCBS die, and it's worked fine. That also lets me load to a long OAL for best ballistics. I have not tried this with the 500 grain Hornady soft point yet. Hornady tells me they are going to put the cannelure farther down the bullet and load their factory 500 grain ammo to 2.300" OAL (still within SAAMI spec) which would make it the best factory load out there for big game.

Thunderbolt loads
Some have accused me of overloading my guns. I do not. My loads do not exceed the pressure of top factory loads. The factories load to top pressure with an overall length of around 2.050". My normal loads use an overall length of 2.320" to get 25%-35% more case capacity and are loaded to *lower* pressure to equal or exceed factory ammo ballistics.

A thunderbolt load is a round that is loaded to maximum or near-maximum allowable chamber pressure AND an overall length of 2.320" to give greatest possible net case capacity and thus the greatest possible energy. If you want to shoot loads like this, either for hunting or for bragging rights, I recommend you use new StarLine cases, and after they've been fired once, reserve them for more pedestrian ammo ("pedestrian" .500 ammo is still *much* more powerful than anything else out there.) The neck tension appears to decline after the first full-power firing to where the velocity drops about 50-60 FPS on subsequent reloadings.

Some batches of StarLine brass are softer than others and extraction can get sticky at levels that worked fine with another batch. Back off on charge weight if this happens. Hornady .500 brass is made for pistol primers and is a little softer than StarLine. I limit Hornady brass to just under 50,000 PSI to avoid sticking. It is fine for 95% of the ammo I shoot. I don't have enough experience with other makes of brass such as CBC or MagTech to comment on them.

The minimum shank in the case dimension that will work is about .200", and depending on nose shape, a bullet .900" long with .200" shank in the case will weigh between 400 and 460 grains. The 400 can be

driven over 2000 FPS from my 5" .500 with its tight cylinder gap using new StarLine brass. A 450 grain bullet with .300" shank in the case can be sent out at close to 1900 FPS. I fired these loads at half inch thick(!) mild steel plate at 50 feet and they almost made it through. They made a ¾" deep crater in the steel you could stick your thumb in. I was impressed.

Custom bullet molds

In my opinion the best source for custom molds for the .500 and all other calibers is Dan Lynch at www.mountainmolds.com. Dan claims that he is not a custom mold maker, but what he really means is that he doesn't want to *design* molds for other people. He wants to spend his time making and selling molds, not answering theoretical questions. He has an online bullet design page that allows you to design your own bullet mold and email the design to him for him to produce.

I cannot say enough good things about Dan's design page. It is better, easier to use, and more accurate than anything I've ever seen, and it instantly draws an accurate picture of the bullet you've designed.

Dan is currently building a new shop out in the middle of nowhere, and doing all the work himself. He has temporarily halted mold production, but will be back at it before too long. See his website for progress. *Read his entire website* before emailing him with a question he's already addressed somewhere on his site. Even if he doesn't start making molds again for a year, the wait will be worth it.

Specific designs

Here is some advice if you want to duplicate the results I've gotten with my designs, and avoid cluttering up Dan's inbox with a bunch of emails asking him the same questions:

Go to his .500 bullet design page. There will be a lot of things you can change, but default values and styles will be listed, and many of these you want to leave as they are. Here are the things you want to change:

Weight: Start with at least 500 grains so you can see the program draw a picture of a long nose bullet. You can tinker with the weight later, after everything else is done.

Nose length: I use .700" for maximum case capacity. If you are an optimist about S&W bringing out a shortened X-frame in .500 Special, that cylinder length will be 1.900" long and the case is 1.285", so you'll want a nose length of about .625" to optimize the .500 Special round in S&W guns, if they appear.

Bullet type: Bore riding tangent ogive (BTAN) for best bullet alignment in the barrel.

Bore ride length: I change from the default of .050" to .150" on my long-nose designs.

Groove-to-band length ratio (GTB): I change from the default of 1.0 to .3 or .4. This gives a larger number of thinner grease grooves than the default. When the result gives you a choice of number of grease grooves, click on the largest number and have it draw that design.

Meplat: For my long range designs, I use the smallest number possible, which used to be 40% but now is down to 36%. This will give a relatively pointy bullet that will shoot flatter and penetrate more but won't give the wounding power of a wider flat point.

For my close range stoppers, 93% used to be the biggest you could go. It's almost a full wadcutter. Try different percentages and see what looks good to you for a nose shape. With everything else set as I've described, any nose shape should shoot well in the 5" JR/PC guns. (One caveat: A bullet with a *very* wide

flat point will almost certainly have its accuracy fall apart *somewhere* at extreme range regardless of twist. John Linebaugh has painted the bases of bullets bright orange and shot them at extreme range with the sun at his back and reports you can see this phenomenon through a spotting scope and sometimes with the naked eye.)

Base type: The default is plain base; switch to gas check if that is what you want.

General: Leave all the other settings at Dan's defaults, like diameters, etc. I cast straight wheelweight alloy dropped from the mold into a 5-gallon bucket of ice water, use NRA formula lube, size to .500", and have had excellent results. Change the alloy type on the program if you are going to cast with something other than wheelweight alloy.

The program won't let you design a .500 bullet with a shank shorter than about .200" long, and it won't let you design a bullet with a shank anywhere near that short if you want a gas check design. If you are bent on getting the shortest possible shank for maximum possible net case capacity and thus energy, stick with a plain base design and use a thin PVC wad to protect the base, or just tolerate any potential leading. The lightest bullet possible with a 40% meplat and .700" nose length is about 400 grains. The lightest with a 93% meplat is about 460 grains. You'll have to shorten the nose length to some dimension below .700" if you want lighter bullets than that in these styles.

I think Dan has decided his blocks are not suited to bullets 1.395" long any more, so the heaviest bullet you can design may be "only" 700 grains or so, not the 725 I have.

If you want only one bullet for all around use, and extreme range plinking doesn't particularly excite you, I'd suggest a 500-575 grain gas check design with a 70%-80% meplat. Load it down for plinking and up for hunting.

Reloading equipment

For prepping large quantities of fired brass, get a cheap cement mixer from Home Depot or Harbor Freight, and buy corn cob media in 50 lb. bags. Add a pint or two of mineral spirits to keep the dust down and give the cases a nice shine. You can also use the cement mixer to tumble grungy military surplus ammo, something that is not safe to do with vibratory tumblers that may fracture the powder grains in the loaded rounds.

Carbide dies are almost a necessity when loading the big .500 case. Don't believe the fools that tell you carbide dies don't need lubed cases. I put some STP Oil Treatment on my hands and run my hands through the buckets of brass. You don't have to hit every single case; if you miss some, the residual lube in the die from the previous cases will be enough. Then clean off your hands with degreaser and get to loading.

I shoot lots of .500 ammo and I have a *very* early Dillon 1050 progressive that I set up in this caliber. If you elect to follow my example, and if you load to 2.320" OAL, you may need to mark your crimp die after it's adjusted to the proper point, take it out of the toolhead, and grind clearance on one side of the bottom of the die to allow the long loaded round to clear the bottom of the die as the shell plate turns to eject the loaded round. I think new 1050 tools have a longer stroke so that this is no longer necessary.

The weak point of Dillon tools is the junky powder measure made of cheap castings. It has sloppy tolerances and will leak ball powders that have very fine grains. The measure is acceptable for IMR-type (stick) powders. Invest in a benchrest quality measure patterned on Homer Culver's design if you use ball powders. These measures have numbered click adjustments and are 100% repeatable in their settings.

Use the Dillon tool to resize, deprime, prime, and bell your brass and then manually charge, seat, and crimp on another tool. If you can figure out how to adapt a Culver-type measure to automatic operation in the Dillon, call me. Better yet, convince Mike to offer a Culver-type measure as a $350 option on his tools. It would be well worth it for volume production.

Holsters and gunbelts

For my money the best holsters are the horsehide ones made by Ken Null. He has a design for this gun that can be worn either strong-side or cross-draw. I prefer the cross-draw position for most applications, particularly when driving or sitting on an ATV.

Ken Null
161 School Street NW
Resaca, GA 30735
(706) 625-5643
Website: www.klnullholsters.com

Many makers (including Ken) produce fine gunbelts. The one I use for the .500 is made by Kramer Handgun Leather and is a sandwich of horsehide and sharkskin 1¾" wide. The sharkskin about triples the cost but I've worn a Kramer 1 ¼" sharkskin belt almost every day for four years and it looks like new. I'm sure it will last longer than I will. For big guns you need a wide belt that won't roll, and I haven't found anything that will resist rolling like sharkskin.

Happy shooting!

John Ross 7/22/07