The BBW#13 nose profile on the Safari Raptor, in .404 Jeffery.

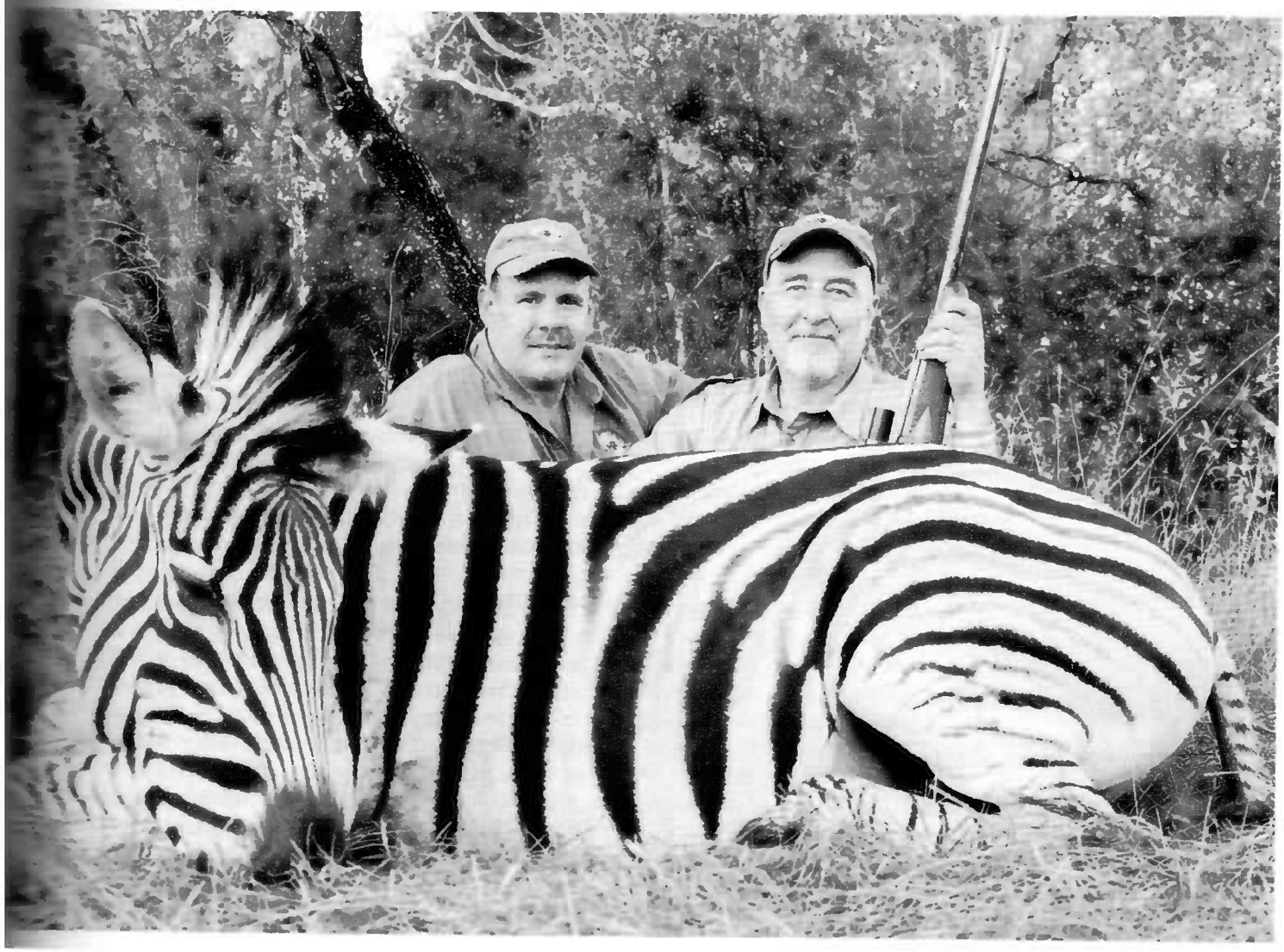
Cutting Edge Bullets, brainchild of Dan Smitchko, takes the polar opposite approach. Instead of designing a bullet that will be tougher than nails and hold together no matter what it hits, they designed a bullet that would intentionally come apart. The CEB Raptor is a unique design, one that I've come to trust in the hunting fields. The bullet is designed to be frangible — at least to a point. From the medium calibers all the way up to the safari calibers, the bullet has been engineered to provide a delicate balance of impact trauma and straight-line penetration, which is crossways to the traditional school of thought regarding expansion and penetration. It features a particular nose profile CEB calls the BBW#13 that has demonstrated the best penetration qualities, and undoubtedly they have something right. There have been many hands in the development of the Cutting Edge line. For example, I have it on good authority that BBW stands for Bastard Bullet Works, with the nose profile being developed by using a bastard file and experimenting with varying angles until the desired result had been achieved. Indeed, those hands have succeeded in developing a bullet that works very, very well.

The Raptor is a monometal, all-copper bullet, lathe-turned affair, designed to come apart once flesh and bone are struck. It's a hollowpoint with a nice, wide hole in the end, and skived walls. This is exactly where the Cutting Edge Raptor deviates from all traditional designs. The bullet is designed to break apart, with the walls of the hollowpoint fragmenting into what CEB calls 'blades.' Those blades cause a significant amount of impact trauma, traveling 8-10 inches deep into the animal in a spiraling pattern. They radiate 6-10 inches from the center of impact, but the base of the bullet — left at caliber dimension once the walls of the hollowpoint have broken off — continues to penetrate the animal. This may sound like a sketchy scenario, but I've seen the bullet work perfectly on a number of species, and at a bullet weight lighter than would be normally called upon for a particular application. Between whitetails, and a half-dozen or so African plains game species, the Raptor has proved itself in a number of different calibers for me.

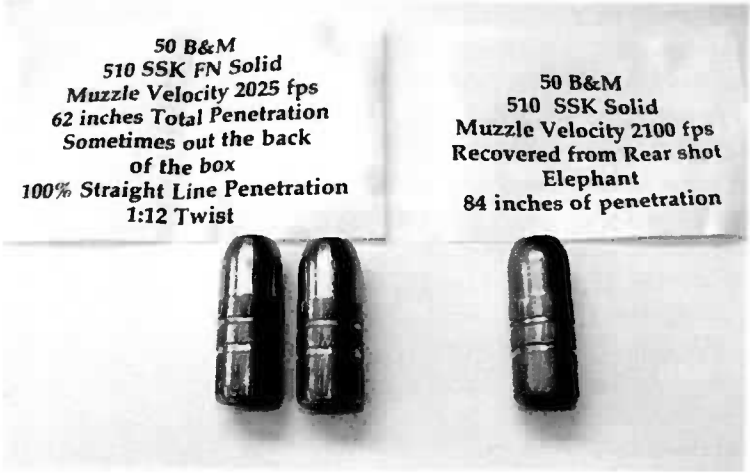
Many times, while performing the post-mortem autopsy in the skinning shed, all that will be recovered are the blades, as the base of the bullet frequently exits the animal, irrespective of angle. As in the story I related earlier in this chapter, where I used the Raptor in my .300 Winchester Magnum at 150 grains, I've loaded this bullet in .375 caliber at 235 grains, in .416 caliber at 325 grains, and in my .404 at 325 and 350 grains. None of these bullets have let me down. In fact, I wouldn't hesitate to recommend them to any client who wanted a good bullet for their rifle. I've used the .30 caliber bullet to crumple a kudu on the run as well as to ruin a nice waterbuck's day, as he was lying down, 225 yards away. At the shot, the waterbuck stood, reeled for 10 yards, and fell down as dead as a doornail. That was a small target (with the vitals all squashed as he was lying down), but the bullet was accurate, and gave fantastic terminal performance. Watching a 325-grain .416 bullet penetrate a big-bodied zebra from stem to stern, with the bullet base exiting out of the rear of the animal, engenders a whole lot of confidence. This bullet design will gain all sorts of ground in the near future.

Curious about that BBW#13 nose profile and its origins, I asked Michael McCourry, who had a huge hand in the development of this nose profile, to explain it further. McCourry set out to build a better mouse trap.

"Early in 2006, I took the first 50 B&M Prototype rifle to South Africa for a test run on plains game," McCourry explained. "This was a 2-inch RUM case at .500-inch actual diameter. We were testing bullets common to the .500 S&W at the time, 500-grain Hornady at 1800 fps, 400-grain Sierra at 2100 fps, 375-grain Barnes X at 2300 fps, and a few others. Along with these was a 400-grain round-



Dave deMoulpied and his zebra, which fell to the 354-grain CEB Raptor, from his .416 Rigby.



nose solid that JD Jones and I had done by David Fricke of Lehigh Bullets. At the velocities everything ran, results actually exceeded expectations; no doubt that .500 caliber was coming into play here, and far, far ahead of anything I had seen in .45/70. The big ugly disappointment was the round-nose solid, a turned brass bullet. On several occasions — on kudu and eland — the solid would veer off course as much as 90 degrees and not reach its destination.

"This led me into the search for a perfect solid, which was successful in the end. I needed a solid to work with these .500 caliber rifles. That led to an incredibly tedious process of test work. In the beginning, we basically took a similar design to the then newer Barnes Banded Flat Nose Solid. This was very successful in the new 2.25-inch .500 caliber 50 B&M rifles. I used the bullet on a couple of elephant, and five Cape buffalo in 2007 with extreme success and great depth of penetration, and above all, dead straight-line penetration. However, the search continued to improve even upon this success. At that time I was running this bullet at 2,025 fps in the 18-inch barrel of the 50 B&M.

"JD Jones and I continued to play around with a few different designs over the next couple of years, and I continued to test and look at all other big bore calibers from .416 to .510 and different designs of solids. Every single solid manufactured and available was tested and we began to learn a great deal of what factors are involved with solid penetration, what did the driving.

"Sometime in either late 2009 or early 2010 I met a fellow named Sam Rose. Sam was extremely interested in bullet technology, and we shared many of the same desires for a solid. Sam is a talented machinist and the fact that he had his own lathe ended up being a huge boost to our study here. Sam and I came up with some of the wildest-designed solids one can imagine, and we were testing nearly four to five sessions a week for months on end.

"During these studies we conducted one of the most important studies done with solids, a meplat size test to understand at what point we got total stability, simply because of meplat size. We tested a .500-caliber bullet, basically Barnes Flat Nose profile from a round-nose up to 80 percent of caliber meplat size, as I recall. What we learned is that everything up to 65 percent meplat of caliber was not completely stable during terminal penetration. We started seeing some stability at 60 percent meplat size, but at 65 percent meplat we got total stability and the deepest straight line penetration. At 70 percent meplat we still had dead-straight penetration, but depth of penetration began to decrease, and the same for 75 and 80 percent. We found 65 percent meplat of caliber perfect.

"During this process we also learned that twist rate did have an effect as well. Faster twist gave more stability. But twist rate only came into effect with lesser meplat size, less than 65 percent. Faster twists would stabilize lesser meplat size for added straight-line depth, it would not fully stabilize for the entire depth of penetration, but it would increase straight-line stability. Twist rate had no effect on proper-sized meplat, 65 percent or better. In fact, I had some oversized barrels here that we tested 65-70 percent meplat size, no engraving on the bullets at all, and meplat size alone stabilized them during terminal penetration up to and sometimes exceeding 90 percent of the total depth of penetration, and this is with no engraving on the bullets at all.

"We also learned that nose profile made a difference as well, some nose profiles did better than others, some more stable than others, while certain

nose profiles increased penetration. And, a radius edge instead of a sharp edge on the meplat made a huge difference as well, not only in depth, but stability at the very end of penetration.

"We were literally testing hundreds of solids a week, and every small step of the way learning new things about how a solid actually works. Listed below are the absolute known factors involved with terminal penetration of solids, in order of importance to straight-line penetration and depth of penetration in either aqueous test material or animal tissue.

#1. Meplat Percentage of Caliber
#2. Nose Profile
#3. Construction & Material
#4. Nose Projection
#5. Radius Edge of Meplat

Above Factors related to Bullet Design

#6. Velocity
#7. Barrel Twist Rate
#8. Sectional Density

"Now the old diehard convention wisdom always says SD is number one. This is not true at all, and we can prove it time after time, in any caliber. (Author's note: this comment is in reference to 'solid,' or non-expanding bullets.) If a solid is not stable, it will not penetrate in a straight line; it will veer off course, and penetrate less, every single time, as opposed to a properly designed solid. The one and only time that SD becomes a factor at all is when all of the other factors are dead equal, all the way down the line. Take for instance the very fact that a properly designed 325-grain .458 caliber solid will double the depth of penetration of a 500-grain round nose .458 caliber solid. SD has little to do with the penetration of solids, unless all else is equal.

"Along the way, JD had sent several different designs he was working with in both .458 and .500 as well. One of these was derived from some of his old-time cast bullets that he had used in various JDJs over the years, but now in a .500 caliber copper solid. I had tested this bullet many times and always found it gave 100 percent dead straight-line penetration. One day I handed one of these to Sam Rose, and asked him to measure the degree of the angle off the nose, and for him to make a series of different degrees for us to test.

"Sam went home, measured this bullet and found it was right at a 15-degree angle off the nose. The meplat measured slightly above 72 percent. As I recall, Sam made a variety from 10 degrees all the way to 20 degrees off the nose and we tested.

"All tested well until we got above a 15-degree angle, and then things got a little squirrely. We found that everything between 11 and 15 degrees did very well, was stable. A smaller meplat size of 65 to 67 percent depth of penetration was incredible compared to other tests we had done. In the end, we picked the 13-degree angle, which was basically in the middle. Now during all this time, teasing Sam, I accused him of making bullets with a "bastard file" as a joke. He was sending several different designs of some really wild stuff weekly.

"The bastard file joke ended up evolving into Bastard Bullet Works, or BBW.

"We also started working very closely with Dan Smitchko of Cutting Edge Bullets. Dan was instrumental in making the changes we

This is the original bullet that JD sent.

525 #13 CEB Solid
.600 Nose Projection
Muzzle Velocity 2312 fps
Impact 22 yards
X1—71 inches
X1—72 Inches
Dead Straight

500 MDM
1:12 Twist Rate 21" Barrel
8/26/2014
475 #13 CEB Solid
.600 Nose Projection
Muzzle Velocity 2475 fps
Impact 22 yards
X2—62 inches
Dead Straight

458 B&M
1:14 Twist Rate 20" Barrel
8/26/2014
450 North Fork New Profile
MDM Bands
.600 Nose Projection
Muzzle Velocity 2252 fps
Impact 22 yards
X2—64 Inches
X2—65 Inches
Dead Straight

North Fork followed suit with a similar solid. It too is an excellent bullet.

desired, to complete the study with CNC-machined bullets. After many months and many thousands of rounds fired during the test work, we declared the 13-degree angle nose, and 67 percent meplat size bullet the best solid we had ever tested, and the most consistent in all calibers tested. Our mission had been a great success, and it was decided to give the design to Dan at CEB, and let him run with it. In the beginning, he asked what we wanted to name it, I said BBW #13 — "Bastard Bullet Works," with the #13 after the angle off the nose. Later, a more proper name was given by CEB, the Safari Solid.

"Having a variety of .500 caliber rifles, including lever guns, BBW #13s were designed for all of my .500 caliber cartridges, from lever to the larger 500 MDM. BBW#13s are available from 375 grains to 550 grains in .500 caliber. Now, #13s can be had in all major large bore calibers up to the big 900 grain .620 caliber for 600 Nitro and 600 OverKill. #13's have been used extensively in the field on elephant, buffalo and hippo many times over now, all with extreme success. This is the go-to solid when absolute straight-line deep penetration is required.

"If you notice the bands on these bullets, please take note this was a special area of study, too. Sam was extremely interested in double rifles, and in particular a bullet band design that was "safe" for doubles. I have the capability here of doing pressure work. We hooked a strain gage four inches from the muzzle of several double rifles, and other rifles as well, reduced the loads to where the strain gage would only measure the passing of any given bullet, and measure the amount of expansion in the barrel as that bullet passed that point. The design you see, in both the Cutting Edge Bullets and the North Fork Bullets gave the least barrel strain overall of any and most all other bullets. We needed the three full diameter bands at the top and one at the rear to maintain accuracy. The more bands that were added, the barrel strain increased. We learned that barrel strain is affected by bullet diameter and bearing surface. Reduce the bearing surface, you have reduced barrel strain, reduce the diameter, you again reduce the barrel strain. But at some point, you can only go down so far in diameter before affecting other areas like accuracy, stability, and so forth. Brass gives less barrel strain than copper in most cases, all being equal. The North Fork bullets are equal to the CEB in this area because of their reduced bearing surface, even though they are copper-based. The main factors are bearing surface and diameter."

McCourry's testing sheds much light on how bullets behave in both test media and real-world scenarios. I don't have as many opportunities to test the

solids in the field (dangerous game safaris are very expensive) but I'm glad we have folks like Michael McCourry who have a passion for developing the best bullets available.

Rifle Bullet Penetration: