Solids vs Monometal Bullets - Which is Best?

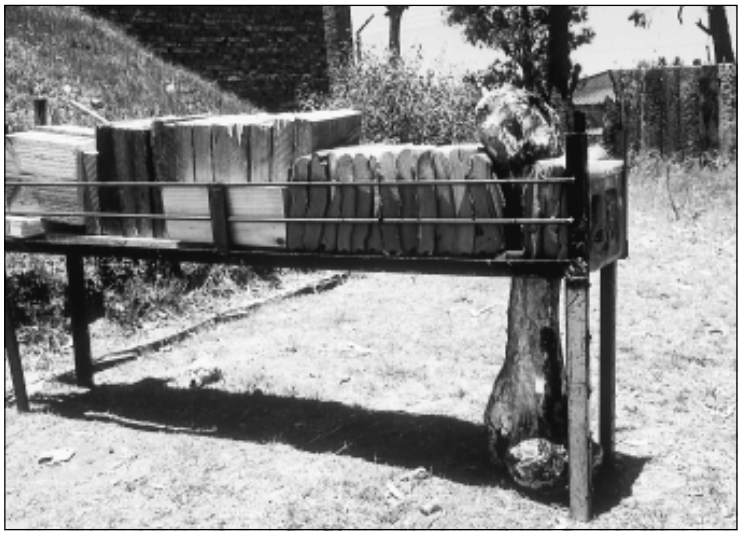
By Charlie Haley

The elephant was down, and the hunt had been successful. The place was Chirundu, and we were all at the Rifa education camp for prospective professional hunters and guides.

The group which had hunted the elephant had worked long and hard, and the rest of the group were there to learn about shot placement, how to approach a downed elephant, where to place an insurance shot, and all the hundred and one little techniques of experience from the instructors, those little things which make the difference between a long and successful career and ending up as a little puddle of strawberry jam in the African dirt before your career has even begun. The elephant in question had been hit by three well-placed bullets;- one in the head with a .458, one in the neck with a .416 and a body shot with a .460 Weatherby. All the bullets were monometal solids, and none had exited. This started a train of thought going in my little mind, to wit:- Do monometal bullets penetrate as well as the generally heavier and denser conventional solids in heavy rifles, assuming all goes well with the latter? I was surprised to find that none of these monometal bullets had exited the elephant, and wondered if a well constructed solid might not have done so.

Some years ago, the only bullets available for maximum penetration on heavy, dangerous game were conventional solids - that is, lead cored bullets which were (generally) encased in a steel jacket with a copper wash on the surface. Such bullets were supposed to keep their shape no matter what, and penetrate to great depth. Such performance was needed, especially on elephant if the bullet was to reach the brain or other vital organs protected by massive bones and resilient tissue, hidden right in the depths of a huge animal. The trouble was, they didn't always keep their shape. Solids were prone to a variety of failures such as fishtailing, rivetting, bending, splitting or even breaking up completely. Such misbehaviour led to very erratic penetration or even none at all, and was termed as "sick leave material" by National Parks personnel of yore. This, of course, was due to the likelihood that if a solid pulled such a stunt on a heavy, dangerous and irate animal that you, the shooter, would shortly be spending a considerable time flat on your back in hospital listening to your bones knit. If you were lucky. This in turn gave rise to the monometal bullets, pioneered by A-Square and their Monolithic bullet. Such bullets have no separate core and jacket, but as the name suggests are made of a hard homogeneous brass or bronze-like metal. Such bullets resisted deformation much better than the older, failure-prone lead cored solids, and soon became very common in the safari industry. At the same time, though, great strides were being made in the construction of conventional solid bullets. A variety of premium solids are now available which resist deformation far better than the older specimens. Now the question remains - which one penetrates better? This question is not as straightforward as it may appear at first, especially with regard to the .458 Winchester Magnum (one of the most popular heavies in this part of the world). .458 solid bullets are

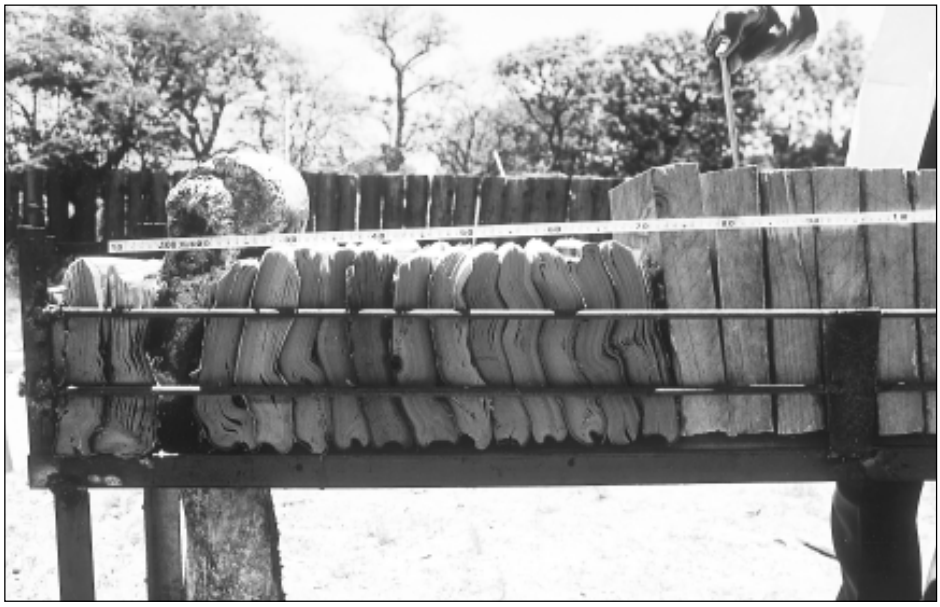
The Bullets tested (L - R): Barnes 500 grain, Woodleigh 500 grain, Speer African Grand Slam 500 grain, A-Square 475 grain.



Our "Elephant Sandwich" completed and ready to go.

standardised at 500 grains. However, monometal bullets are less dense than conventional solids, so a 500 grain monometal bullet will be appreciably longer than a conventional 500 grainer. While 500 grain monometal bullets are available, they are generally loaded in bigger cases such as the Lott, Watts or Ackley, as they intrude too much on the .458's already limited powder space. Depending on the maker, monometal bullets for the .458 are in the region of 465 to 475 grains. They are therefore the same length, size and shape as conventional solids, but some 25 to 35 grains lighter. On the other hand, velocities achievable with these lighter bullets are somewhat higher. So, does the lighter weight and lesser density of monometal bullets compromise their penetration, or do their somewhat higher velocities lead to greater performance? Generally speaking, momentum has been found to be of greater importance than velocity in heavy rifles, but .458's have been found wanting in the velocity department due to the aforementioned limited powder capacity, so might not a bit less bullet weight and a bit more velocity be advantageous in this specific instance? There are many questions and a lot more opinions with regard to this issue, so I resolved to do a few tests in order to try and resolve a few of them.

The calibre of choice was the .458, partially because I own, like and use one, but mainly because it is perhaps the most common and popular heavy in the guiding and hunting industry. It is emphasised that the findings of these tests will be valid only for this calibre, and cannot be taken as any indication as to what may happen in any other chambering with different velocity ranges, bullet weights and other variables too numerous to mention. The choice of a suitable test medium was not so easy. The penetration medium used can profoundly influence the results obtained, and one must appreciate that the results obtained are valid for that medium only - that is, if one uses steel plates, or plywood blocks, or Aunt Matilda's sago pudding, one can only safely assume after testing that 'x' bullet will out-penetrate 'y' bullet in steel plates OR plywood blocks OR sago pudding, and that the results do not necessarily have any relevance in any other substance. If one tries to be as realistic as possible, however, the medium chosen will have that much more relevance to the object in question. It therefore had to be something obtainable, relevant and able to be duplicated. I am fond of water soaked telephone books as being a medium which reasonably duplicates animal tissue with regard to bullet performance, penetration, etcetera. I have used it before and am happy with it as a repeatable and relevant medium. On its own, however, it would be unsuitable for the tests I had in mind. Firstly I would need a HUGE length of them to stop a bullet as penetrative as a .458 solid, and secondly elephants do not merely consist of muscle tissue, but of bone (and other things) as well, and it is bone which is the real test of a good solid. It is those massive shoulder and leg bones and that vast honeycombed skull which separates the sheep from the goats as far as good bullets go. So, in order to be a) more realistic and relevant, and b) to reduce penetration to more manageable levels, I was going to have to incorporate some bone-like substance into these penetration tests. The trouble was, what? I did have a selection of shoulder bones available, but the trouble with actual bones are their lack of uniformity. Very different results can be obtained if the shaft is struck (where bone is relatively dense and brittle) as opposed to the ends (where it is not so dense and brittle, but is larger). Furthermore, if a bullet strikes a curved bone surface at a bit of an angle then deflection is possible, which will further invalidate test results. Much thought on the subject and much discussion with doctors, biologists and the like revealed that a suitably dense and hard wood should suffice. However, after great effort to procure suitable wood was met with equal if not greater lack of success, I reverted to the bones. After all, it was the most realistic and relevant substance available, and wood has its own variables too - length of seasoning, residual dryness, density, part of tree from which taken, to name but a few. So, bone it was. Much effort went into ensuring that the bullets struck a relatively flat portion absolutely perpendicularly, that the same thickness was penetrated in each instance



This is how far the premium solids penetrated.

and that the same portion of bone was struck.

Now came the choice of bullets. On the "conventional solid" side I chose firstly the Woodleigh, which is widely regarded as being the most stoutly constructed normal solid available, and the Speer African Grand Slam. The Speer is not truly conventional in that its core is tungsten. However, it does have a core, and as tungsten is even denser than lead, a 500 grain Grand Slam is even shorter than a normal solid, making it one of the best possible bullets available for the .458. The monometal bullets were represented by, firstly, some old A-Squares (the original Monolithics) and the Barnes Super Solids. These latter were 500 grain, as opposed to the 475 grain A-Squares, and were loaded to duplicate the speed of a conventional 500 grain solid. At this point it is relevant to mention that it is not a good idea to try and duplicate this in the .458. The greater length of a 500 grain monometal bullet means that its bearing surface is also that much greater, and thus pressures are increased. Bullets of greater bearing surface should be loaded to lower velocities to remain within safe pressure limits. This test was done under controlled conditions to observe the effects of solids and monometal bullets of equal weights at equal speeds. What I'm saying here is that don't YOU try and pull this stunt, OK? It can be dangerous, and if you try it and get into trouble and disappear in a small mushroom cloud, I'm NOT the one! A framework was duly constructed to hold the books and bones, and work commenced on our "elephant sandwich". This consisted of 10cm of soaked phone books, 7 - 8 cm of hard, solid leg bone, a further 50cm of phone books and then a backing of pine blocks to act as a bullet stop should any of the projectiles manage to penetrate all of the foregoing - I had no idea of just what sort of penetration to expect. A total of five loadings were tested. On the conventional side, we had the 500 grain Woodleighs and Speer African Grand Slams, both launched at a speed of 2180 fps. On the monometal front were the 475 grain A-Squares at the higher speed of 2280 fps, and the 500 grain Barnes Super Solids at the same speed as the conventional solids - 2180 fps. The test rifle was a Winchester model 70 and the range of shooting was 5 metres. The fifth load was a control sample of a typical factory .458 load of some years ago. An ancient solid was pulled from a Winchester factory load dating from the 1970's, and loaded to 1950 fps. This was typical velocity obtained from most factory .458 ammo a while ago, the designated 2130 fps notwithstanding.

The effects of the solid bullets exiting bone - The faster A-Square monolithic produced the right-hand exit. It takes a well-designed solid to withstand this!

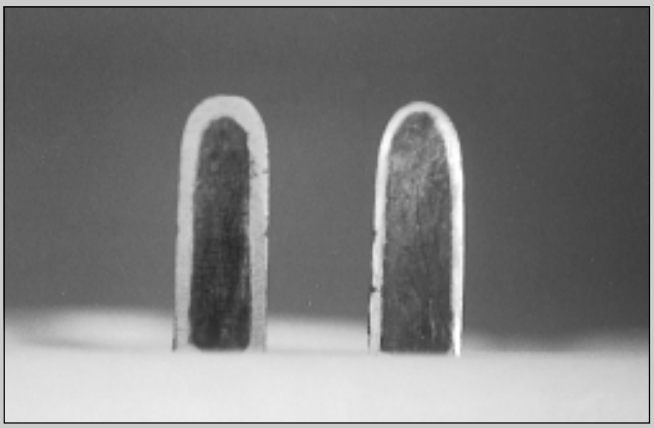
The tests then commenced. The Woodleigh was the first to go, and it was with some trepidation that the first round was launched. Firstly, it was important that the bullet strike the duly marked reference line EXACTLY, in order that the bullet did not impact the bone at any sort of angle, and secondly I was wondering if the penetration frame was adequate for the bullet. Were there enough phone books? Was the backing adequate? Was my medical aid up to date? I fired. The bullet hit the right spot, I was still alive and the "elephant sandwich" frame was still intact. The performance of the bullet was nothing short of brilliant. The Woodleigh had penetrated the bone, all the phone books and was halfway into the second pine backstop board for a total penetration of 82 cm! Now it was the turn of the A-Square. I fully expected reduced penetration from this lighter and less dense projectile as I fired it into the re-constituted penetration frame - this I freely admit. After all, it was the lack of exits on the aforementioned elephant which started this whole thing off. Up I went to the elephant sandwich, and commenced looking for the spent projectile in the phone books behind the bone. No, it had gone further. I looked further along the phone books. No, it had gone further. I looked at the first pine backing block. It had gone further. Guess where it was? Halfway into the second pine backstop, for a total penetration of...82cm! Absolutely identical performance to the Woodleigh! Next came the Speer African Grand Slam. I started looking for it in the second pine backstop. There it was. Total penetration - you've guessed it - 82 cm! Next was the 500 grain Barnes monometal, and this bullet actually made it through the second backstop and was thinking about sticking into the third. It managed a grand total of 3 cm extra penetration, which I don't regard as being especially significant. Further confirmation shots were fired, which merely reinforced the first set of findings. So, there we have it - the added velocity of the monometal bullets compensated for their reduced weight to make them almost uncannily identical to conventional solids - in .458 calibre, and in the test medium (which I regard as being pretty darn near identical to any elephant you may meet in the field).

Of especial interest was the condition of the recovered projectiles. The Woodleighs, Speers and Barnes were in excellent shape, but the lighter monolithics were flattened somewhat. This did not affect their penetration in the least, I hasten to add, and is not necessarily any sort of black mark at all - after all, they were being driven faster than they were originally intended to be. It was noteworthy that the Barnes monometal at more sedate speeds was hardly deformed at all. This poses another set of questions - it is quite evident from these tests that ANY bullet will eventually deform under these conditions once a certain velocity has been reached. Furthermore, there will eventually come a velocity level at which the deformation level compromises the penetrative abilities of that bullet. Obviously, every bullet will have its own specifications as to when this level is reached, which suggests a whole new battery of tests to investigate this phenomenon. Watch this space - this is important to know. For example, in these limited tests which I performed, the velocity deformation limits of the A-Square bullets had been exceeded, but

not sufficiently in my opinion for penetration to be compromised. At what speed can this bullet be driven before this will happen? Only further tests can reveal this.

You may well be wondering what became of the control test, the old solid at 1950 fps. Well, this was even more interesting, and I reckon went a considerable way towards validating the relevance of the "elephant sandwich" test medium. At a genuine chronographed 1950 fps, this bullet gave absolutely typical performance of the sort that was commented upon at length by National Parks and Tsetse control officers of years ago. The bullet penetrated the bone, but then blew to bits for a total penetration of precisely half that of the others - 41 cm in all. True "sick leave" material. This bullet would penetrate the leg bone, but wouldn't have a snowball's chance in hell of finding its way into the vital organs thereafter. If the animal in question wasn't irate before, it will certainly be seeking you out for a VERY meaningful round of discussions after being swatted with such a dud. This, I might add, is not a condemnation of old Winchester ammo alone - ALL were noted for such overly emotional reaction to striking something solid. These tests thus further indicate that it is unwise in the extreme to rely on old .458 ammo of indeterminate origin for front-line work on dangerous game. Not only is the velocity level questionable (if it goes off at all - I had to dig the extruded powder from the old round of ammo with a screwdriver), but the bullets themselves are not up to snuff. Yes, I know .458 ammo is expensive in this part of the world. Yes, I know that even premium quality bullets are expensive. Engrave this little message in your little Pro Hunter/ Guides heart:- GOOD QUALITY AMMO AND ESPECIALLY BULLETS, ARE WORTH EVERY CENT WHEN DEALING WITH DANGEROUS GAME, AND FAR MORE THAN THEIR WEIGHT IN GOLD!!! I'm not kidding. My personal favourite, the tungsten cored Speer African Grand Slam must be over $200 EACH by now. Just for the bullet. Woodleighs are over $100. Have you checked out the cost of coffins recently? A reasonable nothing-fancy-but-still-reasonably-tasteful-and- elegant model will set you (or your loved ones) at least $10,000. This does NOT include flowers, sombre piped music, hire of long black hearse and the labour costs incurred when 250 villagers scour the subregion for a solid week searching for all the sundry portions of your late lamented carcass which has been spread about the four points of the compass by an irate pachyderm who correctly deduced that YOU were the one responsible for his (or her - let's not be sexist and forget cow elephants...) immediate pain, grief and anguish. Let's not also forget that a coffin is probably over-ambitious for the task at hand, and that a biscuit tin may well suffice...I might add that before these tests I might well have been tempted to pull the bullets of old ammo, to add a fresh primer and energetic powder charge, and to rely on same.... I will confess to learning much from these tests, and would hope that you the reader will do likewise. Much has been found out, but much remains to be discovered. I will say that in the field I will now have complete con-fidence in the performance of premium bullets in the .458 Winchester, be they solids or monometal. Were my brass topped with Woodleigh, Speer, A-Square or Barnes bullets, I would stake my life and the lives of my clients on the performance of those projectiles in the most extreme of emergencies.

Recovered bullets (L - R): Woodleigh, Speer, A-Square and Barnes. Note flattened tip of the lighter A-Square, although penetration was not affected. Also note slight bend on the Barnes bullet.



This shows how far solids have advanced in design and construction. A sectioned Woodleigh left is compared to an old British solid right.

Solids behaving badly. . . This sort of abysmal performance from old .458 solids led to the emergence of monometal bullets.

Even monometal bullets are not perfect. This bent specimen is a 300 grain .375 monometal recovered from an elephant carcass.