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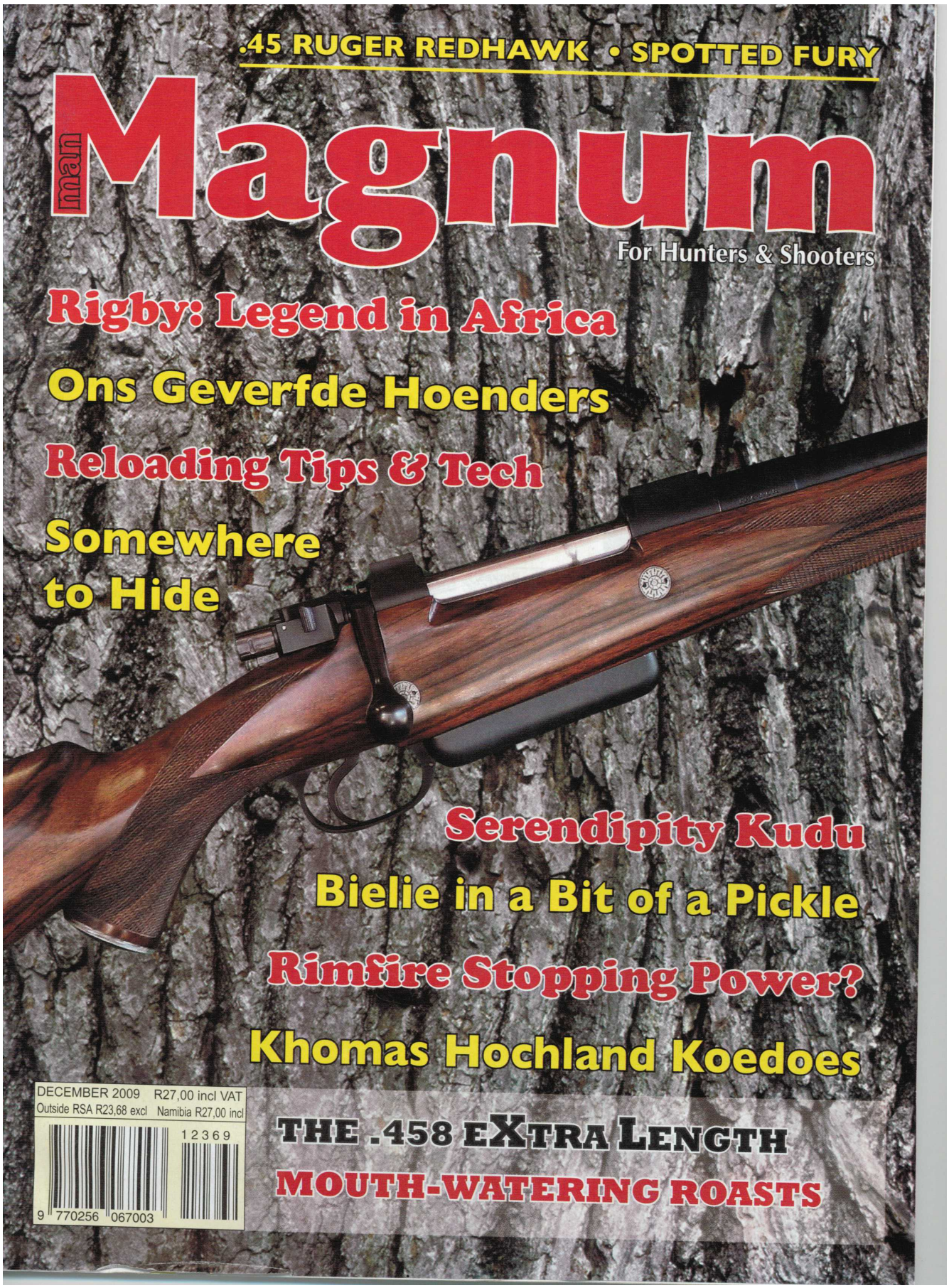

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THE .458 eXTRA LENGTH

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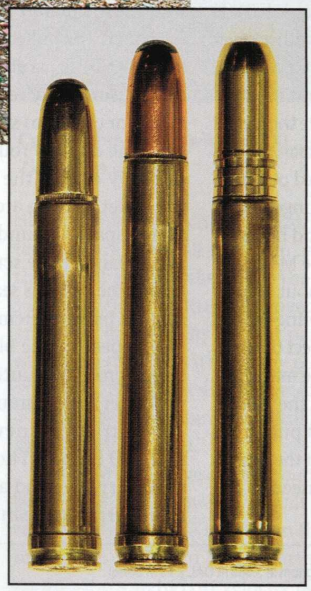
The .458XL

By ROBERT BRIDGES

The .458 Winchester Magnum cartridge was introduced in 1956 as the bolt-action equivalent (ballistically) of the highly successful .470NE. As the old British big bore cartridges faded from the scene during the 1960s and '70s, the .458 Win Mag became accepted as Africa's dangerous game stopper and a standard issue rifle in most game and tsetse control departments – a position it holds to this day. It went through a period of controversy, criticized by some for episodes of lacklustre performance due to less than optimal velocities. The general conclusion was that its short case (designed for use in standard length bolt-actions) was low on powder capacity, hence required heavily compressed powder charges to achieve the original specs. This compressed powder degraded during storage, resulting in squib loads. (During this same period a batch of factory ammo loaded with undersized bullets was said to have further damaged the .458's reputation.)

The ammunition manufacturers' solution was to reduce the powder charge, which reduced the velocity to between 1900 and 2000fps with the 500gr bullet. While the .458 Win Mag remains an adequate dangerous game cartridge at these specs, its 'borderline' ballistics remain the centre of discussion, and at times criticism, among big game hunters. There are those who want the original velocity specification of 2150fps. Jack Lott approached this 'Win Mag problem' by lengthening the case to 2.8 inches (using blown-out .375H&H cases) for extra powder capacity, and by lengthening the cartridge's overall length (OAL) to 3.6 inches. The successful outcome was to reliably increase the velocity of the 500gr .458 bullet to equal and surpass the 'gold standard' of 2150fps and 5000 foot pounds of muzzle energy without pressure or powder compaction problems. This conversion was called the .458 Lott, and converting a standard .458 Win Mag barrel to .458 Lott required a simple reaming job to extend the chamber by the required amount – assuming the rifle's action and its magazine box could accommodate the longer cartridge.

Many rifles chambered for the .458 Win Mag do have actions long enough to accommodate cartridge lengths of 3.6 inches. But



Above: Range set-up. Right: The .45 calibre family (l-r) .458 Win Mag, .458 Lott, .458XL

is it really necessary to extend the length of the cartridge case to accommodate the extra powder, necessitating a chamber reaming job, and hence, in South Africa, reproofing? Handloaders have long known that the generous throat of the .458 Win Mag permits the bullet to be seated further out (beyond the standard 3.34 inch OAL) thus providing more powder space in the standard Win Mag case. Rifles in .458 Win Mag from Remington and CZ do not need any modification to function with the longer cartridge, and rifles such as the Winchester M70 only require factory parts swaps. Ideally, seating the bullet further out requires a new crimping groove to be formed on the bullet shank at the appropriate position to receive the crimped case mouth – we'll come back to that later.

In preparation for a dangerous game safari in Zimbabwe, some fellow Alaskans and I chose to develop .458 Win Mag loads retaining the original case length of 2.5 inches, but seating the bullet further out to achieve the same cartridge overall length as the .458 Lott, thus achieving the same functional case capacity as the Lott's. We dubbed it the .458XL (eXtended Length) and we assessed its performance against the Lott's with a variety of powders, bullet weights and designs. Our projected endpoint was replication of the factory velocity/energy of the .458 Lott, which meant projected muzzle velocities approaching 2250fps for 500gr bullets, 2150fps for 550gr and 2400fps for 450gr bullets.

The initial evaluation of the .458XL centred on powders readily available in the United States, without forethought about powders available to the South African reloader. To make this applicable to southern Africa, new load data needed to be developed using powders very similar to those available in South Africa. In years past, there was a commercial relationship between Somchem and Accurate Arms, a propellant provider in the USA. This is no longer the case, but very fortunately, the current head ballistician for Western Powders Inc (Accurate Arms is a subsidiary) is Johan Loubser, formerly Technical Specialist – Tube Weapon Ballistics at Somchem. Accurate Arms lists two ball powders for use with the .458 Win Mag (A-2230 and A-2460) and two for the Lott (A-2230 and A-2520). Mr Loubser informs us that A-2520 is very similar to Somchem S341; and A-2460 approximates Somchem's S321. Unfortunately, A-2460 was not available to us in Alaska at the time, but A-2230 was, and while a little faster burning than A-2460, was considered by Mr Loubser as an adequate substitute for S321.

Substituting one powder for another requires a prudent approach to the safe working up of loads, and we started with initial charge weights at 10% below maximum powder charges. Caution is always called for when approaching maximum loads, with close attention to signs of excessive pressure. An important reminder is that the ambient temperature during an Alaskan summer hovers in the 15-20°C (60-70°F) range.

From the initial work, our group had found that a medium burning-rate extruded powder (Hodgdon Varget – ADI 2208) was very satisfactory for the 500 and 550gr bullets. Adding an extruded powder to the selection was deemed appropriate. Extruded tubular powders are more progressive in burn characteristics than ball powders, which suits high expansion ratio calibres such as the .458 Win Mag and .458XL. From load data and separate reloading information coming out of South Africa, IMR-4320 was deemed a suitable substitute for Somchem S355.

To establish the basic relationship between powder charge and velocity, a series of incremental loads were shot for each major bullet weight and design, to gauge performance with attention to pressure. We used two grains of powder as increments starting at 10% below maximum expected levels. Going forward, all references are for the powders we used, but recognizing the relative equivalence of A-2230 to S321, A-2520 to S341 and IMR-4320 to S355.

Bullets tested (l-r): Hornady 500 DGX and DGS; Swift 500 A-Frame; Barnes TSX 450 and 500; Barnes Banded Solid 450 and 500; Woodleigh 500 SP and Solid; Woodleigh 550 SP and Solid.

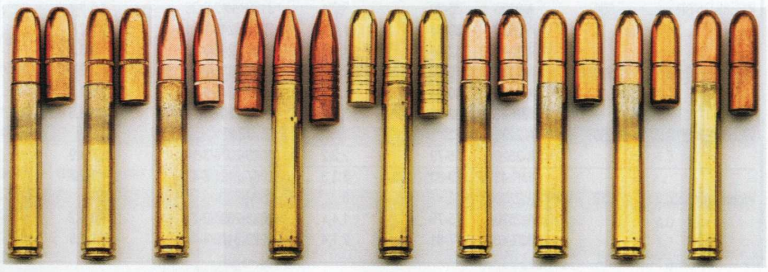


Table 1: Overall Bullet Length versus Length in Case Neck

Bullet	Gr	Overall length	Length in case	Bullet	Gr	Overall length	Length in case
Barnes TSX	450	1.515	0.415	Swift A-Frame	500	1.425	0.325
Barnes Banded	450	1.374	0.274	Trophy Bearclaw	500	1.330	0.230
Barnes TSX	500	1.656	0.565	Woodleigh Soft	500	1.305	0.205
Barnes Banded	500	1.518	0.418	Woodleigh PP	500	1.394	0.294
Hornady DGX	500	1.386	0.286	Woodleigh Solid	500	1.388	0.288
Hornady DGS	500	1.384	0.284	Woodleigh Soft	550	1.414	0.314
Hornady SP	500	1.363	0.263	Woodleigh Solid	550	1.521	0.421

The primary rifle used for the load development was a CZ 550 Safari Magnum, with additional assessment using a Winchester Model 70 Safari Express, a Ruger No1-H Tropical in .458 Win Mag, along with a Ruger M77RSM MKII in .458 Lott. The CZ 550, the Ruger 1-H, and, of course, the Lott required no modifications to accommodate the longer .458XL cartridge. The Model 70 Safari Express required four parts to be swapped out from the factory bins. These were the longer magazine with follower, the ejector and bolt stop from the .375H&H version of the Model 70. Push-feed Winchesters (i.e. without Mauser 98 type separate ejector) use a spring-loaded plunger within the bolt face to eject the case, and only need the .375H&H style magazine, follower and bolt stop to accept the .458XL cartridge. A small hammer and punch are the only tools needed to drift out the pins to exchange the bolt stop and, as needed, the Mauser-type ejector.

The first step is to verify that a 3.6 inch long .458XL dummy round will feed easily from the magazine, and once chambered, will allow the bolt to fully close without resistance. The bullet should not firmly contact the rifling, as abnormally high chamber pressures may result. If in doubt, use a match or candle to smoke-blacken the bullet of the dummy round; chamber it, then carefully extract the round and examine the bullet. If there are small shiny patches evenly spaced around its shank, where the rifling lands have scraped off the soot, it means the bullet is seated too far out. If so, seat the bullet incrementally deeper in the case, repeating the blackening and chambering procedure until these shiny patches no longer appear around the bullet.

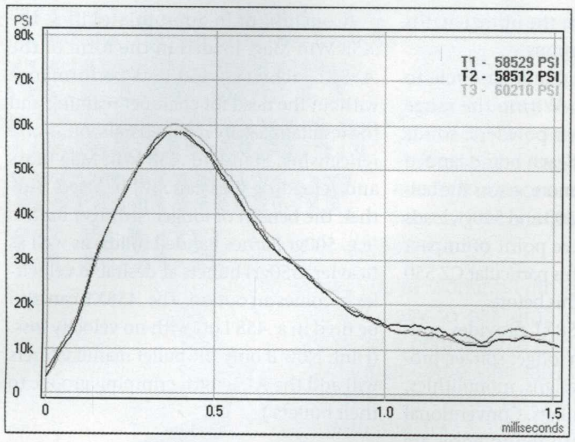
We trimmed new Winchester cases to 2.490 inches. Though not absolutely necessary, we used a flash-hole trimmer to deburr and clean out the flash-holes (clinging brass fragments can hinder uniform passage of the primer flame). We used a primer pocket reamer to true the primer pocket depth and square the bottom of the pocket to permit full and uniform seating of the primer. This is usually reserved for precision long range shooting, but we felt this fully optimized the cases for the fairest load comparison. We used Federal 215 primers, considered the 'hottest' and known for consistently good ignition in magnum loads. Otherwise, use any magnum large rifle primer like CCI 250.

Our bullet selection included Barnes TSX and Banded solids in 450 and 500gr; Hornady 500gr DGS and DGX; Woodleigh 500 and 550gr softs and solids; and Swift 500gr A-Frames. Increased neck tension was created by crimping the case with the Lee factory style crimping die, and forming new crimping grooves on the bullets with the Corbin Hand Cannelure Tool. The Lee crimper has a collet design that circumferentially squeezes the end of the case against the bullet without downward compression on the case as seen with regular crimpers. The .458XL crimping was easiest for the 450 and 500gr Barnes TSX and Banded Solids, with their cut grooves acting as cannelures.

We assessed the loads for velocity, extreme spread, accuracy and point of impact. Internal ballistics were assessed in terms of maximum pressure and uniformity of combustion. We fired three shots per powder weight for each bullet make and weight. Relative chamber pressures and combustion uniformity were read by means of the Pressure Trace I computer system, and calibrated to prepared rounds of known pressure. The Pressure Trace system uses a piezoelectric strain gauge which is attached to the forward chamber area of the barrel by means of Superglue. An electronic module connects the sensor to a laptop computer which stores the pressure data. The graph shows the computer display of the pressure curves for three shots measured with the system. The pressure data is acquired for the less-than two milliseconds that the bullet travels down the barrel. Uniformity of combustion was graded from 1 to 4 in descending quality of uniformity, although maximum extreme spreads of pressure were less than 6% of average pressure for any load. Maximum loads listed should be considered within safe pressure limits *only* for these specific rifles. External ballistics were measured at 8 feet from the muzzle using the CED Millennium chronograph.

Table 3: CZ 550 .458XL (.458 Winchester Magnum at 3.585 in OAL), 25 in barrel

Bullet Make/Style	Gr	Powder/Weight (gr) 2gr intervals		Uniformity	Velocity/ES	Group Inch (100yd) Range
Barnes TSX	450	A-2230	80-84	1,1,1	2312-2422/11-26	0.8-3.0
		A-2520	84-86	1,2,1	2319-2417/13-14	1.0-1.9
Barnes Banded	450	A-2230	80-84	1,1,1	2382-2438/6-7	1.6-4.4
		A-2520	84-86	3,3,2	2370-2440/11-27	1.7-4.2
Barnes TSX	500	A-2230	75 -79	3,4,4	2058-2165/6-18	1.2-2.9
		A-2520	79-83	4,2,1	2149-2222/12-21	1.6-2.3
		IMR-4320	77-81	3,2,1	2116-2202/9-38	1.2-3.3
Barnes Banded	500	A-2230	77-81	2,3,1	2247-2319/7-23	2.2-3.4
		A-2520	77-81	1,2,1	2186-2271/3-11	1.5-3.0
		IMR-4320	77-81	1,3,2	2170- 2278/9-15	2.6-3.5
Hornady DGX	500	A-2230	75-79	1,1,1	2153-2230/9-15	1.1- 2.7
		A-2520	82-86	3,4,2	2211-2287/12-24	1.7-2.9
		IMR-4320	82-86	3,2,1	2173-2255/6-18	1.2-2.2
Hornady DGS	500	A-2230	73-77	1,2,3	2094-2203/8-22	1.3-4.0
		A-2520	80-84	3,2,2	2182- 2238/2-8	2.0-2.8
		IMR-4320	82-86	4,2,2	2169-2258/5-24	1.7-5.1
Swift A-Frame	500	A-2230	75	3	2146/12	1.8
		A-2520	78-80	3,4	2119-2187/12-55	2.0-3.2
		IMR-4320	80-82	2,4	2155-2204/36-52	3.3-4.1
Woodleigh SP	500	A-2230	75-79	3,2,4	2138-2242/8-26	1.5-3.1
		A-2520	80-84	1,4,2	2205-2248/10-15	1.7-2.6
		IMR-4320	82-86	4,4,2	2166-2246/8-33	1.8-3.3
Woodleigh Solid	500	A-2230	75-79	3,4,3	2135-2221/2-15	1.2-2.2
		A-2520	80-84	2,2,2	2163-2246/9-24	1.6-3.9
		IMR-4320	82-86	3,1,2	2172-2257/10-19	0.2-3.6
Woodleigh SP	550	A-2230	73	3	2022/52	3.2
		A-2520	75-79	2,2,2	2029-2074/3-14	2.7-4.9
		IMR-4320	79-83	3,3,3	2067-2121/8-42	1.1-2.3
Woodleigh Solid	550	A-2230	73	3	2069/8	3.7
		A-2520	75-79	1,4,1	2023-2096/2-7	1.8-4.2
		IMR-4320	77-81	2,1,4	2020-2129/4-14	2.1-2.8



When the bullets are seated out to a maximum of 3.6 inches, the length of bullet shank inside the case is reduced by 0.3 inches. **Table 1** displays the overall bullet length by manufacturer and the minimum length of bullet within the case neck. Handloading experience suggests that the bullet should be seated in the case neck to a depth equal to its diameter. There are notable exceptions to this.

We disassembled three Hornady .458 Lott factory loads (500gr soft points) and found that their mildly compressed ball powder charges averaged 88.6gr in weight. Average muzzle velocity was 2259fps. We matched these .458 Lott factory loads against our .458XL reloads using the same bullet but propelled by our three test powders. As shown in **Table 2**, these three powders can match the factory load for velocity.

Table 3 shows the results obtained with the CZ 550. The three powders performed well, and by inference, their Somchem analogues should do as well. The two faster powders handled the 450 and 500gr bullets, while the S341 and S355 surrogates handled the heavy-for-calibre 550 Woodleigh bullets with satisfactory outcomes. This data reaffirms the outcome of our initial work with the .458XL prior to our safari. It must be noted that the listed accuracy was the summed range for the three powder charges used, and does not directly coincide with the incrementally increased charges as the uniformity listings do. There is always a balance to be struck between muzzle energy, accuracy and chamber pressures. Within these listings, one can find a good balance of muzzle energy to accuracy while keeping pressures down, and functional reliability high. Handloading permits the additional use of premium-grade bullets (particularly in the 450 and 550gr weights) not commonly available as commercial offerings.

The loads worked up with the CZ 550 were also adequate in all of our other test rifles as seen in **Table 4**. Certain rifles performed better with certain loads. The Ruger .458 Lott suffered no degradation in performance when shooting the .458XL loads with either the 500 or 550gr bullets. Part of this variation between the rifles may be due to differences in length of their respective chamber leades and the resulting free-bore. Another possibility might be

Table 2: Ruger .458 Lott Shooting .458XL Handloads with Tested Powers

Bullet Make	Gr	Powder/Weight		Primer	Muzzle Vel	Group size (in)
Hornady SP	500	Factory	88.6	Factory	2259	2.0
Hornady SP	500	A-2230	79	Fed 215	2283	4.0
Hornady SP	500	A-2520	82	Fed 215	2279	2.7
Hornady SP	500	IMR-4320	86	Fed 215	2306	4.8

Cape Buffalo taken with .458XL, South Chewore, Zambezi Valley, Zimbabwe (2005).

slight differences in chamber size, bore diameter, or rifling characteristics, which can all vary from one make of rifle to another, even though all are chambered for the same factory cartridge. Again, such variations reinforce the need to start at low charge weights and work up carefully in your particular rifle. Many newer Lott rifles have chambers which may not have as deep a throat as a .458 Win Mag. This particular Ruger .458 Lott rifle could not chamber a Trophy Bonded Bearclaw at full length while the standard .458 Win Mag rifles could.

Of course, increasing case capacity lowers pressures (all else being equal), consequently, about 3 to 5gr of additional powder is required for the .458XL to regain the velocity of the standard (normal length) .458 Win Mag. A further 3 to 5gr brought the velocities into the sought Lott velocity ranges. To get maximum charges of IMR-4320 powder into the case with acceptable compression using the lengthy 500gr Barnes bullets required a 24" drop tube to compact the powder. A drop tube was also needed to load A-2520 powder with the 450gr TSX bullets at maximum levels. The 500gr TSX loading could not hold a crimp with over 81gr of IMR-4320.

Of the 500gr bullets, the Swift A-Frame generated the highest chamber pressures versus velocity with all three powders. Similarly,

Table 4: All test rifles with selected .458XL (3.585 in. OAL) loadings

Bullet Make/Rifle	Gr	Powder/Weight		Velocity/ES	Group in Inch (100yd)
Hornady DGX	500	A-2520	84 gr	-	-
CZ 550				2241/13	1.7
Winchester 70				2270/3	1.5
Ruger No. 1				2244/11	2.4
Ruger .458 Lott				2315/7	2.2
Hornady DGS	500	A-2520	84 gr	-	-
CZ 550				2238/6	2.8
Winchester 70				2290/9	1.2
Ruger No. 1				2261/17	2.2
Ruger .458 Lott				2324/27	1.5
Woodleigh SP	550	IMR-4320	83 gr	-	-
CZ 550				2121/42	1.1
Winchester 70				2184/13	1.8
Ruger No. 1				2161/14	2.2
Ruger .458 Lott				2185/7	1.5
Woodleigh Solid	550	IMR-4320	81 gr	-	-
CZ 550				2129/14	2.2
Winchester 70				2135/18	4.0
Ruger No. 1				2108/7	1.7
Ruger .458 Lott				2162/12	1.3

the length of the 500gr Barnes TSX limited case volume, and hence limited maximum velocities to just over 2200fps. IMR-4320 provided the highest velocities with lowest pressures for the 550gr Woodleigh softs and solids.

The Barnes Banded Solids yielded the highest velocities with the least pressure. (Graeme Wright, on page 230 of his superb new third edition of *Shooting the British Double Rifle*, discusses similar findings with grooved solid brass bullets.) Each of the three powders could easily propel the 500gr Banded Solid to 2300fps, and A-2230 and A-2520 propelled the 450gr Banded Solid into the mid-2400fps. As a reference, the load used to take the Cape buffalo shown here was a 450gr Banded Solid at 2475fps using Hodgdon Benchmark. The buffalo was downed with one shot and then finished off with a follow-up spine shot. The overall length of our test rounds may not prove the most accurate for your particular rifle. We compared the accuracy of rounds loaded with 80gr of A-2520 behind Hornady DGX bullets seated to overall cartridge lengths of 3.60, 3.55 and 3.50 inches. The 3.55 inch OAL round produced the best group (bullet holes all touching), with the other lengths yielding about 1 inch groups.

We chose a 4 inch diameter circle to assess point of impact. Within the range of loadings of the three powders, solids and soft-nose bullets of each brand landed within this area. Furthermore, across the bullet weight range of 450, 500 and 550gr, loads could be selected to give point of impact within this same area. This particular CZ 550 rifle has demonstrated this before.

In summary, the .458XL provides optimum performance with longer spitzer, protected point and FMJ designs, monolithics, and heavy-for-calibre bullets. Conventional soft points in 500gr with round noses are the most compact, with less case neck contact, but still performed well. Uniform ballistics were readily obtained and the bullets remained firmly in the cases. Most of the charges produced very low extreme spread in velocities, comparable to many match rounds. The single best powder was A-2520, generally providing good velocities without high pressures and with good accuracy. Going to an extruded powder provided an additional option for the heavy-for-calibre 550gr bullets from Woodleigh.

Conclusion: In appropriate rifles, the .458 Win Mag, loaded in the form of the .458XL, achieves .458 Lott performance without the need for chamber reaming and the resultant legally required reproofing and relicensing. Standard .458 Win Mag brass and reloading dies can still be used. Further, the benefit of longer, stronger bullets (e.g. 500gr Barnes Banded solids) as well as heavier (550gr) bullets at desirable velocities becomes an option. The .458XL can also be fired in a .458 Lott with no velocity loss. (Hint: Now if only the bullet manufacturers will add the XL length crimping groove to their bullets.)

Acknowledgements: Johan Loubser provided invaluable assistance as technical adviser with regard to the appropriate selection of powders to bridge the gap between those available in the United States and in South Africa. His professional experience at Somchem and with Accurate Arms made this advice not only advantageous but critical for the successful completion of the project. My co-workers on this project were Mary Mundell, David Zuck and Dr Richard Kilby M.D.