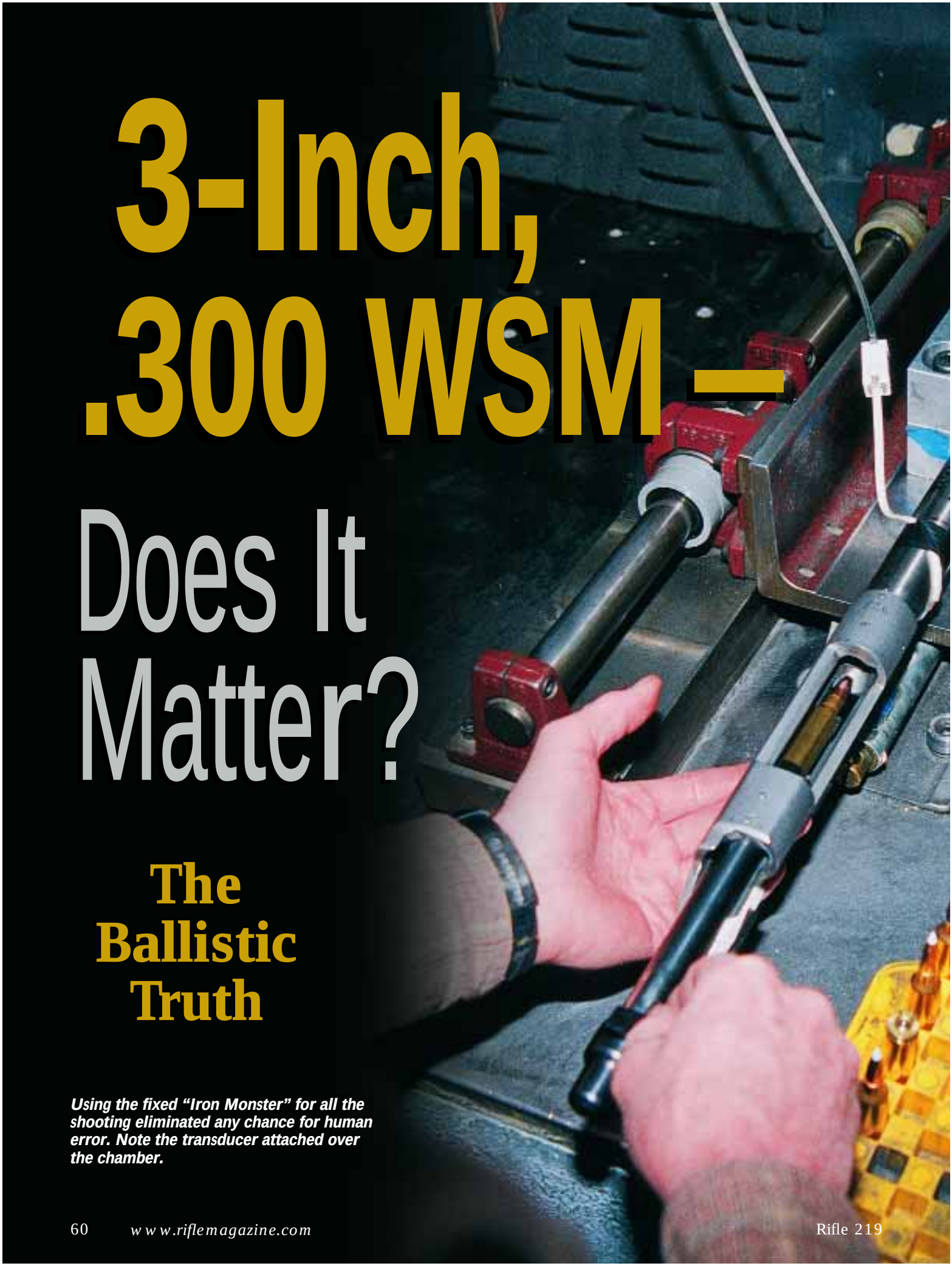
3-Inch, .300 WSM — Does It Matter?

The Ballistic Truth



Using the fixed "Iron Monster" for all the shooting eliminated any chance for human error. Note the transducer attached over the chamber.

Chub Eastman

With the introduction of any new cartridge you invariably hear someone make a comment about long bullets being seated too deeply. The perceived problem being that the rear of the bullet extends too far in the case, restricting the amount of powder that can be used. The theory is that anytime the base of the bullet extends past the break in the shoulder of the case, you lose a certain amount of case capacity. Consequently the maximum efficiency of the cartridge cannot be reached.

The first barrel was chambered to SAAMI specifications. The second barrel was chambered with the same reamer except for a straight .250-inch leade.

This was especially true when the .284 Winchester, .350 Remington Magnum and the 6.5 Remington Magnum were introduced years ago. These were cartridges designed to produce lots of horsepower in a short-action rifle.

When the .300 Winchester Magnum was introduced, the same comments were heard. It was designed to equal or better the performance of the .300 H&H, which required a long action, while the Winchester case fit in a standard .30-06 length action. With the Winchester's short neck and fairly sharp shoulder the same perceived problem cropped up when bullets over 165 grains were seated well below the shoulder.

When Winchester and Remington introduced their new lines of short magnum cartridges, the same old arguments were resurrected again. The bases of heavy bullets extend too far in the cases, taking up powder capacity, etc., etc.

3", .300 WSM

During a conversation with Mike Lake, plant manager at Nosler, Inc., the question: "Does it really make a difference?" came up. Would chamber pressure rise or fall as the bullet is seated farther out? How much can be gained or lost in velocity and accuracy?

In some respects ballistics is a form of black art, and a good ballistician sometimes reminds you of a medieval alchemist when someone poses the "what if?" scenario to them. Mike, being an inquisitive ballistician, couldn't hold back the juices of curiosity to answer the question.

A few days after our conversation, I got a phone call from Mike saying there were a couple of test barrels chambered for the popular .300 WSM available, and there was a time slot during the night shift we could take advantage of. This was the time, under controlled conditions, to see if the seating depth theory was true or not and how much difference it really makes.

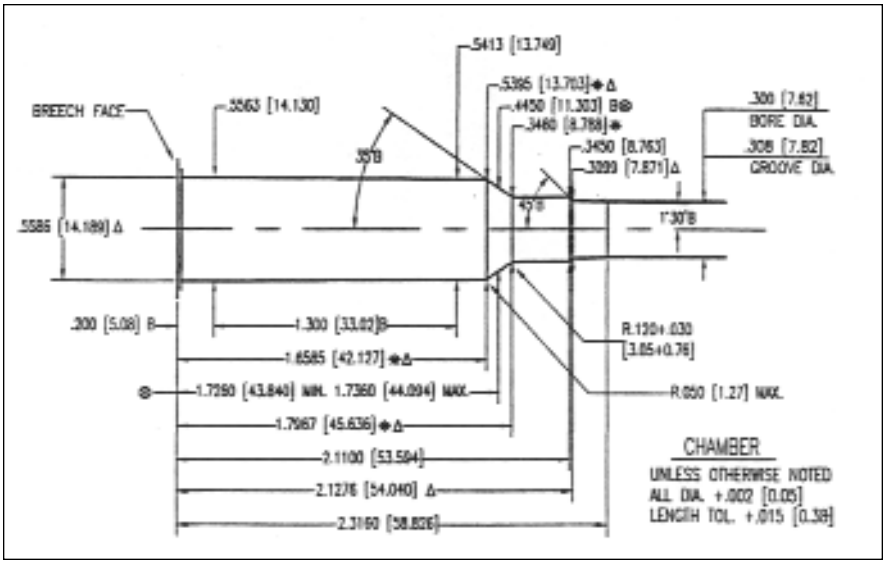
The .300 WSM cutaways show how far the bases of the bullets extend into the case at the four different OALs used in the test: (left to right) 3.000, 2.940, 2.880 and 2.820 inches.

The first barrel was chambered to SAAMI specifications. When you look at the chamber, it appears as if there is no leade or freebore before it goes to the lands and grooves. In reality there is a taper at 1.5 degrees that extends .188 inch from the case mouth.

The second barrel was chambered with the same reamer except for a straight .250-inch leade or freebore ahead of the case mouth with a 1.5-degree taper to the lands and grooves. This straight leade was chosen to make sure a cartridge overall length of 3.000 inches could be chambered.

Both barrels were Wiseman test

Left, chamber casts show the two different leades used in the test: factory SAAMI chamber and tapered leade (left) and factory chamber with modified straight leade to .250 inch (right). Below, the SAAMI chamber drawing.



Ballistician Jason McCullough developed loads for the project.

barrels 1.25 inches in diameter. Each was affixed with a transducer to measure chamber pressure and attached to an Oehler Model 83 Pro-Ballistic Lab chronograph. Each was mounted in a solid machine rest, lovingly called the "Iron Monster." This was done to eliminate any human error that might occur if shooting was done by the hand-held method.

It should be noted the only difference between the two barrels, besides the chamber leade or freebore, was length. The standard chamber barrel was 26 inches long while the modified chamber barrel was 24 inches. It is interesting that the velocity differences between the two were not that much.

To further eliminate any variance that could occur, each round was fired using new, unfired Winchester brass.

Factory Winchester Supreme and Federal Premium ammunition using the same 180-grain AccuBond bullets were fired in each barrel to establish the chamber pressure and velocity to be used as the benchmark. The goal was not to exceed pressures of factory ammunition.

With the help of ballistician Jason McCullough two popular and logical powders for the .300 WSM were chosen: H-4831SC and Reloder 22.

Factory overall loaded length (OAL) for both Federal Premium and Winchester Supreme with the same 180-grain AccuBonds measured 2.820 inches. This was also the starting OAL with the handloads.

After working up a load with each powder that equaled factory ammunition in pressure, velocity and OAL using the same 180-grain AccuBond, the shooting started.

Starting OAL was 2.820 inches and was increased .060 inch at a time until an OAL of 3.000 inches was reached. Three-shot groups were fired at each OAL. In theory, as the bullet was seated farther out, the subsequent drop in pressure would require an increase in powder to maintain loads at factory pressures.

Starting OAL was 2.820 inches and was increased .060 inch at a time until an OAL of 3.000 inches was reached.

The first surprise that proved this theory was questionable came when the second series of shots were fired when OAL was set at 2.880 inches. No increase or decrease in powder was needed to obtain near the same pressure or velocity using the barrel with the modified chamber. Surprise again, when we found the same results at 2.940 inches OAL and at a full 3.000 inches OAL.

3", .300 WSM

When the same loads were used in the barrel with the SAAMI factory chamber, it was a different story. Using the same powder charge, as the OAL length increased, the pressure and velocity increased. It was not expected that the cartridges loaded to a full 3.000 inches OAL would chamber, but they did, albeit with less than .005 inch to spare. From the table, the 3.000-inch OAL cartridges exceeded factory parameters with chamber pressures over 63,000 psi.

What was learned by this interesting exercise? The boys at Winchester knew what they were doing when they designed the .300 WSM to give the best performance when SAAMI specifications are used.

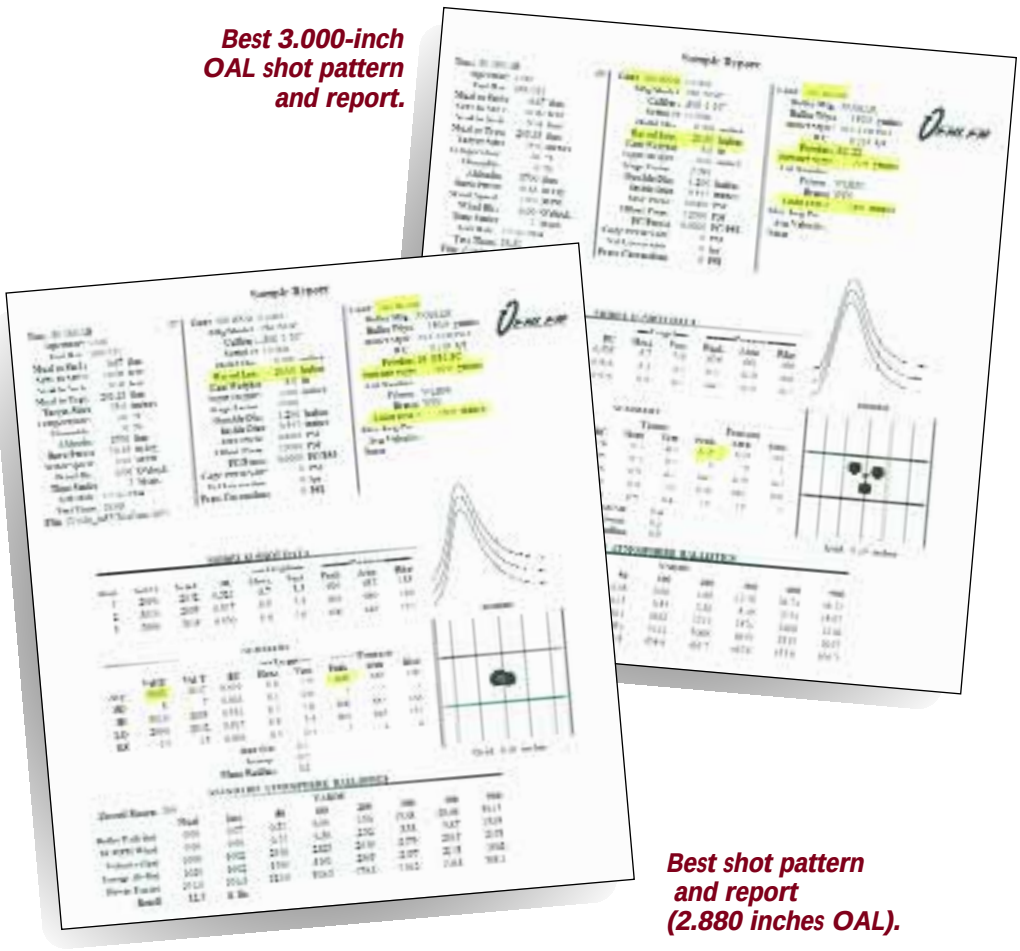
A point of interest is the fact that Nosler's ballisticians use the .300 WSM as the cartridge of choice when testing production runs of all .30-caliber bullets.

While new brass was used for each shot during the project, a few rounds were fired using once-fired brass to see if there were any major changes. There was a slight difference when once-fired neck-sized cases were used but not enough to see any differences in the pattern of performance.

There is a possibility the numbers could be different if slower powders were used, but that is doubtful. The two powders chosen were ones that were suggested in most reloading manuals and seemed to be a popular choice.

Theories and logical reasoning sometimes go down the drain when you actually pull the trigger and record the results.

Having shot a .300 WSM for the past couple of hunting seasons with great success, I had wondered if performance could be increased with a little longer barrel and a little longer OAL length to the cartridge so the base of the bullet doesn't take up extra space in the case. I guess the old adage is true: "If it ain't broke, don't fix it."



Best 3.000-inch OAL shot pattern and report.

Best shot pattern and report (2.880 inches OAL).

Ballistic Comparisons

bullet (grains)	powder	charge (grains)	pressure (psi)	velocity (fps)	overall loaded length (inches)
.300 WSM – SAAMI Chamber with .250 Straight Leade					
180 Nosler AccuBond Winchester Supreme factory			59,800	2,969	2.820
180 Nosler AccuBond Federal Premium factory			59,300	3,011	2.820
180 Nosler AccuBond	H-4831sc	69.0	59,400	2,912	2.820
		69.0	59,600	2,913	2.880
		69.0	59,200	2,909	2.940
		69.0	59,300	2,913	3.000

Notes: Above loads fired through a Wiseman 24-inch test barrel. New W-W brass and Winchester Large Rifle primers used throughout. Pressure and velocity numbers are three-shot averages. An Oehler Model 83 with transducer used to measure velocity and pressure.

bullet (grains)	powder	charge (grains)	pressure (psi)	velocity (fps)	overall loaded length (inches)
.300 WSM – SAMMI Factory Chamber and Leade					
180 Nosler AccuBond Winchester Supreme factory			59,700	3,002	2.820
180 Nosler AccuBond Federal Premium factory			60,200	3,064	2.820
180 Nosler AccuBond	H-4831sc	69.0	59,200	2,976	2.820
		69.0	60,500	3,002	2.880
		69.0	61,200	3,011	2.940
		69.0	62,800	3,029	3.000
	RL-22	70.5	59,500	3,045	2.820
		70.5	60,700	3,058	2.880
		70.5	60,700	3,062	2.940
		70.5	63,500	3,101	3.000

Notes: Above loads fired through a Wiseman 26-inch test barrel. New W-W brass and Winchester Large Rifle primers used throughout. Pressure and velocity numbers are three-shot averages. An Oehler Model 83 with transducer used to measure velocity and pressure.

Be Alert – Publisher cannot accept responsibility for errors in published load data.