

FACTORY AMMUNITION TEST

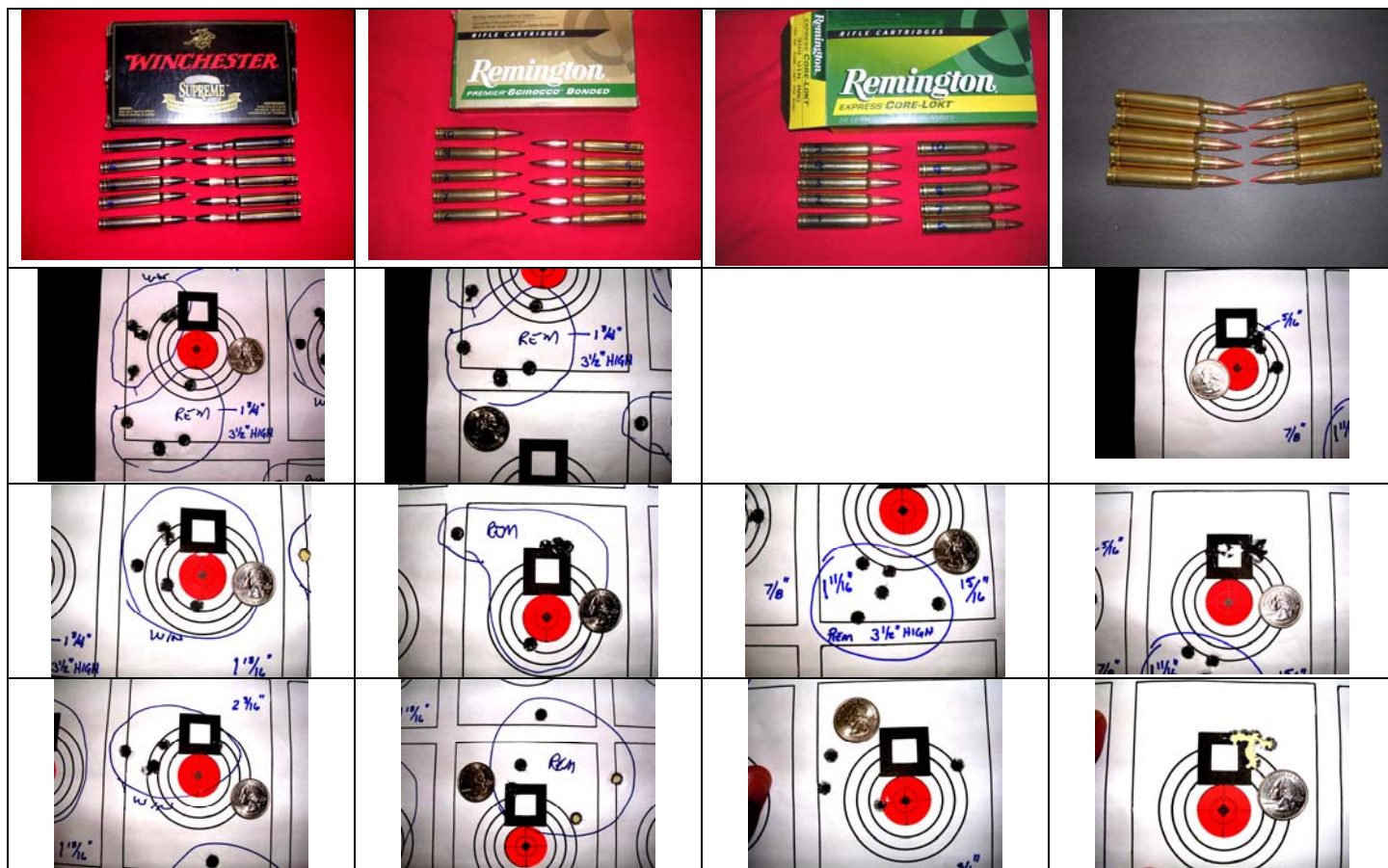
Factory ammunition contributes more inaccuracy in group size than many rifles do. In this test, factory ammunition added over an inch to the rifle's inaccuracy. Rifle reviewers, who use factory ammunition to group test rifles, unfairly criticize the rifle for the inaccuracy caused by factory ammunition.

Test Results for 100 yard 5 shot groups:

Ammunition	Smallest Group	3 group average
Win. 300 Win Mag 180 Gr. BST Supreme	1.75"	1.92"
Rem. 300 Win Mag 180 Gr. SSB Prem. Scirocco	1.75"	2.42"
Rem. 300 Win Mag 180 Gr. Core-Lokt	1.69"	2.21"
Hand Loads, 300 Win. Mag. 178 grain Hornady A-Max	0.56"	0.79"

(Core-Lokt had 9 shots, but they were consistent with rifle's history with Core-Lokts)

Three types of 300 WIN MAG, 180 grain cartridges were used for the test – Winchester BST Supreme (the cartridge used in Outdoor Life's Study), Remington Premier Scirocco Bonded, and Remington Core-Lokt. Hand loads were used for the control ammunition (178 grain Hornady A-Max, 78 grains of IMR 7828, Lapua fire formed brass, and Winchester Match Magnum Primers).



- Some notes:
1. Remington Factory Ammunition shot 3 1/2" higher than Winchester and Hand loads.
 2. The hand loads shot a tight group with a flyer; whereas, the factory had a shotgun pattern.

I'm a Mechanical Engineer, who shoots competitively. Since the early 80's, I hand loaded ammunition because factory ammunition did not provide the accuracy that I required. 1995 through 2001, I competed in 600 & 1000 yard NRA Long Range Competition. From 2002 through 2003, I shot long range tactical matches. In Nov. 2002, I took 3rd place in a national match. My partner and I took 2nd place at SniperQuest2003. Since then, I've been accurizing bolt action rifles.

Group size is the result of many small inaccuracies: human errors, rifle errors, and ammunition errors. Hand loads were used as a basis to measure the human and rifle errors. The addition to group size was directly caused by the factory ammunition. The rifle used was a 6 ½ lb, 300 WIN MAG that I recently built. On good days, it consistently shoots in the low 30's (under 0.330") with expandable bullets.

The test day was a cloudy summer day with the wind blowing from four o'clock at a constant 5 mph and gusts reaching 15 mph – not the perfect conditions to measure group size. Since all the ammunition was shot under near the same conditions, through the same rifle, by the same person, on the same day; the ammunition was equally handicapped. Outdoor Life used the Winchester ammunition in their rifle test so that's where I started. As the day progressed, the shooting conditions got worse. I shot the hand loads last to show no unfair advantage towards them. The rifle was cleaned prior to each brand tested. On the first group from the hand loads, the cold bore blew the 5/16" group to 7/8".

This will be a good time to take a short review course on internal ballistics. The primer goes off. The bullet jumps out of the brass case and seats into the rifling lands. The powder is ignited. The pressure causes the case to expand to the chamber wall, which forms the seal. Pressure builds, and the bullet is forced forward. The lands cut into the bullet. The powder continues to burn accelerating the bullet through the barrel. In order to achieve the perfect group, the bullets have to leave the barrel at the same speed and have to be pointed in the same direction. In order to achieve identical velocities, the energy used in each step of this process has to be consistent. The most important, non-human errors, are inconsistencies that occur prior to the bullet seating into the lands of the barrel. The most important factory ammunition inconsistencies are sloppy Ogives and poor concentricity tolerances.

Ten bullets were taken out of each box and were numbered. The overall length was my first measurement. Overall length is not important to me, but I know that I would be criticized if I left it out.

The next measurement was the Ogive. Ogive is the measurement from the base of the case to the point that the bullet becomes the caliber. Consistent Ogive assures consistent distance from the chambered bullet to the lands of the barrel (bullet jump). An inconsistent Ogive, will cause an inconsistent bullet seating depth into the lands, which will cause inconsistent bullet velocities exiting the barrel.

Shoulder length was measured next. Consistent shoulder measurement assures consistent used energy to expand the case to the chamber wall. Again, this affects the bullet's initial seating depth into the lands.



The last measurements on the assembled cartridge were the concentricity of the case neck and bullet. If the bullet is not concentric, the bullet will be off when it is seated into the rifling. Once the bullet is seated into the rifling, it takes the shape of the inside of the barrel. If the bullet is off when it enters the rifling, it will be off when it leaves the barrel. When the bullet leaves the barrel, the bullet has to stabilize to follow the theoretical trajectory. The inconsistency of the concentricity will make the flight time to target inconsistent because the time necessary to achieve stabilized trajectory will be inconsistent. Inconsistent flight time equals inconsistent point of impact.



A bullet puller was used to remove the bullets and the powder was measured. The result of inconsistent powder measurement is inconsistent pressures, which results in inconsistent velocities. The case lengths were then measured.



The results can be found in the table below. The greatest difference is more important than standard deviation, because the greatest difference could be two sequential shots. The second group with the Remington Premium Ammunition is a perfect example. Draw your own conclusions.

Summary of Factory Ammunition Inconsistencies:

Specimen		OAL (inches)	Ogive (inches)	Powder (grains)	Concentricity Error		Case WT (grains)	Case Length (inches)	Neck Thick Error (1/1000")	Shoulder (1/1000")
					Bullet (1/1000")	Neck (1/1000")				
Rem. 300 Win Mag 180 Gr. Core-Lokt	Minimum	3.305	2.749	69.1			241.6	2.608		-15
	Maximum	3.323	2.763	69.8	15	9	243.8	2.614	4	-12
	Greatest Diff.	0.018	0.014	0.7			2.2	0.006		3
Rem. 300 Win Mag 180 Gr. SSB Prem. Scirocco	Minimum	3.304	2.618	70.3		1	242.3	2.61		-14
	Maximum	3.324	2.639	71	9	4	243.9	2.612		-12
	Greatest Diff.	0.020	0.021	0.7		3	1.6	0.002		2
Win. 300 Win Mag 180 Gr. BST Supreme	Minimum	3.315	2.673	72.7		0	244.4	2.612		-18
	Maximum	3.33	2.685	73	22	8	248	2.62		-11
	Greatest Diff.	0.015	0.012	0.3		8	3.6	0.008		7

Detailed Data:

Factory Ammunition Data
Remington 300 Win Mag, 180 Gr. Core-Lokt
Measurements taken 2/14/06

Specimen	OAL (inches)	Ogive (inches)	Powder (grains)	Bullet WT (grains)	Concentricity Error		Case WT (grains)	Case Length (inches)	Neck Thick Error (1/1000")	Shoulder (1/1000")
					Bullet (1/1000")	Neck (1/1000")				
1	3.313	2.755	69.6	180.3	(Note 1)	(Note 1)	243.2	2.613	1.0	-12
2	3.323	2.762	69.1	181.5	(Note 1)	(Note 1)	242.7	2.611	1.0	-13
3	3.317	2.763	69.7	180.6	(Note 1)	(Note 1)	242.8	2.609	1.0	-12
4	3.315	2.758	69.3	180.4	14	2	243.1	2.608	1.0	-15
5	3.314	2.758	69.8	180.9	7	2	243.7	2.611	1.5	-14
6	3.317	2.760	69.7	180.6	12	1	243.8	2.614	2.0	-14
7	3.314	2.757	69.5	180.6	10	9	241.7	2.610	0.0	-15
8	3.314	2.757	69.7	180.6	11	4	241.6	2.613	0.5	-15
9	3.305	2.749	69.4	180.3	15	8	242.6	2.611	4.0	-15
10	3.315	2.758	69.4	181.7	15	5	243.2	2.613	2.0	-14
Minimum	3.305	2.749	69.1	180.3			241.6	2.608		-15
Maximum	3.323	2.763	69.8	181.7	15	9	243.8	2.614	4	-12
Greatest Diff.	0.018	0.014	0.7	1.4			2.2	0.006		3

Remington 300 Win Mag, 180 Gr. SSB Prem Scirocco
Measurements taken 6/9/06

Specimen	OAL (inches)	Ogive (inches)	Bullet Length (inches)	Powder (grains)	Concentricity Error		Case WT (grains)	Case Length (inches)	Neck Thick Error (1/1000")	Shoulder (1/1000")
					Bullet (1/1000")	Neck (1/1000")				
1	3.312	2.626	1.432	71.0	9	2	242.3	2.610		-12
2	3.305	2.620	1.428	70.3	4	4	243.6	2.612		-14
3	3.324	2.639	1.430	70.3	6	3	243.9	2.612		-12
4	3.305	2.619	1.431	70.3	7	3	242.5	2.611		-13
5	3.305	2.620	1.432	70.3	5	2	243.2	2.610		-14
6	3.320	2.634	(Note 2)	(Note 2)	5	1	(Note 2)	(Note 2)		-12
7	3.304	2.618	(Note 2)	(Note 2)	6	4	(Note 2)	(Note 2)		-13
8	3.306	2.623	(Note 2)	(Note 2)	9	3	(Note 2)	(Note 2)		-13
9	3.320	2.639	(Note 2)	(Note 2)	9	4	(Note 2)	(Note 2)		-13
10	3.319	2.636	(Note 2)	(Note 2)	8	4	(Note 2)	(Note 2)		-13
Minimum	3.304	2.618	1.428	70.3		1	242.3	2.61	0	-14
Maximum	3.324	2.639	1.432	71	9	4	243.9	2.612	0	-12
Greatest Diff.	0.020	0.021	0.004	0.7		3	1.6	0.002	0	2

Factory Ammunition Data
Winchester, 300 Win Mag, 180 Gr BST Supreme

Measurements taken 6/9/06

Specimen	OAL (inches)	Ogive (inches)	Bullet Length (inches)	Powder (grains)	Concentricity Error		Case WT (grains)	Case Length (inches)	Neck Thick Error (1/1000")	Shoulder (1/1000")
					Bullet (1/1000")	Neck (1/1000")				
1	3.322	2.678	1.632	73.0	2	0	244.6	2.614		-15
2	3.325	2.680	1.632	72.8	1	0	244.6	2.613		-17
3	3.325	2.680	1.633	72.9	14	3	248	2.620		-15
4	3.321	2.676	1.633	72.7	5	2	247.5	2.612		-18
5	3.315	2.673	1.631	73.0	14	6	244.4	2.615		-15
6	3.327	2.682	(Note 2)	(Note 2)	22	8	(Note 2)	(Note 2)		-14
7	3.329	2.683	(Note 2)	(Note 2)	7	2	(Note 2)	(Note 2)		-15
8	3.330	2.685	(Note 2)	(Note 2)	8	2	(Note 2)	(Note 2)		-15
9	3.326	2.680	(Note 2)	(Note 2)	3	2	(Note 2)	(Note 2)		-11
10	3.323	2.678	(Note 2)	(Note 2)	10	2	(Note 2)	(Note 2)		-15
Minimum	3.315	2.673	1.631	72.7		0	244.4	2.612	0	-18
Maximum	3.33	2.685	1.633	73	22	8	248	2.62	0	-11
Greatest Diff.	0.015	0.012	0.002	0.3		8	3.6	0.008	0	7

Notes:

- 1 I pulled the bullets from 1 - 3 before I realized that I still had to measure concentricity.
- 2 At \$31+ a box, I only pulled 5 and saved the rest for the range.
- 3 Rifle chamber Ogive = 2.852" – Factory Chamber

By: Wayne D. Talley
Houston, TX