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## Field Study—Steel Versus Lead in Aerial Hunting<sup>1</sup>

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David Nelson<sup>3</sup>

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The purpose of this study is to get an objective measure of the comparative performance of steel and lead when used in aerial hunting. Comparisons will be made by patterning lead and steel from 35 and 45 yards using improved cylinder and modified shotgun barrels. Tests will be conducted from the ground and air to compare penetration by lead and steel.  
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The use of steel shot in South Dakota's ADC aerial hunting operations was initiated primarily because of the availability of steel shot over the non-buffered lead shot. After steel shot was in use, three other positive characteristics began to show up in the favor of steel. These were pattern density, penetration and minimized recoil.

Pattern densities were evaluated in the field for 35 yards and 45 yards (see tables 1 and 2). The shot sizes evaluated are 4 buck, BB LL, BB steel, F steel and T steel. F steel is .220" diameter or slightly smaller than 4 buck, T steel is .200" diameter and BB is .180" diameter. The barrels used for testing were the 26" beretta A-302 I.C. for all shot sizes except the T shot. T shot was tested in the Browning Investor 26" with all chokes and the F shot in full choke. The 28" modified barrel was also a beretta A-302 3" magnum. A 40" circle was used instead of a 30" circle to better cover the silhouette of a coyote. The beretta A-302 I.C. 26" is used exclusively for aerial hunting operations in South Dakota. The pattern densities with this choke are very similar for BB LL and BB steel. The impressive characteristics of the BB LL and BB steel are the density of the patterns with 75 pellets and 90 pellets per load respectively. The F steel and 4 buck showed no consistency in patterns with each showing large holes in the pattern for all barrels tested. T steel shows promise with the I.C. barrel and a pellet count of 60 which helps to better cover a pattern as opposed to a 34 pellet count on 4 buck and 48 pellet count on F steel.

<sup>1</sup> Paper presented at the Eighth Great Plains Wildlife Damage Control Workshop (Howard Johnson's, Rapid City, South Dakota, April 28-30, 1987)

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Table 1--35 yard pattern density

Length	Barrel	Shot Size	40" Circle
26"	I.C.	1 1/4 BB Steel	94%
28"	Mod.	1 1/4 BB Steel	84%
26"	I.C.	1 1/2 BB LL	93%
28"	Mod.	1 1/2 BB LL	96%
26"	I.C.	1 1/2 4 Buck	76%
28"	Mod.	1 1/2 4 Buck	82%
26"	I.C.	1 1/4 F. Steel	92%
28"	Mod.	1 1/4 F. Steel	83%
26"	Full	1 1/4 F. Steel	98%

Table 2--45 yard pattern density

Length	Barrel	Shot Size	40" Circle
26"	I.C.	1 1/4 BB Steel	80%
28"	Mod.	1 1/4 BB Steel	86%
26"	I.C.	1 1/2 BB LL	77%
28"	Mod.	1 1/2 BB LL	87%
26"	I.C.	1 1/2 4 Buck	47%
28"	Mod.	1 1/2 4 Buck	68%
26"	I.C.	3" 1 1/4 F. Steel	81%
26"	Mod.	3" 1 1/4 F. steel	77%
28"	Mod.	3" 1 1/4 F. Steel	60%
26"	Full	3" 1 1/4 F. Steel	67%
26"	I.C.	3" 1 1/4 T. Steel	95%
26"	Mod.	3" 1 1/4 T. Steel	88%
26"	Full	3" 1 1/4 T. Steel	88%

Penetration evaluation was done at 35 yards and the number of pellets that exited the coyote on a broadside shot were counted (see table 3). With the operational use of BB LL and BB steel from the aircraft, penetration seems to be similar also.

Table 3.--Penetration of coyote at 35 yards

Shot Size	Number Through Coyote	Pellets Per Load
BB Steel	5	90
BB LL	7	75
F Steel	5	48
B Buck	0	34

The 1 1/4 oz. BB steel 2 3/4" load has a mild recoil which is also desirable to many aerial gunners. The 1 1/4 oz. 3" magnum F shot and T shot resemble the record of 1 1/2 oz. BB LL at least to our shoulder nerve endings.

Two concerns that have been voiced regarding the use of steel shot in aerial hunting operations are a super tight pattern and the time lag between the time a coyote dies on his feet and the time to which he realizes it and tips over.

The tight pattern is the result of a short shot string (see table 4). A 20 foot length of 48" brown wrapping paper was fastened to a fence and shot strings were measured at 60 mph. The BB steel does not string out like lead therefore it is essentially hitting the ground at the same time and showing a tight pattern on the ground below the airplane.

Table 4.--Shot String, 35 yards at 60 miles per hour.

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1 1/4 BB Steel, 4 feet 1 inch, or 49 inches  
 1 1/2 BB LL, 5 feet 4 inches, or 64 inches  
 1 1/2 4 Buck, 5 feet 9 inches, or 69 inches  
 F Steel, 5 feet 6 inches, or 66 inches

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Shot String was a +15" longer with BB LL than BB Steel. F Steel was a +17" longer than BB Steel. 4 Buck was a +20" longer than BB Steel.

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As far as the time lag problem, BB steel again resembles BB LL in that it seems in order to gain good penetration we have to sacrifice knock-down power. If a coyote is centered in the "tight" and "dense" BB steel pattern at reasonable range, there is no time lag - he is done. If caught on the edge of the pattern, the coyote can be ventilated good enough for a lethal hit but will cover some ground before it tips over. If working in heavy cover or on more than one coyote, it is possible to lose valuable time working a coyote that tips over just as the next pass is being made or it tips over in heavy cover and is not spotted. Neither of these two concerns are really a problem to the aerial gunner that is adept in hitting a coyote with other shot loads because if he can center the coyote in the pattern the shot string isn't needed to help him hit the coyote and there are enough pellets on target so there will be no "lag time" to tip over.

This is not a scientific study but only a field evaluation of steel shot since we are already using it in our aerial hunting operation by our own choice.