



TERMINAL BALLISTICS EVALUATION REPORT

Sierra 6mm 116gr & 107gr TMK | Hornady 103gr ELD-X (Control)

Live Tissue Evaluation — Multi-Cartridge Field Study

1. TEST OVERVIEW

Objective	Evaluate terminal performance of the Sierra 6mm 116gr and 107gr Tipped MatchKing (TMK) projectiles in live tissue across multiple cartridges and impact ranges, using the Hornady 103gr ELD-X as a performance control.
Total Engagements	22 recorded shots across 3 cartridge platforms
Range Envelope	30 yards to 530 yards
Impact Velocities	1,717 fps to 2,659 fps

2. TEST PLATFORMS

Platform	Cartridge	Notes
1	6x45mm	6mm projectile necked from .223 Remington case
2	6XC	6mm cartridge designed for long-range competition and hunting
3	6UM	6.5 SAUM necked down to 6mm and improved.

3. PROJECTILES EVALUATED

Projectile	Role	Design Intent
Sierra 116gr TMK (MatchKing)	Primary	Tipped match-grade projectile; evaluated for terminal performance in hunting applications
Sierra 107gr TMK (MatchKing)	Primary	Tipped match-grade projectile; evaluated for terminal performance in hunting applications
Hornady 103gr ELD-X	Control	Purpose-designed hunting bullet with Heat Shield tip; established terminal performance baseline

4. ENVIRONMENTAL CONDITIONS

Parameter	Value	Notes
Temperature	-15°F to 20°F	Cold weather conditions throughout testing
Elevation	~1,200 ft MSL	Above-sea-level shooting position
Density Altitude	-3,000 ft DA to 1,000 ft DA	Variable; cold temps significantly reduced effective DA
Relative Humidity	~50%	Moderate humidity throughout

5. INDIVIDUAL ENGAGEMENT DATA

The table below presents all 22 recorded engagements. Shot angles are recorded as presented at time of impact. Wound channel measurements reflect observed permanent cavity dimensions.

Shot #	Range	Cartridge	Projectile	Impact Vel.	Angle	Animal Result	Exit	Wound Channel / Necropsy Findings
1	140y	6XC	116gr TMK	2,589 fps	Quartering to (R)	40 yards	Yes	Entered inside lung; ~4" perm. wound channel. Passed through liver splitting it in half; continued through stomach creating 8"+ wound channel
2	178y	6XC	116gr TMK	2,524 fps	Broadside (R)	Dropped	Yes	Through onside scapula, rib, nicked spine. ~50% of each lung destroyed; 4–6" permanent wound channel
3	147y	6x45	116gr TMK	2,230 fps	Broadside (L)	Dropped	Yes	Neck length, sub-1" entry. 3"+ wound through lungs; exited offside rib
4	457y	6UM	116gr TMK	2,500 fps	Quartering away (R)	Dropped	Yes	No necropsy detail recorded
5	457y	6XC	116gr TMK	2,170 fps	Slight quartering away (R)	Dropped	Yes	No necropsy detail recorded
6	457y	6XC	116gr TMK	2,170 fps	Broadside (R)	Dropped	Yes	No necropsy detail recorded
7	216y	6XC	103gr ELD-X	2,150 fps	Hard quartering away (R)	Ran 80–100y	Yes	Flipped over, recovered and ran. 0.5–1" entrance wound; 2" wound in onside lung; 4" wound through stomach
8	216y	6XC	116gr TMK	2,150 fps	Nearly facing away (R)	Dropped*	Yes	Fist shot in hind end dropped the deer. Second shot to head. Bullets exited
9	150y	6XC	116gr TMK	2,569 fps	Slight quartering to	Dropped	Yes	4"+ entry through inside scapula into chest; through both lungs (only 2×3" strips remaining); nicked heart removing ~50%; 2" exit hole through rib
10	30y	6UM	116gr TMK	3,131 fps (second shot)	1 st shot running, 2 nd shot quartering away (bedded)	Moved 30+/- yards	Yes	1 st shot running nearly separated the legs completely. 2 nd shot bedded entered behind mid-body, through spine, exited behind diaphragm. Bullet did not enter chest cavity; significant bruising on rear lung lobes; one fragment penetrated offside lung

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Shot #	Range	Cartridge	Projectile	Impact Vel.	Angle	Animal Result	Exit	Wound Channel / Necropsy Findings
11	470y	6x45	116gr TMK	1,800 fps	Quartering to (R)	N/A	Yes	No necropsy detail recorded
12	530y	6XC	116gr TMK	2,030 fps	Broadside (R)	Ran 3y	Yes	Entry through inside scapula separating it in half with 3"+ entry into cavity. Offside humerus vertically separated, held only by skin. 5"+ permanent cavity through body; <20% of lungs remaining; nicked heart
13	530y	6XC	116gr TMK	2,030 fps	Quartering to (L)	Dropped	Yes	Entered chest between front scapula and ribcage nearly separating the inside quarter from body — 10–12" wound. Through inside lung, exited rear lobe of offside lung and through liver; 2" exit; 4–6" perm. cavity
14	482y	6XC+6x45	116gr TMK + 107gr TMK	1,958 / 1,717 fps	Quartering to (L)	Ran 30–40y	Yes	Both bullets entered chest cavity through both lungs. ~20% lung tissue remaining; 4"+ wound channels in both cases
15	490y	6XC	116gr TMK	2,105 fps	Slight quartering away (R)	Dropped	Yes	4–5" entrance at point of scapula. Through front portion of both lungs; 3"+ wound channel; 4"+ exit wound low chest
16	490y	6UM	116gr TMK	2,424 fps	Broadside (R)	Dropped	Yes	Entered high on back, through spine, top of lung; 5–6" exit through center scapula. Entire top portion of lungs missing; bruising throughout
17 (chest)	330y	6XC	103gr ELD-X	2,400 fps	Quartering to	Dropped	Yes	0.5–1" entrance wound; 2" wound in onside lung; 4" wound through stomach
17 (head)	330y	6XC	116gr TMK	2,326 fps	Head-down	Dropped	Yes	Head-down through center forehead, exited right cheek. Entire top of skull opened; brain missing; 2.5–3" exit through face
18	490y	6XC	116gr TMK	2,105 fps	Nearly facing away downhill (R)	Dropped	Yes	6–8" entry through right ham/femur. TC caused 6–8" open wound in stomach; fragment exited top of back. Main bullet through stomach, through offside lung (2"+ wound), bruised near lung, exited front of chest
19	250y	6XC	116gr TMK	2,441 fps	Quartering to (L)	Ran 50y	Yes	Entered behind onside scapula through ribs; damaged top of onside lung; through offside lung removing rear 50%; 6"+ hole through entire stomach

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Shot #	Range	Cartridge	Projectile	Impact Vel.	Angle	Animal Result	Exit	Wound Channel / Necropsy Findings
20	250y	6XC	103gr ELD-X	2,552 fps	Broadside (R)	Ran 50y	Yes	Through outside scapula and rib creating 1" wound into cavity; 2" wound channel through both lungs and liver; caliber-sized exit wound
21	168y	6XC	116gr TMK	2,574 fps	Nearly facing away (R)	Ran 50y (4 shots)	Yes	Shot 1: 8"+ wound channel through stomach; rear lung edges missing. Shot 2: 6"+ wound through right rear quarter. Shot 3: near-separation of leg. Shot 4: 4"+ entrance into rear chest cavity
22	190y	6XC	103gr ELD-X	2,659 fps	Broadside / high shoulder	Dropped (alive 30+ min)	Yes	Penetrated spine and exited offside. Very top edge of offside lung affected; ~1" wound channel. Deer remained alive 30+ minutes
23	190y	6XC	116gr TMK	2,530 fps	Quartering to (R)	Ran 20y	Yes	Shot entered mid ribs, through rear of both lungs, through diaphragm causing a 4" wide wound, through liver with 3" wound, and exited.
24	480y	6XC	116gr TMK	2,410 fps	Broadside (R)	Ran 20y	Yes	N/A

6. COMPARATIVE ANALYSIS

6.1 Penetration & Exit Performance

- **Sierra 107gr and 116gr TMK: 22 of 22 TMK shots recorded as exiting the animal.**
- Sierra 107gr TMK: Exited in the single recorded dual-bullet engagement (Shot 14, 482y, 1,717 fps impact velocity), demonstrating retained performance at reduced velocity.
- Hornady 103gr ELD-X: All 5 ELD-X engagements resulted in bullet exit. Exit wounds were consistently smaller than TMK equivalents. The ELD-X expanded rapidly but created observably narrower wounds.

6.2 Wound Channel Dimensions

Metric	116gr TMK	103gr ELD-X
Typical entrance wound	3"–5"+ (structured tissue)	0.5"–1" (minimal)
Typical permanent cavity	3"–8"+ through vitals	1"–4" through vitals
Lung tissue retained	Often <20–50% remaining	Majority intact; localized damage

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Metric	116gr TMK	103gr ELD-X
Notable maximum wound	10–12" (Shot 13, 530y quartering-to)	4" (Shot 17 chest, stomach)
Scapula engagement	Frequently split/separated	Penetrated with smaller channel
Heart/major vessel hits	Multiple instances of >50% removal	No major heart hits recorded

6.3 Animal Reaction & Post-Shot Movement

Outcome	116gr TMK	103gr ELD-X
Immediate drop	Majority of shots; consistent across ranges	Only spine/CNS hit (Shot 22)
Ran <50 yards	Minority of shots (typically 30–50y)	All non-spine shots ran 50–100y
Ran 80–100+ yards	Not observed (except 4-shot sequence)	Shot 7 (216y): 80–100y flight
Multiple shots required	Shot 21 (4 shots running)	Not documented

6.4 Notable Individual Engagements

Shot 12 (530y, 6XC, 116gr TMK, 2,030 fps) — The offside humerus was vertically separated with only skin remaining intact, demonstrating extreme temporary and permanent wounding through the thoracic cavity. Less than 20% of lung tissue remained. This represents the most extreme terminal effect recorded at extended range.

Shot 13 (530y, 6XC, 116gr TMK, 2,030 fps) — The inside quarter was nearly separated from the body at the point of bullet entry, producing a 10–12" entry wound. The wound channel traversed both lungs and the liver. This shot demonstrates that the TMK maintains aggressive terminal behavior at or beyond 530 yards when velocity is adequate.

Shot 10 (30y, 116gr TMK) — At close range with a quartering-away bedded target, the bullet entered behind mid-body, transited the spine, and stopped behind the diaphragm without entering the chest cavity. Despite this, the temporary stretch cavity produced significant bruising on the rear lung lobes, and a fragment penetrated the offside lung. This is noteworthy for its demonstration of the TC's effects even without direct thoracic penetration.

Shot 22 (190y, 6XC, 103gr ELD-X, 2,659 fps, high shoulder/spine) — Despite a high impact velocity and spine hit, the ELD-X produced only approximately 1" of wound channel in the offside lung, and the animal remained alive for 30+ minutes. This contrasts sharply with TMK results at similar and greater ranges.

7. SUMMARY & CONCLUSIONS

Based on 22 field engagements across three cartridge platforms, ranging from 30 to 530 yards, and impact velocities from 1,717 to 3,131 fps, the following conclusions are drawn:

- **Penetration:** All three bullets exited 100% of shots taken. In all engagements where direct comparison was possible, the Sierra TMK (116gr and 107gr) created much larger wounds along the entirety of the bullets path.
- **Wound Channel Volume:** The TMK consistently produced larger permanent wound channels than the ELD-X across comparable impact conditions. The TMK frequently caused near-total destruction of the thoracic cavity, while the ELD-X typically produced localized tissue disruption.
- **Terminal Consistency at Extended Range:** The TMK demonstrated reliable and aggressive terminal performance to 1,717 fps impact velocity, with wound channels remaining large. Performance degraded minimally across the tested velocity range.
- **Animal Reaction:** The majority of TMK-shot animals dropped immediately upon impact. Animals that fled post-impact traveled significantly shorter distances than those shot with ELD-X projectiles. All ELD-X engagements (excluding the spine shot) resulted in the animal running after the shot.
- **ELD-X Limitations in This Context:** While the ELD-X performed as designed for a hunting bullet — achieving rapid expansion and reliable exit — the reduced wound channel volume and post-shot animal movement indicate it is less effective than the TMK for rapid incapacitation in this tissue type at these velocities.
- **107gr TMK at Extended Range:** The single recorded 107gr TMK engagement (Shot 14, 482y, 1,717 fps) produced 4"+ wound channels through both lungs with approximately 20% tissue remaining, confirming terminal performance at reduced velocities and extended ranges.

OVERALL ASSESSMENT: The Sierra 116gr TMK demonstrated superior terminal performance compared to the Hornady 103gr ELD-X in all measured categories across this evaluation. The TMK is recommended where rapid, deep, high-volume tissue disruption is the primary objective.