

Nos. 25-238 & 25-566

In the Supreme Court of the United States

CUTBERTO VIRAMONTES, et al.,
Petitioners,

v.

COOK COUNTY, ILLINOIS, et al.,
Respondents.

EDDIE GRANT, JR., et al.,
Petitioners,

v.

RONNELL HIGGINS, in his Official Capacity as
Commissioner of the Connecticut Department of
Emergency Services and Public Transportation, et al.,
Respondents.

*ON WRITS OF CERTIORARI TO THE UNITED STATES
COURTS OF APPEALS FOR THE SEVENTH AND
SECOND CIRCUITS*

**BRIEF FOR “CRIME,” AN UNREGISTERED
GROUP, AS AMICUS CURIAE
IN SUPPORT OF RESPONDENTS**

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TABLE OF CONTENTS

TABLE OF CONTENTS	i
TABLE OF AUTHORITIES	iii
INTEREST OF AMICUS CURIAE	1
STATEMENT OF THE CASE	1
A. The Measure of Muzzle Energy Per- Minute (“MEpM”) Defines a Firearm’s Lethality and Best Harmonizes the Cases.....	1
B. The AR-15 Rifle Represents a Dramatic Technological Change from Earlier Firearms That Didn’t Warrant Regulation.....	7
SUMMARY OF ARGUMENT.....	10
ARGUMENT	13
A. History and Syntax Are “Consistent with Common Sense” And Support the “Unusually Dangerous” Test.....	15
B. The MEpM Points to an Empirical Bright Line Test of “Unusual Dangerousness”	17
C. “Bravado and Affray” Laws Provide a Historical Analogy from Yesteryear’s Group Violence to Today’s Armed Madman	20
D. Fourth Amendment Jurisprudence Offers a Pragmatic Approach for Constraining New Technologies	23

E. This Court Should Remand the Cases for Overbreadth and Specific Applications	26
CONCLUSION	28
APPENDIX	
Muzzle Energy per Minute (“MEpM”) Table: Firepower Comparison	1a

TABLE OF AUTHORITIES

Federal Cases

<i>Bevis v. City of Naperville</i> , 85 F.4th 1175 (7th Cir. 2023)	12
<i>Bianchi v. Brown</i> , 111 F.4th 438 (4th Cir. 2024) (en banc), <i>cert. denied sub nom. Snope v. Brown</i> , 145 S. Ct. 1534 (2025).....	13
<i>Caetano v. Massachusetts</i> , 577 U.S. 411 (2016).....	16, 17, 19
<i>Capen v. Campbell</i> , 134 F.4th 660 (1st Cir. 2025).....	13
<i>Carpenter v. United States</i> , 585 U.S. 296 (2018).....	13, 14, 24, 25
<i>Chatrie v. United States</i> , 146 S. Ct. 2193 (2026).....	13, 25, 26
<i>District of Columbia v. Heller</i> , 554 U.S. 570 (2008).....	12, 16, 19
<i>Dobbs v. Jackson Women's Health Org.</i> , 597 U.S. 215 (2022).....	23
<i>Duncan v. Bonta</i> , 133 F.4th 852 (9th Cir. 2025)	13
<i>Hanson v. District of Columbia</i> , 120 F.4th 223 (D.C. Cir. 2024), <i>cert. denied</i> , 2025 U.S. LEXIS 2221 (2025)....	13, 21

<i>Heller v. District of Columbia</i> , 670 F.3d 1244 (D.C. Cir. 2011).....	18
<i>Kanter v. Barr</i> , 919 F.3d 437 (7th Cir. 2019).....	15
<i>Katz v. United States</i> , 389 U.S. 347 (1967).....	14, 25
<i>Mapp v. Ohio</i> , 367 U.S. 643 (1961).....	11
<i>McDonald v. City of Chicago</i> , 561 U.S. 742, 130 S. Ct. 2020 (2010).....	17
<i>Miller v. Bonta</i> , 2026 U.S. App. LEXIS 19416 (9th Cir. Jul. 1, 2026).....	13
<i>Minnesota v. Carter</i> , 525 U.S. 83 (1998).....	25
<i>NYSRPA v. Bruen</i> , 597 U.S. 1 (2022).....	12, 21, 23
<i>Ocean State Tactical, LLC v. Rhode Island</i> , 95 F.4th 38 (1st Cir. 2024), <i>cert. denied</i> , 2025 U.S. LEXIS 2129 (2025).....	13
<i>Snope v. Brown</i> , 145 S. Ct. 1534 (2025).....	18
<i>Teague v. Lane</i> , 489 U.S. 288 (1989).....	11
<i>United States v. Jones</i> , 565 U.S. 400 (2012).....	24, 25

<i>United States v. Knotts</i> , 460 U.S. 276 (1983).....	24
<i>United States v. Miller</i> , 307 U.S. 174 (1939).....	16
<i>United States v. Rahimi</i> , 602 U.S. 680 (2024).....	7, 15, 20, 24

United States Constitution

Second Amendment	5, 8, 10, 12, 14, 16, 19, 23, 25, 26, 28
Fourth Amendment	13, 14, 23, 24, 25, 26
Tenth Amendment.....	23
Fourteenth Amendment	5, 28

Federal Statutes

15 U.S.C. § 7901.....	16
18 U.S.C. § 841(d)	3
26 U.S.C. § 1132.....	16
26 U.S.C. § 5845(f)(2).....	8

State Statutes

Conn. Gen. Stat. § 53-202a	4
§ 53-202a(1)(A)(i)	3
§ 53-202a(1)(B).....	3
§ 53-202a(1)(E)(ii)	3
§ 53-202a(1)(G).....	27
§ 53-202a(7).....	27

Ordinances

Code of Ordinances of Cook County, Illinois

§ 54-211(1).....	3
§ 54-211(2).....	3
§ 54-211(7)(A)(i)	3
§ 54-211(7)(A)(iii)	3
§ 54-211(7)(A)(xix)	3
§ 54-211(7)(A)(xxxvii)	3
§ 54-212	27

Governmental Training Circulars

Dep’t of the U.S. Army, TC 3-22.9: Rifle and Carbine, § 8-19 (2016).....	10
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Online Sources

<i>Dirty Harry</i> , Internet Movie Firearms Database, https://www.imfdb.org/wiki/Dirty_Harry (last visited Oct. 5, 2026).....	22
Kranefuss, Lee, “ <i>MEpM</i> ” Recent Post, https://lkranefuss.com/mepm/ (last accessed Oct. 21, 2026).....	3, 10, 11, 21

Publications

The Federalist No. 84 (Alexander Hamilton)	23
Garry, James B., <i>Weapons of the Lewis and Clark Expedition</i> (2012)	7, 8
Schwantes, Carlos A., <i>The Pacific Northwest: An Interpretive History</i> (1996)	8

Treatises

4 Blackstone [Commentaries on the Laws of England] (1769)	16, 21
--	--------

INTEREST OF AMICUS CURIAE¹

“CRIME” is an unregistered group of people whose acronym stands for Citizens’ Response to Increased Muzzle Energy. Its purpose is to provide an objective logic and framework based on simple laws of physics to constrain the inherently-normative question of what level of lethality renders a firearm “unusually dangerous.” We also wish to aid this Court in its efforts to practice principled constitutional decision-making and faithful originalism. “CRIME” has no parent entity or issuance of stock. Lee Kranefuss, its founder, started and ran the global iShares line of ETF’s for a decade before taking on business and philanthropic works.

STATEMENT OF THE CASE

A. The Measure of Muzzle Energy Per-Minute (“MEpM”) Defines a Firearm’s Lethality and Best Harmonizes the Cases

The damage done by a bullet is largely the result of the amount of energy it has when it leaves the barrel, which is determined by the weight of the bullet and its speed. Higher bullet speed makes a huge difference because energy grows as the square of speed: doubling speed increases muzzle energy by a factor of four and increasing it ten-fold produces 100 times more energy. The AR-15 platform rifle can fire a bullet with a muzzle speed of between 1,140 and 3,479 feet-per-second - which is roughly 2,000

¹ No party or party’s counsel authored or financially supported any of this brief. No person other than a member of the *amicus curiae* made such a monetary contribution.

miles per hour, or three times the speed of sound. And, with semiautomatic operation and large, rapidly-changeable magazines, shooting 60 bullets a minute is not hard to do. That means a single shooter can unleash nearly 60,000 foot-pounds per minute of firepower per minute.

By comparison, a .38 Special handgun delivers about 300 foot-pounds per minute per shot, and holds six shots in its cylinder. If 35 police officers armed with traditional .38 Specials all empty their service revolvers in one minute (210 rounds in total), it would be the equivalent firepower of one person with an AR-15 rifle. In short, we have come very far from 1791 in what a gun is and can do, when a musket was hand-loaded, slow, heavy and long; and, a capable musketeer might be able to fire four shots per minute with muzzle energy of 1,129 ft-pounds per minute -- delivering about 3,900 ft-pounds per minute of firepower.²

MEpM provides an objective measure of how much lethal energy one person can release in 60 seconds by firearm. The Table compiles the MEpM of a range of archetypal firearms and cartridges showing the derivations for each from publicly-sourced information. Handguns, Semiautomatic handguns, Bolt-Action rifles, various Semiautomatic rifles, and AR-15 platform rifles are arrayed in ascending rows by MEpM, with columns that show

² Additionally, musket balls were irregular due to the lack of precision machining. Hence, the useful range was 50-100 yards at best – and an intended target might run out of range before the musket could be loaded and fired. All of which is only to suggest that the Court not require overly specific historical or regulatory analogues for the outlier-MEpM firearm.

the firearm and cartridge, predicate calculations, and cited source.

Bottom line: *the five weapons with the most lethality -- by far -- are all archetypal semiautomatic rifles prohibited under the Connecticut and Cook County statutes. See Grant Pet. App. 97a-122a (Conn. Gen. Stat. §§ 53-202a(1)(A)(i), (B), (E)(ii)); Viramontes Pet. App. 29a-41a (Code of Ordinances of Cook County §§ 54-211(1), (2), (7)(A)(i), (iii), (xix), (xxxvii)).* These firearms have MEpM's of *12-to-27-times* that of the gold-standard police-issue .38 Special revolver. *See* Kranefuss, Lee, "*MEpM*" Recent Post, <https://lkranefuss.com/mepm/> (last accessed Oct. 21, 2026), attached as appendix. Our Table provides an objective measure of how AR-15 rifles' enhanced bullet velocities and firing capacities exponentially increase their lethality above and beyond any other firearm.³

The Table harmonizes the results in *Heller* and *Bruen* in that all handguns, including semiautomatics, have relatively-low MEpM's. We submit that the Connecticut and Cook County statutes are over-inclusive in banning such handguns, and that a more limited ban on AR-15 rifles makes logical sense "without effectively overruling *Heller* and severely limiting the Second Amendment's protection." Pet Brief at 4. MEpM also explains the inherent logic of federal statutes, *e.g.*, 18 U.S.C. § 841(d) (flash powder ingredients) and

³ It is worth noting that the AR-15 was a redesign in the Vietnam War over its World-War-II-era M1 Garand predecessor, increasing its magazine, reducing recoil, and shortening the barrel – precisely to increase its lethality, *i.e.*, its capacity to kill as many combatants as quickly as possible. The AK-47 was the Russian equivalent-redesign.

cases that proscribe civilian-ownership of artillery guns, canon, and explosives like dynamite or detonators, as well as machine guns.

Ultimately, MEpM warrants this Court's attention because it correlates most directly with the collateral damage cost and public interest. Unlike a musket ball, a bullet with the MEpM of an AR-15 rifle shatters bones and liquefies organs. *See* JA8, JA14-JA16 (correlating muzzle energy with the size of the radiating wound cavity caused by the dispersion of kinetic energy), JA41 (referencing injuries to innocent bystanders shot through walls). The AR-15 rifle bullet moves with exponentially greater velocity, since its energy grows as the square of v . It pierces through the chest, and its supersonic shockwave pulverizes tissues and blows organs apart, causing massive internal hemorrhaging. It can also cause collateral damage by penetrating doors and walls. The kicker is that it can wreak such havoc in an astonishingly short burst of time.⁴

Our Table provides quantitative data with a clear demarcation line as the best framework for assessing the States' regulations. While choosing any demarcation is, in a sense, subjective, we submit that it is far more objective than defining "in

⁴ Connecticut passed its ban, Conn. Gen. Stat. § 53-202, *Grant* Pet. App. 97a-122a, in response to the Sandy Hook Elementary School massacre. There, the shooter, using an AR-15-style semiautomatic rifle, with 30-round magazines in taped reloads to reduce reload time, "*unleashed 154 5.56-millimeter rounds in under five minutes[,] [and] killed twenty first-grade students and six educators.*" *Grant* Pet. App. 5a (emphasis added). While this Court does not decide cases based on a weapon's use in a particular crime, however horrific, it may take notice of the firing rate, and the harm exacted in minutes, in evaluating a weapon's "unusual dangerousness."

common use” “for lawful purposes,” or applying the historical statute-precursor approach, or the outlier/state-counting approach to regulation of implied rights under the Fourteenth Amendment. Common sense and lived experience tell us that AR-15 rifles with exponentially-increased MEpM inflict exponentially-increased carnage.⁵ This Court’s Second Amendment jurisprudence should not lose sight of this, even if Petitioners would cast it aside as an immaterial “nuance” or an “off-the-table” policy choice. Pet. Brief at 2, 53. As discussed *infra*, our Table also refutes any notion of linear continuity *in lethality* between the “increasingly commonplace” “repeating firearms” of the 19th Century or the “semiautomatic technology” of the early 20th Century, *id.* at 7, and today’s AR-15 rifles.

Connecticut, for its part, overlooks the rounds-per-minute enhancer, and conflates semiautomatic handguns with MEpM’s far below the AR-15 rifle. *See, e.g., Grant* Resp. Opp., at 5, 32. The AR-15 rifle represents a dramatic technological advancement, as evidenced by its 70% greater MEpM than the next-closest comparator (aside from the very similar Russian AK-47 design copied for its lethality from the AR-15). *See* Attachment “A” (comparing .458 Winchester M70 African at 40,259 ft.-pounds per minute with AR-15 at 68,406). We submit that a legislature may rely upon this paradigm shift in MEpM to regulate the AR-15 rifle as an “unusually

⁵ Petitioners and their amici conflate *misuse* of handguns (suicides, accidental discharges, domestic violence, mistaken identity and bystanders) with *use* of AR-15 rifles to suggest that the former are more lethal than the latter. *See, e.g.,* Pet. Brief at 3. After all, AR-15 rifles were originally designed by the U.S. Military for battlefield use to cause maximum carnage in minimum time, and its lethality has stood the test of time.

dangerous” firearm, irrespective of whether the firearm is in “common use.” *Cf.* Pet. Brief at 46.

In sum, our Table provides these significant insights:

- Archetypal semiautomatic handguns, *e.g.*, the Beretta 92FS and Glock 22, fire with an estimated MEpM of 15,408 ft-pounds/minute and 21,768 ft-pounds/minute, far below those of comparator AR-15 rifles.
- Archetypal bolt-action rifles, *e.g.*, the Remington, Winchester Safari and Winchester African fire with the highest muzzle-energy per shot, but, by design as big game hunting and protection weapons do not fire more than ten rounds per minute with a magazine of only three, recognizing that only the first one or two shots can really be effective for that purpose, and therefore do not produce nearly as high MEpM (34,120, 34,791, and 40,259 ft./pounds per minute, respectively) as archetypal semiautomatic rifles that fire at 50% to 110% to 170% more powerful MEpM’s.
- Archetypal semiautomatic rifles such as the AK-47, AR-15, Browning BAR, M1 Garand, and Springfield M1A fire at between 60,347 and 108,763 ft.-pounds per minute MEpM’s, which are orders of magnitude higher than the other firearms sampled.

Our Table highlights the bright line between the Winchester M70 African bolt-action rifle (a so-called “Elephant Gun”) and the AK-47 because the latter produces 50% more MEpM, which suggests

itself as an objectively-coherent regulatory line that protects semiautomatic handguns and powerful bolt action rifles, but excludes semiautomatic rifles. Neither party nor lower courts draw that same line. The Court may find our deductive reasoning helpful should it decide to remand the cases for overbreadth analysis.

B. The AR-15 Rifle Represents a Dramatic Technological Change from Earlier Firearms That Didn't Warrant Regulation

Petitioners argue that the AR-15 rifle is the lineal descendent of Revolutionary Era weaponry such that side-by-side comparisons with the iconic Kentucky long-rifle show that the two are “not, by and large, fundamentally different” in their stocks, grips, barrel holds or shroud, and forward hand-grip, none of which make the AR-15 rifle fire faster or with greater power. Pet. Brief at 5-8, 8-11, 17-22. But, all of that blinks reality that the AR-15 rifle inflicts dramatically-greater lethality than any prior firearms through increased muzzle velocity and rate of fire (MEpM).

Petitioners trace the AR-15 rifle's lineage to the Lewis and Clark expedition with its 22-round Girandoni air rifle. *Id.* at 7 (*citing* Garry, James B., *Weapons of the Lewis and Clark Expedition*, 100–01 (2012)). The history lesson is meant to defuse Justice Barrett's observation that a lack of regulation during the Founder's era should not be mistaken for a maximalist (“use it or lose it”) exercise of legislative power. *United States v. Rahimi*, 602 U.S. 680, 739-740 (2024) (Barrett, J., concurring). But, the Girandoni air rifle shows precisely why Justice Barrett's caveat matters.

For starters, President Jefferson and Congress authorized and funded the journey as an official U.S. Army expenditure, and Captain Meriwether Lewis provisioned it from the Harper's Ferry arsenal – so this was not an instance of civilian or militia armament.⁶ Moreover, Garry's research shows that the Girandoni air rifle was a “great curiosity” *never* used in combat or for hunting, but rather to impress Native American tribes in theatrically staged boat-and-river-bank demonstrations. *See* Garry, at 97 & n.9. They were “astonished,” according to Lewis, and “think it is *great medicine* which comprehends everything that is to them incomprehensible.” *Id.* at 103 (emphasis in original).

The Girandoni was not a practical weapon in any sense. “It took five hundred to a thousand strokes of a hand pump to fill the air chamber[.]” *Id.* at 99. The air reservoir valve was subject to failure “from something as insignificant as a bit of dirt.” Garry relates that vulnerability to the weapon accidentally firing a ball through a woman's hat 40-feet away as the expedition set off. *Id.* at 94-96, 101. There is “no other good evidence for Girandoni-style air rifles having made it to the United States by [that time].” *Id.* at 101. Thus, it is a strain to suggest that this “curiosity” anticipated the AR-15 rifle in

⁶ Carlos A. Schwantes, *The Pacific Northwest: An Interpretive History* 55 (1996); Garry, at 15-16. They also had a swivel gun, or small cannon, mounted on their keelboat that they fired as a salute. Garry, at 19, 41, 46. But, no one would suggest that this brings the cannon or other artillery within the Second Amendment. *See* 26 U.S.C. § 5845(f)(2), National Firearms Act, (classifying these as “destructive devices”).

any way, or that any reasonable inference may be drawn from the Founders' lack of regulation.⁷

Similarly, the Founders' musket (Charleville/Model 1785) was inaccurate, slow to load, required close range, and had a low MEpM of 3,386 ft./lbs. per minute assuming a rate-of-fire of three rounds per minute.⁸ Thus, whatever else may be said of the ingenuity that led to the development of the Minié ball, breech-loading, integral cartridges, bolt-action firing, rifling, smokeless powder, and repeating mechanisms through the 19th and early 20th centuries, it did not produce a firearm with more than two-thirds the MEpM of the AK-47, the least powerful AR-15 rifle. The quantum leap occurred in 1940 with the development of the automatic rifle whose design goal was to inflict maximal battlefield carnage quickly and at short range. As the lineal descendent of *that* dramatic technological breakthrough in lethality (MEpM), the AR-15 rifle presents an issue of first principles for this Court.

In our view, the Second Circuit was right to discount Petitioner's reliance on unregulated repeating firearms like the Girandoni air rifle from the founding and reconstruction eras, *Grant Pet. App.* 39a-42a, but it did so for the wrong reason.

⁷ If the Girandoni were plotted out on our Table, it would come out as follows: weight of bullet 9.5g; muzzle velocity 900 fps; muzzle-energy 263 ft. pounds, and rpm of 30, for a MEpM of 7,900. That muzzle energy equates to a .38 special, with about a 50% higher rpm, leading to a MepM also about 50% higher than a .38 special.

⁸ The adage "Don't fire till you see the whites of their eyes," often attributed to Col. Putnam at the 1775 Battle of Bunker Hill, thus reflected on the operational limits of the musket.

While “these early multi-shot firearms were neither reliable nor widely used,” their very-low MEpM is the most cogent explanation why the lack of regulation presents a poor analogue for the AR-15 rifle.⁹ That exponential difference in MEpM (7,900 for the Girandoni vs. 60,000-to-108,000 for the AR-15 style rifles) translates directly into rapid carnage in the hands of a single madman, and *that* delta is what makes the AR-15 rifle a regulatory novelty with no early-American comparator.

SUMMARY OF ARGUMENT

Amicus use this brief to present a formula for assessing the *objective* dangerousness of various firearms and we then connect our answers to the legal analysis of the question presented. Second Amendment jurisprudence involves line-drawing exercises even within an originalist approach. Our

⁹ The lower court cited evidence consistent with our Table that the flintlock musket fired with a “muzzle velocity of roughly 1,000 feet per second,” and “[a]s a result they could do much less harm.” *Grant* Pet. App. 41a. While that’s the right inquiry, it lacks completeness. The court noted anecdotally that a semi-automatic rifle can “empty a 30-round magazine in five seconds,” or in one case, 41 shots in 32 seconds, killing nine and wounding 17. *Id.* at 42a. It later accepted the U.S. Army definition of “rapid semiautomatic fire” as *45-rounds per minute*. *Id.* at 48a n.27 (citing Dep’t of the U.S. Army, TC 3-22.9: Rifle and Carbine, § 8-19 (2016).) By contrast, we posit conservatively 30 rounds per minute for our Table calculation. The bigger issue: the lower court did not quantify or compare paradigmatic weapons by rounds-fired-per-minute as an expression of their MEpM, which is *the* salient coefficient for distinguishing AR-15 rifles from *all other firearms*. See Kranefuss, Lee, “*MEpM*” Recent Post, <https://kranefuss.com/mepm/> (last accessed Oct. 21, 2026), attached as appendix.

measurement tool is an empirical standard that (a) reconciles a complicated set of cases; and (b) provides a bright line answer in this case.

A. The Muzzle Energy per Minute (hereinafter “MEpM”) of any firearm is easily calculated from basic physics. The formula for kinetic energy of a moving object is: ($E = \frac{1}{2}mv^2$ per minute x rounds per minute) where m equals the mass of the bullet and v equals its velocity upon leaving the rifle. Thus, doubling the mass (size) of the bullet doubles the muzzle energy; and doubling the muzzle velocity makes the muzzle energy four times as large. Multiplying this number by the rounds a weapon can fire in a minute (hereinafter “rpm”) produces an index of energy delivered over time which directly translates into the rapidity and severity of the wounds it can produce. We regard this index as the best-available measure of lethality.¹⁰ Our compilation appears in the Table published online at Kranefuss, Lee, “MEpM” Recent Post, <https://lkranefuss.com/mepm/> (last accessed Oct. 21, 2026), attached as appendix.¹¹

¹⁰ Notably, it is not a statistical regression of how many crimes are committed with a particular firearm or how many people die as a result, or by suicide or accident which are imprecise indicators of lethality.

¹¹ In submitting our Table’s analysis of public information, we observe that from time to time the Court may rely upon guidance from an amicus to make even the most consequential decisions of law. *See, e.g., Teague v. Lane*, 489 U.S. 288, 300 (1989) (“The question of retroactivity with regard to petitioner’s fair cross section claim has been raised only in an amicus brief.”); *Mapp v. Ohio*, 367 U.S. 643, 646, n. 3 (1961) (applying exclusionary rule to the States even although such a course of action was urged only by amicus curiae).

Using publicly-available data, the semiautomatic handguns and even the heaviest bolt-action rifles produce between 15,000 and 40,000 foot-pounds (ft.-lbs.) of energy per minute. By contrast, the AK-47 and paradigmatic semiautomatic rifles (e.g., the AR-15, Browning BAR, M1 Garand, and Springfield M1A) (hereinafter “AR-15 rifle”) produce *60,000 to 108,000 foot-pounds per minute of MEpM*.

B. We submit that a principled distinction may be drawn between firearms on either side of this exponential leap in lethality. Thus, on one side, semiautomatic handguns and all bolt-action rifles are protected, *see District of Columbia v. Heller*, 554 U.S. 570 (2008). On the other, the various States are left to regulate (or not) semiautomatic rifles within their borders, within equitable or analogical limits. Any line-drawing in this area involves normative choices. But, this one, we contend, is far more rooted in objectivity than deciding whether a particular “Arm” is “in common use” “for self-defense.”

C. We explain what the Second Circuit got right in *Grant*: that the right test at Step Two of the *NYSRPA v. Bruen*, 597 U.S. 1 (2022) analysis is whether a particular “Arm” is “*unusually dangerous*,” and the right historical analogue is to “bravado and affray” laws, *Grant* Pet. App. 30a-33a, 37a-49a, 67a-73a (Nathan, J., concurring); and what *Grant* got wrong – failing to consider MEpM as the basis to distinguish semiautomatic handguns and AR-15 rifles.¹² Bottom-line: MEpM provides a sound basis for partially affirming the lower courts here,

¹² We disagree with the Seventh Circuit that AR-15 rifles are *not* “Arms” within the plain text of the Second Amendment. *Viramontes* Pet. App. 2a-3a (citing *Bevis v. City of Naperville*, 85 F.4th 1175, 1185 (7th Cir. 2023)).

and by implication, the First, Fourth, Ninth, and D.C. Circuits¹³ which have also upheld overbroad restrictions on both semiautomatic handguns and AR-15 rifles.

D. Finally, we find in this Court’s protection of the People’s privacy against new State technologies which do not trespass on their “persons, houses, papers, and effects,” U.S. Const. amend. IV, an analogy for an “unusually dangerous” *simpliciter* standard to regulate new MEpM-outlier firearms without resort to any historical precursor-statute.

ARGUMENT

Chief Justice Roberts has observed that “[w]hen confronting new concerns wrought by digital technology, this Court has been careful not to uncritically extend existing precedents.” *Carpenter v. United States*, 585 U.S. 296, 318 (2018). Just last term, in *Chatrue v. United States*, 146 S. Ct. 2193 (2026) the Court cleaved to first principles spacious enough to constrain a geofence warrant that gathered cell phone location data but did not search “persons, houses, papers, [or] effects.” U.S. Const. amend. IV.

¹³ See *Ocean State Tactical, LLC v. Rhode Island*, 95 F.4th 38, 46 (1st Cir. 2024), *cert. denied*, 2025 U.S. LEXIS 2129 (2025); *Capen v. Campbell*, 134 F.4th 660, 671 (1st Cir. 2025); *Bianchi v. Brown*, 111 F.4th 438, 464-72 (4th Cir. 2024) (en banc), *cert. denied sub nom. Snope v. Brown*, 145 S. Ct. 1534 (2025); *Duncan v. Bonta*, 133 F.4th 852, 874 (9th Cir. 2025); *Miller v. Bonta*, 2026 U.S. App. LEXIS 19416 (9th Cir. Jul. 1, 2026) (submission vacated pending these cases); *Hanson v. District of Columbia*, 120 F.4th 223, 237-38 (D.C. Cir. 2024), *cert. denied*, 2025 U.S. LEXIS 2221 (2025).

This case involves new concerns wrought by a new firearm technology. It calls upon the Court to explicate what level of lethality in individual hands is too much, or, if the test is empirical, whether that decision should be left to legislatures. *See Carpenter*, 585 U.S. at 386 (Alito, J., dissenting) (legislation is preferable “to respond to rapidly changing technology”); *id.* at 390-394 (Gorsuch, J., dissenting) (contours of “privacy” are better not “left to the judicial imagination[,]” and *if the test is empirical, it should be left to legislators*). A majority of the Court accepts that “the Fourth Amendment protects people, not places,” *Katz v. United States*, 389 U.S. 347 (1967) (recognizing that electronic as well as physical intrusions may violate the Fourth Amendment). Likewise, the Second Amendment protects people, not guns, and at the periphery of “unusually dangerous” firearms, is best left to empirical test.

MEpM provides an empirical test of the AR-15 rifle’s lethality against other comparators, historical and current. The results lend themselves to a clear bright line below which semiautomatic handguns and bolt-action rifles are protected, and above which, AR-15 rifles are not. As the Second Circuit found, the historical test is best understood as whether a firearm is “unusually dangerous” and the closest statutory-precursor are “bravado and affray” laws. Cinching that bright line is still subjective, but far less so than “common use” or legislative-practice doctrines. And, privileging “common use” which is highly-regional, self-reported, or otherwise skewed to “uncritically” calcify Second Amendment law heightens our political divisions. Conversely, if this Court finds no Second Amendment right to “keep and bear” an AR-15 rifle, the vast majority of current

owners will be utterly unaffected as they live in the 40 States that choose not to regulate it.

On this basis, the Court should affirm that legislatures may ban AR-15 rifles and remand the cases for overbreadth analysis and procedural protections.

A. History and Syntax Are “Consistent with Common Sense” And Support the “Unusually Dangerous” Test

Justice Barrett has observed that “[h]istory is consistent with common sense: it demonstrates that legislatures have the power to prohibit dangerous people from possessing guns.” *Rahimi*, 602 U.S. at (Barrett, J., concurring) (quoting *Kanter v. Barr*, 919 F.3d 437, 451, 464-465 (7th Cir. 2019) (Barrett, J., dissenting)). The lower court’s reading of history and syntax in this case squares with common sense that legislatures have the power to prohibit “unusually dangerous” guns under an empirical standard. See *Grant Pet. App.* 48a, 70a-73a.

History and Syntax. The Second Circuit cited Blackstone’s text and historical linguistic evidence that the Founders would have understood both disjunctive and conjunctive phraseologies as a grammatical hendiadys meaning one and the same thing, *i.e.*, “a ban on weapons that were ‘unusually dangerous.’” *Id.* at 30a-33a & n.19; see also *id.* at 70a-72a (Nathan, J., concurring) (“unusually dangerous” is the doctrinal test most faithful to the “variegated historical descriptions,” and even more, the “historical *reasons*”) (emphasis in original). This seems persuasive on its own terms, but even more so because it accords with common sense, and avoids a

case-dispositive test (“common use”) that sidesteps dangerousness altogether.

The conjunctive test (“unusual *and* dangerous”) urged by Petitioners and the United States as amicus, and favored by Justice Alito, *Caetano v. Massachusetts*, 577 U.S. 411, 417 (2016) (Alito, J., concurring), is neither textual nor deeply historical, but pegged to a relatively-recent “tradition” that started with regulation of sawn-off shotguns under the National Firearms Act, 26 U.S.C. § 1132. *United States v. Miller*, 307 U.S. 174, 179 (1939); *see Heller*, 554 U.S. at 627 (“another important limitation on the right to keep and carry arms [was] fairly supported by the historical tradition of prohibiting the carrying of ‘dangerous and unusual weapons.’ *See* 4 Blackstone [Commentaries on the Laws of England] 148-149 (1769) [*inter alia*]”).¹⁴

Common sense. The conjunctive test’s most severe failing is as an offense against common sense. It makes the Second Amendment right turn on a host of normative judgments about what numbers of individual owners¹⁵ or of individual guns sold constitute “common use.” *Grant Pet.* App. 30a, 32a. After all, defining “unusual” in terms of circulation

¹⁴ *Miller* used an interpretive method – asking “whether [the weapon bore a] reasonable relationship to the preservation or efficiency of a well regulated militia,” *id.* at 178 -- that this Court disavowed in *Heller*, 554 U.S. at 627.

¹⁵ Among the issues: how should so-called “super owners” who own between eight and 140 weapons be counted (3% of the U.S. adult population own nearly half of all civilian guns) -- by person or by firearm?; and what significance, if any, should be given to 15 U.S.C. § 7901 *et seq.*, a liability shield for gun manufacturers, that acts as a form of public subsidy for sales?

in society is far more subjective than empirically defining “dangerous.” And, the value-choices only compound if AR-15 owners’ motivations are also to be quantified.

Petitioners assert that between 16 million and 26 million AR-15 rifles are in private hands nationally. Pet. Brief at 11. Even if those self-reported surveys are reliable, how is a court to evaluate its threshold significance in a Nation of 270-million adults using “a body of evidence susceptible of reasoned analysis”? *McDonald v. City of Chicago*, 561 U.S. 742, 804 (2010) (Scalia, J., concurring). And, if stun gun ownership by 200,000 civilians in 45 non-regulating states qualifies as “common use,” see *Caetano*, 577 U.S. at 420 (Alito, J., concurring), one may rightly wonder are there any teeth at all to “common use”?¹⁶

Conversely, the “unusually dangerous” MEpM test meets Justice Scalia’s insistence on an empirical standard. See also *Caetano*, 577 U.S. at 418 (Alito, J., concurring) (“relative dangerousness” must distinguish outliers among all “arms” whose very purpose is “to produce death or great bodily harm”); see also *Grant* Pet. App. 32a (explaining the logic of applying “unusual” as a modifier and “obvious fit” for “dangerous”).

¹⁶ The United States’ proposition that “[a] court should face no trouble in concluding, for instance, that [...] sword canes and spears are not [in common use][.],” USA Amicus Brief, at 17, suggests not.

B. The MEpM Points to an Empirical Bright Line Test of “Unusual Dangerousness”

Semiautomatic handguns. Under *Heller*, statistical evidence that a particular firearm has been used or is favored by criminals is rightfully not evidence of its dangerousness. Our MEpM Table harmonizes with *Heller*, *McDonald*, and *Bruen* because it shows a clear bright line, and semiautomatic handguns fall on the protected side of that line. In that sense, MEpM answers then-Judge Kavanaugh’s search for any evidence of “a sensible and principled constitutional line” between semiautomatic handguns and rifles. *Heller v. District of Columbia*, 670 F.3d 1244, 1269, 1286 n.14 (D.C. Cir. 2011) (“*Heller II*”) (Kavanaugh, J., dissenting); *Snope v. Brown*, 145 S. Ct. 1534 (2025) (Kavanaugh, J., statement respecting the denial of certiorari) (“it can be analytically difficult to distinguish the AR-15[] [rifles] at issue here from the handguns at issue in *Heller*. AR-15s are semi-automatic, but so too are most handguns.”) It bears emphasizing that the MEpM coefficient of these firearms is a principled way to measure lethality and thereby, to establish, by comparison with other protected firearms, an empirical test for “unusual dangerousness” *simpliciter*.

MEpM is a direct measure of energy per minute, and energy is what damages any material or body. That is exactly what energy measures: a plate dropped on the head of a pedestrian from a second story window, and a concrete block from the tenth, differ, precisely, in energy. And ten concrete blocks per minute dropped on the same pedestrian inflicts ten times the damage as one per minute: this is

exactly what MepM measures the equivalent of with firearms. The metric is easy to understand and captures the right things in exactly the ways things should fit together – just as it would for concrete blocks – precisely as an objective measure should. For this reason, Second Amendment protection of AR-15 rifles simply does *not* “follow[] *a fortiori* from *Heller*’s holding that it protects semiautomatic handguns.” USA Amicus Brief, at 22.

The bright line test. *Heller* instructs that “the enshrinement of constitutional rights necessarily takes certain policy choices off the table.” *Heller*, 554 U.S. at 636. But, deference to legislative empiricism that “x” amount of MEpM invests too much firepower in private hands is not an untethered “policy choice.” The 50% increase in MEpM from the most powerful bolt-action rifle (the Winchester M70 African) to the AK-47 rifle (the least-powerful AR-15 style rifle), presents an obvious categorical line.

This is neither interest balancing, cost-benefit analysis, nor a new and different flavor of strict or intermediate scrutiny. Instead, it flows from the principle of *Heller* that the core Second Amendment right to keep and bear arms is not unlimited, *Heller*, 554 U.S. at 626, and one plain limit is *objective* “unusual dangerousness.” The legislature, rather than the judiciary, is the proper branch to draw that line where empirical MEpM lethality greatly exceeds those of semiautomatic handguns and bolt-action rifles protected by the contours of the right.

Caetano v. Massachusetts, 577 U.S. 411 (per curiam) is consistent with this approach because MEpM does not concern itself with *any* non-relevant characteristics of the firearm, *e.g.*, its post-enactment pedigree, usefulness in warfare or in

crime. According to our Table, the AR-15 rifle *is* a modern outlier firearm in terms of its exponentially outsized firepower. That simply means the various States *may* choose to regulate it in ways that will not pass muster for semiautomatic handguns or bolt-action rifles. The proper judicial inquiry, in our view, focuses on whether the legislature has applied *neutral, common-sense criteria* for assessing modern outlier weapons, not whether the States themselves are “outliers.”¹⁷ We suggest to the Court that MEpM, a measure implicitly adopted by the lower court, is the way to go in considering whether certain presumptively-covered “arms” are, by virtue of their extreme lethality, unprotected from specific and appropriate state Legislative action.¹⁸

C. “Bravado and Affray” Laws Provide a Historical Analogy from Yesteryear’s Group Violence to Today’s Armed Madman

Going armed laws, also known as “bravado and affray” laws, “prohibited riding or going armed, with dangerous or unusual weapons, to terrify the good people of the land.” *Rahimi*, 602 U.S. at 697

¹⁷ Amicus Professor Amar would have the Court find dispositive that 40-States encompassing two-thirds of America’s population permit civilian ownership of AR-15’s, but he suggests the Court “avoid premature judicial ‘lock-in’” that nips reform movements in the bud when it comes to the 13-States (all of them electorally “Blue”) that ban large capacity magazines (“LCM’s”). Amar Amicus Brief, at 35-36. The obvious riposte is what makes 13, not 10, the magic number for judicial hands-off, and where’s the objectivity in that?

¹⁸ Other novel weapons, *e.g.*, hunter-killer drones, may require other empirical tests for assessing dangerousness in due course.

(cleaned up); *see also Bruen*, 597 U.S. at 46 (*quoting* 4 William Blackstone, Commentaries *148-49 (defining the offense of affray to include going armed with “dangerous or unusual” weapons); *Grant Pet. App.* 31a n.18 (same).

Grant found a relevant historical tradition of restricting unusually dangerous weapons when legislatures observed these weapons’ “unprecedented lethality” in “use in terror or to perpetrate mass casualties.” *Id.* at 59a-60a & n.40. It canvassed the history of laws restricting, *inter alia*, launcegays, Bowie knives, dirks, Thompson submachine guns, and sawn-off shotguns, *id.* at 51a-58a, before focusing on the capacity of semiautomatic rifles with “vastly increased” “capacity and [] rapidity of firing.” *Id.* at 38a (*quoting Hanson v. District of Columbia*, 120 F.4th 223, 240 (D.C. Cir. 2024), *cert. denied*, 2025 U.S. LEXIS 2221 (2025)) (cleaned up). But, the Second Circuit did not muster the best evidence to quantify the effect of this new technology in dramatically enhancing MEpM as an objective measure of its lethality vis-à-vis relevant comparator handguns and rifles. *See* Kranefuss, Lee, “MEpM” Recent Post, <https://lkranefuss.com/mepm/> (last accessed Oct. 21, 2026), attached as appendix.

Our MEpM Table quantifies just how dramatically the technological advancement of the AR-15 enhances firepower. In our view, “affray” laws are the right historical analogue, albeit at an understandably high-level of generality, for the reason given by the Second Circuit: “The Founders faced no problem comparable to a single gunman carrying out a mass murder in seconds.” *Grant Pet. App.* at 43a. The Table makes this point clearly: A

single person wielding an AR-15 rifle has all the MEpM, or more, of a historical posse.

The Second Circuit found its analogue in the Founder’s era 1770 Boston Massacre, noting that “seven British soldiers firing flintlock muskets into a crowd managed to take only five lives.” *Grant* Pet. App. 41a. While that comparison lacks the precision of our Table, the point remains the same: the AR-15 rifle vests an exponentially-higher amount of firepower in individual hands beyond any other historical or current firearm. To borrow from popular culture, it would take *eight* Inspector Callahans, *each* emptying their 6-shot .44 Magnum revolvers (“the most powerful handgun in the world”) *three times* in a minute to equal the firepower of one person armed with an M1 Garand rifle, a mid-range AR-15 archetype, that expends 85,219 ft-pounds per minute of MEpM, firing 30-rounds in that same timeframe. *See, e.g., Dirty Harry*, Internet Movie Firearms Database, https://www.imfdb.org/wiki/Dirty_Harry (last visited Oct. 5, 2026).

That, in a nutshell, is why the Second Amendment’s text and historical tradition do not bar legislatures of the various States from regulating possession or distribution of such an outlier firearm within their borders. Professor Amar is persuasive that the “hunt for [Founding-era regulatory] precursors” (even if not insistent on “dead ringers”) is inapposite when confronting a dramatic technological change that creates out-sized individual power.¹⁹ Amar Amicus Brief at 32-33. We

¹⁹ We agree with Professor Amar that the Founders and Reconstructionists simply did not have to contend with, and therefore had no cause to regulate, the possibility that a single

also agree that sensitivity to our “deeply-polarized”²⁰ Nation counsels for an approach that permits minority (Blue) State regulation of objectively-outlier firearms. This allows individual States to evaluate those interests differently at the periphery of the Second Amendment right against those collective rights elsewhere enshrined to “ensure domestic tranquility” and “promote general welfare” (Preamble), or reserved to the States (Tenth Amendment). *See, e.g.,* The Federalist No. 84 (Alexander Hamilton); *Dobbs v. Jackson Women’s Health Org.*, 597 U.S. 215, 302 (2022) (noting that prior decisions “enflamed debate and deepened divisions,” and returning authority to regulate abortion to the people and their elected representatives). There, as here, “the people of the various States may evaluate those interests differently[.]” *id.* at 256, especially along partisan lines, and this Court should not enflame divisions by removing it from the People’s elected representatives.

D. Fourth Amendment Jurisprudence Offers a Pragmatic Approach for Constraining New Technologies

In *Bruen*, 597 U.S. at 27, this Court acknowledged that “cases implicating unprecedented societal concerns or dramatic technological changes may require a more nuanced approach.” Thus, while “the meaning of the constitutional text is fixed at the time of its ratification and [] the ‘discoverable historical meaning ... is authoritative in most

madman could “kill dozens in seconds,” *id.* at 33, which is a design feature of the AR-15 rifle’s singular MEpM.

²⁰ Amar Amicus Brief at 37.

circumstances,” *Rahimi*, 602 U.S. at 737 (Barrett, J., concurring), this, too, is not without limits. The Fourth Amendment case law shows one possible parallel between privacy and dangerousness here.

The phrase “dramatic technological change” itself first appears in this Court’s modern Fourth Amendment jurisprudence as it began to adapt to a world where common-law trespass has become increasingly unnecessary to many forms of surveillance. *See, e.g., United States v. Jones*, 565 U.S. 400, 429-30 (2012) (Alito, J., concurring) (“In circumstances involving dramatic technological change, the best solution to privacy concerns may be legislative.... to gauge changing public attitudes, to draw detailed lines, and to balance privacy and public safety in a comprehensive way.”); *cf. United States v. Knotts*, 460 U.S. 276, 283 (1983) (Rehnquist, J.) (“if such dragnet-type law enforcement practices as respondent envisions [twenty-four hour surveillance of any citizen] should eventually occur, there will be time enough then to determine whether different constitutional principles may be applicable.”).

Thirty-five years later, when police used wireless cell-phone site location data cataloging a suspect’s movements *in toto* to confirm his proximity to the sites of four robberies, the Court (Roberts, C.J.) held that such a search implicated Fourth Amendment privacy interests and required a warrant. *Carpenter v. United States*, 585 U.S. 296. In that way, *Carpenter* fulfilled *Knotts*’ openness to “expand [its] conception of the [Fourth] Amendment” to protect individual rights in the face of (1) “innovations in surveillance tools,” “advancing technology,” “a new phenomenon,” “an entirely new

species of business record,” and (2) the ubiquity of cell phones as “almost a ‘feature of human anatomy’” to achieve “near perfect surveillance.” *Id.* at 304, 309, 311-12, 318 (citation omitted). This case asks the Court to expand its conception of the Second Amendment in similarly reckoning with the “seismic shift in [] technology,” *id.* at 313, that makes the AR-15 rifle so much more dangerous than any of its comparators.

In *United States v. Jones*, 565 U.S. at 408-09, 411, the Court (Scalia, J.) clarified that “*Katz* [*v. United States*, 389 U.S. 347 (1967)] did not narrow the Fourth Amendment’s scope[,]” but *added* the privacy-test to the trespassory test, calling it a necessary “novelty” to apply “at a minimum the degree of protection [the 19th century right] afforded when it was adopted.”²¹ Just last Term, this Court applied the doctrine to hold that police use of a “geofence warrant” to identify a robber by his cell-phone’s proximity to a bank when the crime occurred also constituted a search under the Fourth Amendment. *Chatrie v. United States*, 146 S. Ct. 2193.

²¹ While Justice Scalia once derided Justice Harlan’s “expectation of privacy” as a “fuzzy standard,” *Minnesota v. Carter*, 525 U.S. 83, 91 (1998) (Scalia, J., concurring), by the time *Jones* was decided, he, like the majority thereafter in *Carpenter* and *Chatrie*, recognized its relevance to the “reasonableness” of a search or seizure employing new investigatory technologies. At the same time, Justice Scalia confirmed his underlying view that where the answer “is not remotely contained in the Constitution, ... it is left -- as many, indeed most, important questions are left -- to the judgment of state and federal legislators.” *Id.* at 98. It would be odd if the institutional-modesty tenet of originalism applied everywhere — except the Second Amendment.

In all of these cases, this Court has hewn to first principles: the basic purpose” of the Fourth Amendment” “is to safeguard the privacy and security of individuals against arbitrary invasions by governmental officials.” *Id.* at 2204-05. Time and again, the Court has rejected a “mechanical interpretation” that fixates solely on the historical-trespassory form of infringement. *Id.* at 2205-06 & n.7 (collecting cases), 2213 (discussing the cell-phone’s pervasive role in dragnet-like new surveillance technologies that mine it for sensitive personal information). Bottom line: because “the Founders could not have imagined such a technology,” resort to their understanding that Americans have “the right to be let alone” is necessary to interpret the Amendment in contemporary society. *Id.* at 2216-17.

The parallel here: like reasonable expectations of privacy, an empirical doctrine of “unusual dangerousness” *simpliciter* may be useful in evaluating whether the AR-15 rifle lies beyond the scope of the Second Amendment right because of its dramatic technological advancement in lethality. Such a doctrine subjects to the constraints of empiricism the power of legislatures as the democratic will of the people to regulate (or not) the people’s right to keep and bear unduly-powerful arms.

E. This Court Should Remand the Cases for Overbreadth and Specific Applications

Assuming this Court accepts MEpM as an empirical measure of the AR-15 rifle’s lethality which puts it outside the people’s right to keep and bear arms and answers the certiorari question, the

lower courts in these cases have much work to do. *First*, the statutes may be facially overbroad in banning many models of semiautomatic handguns with lower MEpM's. *Second*, the lower courts must answer whether AR-15-style firearms not designed to be fired from the shoulder are more properly classified as protected handguns by reference to their MEpM's. *See, e.g., Grant* Pet. App. 13a-14a & n.10 (summarizing Conn. Gen. Stat. § 53-202a(1)(G)). *Third*, if “bravado and affray” laws provide the precursor-analogue predicate rather than adopting “unusually dangerous” *simpliciter*, the lower courts must determine whether the laws are also overbroad in banning the “keeping” of AR-15 rifles in the home rather than “bearing” them outside of it. *Fourth*, do fair notice and reliance interests bar the application of Code of Ordinances of Cook County § 54-212 to current owners of any AR-15 rifles, which criminalizes possession without the grandfathering of Conn. Gen. Stat. § 53-202a(7).

CONCLUSION

This Court should hold that the Second and Fourteenth Amendments do *not* guarantee the right to possess AR-15 platform and similar semiautomatic rifles, and remand the cases for further proceedings.

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APPENDIX

See Kranefuss, Lee, “*MEpM*” Recent Post,
<https://lkranefuss.com/mepm/>
(last accessed Oct. 21, 2026)

TABLE OF APPENDIX

Muzzle Energy per Minute (“MEpM”) Table:

Firepower Comparison..... 1a

Muzzle Energy per Minute (“MEpM”) Table:
Firepower Comparison

Cartridge	Representative firearm	Action	Mag	Bullet Weight (gr)	Muzzle Velocity (ft/s)	Muzzle energy (ft-lbs per round)	Rate of fire (rounds /min). 16	Energy delivered (ft-lb/min) = MEpM	Multiple of 1780 musket	Barrel (in.)	Free recoil (ft-lbf)	Source see notes
.69 cal musket ball	Charleville / Model 1795	Flintlock, muzzle-loaded	1	420	1,100	1,129	3	3,386	1.0×	45	—	12
.38 Special	S&W 686, 4"	Revolver	6	125	1,027	293	18	5,271	1.6×	4	4	10,15
.357 Magnum	S&W 686, 4"	Revolver	6	125	1,436	572	18	10,305	3.0×	4	9	10,15
9mm Luger	Beretta 92FS	Semi-auto pistol	15	124	1,115	342	45	15,408	4.6×	5	5	10,15
.40 S&W	Glock 22	Semi-auto pistol	15	180	1,100	484	45	21,768	6.4×	4	6	5,15
.308 Winchester	Remington 700	Bolt-action	4	150	2,820	2,649	10	26,494	7.8×	24	15–20	7
.270 Winchester	Remington 700	Bolt-action	4	150	2,900	2,802	10	28,018	8.3×	24	17	2
.375 H&H Magnum	Winchester M70 Safari	Bolt-action	3	300	2,530	4,265	8	34,120	10.1×	24	37	3, 7
.300 Win Magnum	Remington 700	Bolt-action	3	180	2,950	3,479	10	34,791	10.3×	24	31.5	6
.458 Win Magnum	Winchester M70 African	Bolt-action	3	400	2,380	5,032	8	40,259	11.9×	24	62	4, 7
7.62×39mm	AK-47	Semi-auto rifle	30	123	2,350	1,509	40	60,347	17.8×	16	7	11
5.56×45mm NATO	AR-15	Semi-auto rifle	30	55	3,055	1,140	60	68,406	20.2×	16	<15	1, 8, 13
.300 Win Magnum	Browning BAR	Semi-auto rifle	4	180	2,950	3,479	20	69,583	20.5×	24	31.5	6
.30-06 Springfield	M1 Garand	Semi-auto rifle	8	150	2,920	2,841	30	85,219	25.2×	24	20	9
7.62×51mm NATO	Springfield M1A	Semi-auto rifle	20	144	2,749	2,417	45	108,763	32.1×	22	17	9,14

Footnotes

- [1] *Garland v. Cargill*, 602 U.S. 406, 433-34 (2024) (“AR-15 can achieve a fire rate of around 60 rounds per minute, with one pull of the trigger per second. [...] a bump stock can fire at a rate between 400 and 800 rounds per minute.”) (citations omitted).
- [2] “.270 Winchester,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/.270_Winchester, last accessed: Oct. 17, 2026 (ballistic performance table) (citations omitted). Table uses velocity of 2,900 ft/s not 2,850 ft/s cited, overstating firearm’s MEpM.
- [3] “.375 H&H Magnum,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/.375_H%26H_Magnum, last accessed Oct. 17, 2026 (The Table uses 300 gr. at 2,530 ft/s.; NRA American Hunter recoil table - .375 H&H 37 ft-lbf, .458 Win Mag 62 ft-lbs.; and interpretive bands for .223 and .308.)
- [4] “.458 Winchester Magnum,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/.458_Winchester_Magnum, last accessed: Oct. 17, 2026 (ballistic performance table). Table uses velocity of 2,380 ft/s not 2,468 ft/s cited by source, understating firearm’s MEpM.)
- [5] “.40 S&W,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/.40_S%26W, last accessed: Oct. 17, 2026 (ballistic performance table). Table uses 180 grams as bullet weight.
- [6] Littlefield, Wes. “300 Win Mag Recoil: How Hard Does the 300 Winchester Magnum Kick?” *ammo.com*, avail. at: <https://ammo.com/recoil/300-win-mag-recoil>, last accessed: Oct. 17, 2026. Table imputes .300 Winchester Magnum free recoil of 31.5 ft-lbs.
- [7] Massaro, Philip, “Behind the Bullet: .458 Winchester Magnum,” *NRA American Hunter*, avail. at: <https://www.americanhunter.org/content/behind-the-bullet-458-winchester-magnum/>, last accessed: Oct. 17, 2026. Table imputes free recoil of .375 H&H 37 ft-lbs; .458 Win Mag 62 ft-lbs. under interpretive bands for .223/308 firearms.
- [8] Independent chronograph data, M193 55 gr from a 16-inch AR-15 equates to 3,055 ft/s.

- [9] “M1 Garand,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/M1_Garand, last accessed: Oct. 17, 2026. “M14 rifle,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/M14_rifle, last accessed: Oct. 17, 2026. Table uses barrel lengths of 24- and 22-inches for M1 Garand and M14 rifles, with effective range of 500-yds.
- [10] “*Ballistics By The Inch, real-world guns*,” archive avail. at: <http://ballisticsbytheinch.com/realworld.html>, last accessed: Oct. 17, 2026. Table uses barrel measurements and bullet weights: .38 Special; S&W 686 4in, Cor Bon 125 gr. JHP, 1,027 ft/s.; .357 Magnum S&W 686 4in, Federal 125 gr JHP, 1,436 ft/s.; 9mm: Beretta 92FS 4.875in, Federal 124 gr Hydra-Shok, 1,115 ft/s.
- [11] “AK-47,” *Wikipedia*, avail. at: <https://en.wikipedia.org/wiki/AK-47>, last accessed: Oct. 17, 2026; “Comparison of the AK-47 and M16,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/Comparison_of_the_AK-47_and_M16, last accessed: Oct. 17, 2026. Table imputes for AK-47, 16.3-in. barrel, bullet velocity of 2,350 ft/s, and, with 30-round magazine, practical semi-automatic rate of 40 rpm, with 380-yards effective range.
- [12] “Charleville musket,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/Charleville_musket, last accessed: Oct. 17, 2026; “Musket Model 1777,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/Musket_Model_1777, last accessed: Oct. 17, 2026; “Model 1795 Musket,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/Model_1795_Musket, last accessed: Oct. 17, 2026. Table imputes .69 calibre, 45-in barrel, 1,000-1,200 ft/s., 2-3 rounds per minute, 27.19 g (420 gr) ball, effective range 50-75 yds. The musket range of 62 yd is the midpoint of sourced 50-75 yd band. Its 420 gr ball and 1,100 ft/s velocity are midpoints of sourced 1,000-1,200 ft/s range; at 1,000 ft/s, its muzzle energy is 933 ft-lbs; and at 1,200 ft/s, it’s 1,344 ft-lbs. Table imputes a midpoint of 1,129 ft/s.
- [13] “Colt AR-15,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/Colt_AR-15, last accessed: Oct. 17, 2026. Table imputes an effective firing range of approx. 550 m (600 yd).
- [14] “M14 rifle,” *Wikipedia*, avail. at: https://en.wikipedia.org/wiki/M14_rifle, last accessed: Oct. 17, 2026. Table imputes an effective firing range of 500 yds (460 m).

[15] Pike, Travis, “Effective Range of Pistols, Rifles, & Shotguns,” *Pew Pew Tactical*, avail. at: <https://www.pewpewtactical.com/effective-range-pistols-rifles-shotguns/>, last accessed: Oct. 17, 2026. Table imputes effective-ranges for the .9mm and .45 ACP of 50 yds., for the .357 Magnum, 100-yds.

[16] Only two rates of fire can be sourced -- the AR-15 at 60 rpm, fn. 1, *supra*, and the AK-47 at 40 rpm, fn. 11, *supra*. All other rates are preparer’s conservative estimate.

[17] Only three rates of free recoil can be sourced -- the .300 Win Mag at 31.5, fn. 6, *supra*; the .375 H&H at 37, fn. 3, *supra*; and the .458 Win Mag at 62. All other recoils are preparer’s conservative estimate.