## EXTENDED BALLISTIC DATA FOR THE FEDERAL . 308 MATCH ROUND:

All the data you wanted but couldn't find -- wind, moving targets, trajectories, etc. By Maj. John L. Plaster, USAR (Ret.)
After nearly a decade of instructing police and military students in counter-sniping and precision shooting, I've amassed a useful variety of . 308 Match ballistic data, which has been further refined and developed for inclusion in a new textbook, "The Ultimate Sniper: An Advanced Training Manual for Police and Military Snipers."

The most thorough book ever written on sniping and long-range scoped rifle shooting, it also contains extended data on Federal . 223 Match, . 300 Winchester Magnum; 7.62mm military Match; . 243 Winchester; and even the . 50 Caliber Browning rounds.


Because this . 308 Match data is of great interest to NTOA riflemen -- and such a wide variety has never before appeared in print -- my publisher, Paladin Press, has authorized me to share it with you.


Although derived from ballistic tables provided the author by Federal Cartridge Co., many of these results required such additional calculation that I alone must take responsibility for accuracy. While these calculations were meticulously performed, I still recommend that you verify the results in your own rifle before attempting a 'real-world' shot.

## The Trajectory Table

The accompanying trajectory table (Table one) tracks this round for any zero distance from 100 through 1000 yards. While few law enforcement riflemen zero their weapons beyond 100 yards, l'd rather risk giving you too much information than not enough.
(Some tactical missions, such as skyjacks, of course, may require a more distant zero.)
Still, even if you zero for just 100 yards, you should know the exact bullet trajectory so you'll see how high to 'hold' for a longer range shot, if it proves necessary.

## Moving Target Data and Compensation

Normally it's much better to wait and engage your target when he pauses momentarily rather than attempt a moving target shot. But a moving target may be the only shot you've got.

All the data published in Table Three reflects a target moving 90 degrees to the path of your bullet, that is, moving directly right or left, which is FULL VALUE. Should the target move oblique right or left, whether toward or away from you, use ONE HALF the value
since in relative terms he's crossing your front at half the speed. And when he's heading directly toward you or away from you, there's NO VALUE and no movement compensation or leads at all. Aim dead-on.

## TABLE ONE

TRAJECTORY TABLE, FEDERAL MATCH . 308 CAL.168-Gr. BOATTAIL HOLLOWPOINT
Trajectory by Yards, Expressed in Inches

| Zero Range | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 100 Yards | Zero | -4.5 | -15.9 | -35.5 | -64.6 | -105 | -159 | -228 | -315 | -421 |
| 300 Yards | +5.3 | +6.1 | zero | -14.3 | -38.1 | -73.2 | -121 | -185 | -267 | -369 |
| 400 Yards | +8.9 | +13.3 | +10.8 | Zero | -20.1 | -57.6 | -96.3 | -157 | -235 | -333 |
| 500 Yards | +13.0 | +21.5 | +23.1 | +16.5 | Zero | -27.0 | -67.6 | -124 | -198 | -292 |
| 600 Yards | +17.5 | +30.5 | +36.6 | +34.5 | +22.9 | zero | -36.1 | -87.8 | -157 | -247 |
| 700 Yards | +22.6 | +40.7 | +51.9 | +54.9 | +48.4 | +30.6 | Zero | -47.0 | -112 | -196 |
| 800 Yards | +28.4 | +51.4 | +69.3 | +78.1 | +77.4 | +65.4 | +40.2 | Zero | -59.4 | -139 |
| 900 Yards | +35.0 | +65.5 | +89.1 | +105 | +110 | +105 | +86.4 | +52.2 | Zero | -72.4 |
| 1000 Yards | +42.2 | +80.0 | +111 | +133 | +147 | +149 | +137 | +110 | +65.2 | Zero |

Table Two contains basic velocity and energy data.

## TABLE TWO

FEDERAL . 308 168-Gr. BT HP Match, Velocity in Ft-per-sec., Energy in Ft-Lbs.

|  | Muzzle | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| VELOCITY | 2600 | 2420 | 2240 | 2070 | 1910 | 1760 | 1610 | 1480 | 1360 | 1260 | 1170 |
| ENERGY | 2520 | 2180 | 1870 | 1600 | 1355 | 1150 | 970 | 815 | 690 | 590 | 510 |

Must you actually carry all this data in your head? No. I memorize just the 3 MPH leads, then double them for a trotting target and triple them if it's at a dead run. And I can mentally cut in half any one of these if the target's moving obliquely.

The easiest way to remember the 3 MPH moving target leads is to COUNT IN SEVENS -- 7, 14, 21, 28, 35, 42 and you'll have the correct walking leads almost perfectly for 100, 200, 300, 400, 500 and even 600 yards.

## Crosswind Data

The best reaction to a stiff crosswind is to shift your location so you're either perfectly upwind or downwind from your target and thereby eliminate the effect of wind altogether.

When relocating is physically or tactically unfeasible, the Wind Data in Table Four allows great accuracy when properly applied.

And don't forget that unlike a moving target, an oblique wind is NOT $1 / 2$ value but $3 / 4$ value since a bullet is very sensitive to a crosswind.

| TABLE THREE |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| MOVING TARGET LEADS, . 308 Federal Match 168 Gr. BTHP Distance in Yards |  |  |  |  |  |  |  |  |  |  |
| Tgt. Speed | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
| Walk 3 MPH | 7" | 13 " | 21" | 29" | 37" | 46 " | 56" | 68" | 80" | 93" |
| Trot 6 MPH | 13 " | $26^{\prime \prime}$ | 42" | 57" | 74" | 92" | 113" | 135" | $158{ }^{\prime \prime}$ | $18{ }^{\prime \prime}$ |
| Dash 10 MPH | 21 | 44" | 68" | 95" | 122" | 154" | 187" | 224" | 264" | 306" |

## Up/Down Shooting Compensation

While the book explains this phenomenon in depth, just let it be said here that up/down shooting requires aiming LOW for compensation. Despite it not seeming logical, this is equally true whether your target is downhill or uphill; always compensate by

## AIMING LOW

Keep in mind how quickly angles increase as a suspect's position gets higher above street-level -- by the time he's about 4-5 stories or higher, and you're across an average downtown street, he's probably already 40 degrees UP. The Austin 'Texas Tower' gunman, Charles Whitman, fired from a 28 -story perch about 50 degrees UP from most-lawmen, who typically returned fire from cover 300 yards away. This means their uncompensated shots probably hit about ten inches high and helps explain why it took so long to neutralize him.

We computed this data for UP/Down angles at 5 through 60 degrees in Table Five, just so you could get a better feel for the effect. (Sixty degrees is the angle at which the greatest compensation is required.)

## TABLE FOUR

WIND DRIFT DATA for Federal .308, 168 Gr. BTHP Match
Effects of a Crosswind 90 Degrees to Bullet Path

| 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 5 mph | $0.4^{" \prime}$ | $1.5 "$ | $3.7^{\prime \prime}$ | $6.8^{\prime \prime}$ | $11.1^{\prime \prime}$ | $16.1^{\prime \prime}$ | 23.5 | $32.0^{\prime \prime}$ | $42.1^{\prime \prime}$ |
| $53.8^{\prime \prime}$ |  |  |  |  |  |  |  |  |  |


| 15 mph | 1.2" | 4.6" | 11.1 | 20.4" | 33.3" | 49.9" | 70.6 | 96.1" | 126" | 161" |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 20 mph | 1.6" | 6.2" | 14.8" | 27.2" | 44.4" | 66.6" | 94.2" | 128" | 168" | 215' |

To keep from dazzling you with too much complicated up/down information, l've included "Simplified UP/DOWN Data' (Table Six) which shows the compensation needed at 100 yards for $30-$, 45- and 60-degree up/down targets. You can see that there's little compensation required at such short range until the angle approaches 60 degrees, and even then you need only aim 1.3 inches LOW to be perfectly on-target.

## TABLE FIVE

Federal . 308 Match, 168 Gr. BTHP Up/Down Compensation Distance (Yards)

| Degree Slope | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 80 | 0 | 1000 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 5 Degrees | . 01 | 04" | 10" | 20" | 33 " | .51" | 74" | 1.0" | 1.4" |  |
| 10 | .04" | 16 | . 40 | . 7 | 1.2" | 1. | 2.7 | 3.9" | 5.2" | 6.9" |
| 15 Degrees | .09" | 3 | .91" | 1.7 | 2. | 4.3 | 6.3 | 8.7 | 12" | $16 "$ |
| 20 Degrees | .16" | . 67 | 1.6 | 3.0 | 5.0" | 7. | 11 | 15" | 21" | 28" |
| 25 | 25 | 1.0 " | 2.5 | 4.7 | 7.8" | 12' | 17 | 24 | 33" |  |
| 30 Degrees | 30 | 1.5 | 3.5" | 6.7" | 11 | 17 | 25 | 34 | 47' | 62" |
| 35 | . 48 | 2.0 | 4. | 9.0 | 15 | 23 | 33" | 47" | 63 " |  |
| 40 Degrees | .62" | 2.6 | 6.3 | 12 | 19 | 30" | 43 | 60" | 82 | 108" |
| S | .70" | 3.3 | 7.8 | 15" | 2 | 37 | 54" | 75 | 102" |  |
| 50 Degrees | . 90 | 4.0 | 9.6" | 18 | 30" | 46" | 66" | 92" | 125" |  |
| 55 Degrees | 1. | 4.8" | 11" | 21" | 35" | 54' | 79 | 110" | 149" | 197 |
| 60 Degrees | 1.3 | 5.6" | 13" | 25" | 41" | 64 | 92 | 128" | 174" | 232 |

## Comeups

The idea of Comeups is to KNOW the exact Minutes of Angle a rifleman needs to raise his sights in order to hit dead-on, when changing from one distance to another, at 100yard intervals.

A scope-equipped police rifleman uses Comeups either with target knobs or even just an elevation ring, to count off $1 / 4 \mathrm{MOA}$ clicks as he cranks to another elevation. Comeups are calculated for a specific round -- based on bullet weight, velocity and resulting trajectory. The ones listed in this table exactly fit the Federal .308 Match trajectory and would not apply perfectly even to the very similar 7.62 mm military Match bullet.

Most modern, quality riflescopes adjust elevation with 1/4 Minute of Angle clicks, which means you must click-off four increments to equal one Minute of Angle. If you have any doubt about your scope's elevation increments, check with an armorer or the manufacturer.

Also understand that the Comeups shown in Table Eight work REGARDLESS of your zero range. In essence, they tell you how much to go up or down from one zero so you'll be zeroed at the next range. There may be tiny variations between these calculations and your own rifle's performance, so testfire and modify them for the most precise results.

## TABLE SIX

## SIMPLIFIED UP/DOWN DATA

 100-Yard Distance| Angle | Compensation |
| :---: | :---: |
| 30 Degrees | $0.3^{\prime \prime}$ |
| 45 Degrees | $0.7^{\prime \prime}$ |
| 60 Degrees ${ }^{*}$ | $1.3^{\prime \prime}$ |

*Maximum effect
So that you can see how to translate this up/down data into 1/4 Minute of Angle scope adjustments, we've included Table Seven, which shows these computations for a 45 Degree Slope.

TABLE SEVEN
Federal . 308 Match, 168 Gr. BTHP Minutes of Angle Up/Down Compensation, 45 Degrees

| Yards |  | Compensation | MOAs | $1 / 4$ MOA Clicks |
| :---: | :---: | :---: | :---: | :---: |
| 100 | $0.7 "$ | 0.70 | $3(0.74 \mathrm{MOA})$ |  |
| 200 | $3.3 "$ | 1.65 | $7(1.75 \mathrm{MOA})$ |  |
| 300 | $7.8^{\prime \prime}$ | 2.60 | $10(2.50 \mathrm{MOA})$ |  |
| 400 | $15.0 "$ | 3.75 | $15(3.75 \mathrm{MOA})$ |  |
| 500 | $24.0 "$ | 4.80 | $19(4.75 \mathrm{MOA})$ |  |
| 600 | $37.0 "$ | 6.10 | $24(6.00 \mathrm{MOA})$ |  |
| 700 | $54.0 "$ | 7.70 | $31(7.75 \mathrm{MOA})$ |  |
| 800 | $75.0 "$ | 9.37 | $37(9.25 \mathrm{MOA})$ |  |
| 900 | $102 "$ | 11.30 | $45(11.25 \mathrm{MOA})$ |  |
| 1000 | $135 "$ | 13.50 | $54(13-50 \mathrm{MOA})$ |  |

REMEMBER: Always compensate by aiming LOW!

## TABLE EIGHT

## COMEUPS

Federal . 308 Match, 168-gr. BT HP

| Yards |  | MOAs |
| :---: | :---: | :---: |
| 100 to 200 | 2.25 | Nine |
| 200 to 300 | 3.00 | Twelve |
| 300 to 400 | 3.50 | Fourteen |
| 400 to 500 | 4.00 | Sixteen |
| 500 to 600 | 4.50 | Eighteen |
| 600 to 700 | 5.00 | Twenty |
| 700 to 800 | 5.75 | Twenty-Three |
| 800 to 900 | 6.50 | Twenty-Six |
| 900 to 1000 | 7.25 | Twenty-Nine |

