Introduction

The aim of this guide is to describe the factors to be considered when choosing a rifle/ammunition combination and to highlight important aspects of rifle ballistics. This guide should be read with the Zeroing and Shot placement guides. It specifically covers:

♦ The legal limitations on which rifles and ammunition can be used;
♦ A description of why expanding ammunition is required to shoot deer;
♦ Bullet trajectory, drop and the effects of wind.

Note: This guide uses imperial measures. To convert to metric, measurements given in yards are approximate only and can be replaced by the same figure in metres. Measures in inches can be replaced by centimetres at the rate of 1 inch = 2.5 centimetres.

Legal limitations

For the killing or taking of deer in England and Wales, firearms and ammunition must conform to requirements laid down in the Deer Act 1991 (as amended). These are stated as follows:

<table>
<thead>
<tr>
<th>Deer Species</th>
<th>Min bullet weight</th>
<th>Calibre</th>
<th>Min muzzle energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>for CWD and Muntjac</td>
<td>50 grains (3.24g)</td>
<td>not less .220</td>
<td>1,000 ft pounds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inches</td>
<td>(1,356 joules)</td>
</tr>
<tr>
<td>for other species</td>
<td>none</td>
<td>not less .240</td>
<td>not less than</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inches</td>
<td>1700ft lbs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2305 joules)</td>
</tr>
</tbody>
</table>

NB. Ensure that all three conditions are met for your chosen calibre of rifle.

♦ Rifle bullets must be either hollow nosed or soft nosed. Note: this is generally interpreted to include “ballistic tip” and other bullets designed to deform in a predictable manner.
♦ Any firearm or other method of humane dispatch may be used to prevent suffering to injured or wounded deer.

Why use expanding ammunition?

The severity of a bullet wound is directly related to damage caused by the path of the bullet plus the amount of kinetic energy that is transferred from the bullet to the tissues of the body.

The path of the bullet through tissue can be categorised into the permanent and temporary wound cavity (see diagrams below).
Expanding ammunition increases the rate at which the energy transfer takes place and will create larger and more predictable permanent wound cavities than solid ammunition.

A temporary wound tract occurs where the expansion of the bullet causes a temporary elastic expansion of the tissue. The contribution of the shock to death is when the elastic limit of the tissue is overcome and permanent damage results.

Plaster casts of permanent wound tract tracts. The same rifle/ammunition was used to produce both

Wound tract 2 was shot at 4 times the range of wound tract 1. The bullet shot at longer range was therefore going much slower and resulted in slower expansion and a significantly smaller wound tract. Do not shoot at very long range. Bullets are designed to expand within a particular energy band. The difference between wound tract 1 and wound tract 2 also illustrates the difference between bullet that had sufficient energy and has expanded, and one that has not.
Ballistic tables

Ballistic tables will ensure that you are aware of the approximate technical capabilities of your rifle ammunition combination. These tables can be generated either by using the information provided with the ammunition or through the use of commercially available, or manufacturer’s free, ballistic software.

Accuracy

A bullet has to strike the correct place in order to achieve a humane kill. The appropriate aim points are discussed in the Shot Placement guide. The ability to place a bullet consistently, over a range of distances and weather conditions, requires knowledge and understanding of the cumulative effect of three key factors:

1. The effect of distance on group size;
2. The effect of distance on bullet path;
3. The effect of wind on bullet path.

The examples on this page are based on a notional 4” diameter vital zone (killing area) for a chest shot deer. The right bullet, falling within this vital zone, would kill a deer of any species found in England and Wales.

The effect of distance on group size (Fig. 1)

Group size is the result of an individual’s ability to shoot, plus the consistency of the rifle/ammunition combination.

Group size will increase proportionately over distance e.g. if your grouping is 3" at 100 yards, it will increase to 6” at 200 yards and 9” at 300 yards (Fig. 1). The longer the range, the less the likelihood of the bullets consistently falling within the notional 4” vital zone.

The effect of distance on bullet path (Fig. 2)

While all bullet flights (trajectories) are curved, the exact path will depend mainly on the bullet weight, its speed and how efficiently it flies through the air. Bullet paths will therefore be different for different rifle/ ammunition combinations.
Unlike group size, which increases in direct proportion with distance, bullet drop does not. In relation to the line of sight, bullet drop can be largely ignored within the zero range, but increases rapidly beyond it, making distance judgement critical.

All rifles for shooting live targets should be zeroed in such a way that the bullet falls within the chosen vital zone over as long a distance as possible from the muzzle. As a rough rule-of-thumb zeroing most deer rifles so that shots fall within a 4 inch (10 cm) vital zone up to 200 yards (metres) without the need to adjust the point of aim, will help to eliminate errors in distance judgement (see the Zeroing guide).

The effect of wind (Fig. 3)
The effect of wind on the flight path of a bullet is relatively difficult to predict. The extent to which wind will push a bullet off course (wind deflection) will depend on wind strength, wind direction relative to the bullet path, the speed and shape of the bullet and the distance that it travels. Winds at right angles to the bullet path will have the most effect, head or tails winds only a marginal effect. The effect of wind is also inconsistent over distance, strong winds near the muzzle will have proportionately greater effect than nearer the target.

♦ Ensure that you understand as far as possible the effect of wind on the flight of your rifle/ammunition combination, in order to take the decision whether to shoot.

Putting it all together (Fig. 4)
♦ Deciding on exactly where to aim or whether a particular shot is advisable, depends on the personal ability of the shooter and an ability to assess the cumulative effect of the 3 variables above.

Further info
♣ See the Legislation guide