# LIGHT FANTASTIC

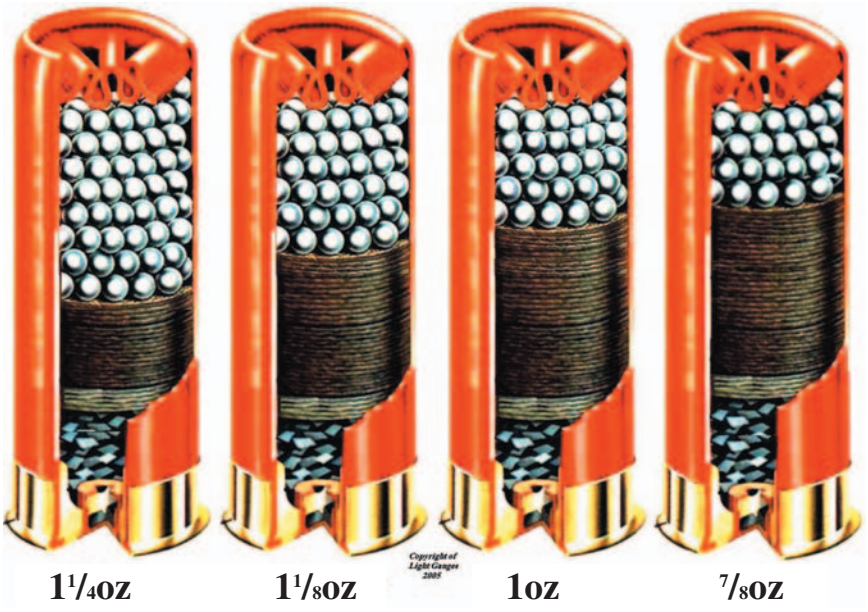
**TIM WOODHOUSE** PONDERS WHY LIGHTER CLAY LOADS WORK SO WELL

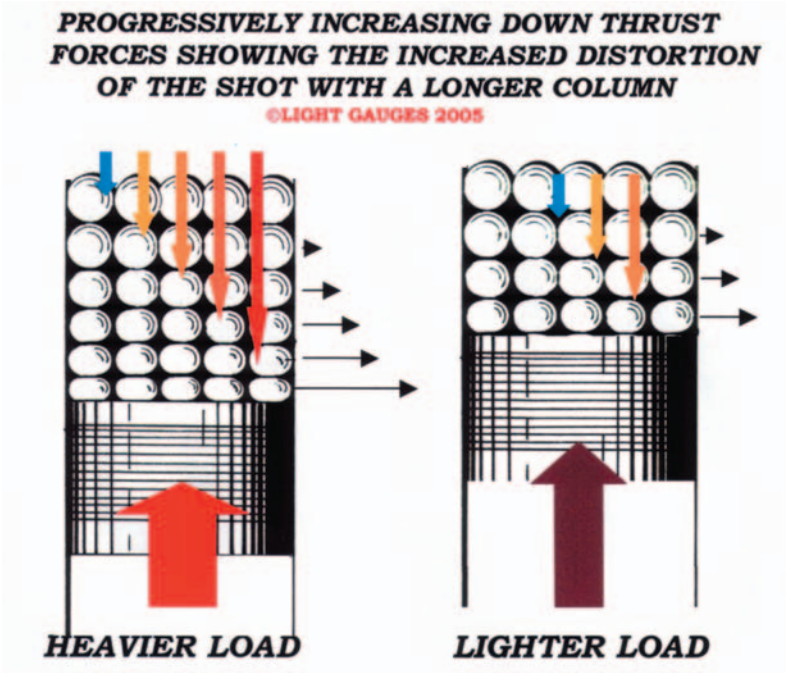
With the gradual reduction in charge weights over the years from the once almost universal 1¼oz load, scores do not seem to have been affected adversely. Now with the considerable drop from 1¼ to 1oz for FITASC shooting, there has been a lot of wailing and gnashing of teeth, bemoaning the demise of these veritable 'cannon shells'. But is the new load limit really going to cause as much upset as seems to be generally feared? Will a 22% reduction of the charge by weight cause problems with pellet distribution and pattern density?

At first glance this seems to be a no-brainer; with a reduction of this magnitude how can it fail to reduce the pattern density? Well, all is not as simple as it may seem as there is more to producing even, well distributed patterns than throwing as much shot as possible down range, choking it to death and hoping for a result.

The key for the development of good patterns at longer distances is the retained shape and residual velocity of the pellets. This is directly affected by the pressure build characteristics in the cartridge at the moment of firing. The type and efficiency of the wadding also plays a major role, with cushioning of the charge against the blow of initial acceleration helping tremendously.

*IT IS THE PELLETS AT THE BASE OF THE CHARGE THAT SUFFER THE MOST PUNISHMENT. THE HEAVIER THE LOAD AND LENGTH OF SHOT COLUMN FOR A GIVEN BORE DIAMETER, THE GREATER WILL BE THE PERCENTAGE OF OTHERWISE RELATIVELY USELESS PELLETS. THESE ARE THE ONES THAT WILL SPREAD THE FURTHEST IN THE SHORTEST TIME…*




The more that the shot is pampered along its journey down the barrel, the better will be the pattern. This has a far greater effect than the degree of choke in the gun, as it is the cartridge combination that ultimately prevails. Loads of equal shot weight and velocity, but having different pressures, wad types and shot hardness, will all produce very different patterns with the same degree of choke.

It is the pellets at the base of the charge that suffer the most punishment. The heavier the load and length of shot column for a given bore diameter, the greater will be the percentage of mashed, squashed and otherwise relatively useless pellets. These are the ones that will spread in the shortest time and will also be at the back end of the shot string with a lower velocity and energy. In fact, with heavier loads and even using relatively large shot sizes (not allowed for sporting clays), the amount of distortion received by these bottom layer pellets is such as to render them quite useless, being practically unrecognizable as shot pellets and falling to the ground after a relatively short distance, nowhere near the intended target direction.

This was always suspected, but the full extent of this destruction of a sizeable portion of the charge was discovered while attempting to find a viable alternative to lead shot for wildfowling at the Ballistics Research Laboratory. All types of shot used were in English number five so as to be able to make accurate comparisons. Even with shot of this size, up to 10% of the shot charge failed to travel far enough to make it to the pattern plate area, due to this severe distortion. The effectiveness of the rest of the charge was found to progressively increase as its position in the shot column was

higher. The electronic equipment used, together with color-coded pellets at the bottom end of the charge, conclusively proved this. With smaller shot than English number five, the percentage damaged will almost certainly be higher.

Perhaps a good analogy of the shot distortion scenario would be the problems associated with high pressures when deep sea diving. The deeper the diver goes, the higher the pressure of the water 'stacked' above him will be. So, if the bottom layer pellets are the equivalent of the diver at maximum practical depth, this pressure is compounded enormously by the force of abrupt acceleration upon the firing of the shell. Indeed, our hapless diver would be squashed beyond recognition if accelerated from this depth to 1300feet per second in less than 7 milliseconds!

With smaller shot sizes this problem becomes more acute and although for closer targets such as skeet this can be an advantage, it is not to be recommended for long sporting clays shots. As the shot pellet size diminishes, the number of pellets in the column stack increases for a given weight of load. This is the main reason for the generally increased spread of the charge for a given cartridge loaded with the smaller sizes of shot.

The usual response to the shot distortion scenario is to load progressively harder shot with a higher antimony content. Antimony is the main hardening agent used in the alloying of lead shot, but as its sectional density is around half that of lead, there is a trade off of sorts to be paid for, with a reduced overall pellet density compared with pure lead.

However, the better shape and condition of these harder pellets tends to more than compensate for this at extended ranges, but they are still damaged to a considerable extent with the heavier loads of the smaller shot sizes that are used for clay target shooting. Having spent considerable time at the pattern plate, with loads of varying shot weights, it is now quite clear that heavier loads tend to throw a wider pattern at all distances for a given degree of choke. Pellet distortion is clearly the main culprit here, but there is another fly in the ointment.

## LESS IS MORE?

When a charge of shot begins to leave the muzzle, it is no longer restrained laterally by the barrel walls – with the immediately preceding pellets still in the bore tending to push at their rear in a greater or lesser manner. This effect is amplified or otherwise by the degree of residual pressure left in the barrel to propel the shot at this point. This tends to cause a battering ram effect into the rear of the charge, which, practically, increases the total spread of the charge. The higher that this residual pressure remains and the longer the shot column, the greater will be the spread for a given degree of choke.

The fastest spreading load for a given degree of choke is the heavily loaded .410 magnum shell, with the 1.63inch (41.4mm) shot column length of the biggest $^{3}/_{4}$oz (21gm) load bordering on the ludicrous.
Compare this with shot column lengths for 12 gauge loads:
**$1^{1}/_{4}$oz 22.24mm/0.88inches**
**$1^{1}/_{8}$oz 19.77mm/0.778inches**
**1 oz 17.3mm/0.68inches**
**$^{7}/_{8}$oz 14.83mm/0.584inches**

$^{7}/_{8}$oz loads do pattern tighter than 1 oz and the 1 oz load is similarly more efficient than the $1^{1}/_{4}$oz monsters in this respect, even when all other factors are as similar as possible. So, with these lighter loads, higher velocities can be comfortably achieved if required, without suffering higher residual barrel pressures and painful recoil. ■

*THE USUAL RESPONSE TO THE SHOT DISTORTION SCENARIO IS TO LOAD PROGRESSIVELY HARDER SHOT WITH A HIGHER ANTIMONY CONTENT. ANTIMONY IS THE MAIN HARDENING AGENT USED IN THE ALLOYING OF LEAD SHOT, BUT AS ITS SECTIONAL DENSITY IS AROUND HALF THAT OF LEAD, THERE IS A TRADE OFF OF SORTS TO BE PAID FOR, WITH A REDUCED OVERALL PELLET DENSITY COMPARED WITH PURE LEAD.*

## IN CONCLUSION

- **Lighter loads are more efficient,** with a much higher percentage of useful working pellets than the heavier shot weights.
- **With a lighter load of shot the patterns will be more regular and even,** with a reduced overall spread containing many fewer 'fliers' when compared to a more heavily loaded cartridge.
- **As the shot charge weight is lowered, a reduced amount** of shot hardening agents can be used to good effect.
- Lighter loads with fibre wads are also more efficient **as a direct result of reduced lateral thrust scrubbing the pellets down the barrel walls.**
- **Recoil can be vastly reduced with the lighter load,** which must be a good thing when it comes to shooting a relatively large number of shells during the course of a day.
- **Lighter $^{7}/_{8}$ oz loads do seem to be popular with several lady shooters** at my club and also with some of the 'old hands' that have had enough of being pounded repeatedly by heavier shells.
- **Potential new shooters can be put off by what they think will be painful recoil,** so the lighter loads must be a good thing for the sport to continue its present growth.