

# Bore'n Again

*The inside story of Ben Taylor's amazing barrel breakthrough*

**D**uring my years of involvement with this magazine I've been privy to some moderately astounding developments. I've been up-close and personal with John Whiscombe's recoil-eliminating contraptions, I was there when John Ford and the late, great Gerald Cardew came up with the GC2 and proved that airgunners would pay serious money for a better rifle, and I've been in on head-shakingly clever stuff from every genius in the airgun business. How lovely for me, then. This time around, I think I may have hit the jackpot.

Ben Taylor has come up with a new barrel system and if it continues to develop at the rate it's going now, it could change the face of shooting. Not just airgun shooting, but pretty much every form of shooting where a single projectile travels down a bore. That includes everything from .177 match to fullbore live ammo, taking in .22 air and rimfire, plus all manner of calibres, formats and applications along the way. The future for Ben's new barrel could involve terms like 'global shooting phenomenon', or it could simply be the biggest thing to hit airgunning...like ever.

As it stands, Ben's barrel will certainly make you read some of this article over and over again, mainly to see if either Ben Taylor or Terry Doe has lost the plot. We

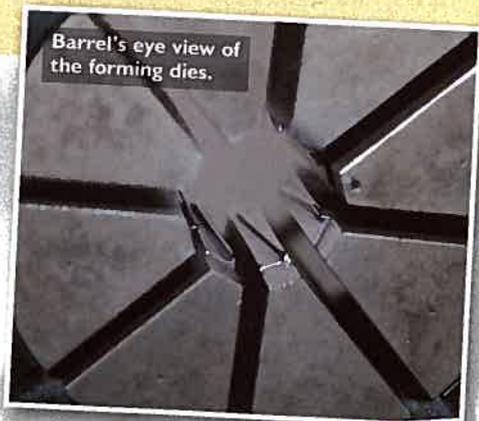
haven't. Well, not on this subject anyway. The fact is, Ben Taylor's barrel creates disbelief, then belief, in everyone who comes into contact with it.

## THE BIG DIFFERENCE

The barrels we're all using at the moment have rifled bores. This rifling comprises the time-proven combination of grooves and lands, arranged in various twist rates and patterns, which impart spin to the pellet, which in turn stabilises it in flight. Rifling is a science in itself and creating it a technical skill that will make or break the performance of the gun. Ben Taylor's barrel gives a discrete nod of respect to these fundamental principles of accepted wisdom, then promptly sticks two fingers up to them.

Basically, and I mean basically, the Smooth-Twist features a non-rifled bore for the vast majority of its length - that's the 'Smooth' bit - morphing into a unique twist for the final few centimetres. That final twist imparts spin to the pellet and a slight choke to the barrel's muzzle, but while it's doing these things, it's also doing more than most people believe. That 'most people' certainly included me, until I saw it and shot it for myself. As previously stated, I still struggled to accept what was going on before my eyes, but the proof was there and I eventually accepted it.

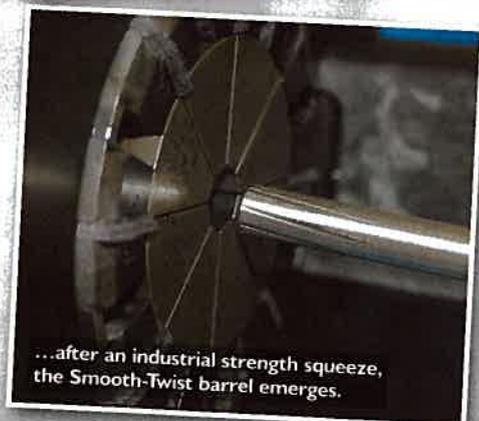




Barrel's eye view of the forming dies.



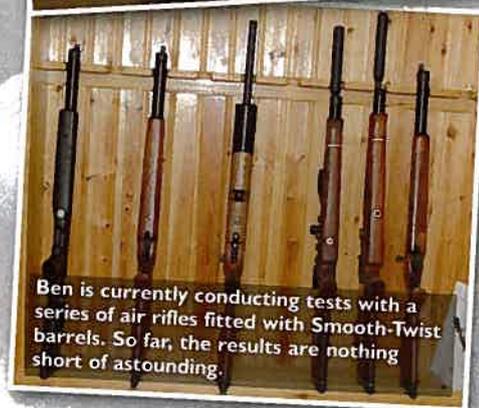
Once the barrel blank has been inserted, the required diameter is dialled in and...



...after an industrial strength squeeze, the Smooth-Twist barrel emerges.



Metal displacement is visible, but the result of this process really does have to be seen to be believed.



Ben is currently conducting tests with a series of air rifles fitted with Smooth-Twist barrels. So far, the results are nothing short of astounding.

## ORIGINS AND SOURCES

Ben Taylor is permanently processing ideas. It's how he functions and having known him for over 20 years, I can't recall a time when he wasn't working on some item of advancement or other. I first met Ben shortly after the launch of Theoben Engineering, where in partnership with Dave Theobald, he was developing the now celebrated gas-ram power system. Over the years, Ben has either devised or been connected with a series of proven, patented inventions, including the Rapid 7 multi-shot sporter, the scope-saving Dampamount, a medical injection system and a varied clutch of mechanical innovations. Every one of these was patented to within an inch of its life and vigorously defended. Ben Taylor works too hard at what he does to allow anyone to walk away with it without paying. Having seen the effort he invests, I don't blame him.

So, Ben's got a healthy track record of coming up with innovative things, but even he was surprised when the results began to roll in from the Smooth-Twist programme.

It was during some development work for FX Airguns of Sweden that Ben had the idea that led to the Smooth-Twist breakthrough. He was working on choking barrels and something went 'ping' in his engineer's brain. Ben thought 'what will happen to the bore if I apply concerted pressure from the outside of the barrel?' From this thought to machining up some dies – not with any great precision, Ben recalls – was a matter of hours, and completely ruining them was a matter of seconds. Ben was so keen to see if his idea would work that he tried to use the dies without hardening them. Result – flattened dies and a second machining session.

This time the dies were fully hardened and polished and a .22 barrel blank was made ready in the forming machine. The machine applied a 'squeeze' to the terminal section of the barrel and Ben was a barrel-swap away from test-firing his new invention. It worked. In fact it worked better than Ben thought possible. Now the real work could begin.

## DEVELOPMENT AND DISCOVERY

Ben was excited, and when he's in that state he gets things done. There were so many variables that had to be nailed down. What was the ideal bore diameter? How much of a 'squeeze' is ideal? How much metal should be removed before the dies get to work? What would be the ideal number, configuration and composition of the dies?

These and a world of related issues had to be resolved before Ben was satisfied with the new development.

One thing was obvious from the start, though: making a Smooth-Twist barrel would be a whole lot easier, faster and cheaper than making conventional rifled barrels. Next stop, the patents people. Ben has his own patents consultant and he was fired-up and pointed at the archives to see if anything like Smooth-Twist had been done before. It hadn't. Barrels with short sections of terminal rifling had been used previously, but these had been worked from inside the

bore in the usual way, whereas Ben's method involved the outside of the barrel blank only. Thus a patent was applied for and protection installed. Once his invention had been secured the development work continued, with every permutation explored. The results make fascinating reading for sad people like me, and I suspect, you.

During his test-firing sessions Ben worked his way through every popular brand of .22 pellet he could find and these were tested side-by-side with a selection of proven conventional barrels. As the data and test targets stacked up, the findings did likewise. Here are the results Ben Taylor would allow me to publish. Please be advised that Ben has consistently been the most 'protective' member of the airgun trade I've ever tried to work around, and as ever with his stuff, what I'm revealing represents only a proportion of what's actually going on. Ben Taylor's work is the airgun equivalent of an iceberg, in that you only see a bit of it at first glance and going deeper to get a look at the rest can be hazardous. Anyway, here's what's emerged so far.

- The Smooth-Twist is incredibly pellet-friendly.

This barrel shoots well with a greater variety of pellets than any conventional barrel tested so far. Ben doesn't jump to conclusions but the signs indicate that this might be due to the 'gentle' way the Smooth-Twist launches its pellets. The lack of distortion from the Smooth-Twist is emerging as a major player in Ben's tests so far.

- The Smooth-Twist is more energy-efficient.

The air-sealing properties of the Smooth-Twist bore, which is essentially a smoothbore during the phase of the pellet's travel that generates its speed and therefore power, appear to be superior to those of conventionally rifled barrels. This factor is still under scrutiny but the fact is that pellets from a Smooth-Twist barrel emerge with up to a foot-pound more energy than they would from the same action feeding a conventional barrel. This means more shots per charge from pre-charged pneumatics and possibly greater power from FAC-rated rifles.

- The Smooth-Twist barrel is truly match-accurate.

The very best groups produced by the Smooth-Twist barrel were occasionally equalled, but never bettered, by conventional match-grade barrels. However, no conventional barrel produced the amount of tight groupings with such a variety of pellets.

- The Smooth-Twist barrel doesn't 'lead-up' like conventional bores.

Again, probably due to the lack of 'impression effect' on the pellets, plus the 'smearing' and deformation of the lead, the Smooth-Twist bore doesn't generate anything like as much lead build-up as a standard rifled one.

- Pellets from a Smooth-Twist barrel are quieter in flight!

Yes really. The 'hiss' produced by the pellet as it flies is noticeably less when that

**STANDARD MATCH BARREL**

**SMOOTH TWIST BARREL**

pellet leaves a Smooth-Twist barrel. Again, the 'smoother' profile of the spinning pellet could well have an effect on the turbulence, and amount of sound-energy, it creates. There's a more important possibility here, though. If those Smooth-Twist pellets are creating less sound-energy during flight, that means they are retaining their energy more efficiently, leaving more of it in place on the strike. The studies are by no means complete but as stated, there are some seriously interesting avenues of exploration opening here.

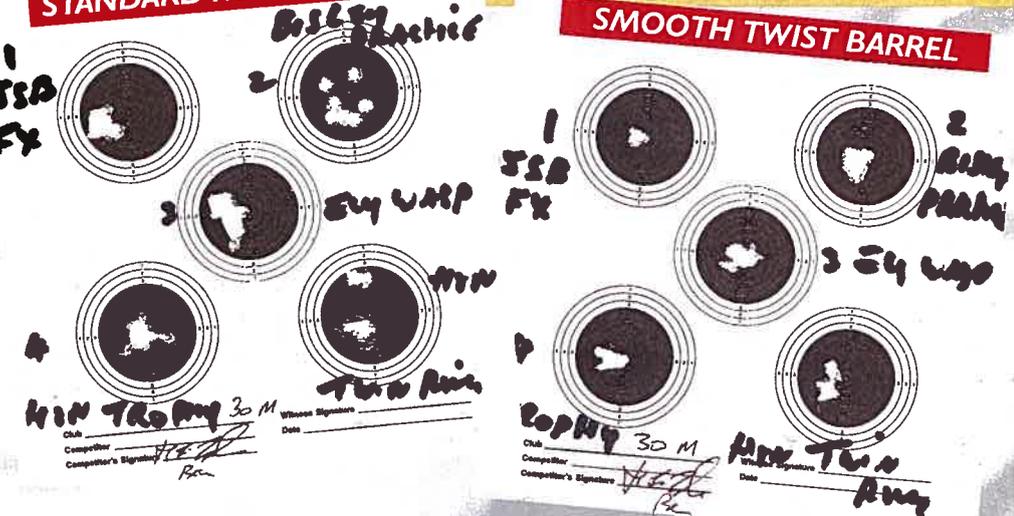
**FUTURE DEVELOPMENT**

Ben Taylor has already decided to experiment with a new five-die machine – the machine shown is his developmental vehicle – which he believes will give him more control over the Smooth-Twist effect and also enable him to produce smaller calibre barrels. With the present eight-die process, the dies themselves are squeezing the barrel in 'opposition' to each other, whereas a five-die setup won't be, and that will certainly have a significant effect on the way the spiral 'waves' in the bore are formed. This change could bring about even more advances and advantages, or it may not. The only way to prove anything is to get the tooling sorted, run off another series of barrels, and repeat the test-firing process until the facts emerge.

Similarly, the composition of the barrel blanks themselves is an area currently under investigation. The steel type most suited to the conventional rifling process may not necessarily be the ideal one for the Smooth-Twist system. Changing the type of steel used for barrels may not be such a huge step, but discovering the optimum 'mix' for the job could be a heavy old mission for someone. It doesn't take a genius to realise that, for every step forward, here, there are several sidesteps that could be taken. That said, if anyone is a master of the developmental foxtrot, it's Ben Taylor.

**MY IMPRESSIONS**

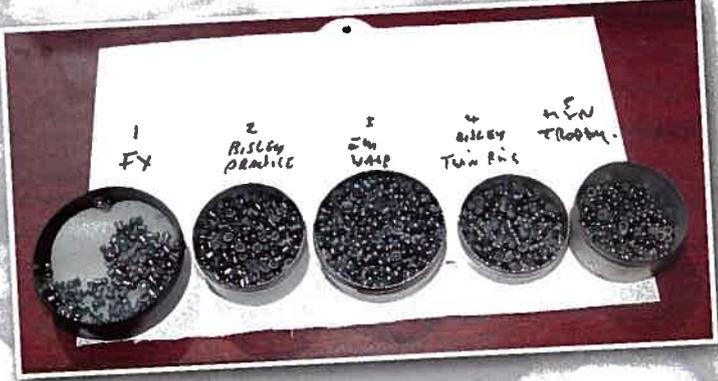
Let's get something absolutely straight here; I am no Ben Taylor, and I make no claims to an in-depth understanding of the science, ballistics, metallurgy or high-level engineering involved in all of this. Ben has explained these to me in the equivalent of yellow crayon and it gave me a headache. I do understand the fundamental principles, however, and I can see how the 'wave-pattern' effect spins the pellet and thus imparts gyroscopic stability. I also know that the Smooth-Twist pellets are quieter in the air because I've heard them, and I can see how quieter pellets could be more energy-efficient pellets. Finally, having seen a Smooth-Twist barrel being made from a blank, and the process of gutting conventional rifling from exactly the same sort of blank, the savings in time, tooling and complexity are as obvious as they are huge. What I'm saying is, at this early stage and from my limited perspective, I can see how significant the Smooth-Twist barrel could be. I've already said it could change the face of shooting forever, and that is surely the case.



Above: The proof of the pudding. The best pellets still shoot better, but the Smooth-Twist shoots well with more types

The most important factor for me is that I have personally tested the Smooth-Twist system and it works. Whatever it's doing, it's doing it incredibly well so far and the signs are extremely positive. I'll be in on the testing programme and its next stage is to see what happens with a .177 Smooth-Twist, and to push the accuracy testing out to 50 metres, and possibly beyond. Ben will mirror my benchrest tests using a fixed rifle platform, and we'll compare notes. It's all exciting stuff and I'm turned on to be a part of it – however it turns out. Any results will be published, as soon as Ben Taylor gives me clearance.

Below: The Smooth-Twist shoots well with more types of pellet than any barrel I have ever tested.



Below: The pellet from the Smooth-Twist barrel (left) shows considerably less damage than one from a conventionally rifled bore.



**WHAT IT ALL MEANS**

Ben Taylor's Smooth-Twist barrels are still in the exploration stage. Will they work just as efficiently in .177 calibre, with .22 rimfire, in live-ammunition pistol format, or who knows how many other shooting systems? Much of it is still in the mix but that's how these things work, especially with something of this potential importance. If things pan out, we'll be shooting airguns that are even more efficient, both at the muzzle and downrange, and we'll have a wider choice of pellet possibilities than we've ever had before. Here's hoping!



One day, will all barrels be made this way?