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Teed up: the long-haul golf ball

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Science Editor

IT has long been known that the secret of how far a golf ball flies lies in its dimples. Now scientists believe they understand the forces at work, as air flows over the ball's surface.

Their work could be the key to a new generation of far more accurate, ultra-long-distance golf balls.

They cracked the problem by deploying the kind of extreme computing power usually reserved for predicting global weather patterns or the behaviour of sub-aromic particles. However, a set of supercomputers — each one thousands of times more powerful than a standard PC — still had to run for 300 hours before they were able to see the exact flow of air around a ball, and its dimples, in flight.

The effort involved seems more than justified by the potential prize — designing low-drag balls for the world's 60m golfers, who spend £1 billion a year on balls. Those developed using the new technology could allow club golfers — whose drives do well to reach 250yd — to match Tiger Woods's current average of about 300yd.

"Up to now, dimple design has been more of an art than a science," said Elias Balaras, professor of engineering at the University of Maryland, who created the equations and software to crack the problem.

Analysing the behaviour of a golf ball in flight is acknowledged as a highly complex aerodynamic problem. A ball hit by a top golfer typically reaches 160mph and spins backwards 2,000-3,000 times a minute.

This backspin generates the lift that keeps the ball in flight, and so is crucial to a long drive. Too much spin, however, produces excessive turbulence, and dimples reduce this risk.

Dimples date back to the 19th century, when players noticed older balls with rough surfaces flew better than smooth, new ones. This is because air flows more easily over a roughened surface — an effect so great that dimples can halve friction, or drag, in flight.

"For a golf ball, drag reduction means the ball flies farther," said Clinton Smith, of Arizona State University, another member of the team, who will detail the findings at a meeting of the American Physical Society's fluid dynamics division later today.

For years, sports goods companies have tried to analyse the airflow using simple trial and error, testing prototype after prototype. A modern ball can feature between 300 and 500 dimples in numerous different shapes and patterns.

> **IT MEANS CLUB GOLFERS COULD MATCH TIGER FOR DISTANCE**

The researchers, who had support from Sumitomo Rubber Industries, makers of Srixon golf balls, took a different approach, using equations based on measurements of balls in flight — a task impossible until now because of the computing power needed.

The super-computers used for the analysis, said Smith, produced the most detailed picture of airflow around a golf ball ever seen, showing drag and air movement across each dimple.

"The long-term goal is to optimise dimple design and realise the lowest drag possible by comparing designs," he said.

Britain has more than 4m golfers, of whom 1.7m play at least 12 times a year. John Bushell, director of Sports Marketing Surveys, a market data consultancy for the sports industry, said: "People always seek out the latest kit, so a ball offering greater distances and accuracy could be in huge demand."

There are pitfalls. In Britain and Europe golf is governed by the Royal and Ancient Golf Club, based at St Andrews, Fife.

The club and its American counterpart, the United States Golf Association, have issued recent rulings against new technology that alters the way the game is played.

Both have set out rules ensuring that balls have a uniform size and weight but have left companies free to change the dimples. This could change if radical new designs increase distances so much that the character of golf is threatened.