THE INDEPENDENT

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Missile technology blasts hole in lbw rows

By David Llewellyn

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Hawk-Eye, the invention of Dr Paul Hawkins, a former Minor Counties cricketer, has adapted missile-tracking technology developed for defence systems, to produce an impressive piece of equipment which, it is claimed, will end arguments about whether a batsman is out leg before wicket.

Channel 4 will be introducing the system to their viewers when the two-Test series against Pakistan begins at Lord's in 12 days' time and their presenter, Mark Nicholas, said: "It will show umpires that more lbw decisions should be given out than they are at the moment."

There is already disquiet among the umpiring fraternity, with Barrie Leadbeater, the chairman of the First-Class Umpires' Association, saying yesterday: "I am all in favour of the umpires getting as much help as they can. Any technological advance that can help us get it right is welcome."

Leadbeater has his reservations, however: "Appealing to the umpire is an important part of the game, indeed it is what makes cricket unique. It is the only sport where players appeal to an umpire for a decision; in all other sports the referee or match official decides independently of the players."

At the moment if an umpire is not absolutely sure of a decision the batsman will be given the benefit of the doubt. "That has been a key part of the ethos of the game," he explained. "If Hawk-Eye is accurate enough to eliminate all doubt, fine, but I think that could lead to a greater number of lbw decisions because of that accuracy, and that in turn could reduce the length of matches. We could end up having Test matches that last two and a half days."

Channel 4 deny this, how-ever. Simon Hughes, who is the programme's technical analyst insisted: "lbw is based on guesswork and assumption. There has never been proof that a ball which hits a batsman on his pad would have gone on to hit the stumps. This system can do that."

Hawk-Eye will use six Channel 4 cameras, three for each end, and each delivery will be interpreted instantly in computer graphics. The bounce, direction, flight and speed will be converted into a three-

dimensional image and Hawkins claims the ball's path from bowler's hand to batsman can be plotted to within five millimetres accuracy.

A software progamme, which takes into account the condition of the ball and the height of the bounce on each of the Test's five days, then allows Hawk-Eye to calculate and predict the flight of the ball had it not been obstructed by the pad. That information can be relayed in a matter of a few seconds to the bowler's end umpire via a pager which he will have in his pocket and allow him to make a decision based on what Hawk-Eye has tracked.

There are no plans for the system to be adopted by the cricketing authorities, despite its obvious coaching benefits: a simplified system could be installed at indoor schools and used to enhance aspiring players' performance and technique.

Hawk-Eye, and further technological advances, could spell the beginning of the end for umpires, prompting Hughes to ask: "Does it matter if it means the end of umpires? The game is for players not umpires."

Hawkins, though, ruled that out. "Hawk-Eye cannot detect an inside edge from bat on to pad, nor can it judge whether the batsman was offering a stroke or not, so the umpires still have a part to play," he said.

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Racket science calls the shots for Nadal and Co to transform the game

Advances in string technology are key to the way tennis has changed, explains Jon Henderson

Jon Henderson
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Rafael Nadal, for all the thunderous groundstrokes he will unleash against Roger Federer in the men's final this morning, knows that his greatness hangs by a mere thread or, more correctly, a piece of synthetic string. Not quite true – but the importance of new man-made strings to the way Nadal and other leading professionals have changed the way tennis is played is becoming increasingly evident.

"Luxilon has changed the game so much," Rodney Harmon, a former tour player who now works for the US Tennis Association, says of one of the brands of polyester string that has seen a sharp rise in its popularity among the pros. "Guys can move back on returns and take huge swipes. The ball spins like a gyroscope and it's almost too difficult to volley. That's why you don't have any pure serve-and-volleyers any more."

Some even reckon that this latest generation of strings has had a greater influence on opening up the game to the relentlessly aggressive brand of tennis that Nadal specialises in, and with which he finally subdued Fernando Verdasco in Friday's marathon semi-final, than the more frequently cited space-age materials used in racket manufacture. "I don't think racket technology has made much of a difference," Harold Solomon, a French Open finalist in 1976 and now a leading coach in the US, told the American magazine *Tennis* recently, "but I do think strings such as Luxilon have enabled players to hit the ball as hard as they can and still keep the ball in the court."

He might also have mentioned Pro Hurricane Tour, another of the so-called monofilament strings that Nadal uses for his Babolat racket.

Nadal, 22, the world number one who last year won the French, Wimbledon and Olympic titles and needs victory today to land his first grand-slam title on a hard court, is the child of the string and racket technology that has fundamentally altered the way professional tennis is played, even if players who favour touch over relentless turbo-charged hitting – notably Federer and Andy Murray – can still flourish.

Not so long ago, in the days when a right-hander's classical forehand involved gliding athletically into the ball with the left foot thrust forward to take the body's weight, Nadal's muscular physique would have been of little relevance. Now, thanks to the technology, the top professionals play the forehand very differently, opening up their stance to smash the ball with all their might, like a boxer delivering a haymaker. Using an extreme western grip (the hand held underneath the handle rather than on top or behind it) to rip up behind the ball, the player unloads a shot that not only travels fast but also with huge of top spin and a looped trajectory that reduces the risk of the ball ending up in the net.

The change in technology that laid the foundation for Nadal's style of tennis was the move away from wooden rackets in the mid-1960s. Then natural gut strings were replaced, a trend that has gathered such pace in recent years that some estimates reckon the polyester-based Luxilon string is now used by two thirds of the top 100 men and nearly half the women in the world's top 100.

Interestingly, these high numbers seem to have more to do with players' gut feeling, as it

were, than scientific evidence, which is inconclusive. The endorsements of Solomon and Harmon are based on experience and hearsay, as is that of Roman Prokes, who has strung and customised rackets for Andy Roddick and Maria Sharapova. "I think Luxilon is the biggest change in the game since graphite rackets," Prokes has said, touting the control and bite it exerts on the ball.

Professor Rod Cross, of the University of Sydney, probably the leading academic expert in these matters, is more circumspect. He doubts that strings make as much difference as rackets. "My educated guess is that wider rackets increased the spin by a factor of three, while polyester adds perhaps five per cent more spin on top of that – compared with nylon and gut," Cross says.

What is beyond question is that the way tennis is played has changed almost beyond recognition in the past 35 years. Rick Macci, a top US coach, says: "Rackets now are like AK-47s. Everybody is hitting the ball harder and heavier. You might have a bigger serve, but you also have a bigger return." You also have Rafael Nadal -- and how Federer deals with him today will, again, be fascinating.

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