

Kenya's Eliud Kipchoge has said running a marathon in under two hours, which he managed to do in October, sends a message to the world that "no human is limited". The special shoes he wore on the day helped overcome any human limitations to such an extent that some commentators have questioned the footwear's prospects for future use in competitive sport.

Shoes help Kipchoge smash barrier

For the first time in history, an athlete has succeeded in breaking the two-hour barrier for running a marathon. The achievement belongs to Kenyan runner Eliud Kipchoge, who completed the distance of 26.2 miles (just over 42 kilometres) in Vienna on October 12 in one hour, 59 minutes and 40 seconds. His feat will not feature in the official record books because of help he received on the day from a number of unconventional sources, one of which, according to some commentators at least, was his shoes.

Eliud Kipchoge holds the existing official marathon world record, the two hours, one minute and 39 seconds he achieved in Berlin in 2018. This still stands because the Vienna run was not in an open competition and involved no less than 41 other athletes running as pacemakers, taking up specific formations to reduce the wind resistance and, therefore, fatigue the athlete would have to cope with. With sponsorship from chemicals group Ineos, the runners were also able to

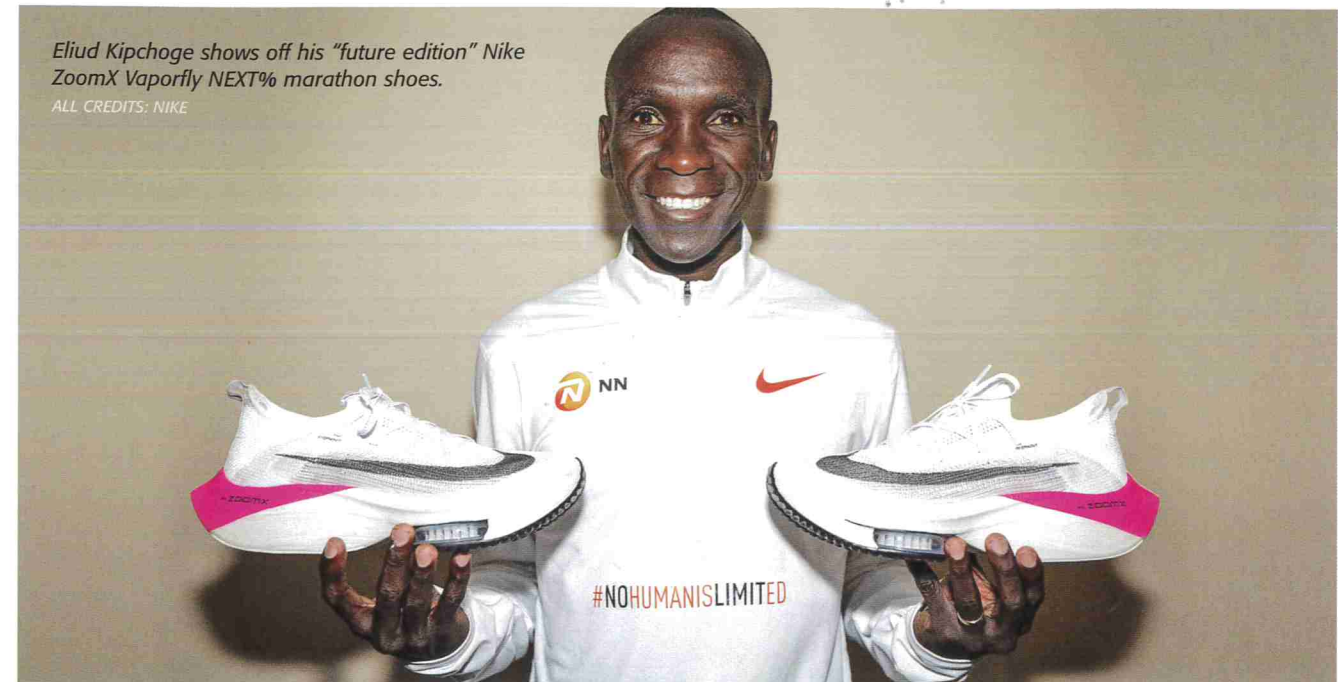
benefit from having an electric pace-car cover the course a few metres ahead of them, with a laser projecting a green line onto the surface to show Mr Kipchoge exactly the path his feet needed to follow to stay on track.

Geese in flight

Data analyst at *The Economist* James Tozer, who also edits the publication's Game Theory blog on sports, says he feels shining the green light on the ideal path was not too much of an infraction, but he holds that the work of the pacemakers to keep Eliud Kipchoge draught-free during the run contributed substantially to the "artificial conditions" that will keep the Vienna event out of the record books. "One of the biggest problems marathon runners come up with is air resistance and if you can reduce that it will have substantial benefits over the course of two hours," he says. What he describes as "an enormous phalanx" of runners rotating in and out, in front and either side of him like geese flying in formation in autumn, will

Eliud Kipchoge shows off his "future edition" Nike ZoomX Vaporfly NEXT% marathon shoes.

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have given the Kenyan athlete a big advantage. Mr Tozer quotes sports scientists as saying that, by their calculations, this could have delivered a benefit of between 2% and 3%, more than the difference between the Berlin and Vienna times.

Another advantage that may, according to Mr Tozer, have been less obvious to people tuning in to watch the October 12 run came from the shoes that Mr Kipchoge was wearing. Everything he wore on the day came from Nike, in whose stable he has been since the early 2000s. In terms of apparel, he wore the 2019 Aeroswift Singlet, an athlete-exclusive version of the Aeroswift Half Tight, the 2019 Elite Racing Sock and, something of a classic in its own right, the Eliud Kipchoge arm-warming sleeves. On his feet for the feat he had what Nike has described as "a future edition" of its ZoomX Vaporfly NEXT% marathon shoe.

Dialogue with Nike

Mr Kipchoge wore an earlier version of this shoe, the Vaporfly Elite, at a previous attempt to break the two hour marathon. This, too, was in an artificial setting, the Formula One race-track in Modena in northern Italy in May 2017. This attempt fell short by 26 seconds. Dialogue between the athlete and the Nike Sports Research Lab has been instrumental in moving the original shoe through a number of iterations already, culminating in the ZoomX Vaporfly NEXT% that helped secure the Vienna triumph. The system behind the shoe uses lightweight, responsive foam in the midsole to give high levels of energy return. There is also a carbon fibre plate to add stiffness and prevent energy loss when bending at the toe and Nike added 15% more foam.

"It's perfectly legal but quite controversial among running aficionados," says James Tozer. "The carbon fibre plate absorbs a lot of the pressure that the runner puts down on the foot and then gives it back to improve running efficiency by 4%. Independent studies have verified this. If it's true that this benefited Mr Kipchoge by anything like 4%, that's another four or five minutes shaved off his time." He worries about an "arms race" developing among athletic shoe manufacturers now to see who can provide wearers with the biggest spring.

Records and controversies

The thought puts him in mind of the controversies that surrounded the Speedo LZR Racer swimsuit in 2008. It used a lightweight, fast-drying, water-repellent, proprietary fabric, with new levels of compression to reduce muscle oscillation and skin vibration. Swimmers wearing it broke 25 world records at the Beijing Olympics that summer and, by 2010, the International Swimming Federation (FINA) had banned the suits. In a similar way, James Tozer believes we may see these shoes banned "quite quickly".

In spite of all this, Eliud Kipchoge has insisted that he achieved what he set out to do. After completing the run, he said: "In my heart and my mind I hoped to run under two hours and make history. I hoped to leave a positive message to the whole world that no human is limited." 🗨️

The original Nike Zoom Vaporfly Elite shoe with which Eliud Kipchoge established the official marathon world record in Berlin in 2018. The shoes have gone through a number of versions since then, with the Kenyan athlete a key contributor to the discussion.

