

FOOTWEAR TECHNOLOGY: SUB-TWO-HOUR MARATHON

Following several years of intense product development and multi-million-dollar investment, Nike narrowly missed out on achieving the first sub-two-hour marathon. Rival adidas is planning an attempt of its own.

Sportswear giants shoot for the moon

The Autodromo Nazionale Monza race track north of Milan, Italy is more accustomed to fast cars than endurance athletes, but at 5.45am local time on May 6 three leading long-distance runners stood on the start line of the 2.4km circuit getting ready to make history. The athletes in question, reigning Olympic champion Eliud Kipchoge of Kenya; two-time Boston Marathon winner Lelisa Desisa of Ethiopia; and Zersenay Tadese of Eritrea, who holds the world record for the half-marathon, were recruited by sportswear manufacturer Nike as part of a project called Breaking2. Its aim was to propel an athlete to the first sub-two-hour marathon time in history with the help of innovative new products and experts in fields ranging from biomechanics to nutrition, and from sports psychology to aerodynamics.

After 17.5 laps of the famous circuit, the live stream of the event, which was being broadcast to all corners of the globe via the internet, picked up Mr Kipchoge crossing the line in a time of 2:00:25, agonisingly short of the target. To breach the two-hour barrier, he would have needed to run each mile just one second quicker. The mood as he came over the finish line was one of celebration; although he narrowly missed out on breaking two hours, he had just completed the fastest ever marathon, knocking more than two and a half minutes off the previous best, the 2:02:57 achieved by his compatriot Dennis Kimetto at the Berlin Marathon in 2014.

His time will not be an official world record, however. Prior to the attempt, Nike told *WSA* magazine that the course would be ratified by the IAAF, athletics' governing body, and that it met all marathon requirements, including independently measured course distance, start versus finish location and course elevation. It was not, however, an officially sanctioned world record attempt due to the use of interchangeable pacemakers, who helped the three lead runners maintain the target pace. They also ran in a series of pre-defined formations to ensure their record-seeking counterparts were not adversely affected by wind resistance.

Eliud Kipchoge, who won the marathon at the 2016 Olympic Games in Rio de Janeiro, came closest to breaking the two-hour barrier in Italy in May.

 Nike





A range of experts contributed to the Breaking2 project, both in product development and for race strategy.

 Nike

Mr Kipchoge said his performance was the culmination of “seven months of dedication”. All three runners skipped spring marathon events in London and Boston so as to put all of their energy into the Breaking2 project. Mr Desisa eventually struggled to a time of 2:14:10, nearly ten minutes off his personal best, but Mr Tadese finished in 2:06:51, nearly four minutes quicker than his previous PB.

Product power

When Nike first announced Breaking2 in December 2016 it described innovative product as the “critical pillar” of the project. To help athletes with temperature regulation, aerodynamics and propulsion, it developed a “complete product system”, which included footwear, apparel and socks. The shoes are the most important of these three components as they spend the most time in contact with the running surface and so can have the greatest influence on performance. Nike began working on marathon-specific footwear in 2013, an endeavour that spawned the Breaking2 attempt.

In March 2017, it unveiled the Nike Zoom Vaporfly Elite running shoe, developed over the previous 18 months specifically in pursuit of the first sub-two-hour marathon time. It features ZoomX midsole cushioning, which the company says is “remarkably lighter, softer and more responsive than traditional foams”. It is designed to give runners greater energy return from each stride, as well as providing cushioning from the road. A stack height of 21mm serves to shield the athlete from any hard impact with the ground, while a 9mm offset between the height of the forefoot and the heel minimises the strain on the wearer’s Achilles tendon.

Embedded within the foam is a “scoop-shaped” carbon fibre plate which adds bending stiffness to the shoe; Nike says this “improves stride-to-stride efficiency”. Dr Geng Luo, a senior

researcher in biomechanics at the Nike Sport Research Lab, explains that the goal of the plate is to reduce how much energy is lost when the runner bends at the toe. Its curved shape prevents added strain on the calf muscle, which would cause fatigue over distance, while also giving the runner the perception of running downhill. The stiffness of the plate was tuned to the needs of each of the Breaking2 athletes. The Zoom Vaporfly Elite’s Flyknit upper, which is woven in one piece was also custom-made. It is extremely lightweight, helping to make the shoe weigh as little as possible for optimum speed.

Race rivals

Mr Kipchoge’s achievement in Italy at the start of May was seen to be so significant in the sporting world that Nike’s major rival adidas, which is itself targeting a sub-two-hour marathon, took to social media to congratulate him on “such a courageous run”. There is no news as to when adidas will make its attempt, but the brand is believed to favour it taking place in a competitive race setting, rather than in controlled conditions as Nike’s did.

The Nike Zoom Vaporfly Elite running shoes contains Nike’s lightest and most responsive foam in the midsole.

 Nike





The Adizero Sub2 has been designed for optimum performance on race day.



Adidas began to think about its own project, which it calls Sub2, around the time of the London Marathon in 2012. In February 2017, it released details of the Adizero Sub2 running shoe, which it said “showcases cutting-edge Adidas innovation”. To develop it, adidas’s Innovation Technologies division explored the performance of a range of materials in different temperatures and environments, as well as on a variety of surfaces. The best prototypes were subjected to rigorous testing by elite athletes, including former marathon world record holder and adidas athlete Wilson Kipsang. It also examined the actual shoes worn in races by Mr Kipsang and other leading marathon runners to determine which areas of the rubber were most worn.

The result was the Adizero Sub2, a shoe engineered specifically for elite athletes on race days. It weighs approximately 100 grammes less than previous racing footwear developed by the brand, which adidas believes can offer a 1% improvement in “running economy”. It features adidas’s lightest-ever midsole foam, Boost Light, an upgrade of the Boost foam it developed alongside specialty chemicals manufacturer BASF. It is made from expanded thermoplastic polyurethane (eTPU), which is created by moulding small beads of plastic using the heat and pressure of steam to form a lightweight, spongy material. The company says it provides greater energy return than the conventional materials used in the soles of running shoes such as ethylenevinyl acetate (EVA).

The Adizero Sub2 has an upper made from a single layer of ultralight fabric, as well as a weight-reduced mesh, internal reinforcements and a system, Microfit, that has been developed to create the optimal support, comfort and fit for high-speed road racing. Adidas also incorporated an enhanced version of its Stretchweb outsole technology, which consists of a rubber compound placed on the areas of the

sole that make contact with the ground, to provide extra grip in all weather conditions. This ensures no energy is wasted due to slipping.

The shoe made its debut at the Tokyo Marathon in February, where it was worn by Mr Kipsang. At the time, it was the only pair in existence and it helped him to win the race in a time of 2:03:58, the fastest ever in Japan.

Forward thinking

The timed Breaking2 attempt took place 63 years to the day since British runner Roger Bannister became the first person to run the mile in under four minutes. Many at the time felt this was an impossible target, but he showed it could be done and opened the door for generations of athletes to do the same. Brad Wilkins, director of next generation research at Nike, expects a similar outcome when the two-hour marathon is finally conquered. “We believe that once the barrier is broken we will see official times fall as learnings are applied to races and a huge mental barrier is removed,” he says.

Nike is confident the “ground-breaking innovation” that has been central to the project will eventually benefit all runners. Although the Zoom Vaporfly Elite worn during the attempt in May will not be sold to the public, two consumer versions will be released on June 8; the Nike Zoom Fly contains the ZoomX foam and a carbon-injected nylon plate, while the Nike Zoom Vaporfly 4% features both the foam and the carbon-fibre plate. For its part, adidas plans to make the Adizero Sub2 shoe, which it describes as “central to the future of adidas running”, available for purchase later this year.

Even though Nike missed out on its ultimate goal of being the first to go under two hours for the marathon, its vision extends far beyond this record. It believes the knowledge gained from the project “will inform generations of runners”.