

Technological advances in running shoes are as old as the industry itself. Decades before it became a **behemoth** across every major sport, Nike was born out of selling shoes to distance runners thirsting for faster times. It employed cutting-edge methods, which in 1971 meant co-founder Bill Bowerman creating a sole by pouring urethane into a waffle maker.

Over the next 50 years or so, shoe companies chased the next leap forward, helping to enhance human capability with small advances - many of them quickly copied by competitors - and scant controversy. Progress was both constant and celebrated.

In January 2016, Kenyan marathoner Eliud Kipchoge tested a new shoe that would come to be known as the Nike Zoom Vaporfly Elite. A straight line of progress, unbeknown to the track and field universe, was about to become jagged and complicated.

The Vaporfly series, and the Alphafly series it **begot**, broke barriers. It sparked controversy. It prompted a response in early February from track and field's governing body, months after Kipchoge wore a prototype pair of the Air Zoom Alphafly Next% as he became the first person to run a marathon in less than two hours. Nike calls Kipchoge "the essence of progress." His shoes, wrote South African sports scientist Ross Tucker, "disrupted the meaning of running."

When it comes to technology in sports equipment, where is the line drawn between hailed and harmful? Other sports have tried to answer the question for years. Swimming banned certain material from suits after records fell at alarming rates in 2008 and 2009. Golf is grappling with the effects of lightly regulated advances in balls and clubs. Cycling is constantly at war with itself over what two wheels should be able to accomplish.

Distance running was slow to realize it faced the same issue. The sport's powers failed to view the running shoe as a piece of equipment. They regulated shoes as if they were clothing instead of a racecar or a tennis racket or a pair of alpine skis. When they finally acted, it was like they were putting toothpaste back in the tube.

"If you wanted to put everybody on the same starting line, you can require people to run with their bare feet," said Damiano Zanotto, the head of the wearable robotic systems lab at Stevens Institute of Technology in Hoboken, New Jersey. "Which doesn't make any sense. There is not negative or bad technology. There is a need for regulation, and clear regulation."

World Athletics, the track and field governing body formerly known as IAAF, released regulations in early February aimed at curbing the effects of advanced technology. Critics, including rival shoe company executives, called it a compromise that came too late, catered too much to Nike, presented ineffective standards and provided more confusion than clarity months away from the 2020 Tokyo Olympics.

"I do think as a governing body, they need to start thinking about the shoe as the piece of equipment," said Shawn Hoy, Saucony's vice president of global product. "It's no different than a golfer's clubs or a tennis player's racket. There have to be parameters within which those products are created, otherwise there is an unfair advantage in the footwear."

"Having said that, there's nothing particularly fair about elite running. If you're a Nike runner, you've got advantages that a Saucony runner doesn't have. If you're a

Saucony runner, you've got advantages an unsponsored runner doesn't," Hoy continued. "If you can train at altitude in Kenya, that's a little different than being able to train in Providence, Rhode Island. I think the fairness conversation has also become kind of an unfortunate sidebar in this whole thing. ... But the genie is out of the bottle, and now we're trying to put it back in. It's just leading to a messy conversation."

The Vaporfly enhanced old ideas and used them in novel and refined harmony. It embedded a springy, carbon-fiber plate in the midsole, which Fila had done in the early 2000s. It used a new foamy substance Nike called ZoomX, which was an improvement on Adidas's Boost foam, first introduced in 2013. Nike made the sole extra thick, which plenty of companies - including, in the most extreme case, Hoka - had tried.

None of those advances kicked up any more trouble than loading rubber into a waffle maker. There was not one silver bullet that suggested the Vaporfly would turn running upside down, and in fact the notion that any shoe's advances could upset the sport was foreign.

"I only really became aware of these shoes in early 2019, more or less when the world at large became aware," said Tim Hutchings, an NBC Sports analyst who has been involved in elite marathon running for decades. "Even then, few had any idea of the seismic shift in runner times that they could produce."

The combination of those factors, and the way Nike integrated them, made them a game-changer. Research showed the shoes improved running economy by an average of 4 percent, a monumental total. Runners who used them could break records, and runners who didn't could not keep up. Rumors circulated of runners under contract with other companies running in unbranded Vaporfly shoes.

"The question ultimately becomes, is the deck stacked?" said Mark Conrad, the director of the sports business program at Fordham's Gabelli School of Business. "Does this make the deck stacked in terms of runners using this product achieving at an unfair level? If it does, it clearly would be unethical unless everybody has access to it."

What makes the Vaporfly series unique, some say, is that the technology could be troubling even if everyone does have access to it. In an exhaustive blog post published Thursday, Tucker argued, with studies to back him up, that even if every runner has access to the Vaporfly technology, or something similar in another brand, it would still create an unbalanced playing field.

Some runners, according to studies Tucker cited, respond to the shoes' technology more effectively in terms of running efficiency, and those who respond well have a massive advantage over those who do not. The advantage is so stark, Tucker wrote, that runners who do not respond to the shoe well would be winnowed from competitive running at an early age.

"When the difference made by technology is larger than the normal difference between athletes, then the integrity of the result is changed," Tucker wrote.

Danny Orr, New Balance's general manager for performance, said Nike could have been more transparent with the IAAF as it developed the Vaporfly. But he joined other experts in putting the onus on the sport's governing body to create parameters for companies to innovate within.

"Very early on, we saw results that were unprecedented with that product, and we felt like at that time the world governing body probably had the opportunity to act," Orr said. "The fact that they didn't since 2016 is what's put us in the position today."

Last October, in a non-sanctioned exhibition in Vienna, Kipchoge became the

first person to run a marathon in less than two hours. He wore the Next%, an evolutionary, extra-chunky version of the Vaporfly. (The next day, Brigid Kosgei shattered a 16-year-old women's record by 1 minute, 21 seconds in the Next%.) The Guardian reported that the Next% could boost a runner's efficiency by 7 to 8 percent. Kipchoge broke the mark on a closed course with the help of pacers, runners there solely to push him along. Still, much of the resulting **discourse** focused on his shoes.

"I don't know if we'd be having this conversation if not for the Kipchoge sub-two-hour marathon," Hoy said. "There's just been so much attention brought to the shoe in the performance of the runner. That shined a big light on this."

While rivals have largely caught up to the technologies in the Vaporfly, the Alphafly represented a new frontier. The components are **proprietary**, which led to guesses about multiple plates in the midsole and the role of a gaudy airpod **affixed** under the sole.

On January 31, World Athletics acted in a way that left few satisfied. It ruled that shoes worn in competition must be "readily available" for four months and not a prototype. For distance running shoes, it placed a ban on soles thicker than 40 millimeters and the use of more than one plate.

"It is not our job to regulate the entire sports shoe market but it is our duty to preserve the integrity of elite competition by ensuring that the shoes worn by elite athletes in competition do not offer any unfair assistance or advantage," World Athletics President Sebastian Coe said in a statement. "As we enter the Olympic year, we don't believe we can rule out shoes that have been generally available for a considerable period of time, but we can draw a line by prohibiting the use of shoes that go further than what is currently on the market while we investigate further."

Experts viewed the changes as insufficient. Conrad called it a "partial ban of future technology." Zanotto said there are reliable, rigorous ways to test how much energy a shoe can store and recover. Regulations should be based on those, he said, and not simple measurements.

"I don't think fixing the maximum thickness of a shoe would solve the issue," Zanotto said. "With the new simulation capabilities that we have, you have to be more specific than that in order to really make sure the performance of the shoe is uniform. Setting those basic geometrical constraints, it's not enough."

From a practical standpoint, shoe companies were upset by the new regulations pertaining to prototypes. Hoy said there was no clear definition of "readily available." Orr said New Balance had planned to release some shoes after the Olympics, and now it will rush them to retail by April to ensure its athletes can use them, upending sales and marketing plans.

"Our biggest concern is, nobody picked up the phone and asked us what we thought or included us in the decision-making process," Orr said. "That's not just us. It's the rest of the sporting goods companies, except maybe one."

Orr didn't say it, but that one company is Nike. Last week, Nike offered a limited release of the Air Zoom Alphafly Next% to the public. It was legal by World Athletics' new regulations and had a 39.5-millimeter sole. "There were a lot of whispers" that World Athletics consulted Nike before they released their regulations, Orr said. (In a statement to the Guardian, World Athletics denied doing so.)

"What we haven't got from World Athletics is any indication that those decisions were based on science," Orr said. "They seemed to be based on a competitive product that meets those numbers exactly, and that's how decisions were made versus

something that was truly science-based."

Nike's central role in the saga has amplified the issues surrounding new technology.

"To be honest, had we done it and (Saucony runner) Jared Ward run a sub-2-hour marathon, I don't know - I don't think we'd be having this conversation," said Hoy, who used to work for Nike. "There is part of this which is, Nike is big. They've got an enormous stable of runners. And therefore it feels unfair. I don't **subscribe** to that. I don't think you get to compete and then, if you don't like the outcome, you say, 'That just wasn't fair.' That's not how competition works."

It will likely be a matter of time before the next leap forward, before the next controversial shoe stirs a similar conversation. How innovation affects competition is what matters to fans, but what keeps the competition afloat is a running shoe industry that needs to sell the next great idea. Innovation, in some eyes, may **muddle** competition. It is also what keeps the industry alive, and therefore is it both necessary and inevitable.

"I don't believe the gap between what Nike has created in this space vs. what we are capable of creating is significant," Hoy said. "My hope is the Olympics, four years from now, maybe it's us that are in the middle about a conversation about what an incredible product we made and how it made runners better. That's what keeps you moving forward."

## Questions

1. Read the following paragraph from the article. "Some runners, according to studies Tucker cited, respond to the shoes' technology more effectively in terms of running efficiency, and those who respond well have a massive advantage over those who do not. The advantage is so stark, Tucker wrote, that runners who do not respond to the shoe well would be winnowed from competitive running at an early age." Which of the following can be inferred from this paragraph?
  - a) The Vaporfly enhances the running efficiency of young athletes much more than that of older runners.
  - b) Runners sponsored by companies other than Nike often compete in unbranded Vaporfly shoes.
  - c) Runners who already wear Vaporfly shoes struggle to improve their times in elite competitions.
  - d) The Vaporfly's features are especially well suited to runners with specific body mechanics or physiology.
2. Read the following statement. "The response of World Athletics, running's governing body, to disruptive developments in shoe technology has not pleased many shoe manufacturers." Which selection from the article BEST supports the statement above?
  - a) The sport's powers failed to view the running shoe as a piece of equipment. They regulated shoes as if they were clothing instead of a racecar or a tennis racket or a pair of alpine skis.
  - b) Critics, including rival shoe company executives, called it a compromise that came too late, catered too much to Nike, presented ineffective standards and provided more confusion than clarity months away from the 2020 Tokyo Olympics.
  - c) Last October, in a non-sanctioned exhibition in Vienna, Kipchoge became the first person to run a marathon in less than two hours. He wore the Next%, an evolutionary, extra-chunky version of the Vaporfly.
  - d) "With the new simulation capabilities that we have, you have to be more specific than that in order to really make sure the performance of the shoe is uniform. Setting those basic geometrical constraints, it's not enough."
3. Which piece of evidence from the article MOST appeals to the reader's sense of logic?
  - a) Golf is grappling with the effects of lightly regulated advances in balls and clubs. Cycling is constantly at war with itself over what two wheels should be able to accomplish.
  - b) There was not one silver bullet that suggested the Vaporfly would turn running upside down, and in fact the notion that any shoe's advances could upset the sport was foreign.
  - c) Zanotto said there are reliable, rigorous ways to test how much energy a shoe can store and recover. Regulations should be based on those, he said, and not simple measurements.
  - d) Last week, Nike offered a limited release of the Air Zoom Alphafly Next% to the public. It was legal by World Athletics' new regulations and had a 39.5-millimeter sole.
4. What purpose is the author attempting to convey by including the following quote? "What we haven't got from World Athletics is any indication that those decisions were based on science," Orr said. "They seemed to be based on a competitive product that meets those numbers exactly, and that's how decisions were made versus something that was truly science-based."
  - a) to show that some industry insiders suspect World Athletics' new regulations are intended to give an advantage to one company
  - b) to show that many experts fail to understand how World Athletics decided on its newly issued rules for competition running shoes
  - c) to illustrate the difficulty of setting rules for competitive running footwear when companies are constantly innovating
  - d) to illustrate the effects of the new rules about competitive running footwear on athletes' preparations for the 2020 Olympics in Tokyo