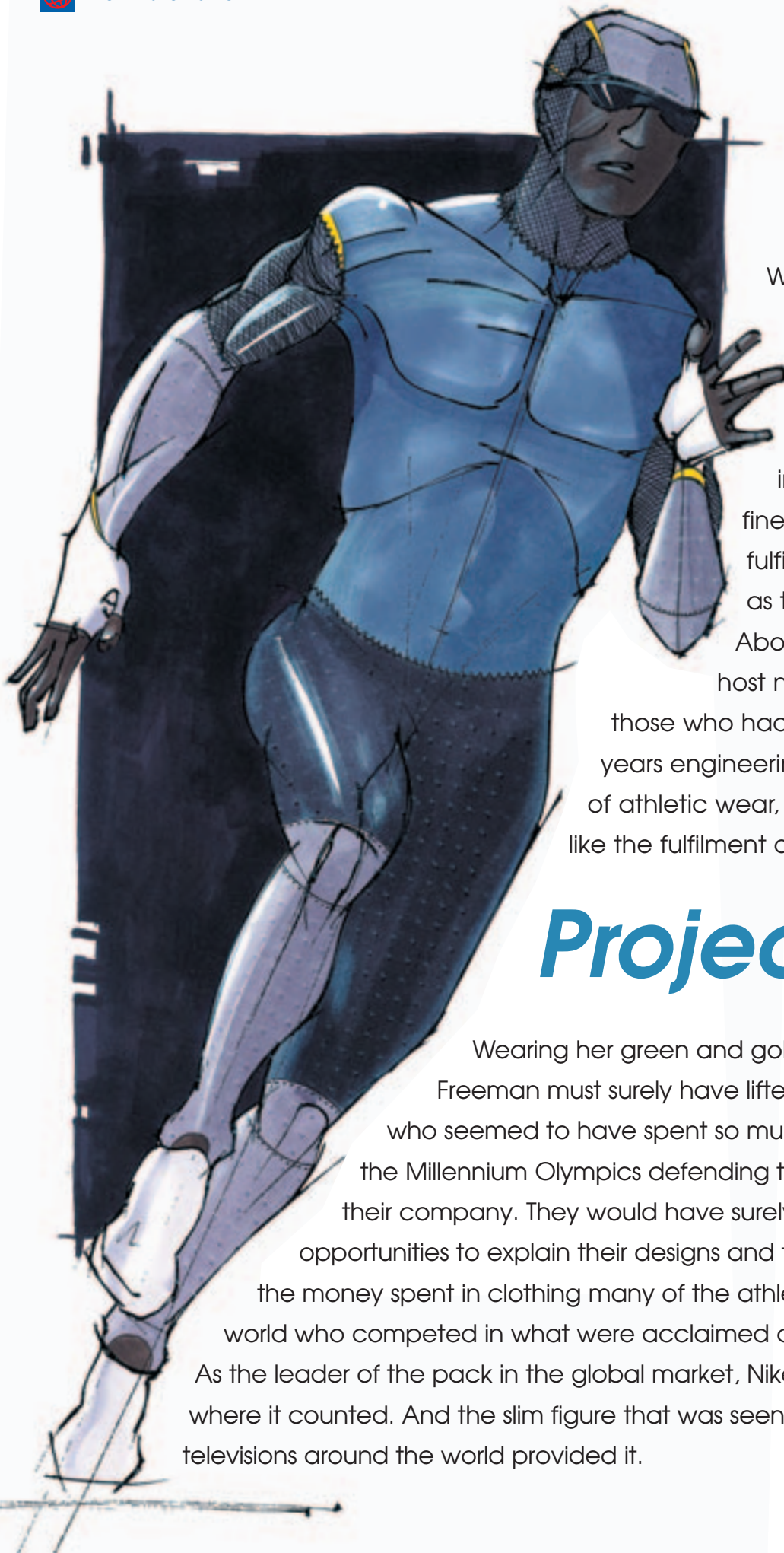




When Kathy Freeman won her gold medal in Sydney at the 2000 Olympics, the world was overjoyed at the image of Australia's finest woman athlete fulfilling her dreams, as well as those of Australia's Aboriginal people and the host nation as a whole. For those who had spent more than two years engineering the most streamlined of athletic wear, it must have seemed like the fulfilment of their dreams too.

Project swift

Wearing her green and gold Swift Suit, Kathy Freeman must surely have lifted the spirits of all at Nike who seemed to have spent so much time in the run-up to the Millennium Olympics defending the ethical policies of their company. They would have surely preferred more media opportunities to explain their designs and technologies as well as the money spent in clothing many of the athletes from all over the world who competed in what were acclaimed as the finest Games ever. As the leader of the pack in the global market, Nike needed success where it counted. And the slim figure that was seen on countless millions of televisions around the world provided it.



The Nike study in aerodynamics was as intense as that of any car designer trying to reduce the last ounce of drag. Analysis showed that the propensity of modern athletes to adorn themselves with jewellery and necklaces had an aerodynamic cost, especially as an athlete's hands may

travel at speeds up to 55 m.p.h., and a clumsy bracelet with it. Numbers which were safety-pinned on to running strips were also not desirable. Even the numbers could slow down a runner. Exposed skin was not very aerodynamic either, certainly not as aerodynamic as certain textiles. The same applied to the athlete's hair.

With feet travelling at similar speeds to hands, laces in the shoes were not desirable. Undergarments which were not part of the apparel system also caused problems, as did creases. And holes and body contours could create turbulence and slow down the runner.

To the casual observer, this study in aerodynamics could seem very esoteric but when records are measured in 100ths of a second and the distance between winner and runner-up often requires careful study of photo-finish images, any improvement in getting the athlete that fraction of a second faster to the

winning tape must be seen as crucial. And desirable.

Studying material on which Nike based its analytical work, one is left with the impression that the designers were influenced by Captain Marvel and his various colleagues from the mid-20th century: it is as if the cartoonists of futuristic cartoon strip themes actually were excellent conceptualists and it has taken the sports activewear industry some while to catch up (or look back for inspiration). One is left wondering what the track athletes at the 2004 Olympics in Greece will look like - the cartoonists of today do not seem to have made too many advances on their predecessors. August is the month chosen for the next Games, when Athens usually bakes in temperatures that make Sydney seem positively wet and arctic, so perhaps the technologists will have found ways of incorporating nano size air-conditioning units in the fibres. (Flexible fabrics with the capacity to supply heat are already available, so why not?)

Finding the answers to all the problems of streamlining happily resulted in the emotionally super-charged image of Ms Freeman crossing the winning line.

It was a matter of seconds before she peeled back the hood of the Swift Suit.

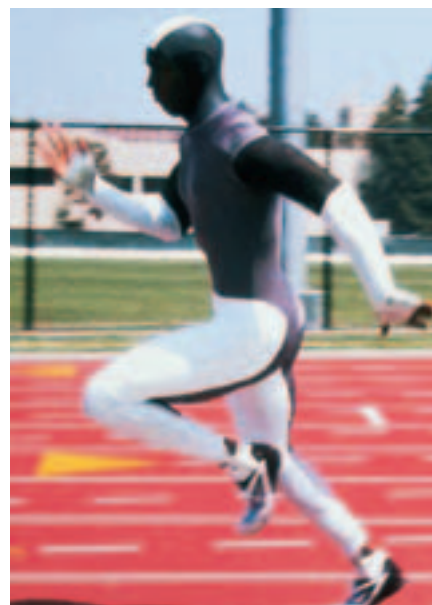
The details of the design

The hood covered the hair to reduce drag without reducing the athlete's ability to hear what was going on around the track. The mesh portion of the hood was lined to prevent hair from protruding, which would otherwise have affected the fabric's surface roughness and therefore its aerodynamic properties. Eyewear, when worn, was placed through the mesh hood, providing sufficient security to keep the glasses in place but stopping the hood from billowing out like a parachute.

Where possible, seams were moved far back on the garment, while seams in the front of the garment were kept low profile and were positioned with the direction of the airflow in mind. Appropriate textiles were used for different parts of the body so that, depending upon movement, the total suit worked as a harmonious whole, moving through the air with similar streamlining.

The fabrics covering the limbs were cut at their angles of maximum velocity, designed to reduce creasing and consequently drag. Zips were invisible, hands were covered in a low friction coated textile appropriate to their high velocity and small size, while graphics were screen printed at the back.

And, overall, a tight fit was achieved to improve proprioception - the body's ability to sense changes in the position and physical





Biomechanic research revealed the optimum spike placement for the five spikes Michael Johnson needed for optimum traction in the 200-metres race (far left). For the 400-metres event, he had expressed the desire to 'feel barefoot'. In a race where traction is still important but sustainable ground speed is key, the company developed a paper thin sole plate (left) bringing the runner closer to the ground. The plate uses glass-reinforced plastic.

tension in a muscle. For good measure, aspects of thermoregulation were put into the equation, with heat being retained in specific areas by comparison with others which vented heat. The dense elastic laminate used on the upper leg offered heat retention and support whilst being breathable and aerodynamic. The rear leg area in the garment was dense and light weight for heat retention and flexibility.

"We spent a lot of time studying the aerodynamics of the human form in motion," states senior designer Eddy Harber who was responsible for the Swift Suit. "To get the answers we need, we combine physics and aerodynamics - and even consider the meteorological conditions in which the athletes are to perform." Harber and apparel designer Rick MacDonald also worked with two leading aerodynamicists, Chester Kyle and Len Brownlie. They conducted wind tunnel tests to lead them to the best combination of streamlining and comfort for the athletes.

Running on a plate

The Swift Suit was not the only performance enhancing area which Nike Sports Research Lab considered. Sprint shoes also came in for restructuring. (The research facility has a staff of more than 40 engineers and research scientists, including partners in the US, Asia and Europe. It has a comprehensive array of computer-based measurement systems that provide propulsion, drag, weight distribution and energy transfer data on specific parts of the body.)

The Lab spent about two years studying the running styles of Michael Johnson, Maurice

Greene and Marion Jones, three of the US's top athletes. A six-camera system that records 240 frames a second was used as well as a force platform, a high accuracy scale that can gather 2,000 pieces of information a second on forces generated by a human foot in the vertical and horizontal directions. It also records the twisting movement about the vertical axis. As if that was not enough to work with, the lab uses a pedar system, a pressure-mapping system that records 99 data points of the foot. Not surprisingly, each athlete had his or her own running style which resulted in three distinctly different sole plates on their sprint shoes. Given the criticism the company has received in recent months about athletes in various sports using Nike merchandise which is not available to the general public, the company is quite clear about its policy. It works one-on-one with athletes at all levels of competition to develop a shoe that will improve their overall performance. In some cases, those shoes are used only by the individual athlete. In other cases, the product is also produced for the consumer, exactly as it is provided to the top athlete for whom it was developed or with minor modifications.

It is worth noting that Michael Johnson had two different sole plates developed, one for 200 metre race, the other for 400 metres; Maurice Green had different plates for the 100 and the 200 metre races; such are the subtleties of research.

Nevertheless, despite all the textile, clothing manufacturing and footwear technology, you still had to be a superb athlete to win gold. 🏆

David Buirski