

# NASA Know-How Helps Athletes Rocket Through Water

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When a swimsuit manufacturer wanted to create a better fabric for competitive swimmers, it sought out some unlikely experts -- aerospace engineers at NASA's Langley Research Center in Hampton.

NASA has decades of experience in fluid dynamics and drag reduction. However, aerospace engineers usually concentrate on the element through which airplanes and spacecraft fly, not the liquid through which swimmers travel. Still, some of the science is similar.

"Air and water are both what are referred to as Newtonian fluids," said Steve Wilkinson, a researcher at Langley's Fluid Physics and Control Branch. "Air has different fluid properties than water, including lower density and viscosity, but it still obeys the same physical laws of motion."

That fact led Warnaco Inc. of New York, the U.S. licensee of the Speedo swimwear brand, to seek use of a NASA wind tunnel at Langley to test swimsuit fabrics that may be used by athletes in international competitions.

"We evaluated the surface roughness effects of nearly 60 fabrics or patterns in our small low-speed tunnel, which is perfect for this purpose," Wilkinson said. "We were assessing which fabrics and weaves had the lowest drag."

Reducing drag helps planes fly more efficiently, and reducing drag helps

swimmers go faster. Studies indicate viscous drag, or skin friction, is about one-third of the total restraining force on a swimmer. Wind tunnel tests measure the drag on the surface of the fabrics.

Wilkinson and other NASA researchers usually spend their time studying drag reduction for airplanes. They even have worked on drag reduction technology for boats, including an America's Cup winner in the 1980s. This expertise is one reason Speedo chose to work with NASA.

"This is the first time I've tested a fabric and there were some challenges involved," said Wilkinson. "I think we've done a really good job with the help of Speedo in coming up with a protocol that enables us to test these fabrics with ease and precision."

The materials tested come in the form of tubes. Wilkinson stretches the tubes over a smooth, flat aluminum plate and then secures the edges with smooth metal rails and tape to form a precise rectangular model shape. Wilkinson runs the material through a number of wind speeds and, with the help of sensors, measures drag on the surface. Under a reimbursable agreement, NASA turns the wind tunnel data over to Speedo for their use.

"It turns out to simulate a swimmer in the water at about two meters per second, we need to run the wind tunnel at about 28 meters per second, which is well within its capability," Wilkinson added. "The tests generally have shown the smoother the fabric, the lower the drag."

Speedo International's research and development team, Aqualab, took those results and used them to help create a new swimsuit the company says is its most hydro-dynamically advanced to date.

Source: NASA

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