

Rocketing Through Water

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The new swimsuits were unveiled in New York. Credit: NASA/Kathy Barnstorff

Swimmers around the world are breaking records this year like never before, including at this week's U.S. Olympic trials. Some attribute it to extensive training as athletes prepare to compete at this summer's games in Beijing. Others say one factor may be a new swimsuit ... a space-age swimsuit made of fabric tested at NASA.

"When I hit the water, I feel like a rocket," said world champion swimmer Michael Phelps about the Speedo LZR Racer suit. Phelps, who won six gold medals and two bronze at the last Summer Olympics in Australia, helped develop the much-talked swimwear. He and others who have worn the skintight body suit have already set 40 of 44 world records since the LZR Racer debuted in February.

NASA researcher Steve Wilkinson also had a hand in the swimsuit's

development. The aerospace engineer at NASA's Langley Research Center in Hampton, Va., admits he doesn't know much about swimming or swimwear.

"Most of the work we do in my branch is internal NASA work ... fundamental research in laminar and turbulent boundary layer physics," said Wilkinson.

One area Wilkinson focuses on is drag reduction ... how to make something propel through air or water faster and more efficiently. That was Wilkinson's task for Speedo ... to test swimsuit material for drag.

"We evaluated the surface roughness effects of nearly 60 fabrics or patterns in one of our small low speed wind tunnels," said Wilkinson. "We were assessing which fabrics and weaves had the lowest drag. The tests have generally shown the smoother the fabric, the lower the drag."

But how can you test a material that's supposed to be used in water in a wind tunnel that uses air? It turns out that air and water obey the same physical laws of motion, so a wind tunnel can simulate similar drag a fabric would experience in water. Testing in air is also less expensive, simpler and offers more testing options than testing in water.

Warnaco Inc., which is the U.S. licensee of the Speedo swimwear brand, approached NASA Langley to test fabric samples, since NASA Langley has researched drag reduction for aircraft and even boats for decades.

Just like reducing drag helps planes fly more efficiently, reducing drag helps swimmers go faster. Studies indicate viscous drag or skin friction is almost one-third of the total restraining force on a swimmer. Wind tunnel tests measure the drag on the surface of the fabrics.

"This is the first time I've tested a fabric and there were some challenges

involved," said researcher Wilkinson. "It was a challenge to figure out how to get the fabric on a test plate and how to prepare the edges so nothing would interfere with air flow over the fabric. I think we've done a really good job with the help of Speedo coming up with a protocol that lets us to test these fabrics with ease and precision."

The candidate materials Wilkinson receives from the company come in the form of tubes. He stretches the tubes over a smooth, flat aluminum plate, then tapes down the edges. The plate goes into the small wind tunnel test section. With a flip of a switch, air flows over it. Wilkinson runs the tunnel through a number of wind speeds and, with the help of sensors, measures drag on the surface. He records the data and then sends it on to Speedo researchers.

The engineer says his research has given him a whole new perspective on swimming and as a result he'll view the Olympics differently this year. "As I watch, I'm going to be wondering if he or she was wearing a fabric that I tested in this wind tunnel," said Wilkinson. "I'm also going to be paying very close attention to the time."

Source: by Kathy Barnstorff, NASA Langley Research Center

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