The New York Times
nytimes.com

March 22, 2004

PATENTS

For Speed in Swimsuits, Add Bumps

By TERESA RIORDAN

EARLIER this month at Pressure, a Manhattan nightclub, buff Olympic swimming hopefuls - including 18-year-old Michael Phelps, who won four gold medals at last year's World Championship - struck superhero poses to show off Speedo's latest line of full-body competitive swimsuits, called Fastskin FSII.

Speedo's multimillion-dollar media campaign may have attracted attention on the "Today" show and the BBC. But will Speedo's Fastskin FSII really be the fastest suit in the water at this summer's Olympic games?

The inventors of a new swimsuit made by Tyr, the second-largest competitive swimsuit maker, beg to differ. Tyr claims that its patent-pending suit will trim more than twice as much off a swimmer's race time as the Speedo suit.

Swimmers generally try to reduce frictional drag by shaving the hair off their body or by donning ultrasmooth suits. Because water is so dense, swimmers expend more than 90 percent of their energy just trying to overcome fluid resistance. Thus, the more they can reduce drag, the more efficient swimmers can be.

According to David Pendergast, a research physiologist at the University of Buffalo and one of the inventors of the Tyr suit, the approach is, at least on the surface, counterintuitive: that a swimmer's time can be improved by increasing rather than

decreasing friction. This friction comes in the form of fabric piping that forms strategically placed ridges on various parts of the suit.

"Most swimsuits have tried to reduce frictional drag," Professor Pendergast said. "But with this suit we took a completely different approach."

It is a new approach for swimsuits but not for skiing: In 1994, Spyder skiwear founder Dave Jacobs designed a downhill skiing suit with similar raised piping. The ski suit was banned before the 1998 Nagano Olympics because it was perceived to give an unfair advantage. By contrast, the Tyr suit has been approved for swimming competition by the International Swimming Federation.

More than 35 years after James Counsilman - who is known as Doc and was the coach of Mark Spitz, who won seven gold medals in the 1972 Olympics - proposed a revolutionary theory in his book "The Science of Swimming," there is still no strong consensus on the physics of swimming.

According to Professor Pendergast, who along with his co-inventors has written a paper on swimsuit research that will be published in the April issue of Journal of Medicine, Science, Sports & Exercise, a swimmer faces three main types of resistance: frictional drag, form drag, and wave drag.

Frictional drag - the drag caused by molecules brushing against the body - is the one swimsuit designers tend to focus on but is actually by far the least significant, according to Professor Pendergast and co-inventor Joseph Mollendorf, a professor of mechanical and aerospace engineering at the University of Buffalo. Far more crucial are form drag, which is the resistance caused by the shape of the body, and wave drag, which is essentially the wake that the swimmer himself creates and must swim through.

Tethering members at the University of Buffalo swim team to what Professor Pendergast called a human centrifuge, the

researchers tested 20 different swimsuit designs by propelling swimmers around a special doughnut-shaped pool at the University of Buffalo. The increase in frictional drag actually caused a drop in other types of drag, Professor Pendergast said.

"The increased frictional drag makes the water flow more closely next to the body, so there is less water resistance and the swimmer has to spend less energy," Professor Pendergast said.

Susan Yecies, a public relations consultant for Tyr, said the company was not planning a splashy media campaign and instead focusing on direct-mail and promotions specific to competitive swimmers. But Tyr does have its own lineup of celebrity swimmers, including Yana Klochkova, who was a gold medal winner in the 2000 Olympics.

Barry Bixler, an engineer who was hired by Speedo to do computational fluid dynamic analyses of its suit, said that it was designed to reduce all kinds of drag, not just frictional drag, and that the seams in the suit as well as small rubber protrusions along the chest had the same effect as the ridges in the Tyr suit.

Professor Pendergast seemed surprised to hear that the Speedo suit reduced anything more than frictional drag. "I would like to see his data," he said of Mr. Bixler's analysis. "If this is something Speedo measured, it seems like he would have mentioned it before."

Given that the influence of a suit's design on a swimmer's time can not be precisely measured, is the effectiveness of a suit contingent most of all on what the swimmer wearing the suit believes it will do for him?

"The psychological aspects of any sport," Mr. Bixler acknowledges, "are almost as important as the physical ones."