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SPEED RAC

The laws of physics help stock-car racer Annabeth Barnes take first place

When she turned 16 last year, Annabeth Barnes got her driver's license. But unlike most kids, Annabeth has been driving since she was 7—and at speeds that would leave many adult drivers in the dust.

Annabeth started out racing go-karts. These are not your average backyard toys, but souped-up

machines that zip around a racetrack at speeds up to 145 kilometers (90 miles) per hour. Many top NASCAR drivers, including Jeff Gordon, Danica Patrick, and Jamie McMurray, got their start kart racing.

Annabeth was featured in the documentary *Racing Dreams* when she was 11. After that, she went on to win several karting championships before moving to stock-car racing. But karting is where she learned to understand the forces that can keep you on track—or spin you out of control.

GET A GRIP

The key to a fast lap is physics. “Race car drivers understand physics really, really well,” says Diandra

Leslie-Pelecky, a physicist at West Virginia University and author of *The Physics of NASCAR*. “They don’t use the same words I use, but they have a gut-level understanding of, ‘If I do this, then that will happen.’”

That understanding helps Annabeth find the quickest path to the finish line. “Obviously, the shortest way around the track is just to stay close to the inside,” she says. “But that’s not the fastest way.” Why not?

Inertia—an object’s tendency to resist change in its motion—makes a kart barreling down a straightaway continue to go straight. When the tires turn to round a corner, *centripetal force* pulls the kart toward the center of the track. But because the

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EXTREME GO-KARTS: Kids from 5 to 16 years old can compete in kart racing.

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kart tries to keep going straight, its weight shifts to the outside during a turn. This makes the inside tires lose some grip and the outside tires gain more grip. That can send the kart sliding across the track. If the driver takes the turn too fast, the car could even flip.

To balance these forces, drivers try to turn at the angle that allows them to travel the fastest without losing control.

"It's like *The Price Is Right*—you want to get as close as possible without going over," says Leslie-Pelecky. "And the penalty for going over is you hit the wall."

THE ART OF THE DRAFT

Understanding *aerodynamics* can mean the difference between



TRACK STAR: Now 16, Annabeth has moved from kart racing to stock-car racing.



SOUTHERN ROOTS: Annabeth lives in Hiddenite, North Carolina.

winning and losing. "When you swim you have to push water molecules out of your way," says Leslie-Pelecky. "When you drive a car, the car has to push air molecules out of the way." As the air molecules hit the front of a speeding vehicle, they create drag, which slows the car down.

Annabeth uses this principle of physics to her advantage by *drafting*—driving behind a friend

whose kart is blazing a trail through the air. This allows Annabeth to go faster. She also knows she can slow competitors by placing her car in just the right position to ruin their smooth air flow. "If you master the art of the draft," she says, "then you can do anything."

Now that she's racing stock cars, like those in NASCAR, Annabeth deals with the same forces but with a much bigger vehicle. When someone says racing just means driving around in circles, she tells them, "Take my car out for 20 laps and come back in. I guarantee you're going to have so much more respect for it." ❁

—Jacqueline Adams

WHAT DO YOU THINK?

Explain in your own words how Annabeth uses physics principles to beat the competition. Cite two examples from the article.