

Art of draft

We call it slipstreaming, the Americans drafting, and it's not just about the air. Andrew Charman blows his way around the ovals.

SLIPSTREAMING has been an essential part of the racing driver's skill kit for many years. Granted when the first speedways such as Brooklands were created in the early 1900s, car builders considered engine size more important than any other factor, and drivers were far too busy hanging on to their ten0-litre-plus monsters around the

anything-but-smooth banking to consider trying to use airflow to help them pass rivals. But with the rise of the F1 World Championship in the 1950s and '60s designers and drivers alike came to understand airflow better, soon learning the advantages of running close behind a rival and letting the car ahead do all the hard work of cleaving a path through the air, especially down the long straights

that were a feature of circuits then.

Since then, aerodynamic technology on race cars has exploded, and today's cars use as much of the air running underneath as that going over the aerofoils. Meanwhile, concerns for safety have seen long, fast straights broken up by chicanes. Today's tracks are tighter, less about outright speed and more about technique, and while



When cars run so close, the action gets hot - four-wide NASCAR at Talladega as drivers try to 'hang out to dry' their rivals.

slipstreaming is still an essential element of F1, engine power is counting for more again.

Except, that is, in one country. In America slipstreaming remains king, except that they call it drafting. American motorsport is very different to what we're used to over here. In the USA the oval rules over the road track. Every town of any note has its own oval, varying from quarter-mile dirt tracks right up to 2.5-mile superspeedways. On such big tracks drafting rules, and they have taken the skill to new levels. All three major formulae in America, ChampCar, Indy Racing League (IRL) and NASCAR, have at some time raced on the fast ovals, although these days ChampCar is becoming a road-course dominated series. Some excellent drafting is seen in

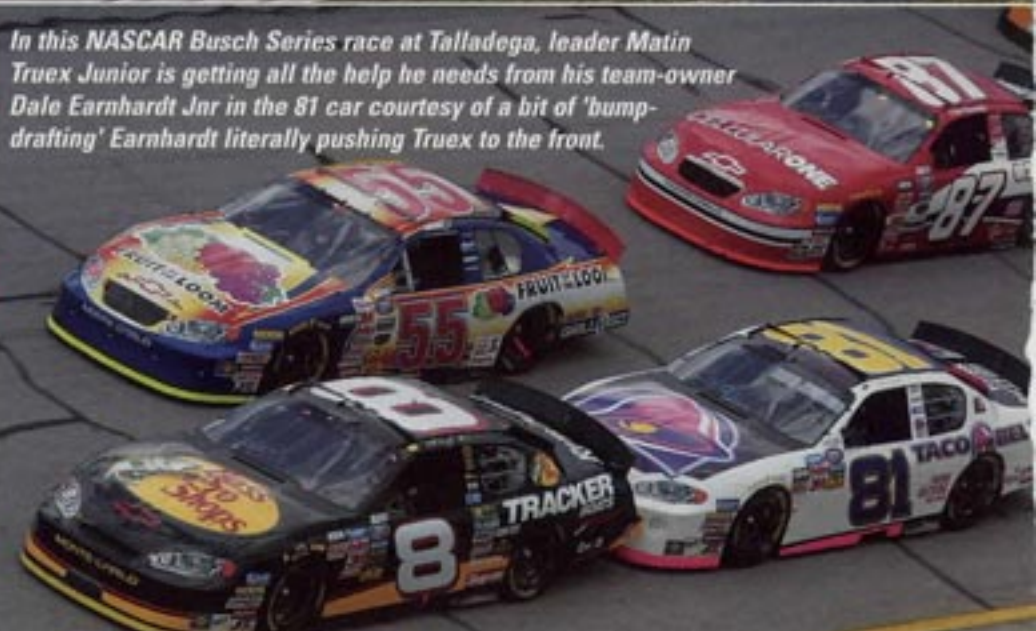
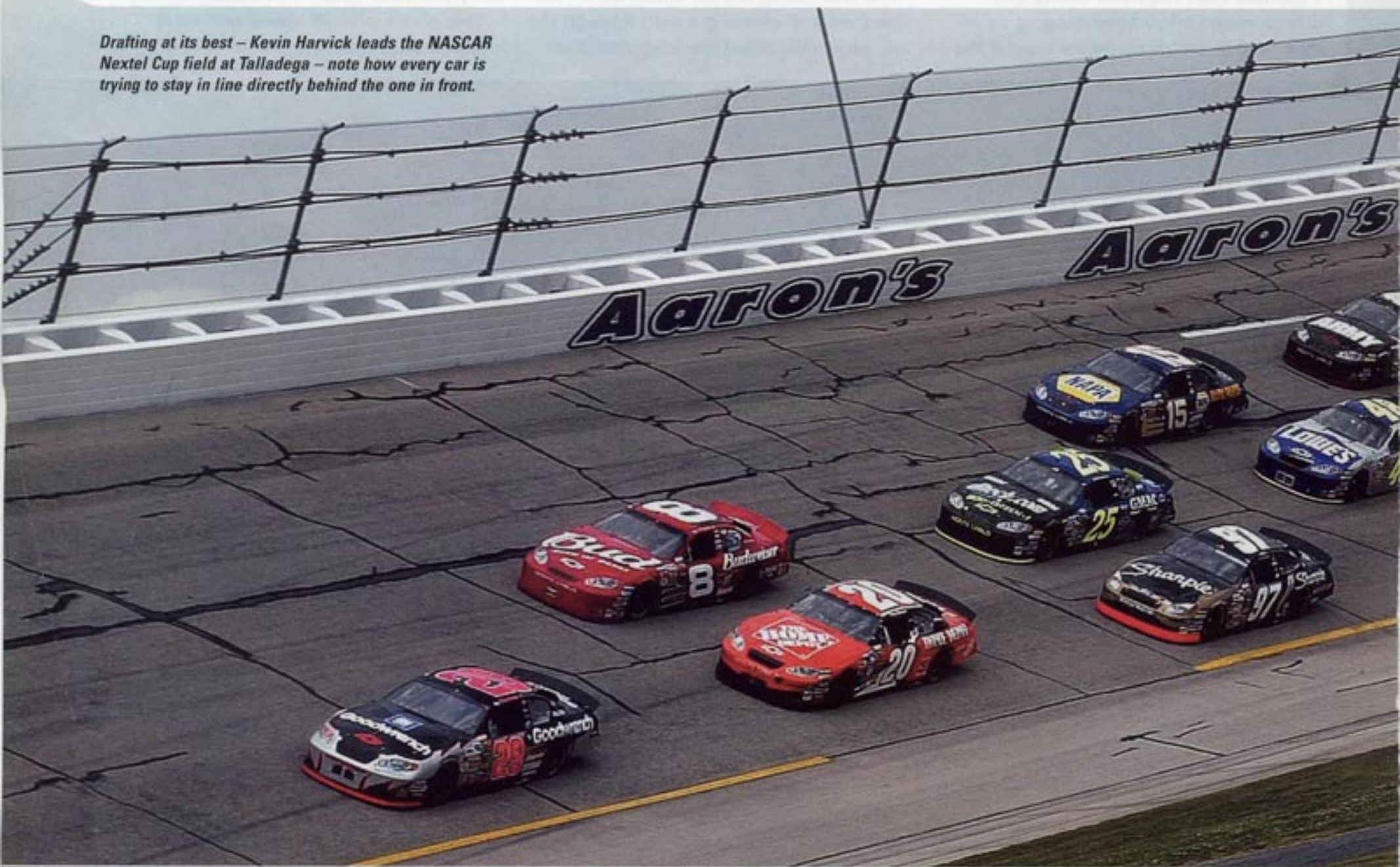
the IRL, on tracks such as Texas Speedway where packs of single-seaters jink past each other several times every lap and races are won by hundredths of a second. But to see drafting at its finest, performed by the real experts, you need to go and watch NASCAR.

Fine, but what exactly is drafting? Well basically it's the science of making airflow work better for two or more cars than it will for a single one. As our diagram shows, when a race car runs at high speed (usually around an oval) it punches a hole through the air, which flows over the car creating an area of vacuum or 'draft', directly behind it. If another car latches onto the tail of the first one, that vacuum allows it to run that vital bit faster, while the smoothed-out airflow over the length of the two

cars also increases the speed of the leading one. Add more cars and the effect is increased, allowing the entire train to pull past those unlucky rivals that are running without a drafting partner.

Drafting works at all but the smallest ovals but it really comes into its own at the faster speedways, above two miles in length. At every NASCAR venue teams are constantly looking for more downforce, to stick their cars more firmly to the track, and will normally tolerate the increased drag that adding downforce creates. But all that changes at Daytona and Talladega, the 2.5-mile speedways known as 'restrictor plate' tracks. Some years ago NASCAR's rule-makers became worried at the speeds being reached at these tracks – driving either of them requires keeping the right

Drafting at its best – Kevin Harvick leads the NASCAR Nextel Cup field at Talladega – note how every car is trying to stay in line directly behind the one in front.



In this NASCAR Busch Series race at Talladega, leader Martin Truex Junior is getting all the help he needs from his team-owner Dale Earnhardt Jr in the 81 car courtesy of a bit of 'bump-drafting' Earnhardt literally pushing Truex to the front.

hand-pedal flat, never lifting except when you pit for fuel. The solution was to insert metal plates in the top of the cars' carburetors, the smaller holes in the plates restricting the air that the carb received. But adding them had a the side-effect – every car ran at exactly the same speed, at which point drafting became very important indeed.

Today races at Talladega and Daytona are comparable to games of chess. From the moment the green flag falls the 43-car field will immediately shift into either two or three long lines, cars inches apart at 190mph-plus as they draft the one in front. Having a drafting partner is essential to success, and rival teams will even do mid-race deals to ensure they get to the front when they need to. Lose the draft and the effect is dramatic. A car

can go from 1st to 20th or less in half a lap if it slips out of the line and doesn't get let back in – commentators call this "being hung out to dry".

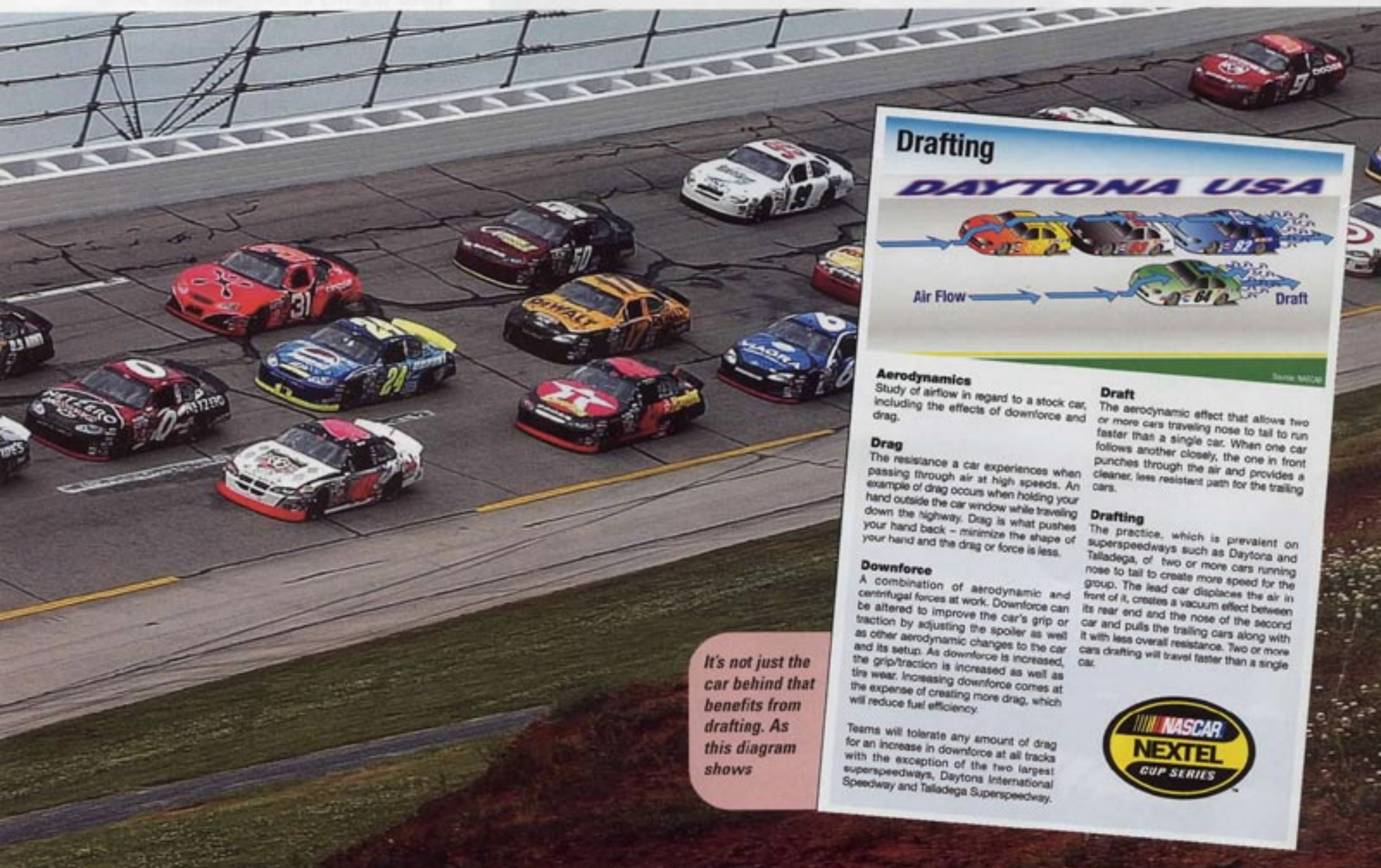
How close does drafting get? As close as is possible. First-time viewers will often gasp in horror as cars in the draft appear to run into the rear fender of the one in front, but the driver of the leading car won't be complaining, he'll want the attention. Because the air displaced by the leading car of a draft line makes those behind run faster, they can actually physically shove the leader to the front of the field. It's called 'bump-drafting' and the drivers are not afraid to do it. "That's restrictor-plate racing," says Home Depot Chevrolet driver Tony Stewart. "There are only a few opportunities to get ahead, so you have to push people around to make

lanes; bump-drafting is the only way to shake things up."

Jimmie Johnson, a leading contender for this year's NASCAR Nextel Cup title, says that the rise of bump-drafting has required some changes to the cars. "In the past you were afraid to really damage your cars or take that risk," he says. "Now you have guys that are a little bit more aggressive on the plate tracks, and we've literally had to build these huge steel-reinforced bumpers, put a steel plate in to keep the shape of the nose so you can blast people like we have been.

So is bump-drafting akin to a love-tap on the car ahead's fender? Not according to Johnson; "We're hitting each other so hard you'd set off an air bag in a passenger car."

Drafting doesn't only work when cars



It's not just the car behind that benefits from drafting. As this diagram shows

Drafting

DAYTONA USA



Aerodynamics

Study of airflow in regard to a stock car, including the effects of downforce and drag.

Drag

The resistance a car experiences when passing through air at high speeds. An example of drag occurs when holding your hand outside the car window while traveling down the highway. Drag is what pushes your hand back – minimize the shape of your hand and the drag or force is less.

Downforce

A combination of aerodynamic and centrifugal forces at work. Downforce can be altered to improve the car's grip or traction by adjusting the spoiler as well as other aerodynamic changes to the car and its setup. As downforce is increased, the grip/traction is increased as well as tire wear. Increasing downforce comes at the expense of creating more drag, which will reduce fuel efficiency.

Teams will tolerate any amount of drag for an increase in downforce at all tracks with the exception of the two largest superspeedways, Daytona International Speedway and Talladega Superspeedway.

Draft

The aerodynamic effect that allows two or more cars traveling nose to tail to run faster than a single car. When one car follows another closely, the one in front punches through the air and provides a cleaner, less resistant path for the trailing cars.

Drafting

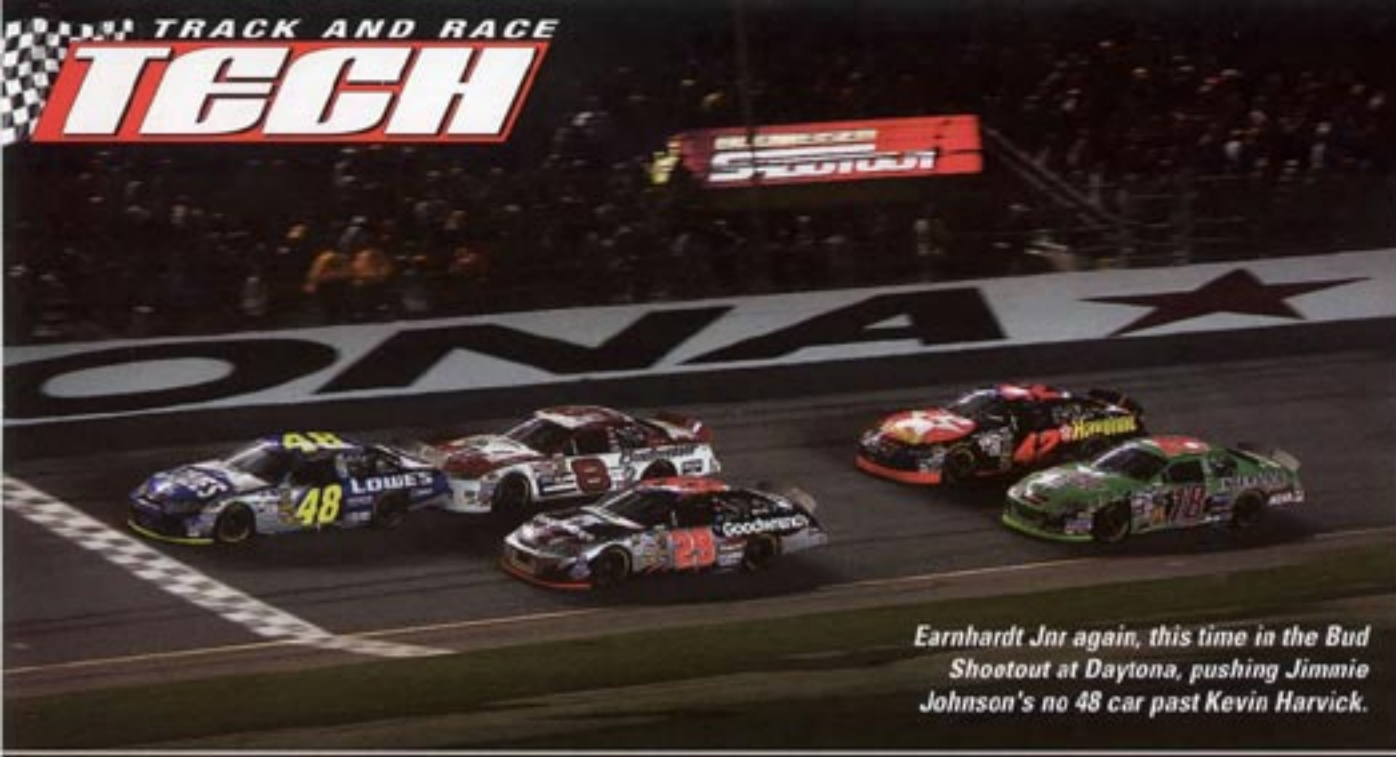
The practice, which is prevalent on superspeedways such as Daytona and Talladega, of two or more cars running nose to tail to create more speed for the group. The lead car displaces the air in front of it, creates a vacuum effect between its rear end and the nose of the second car and pulls the trailing cars along with it with less overall resistance. Two or more cars drafting will travel faster than a single car.



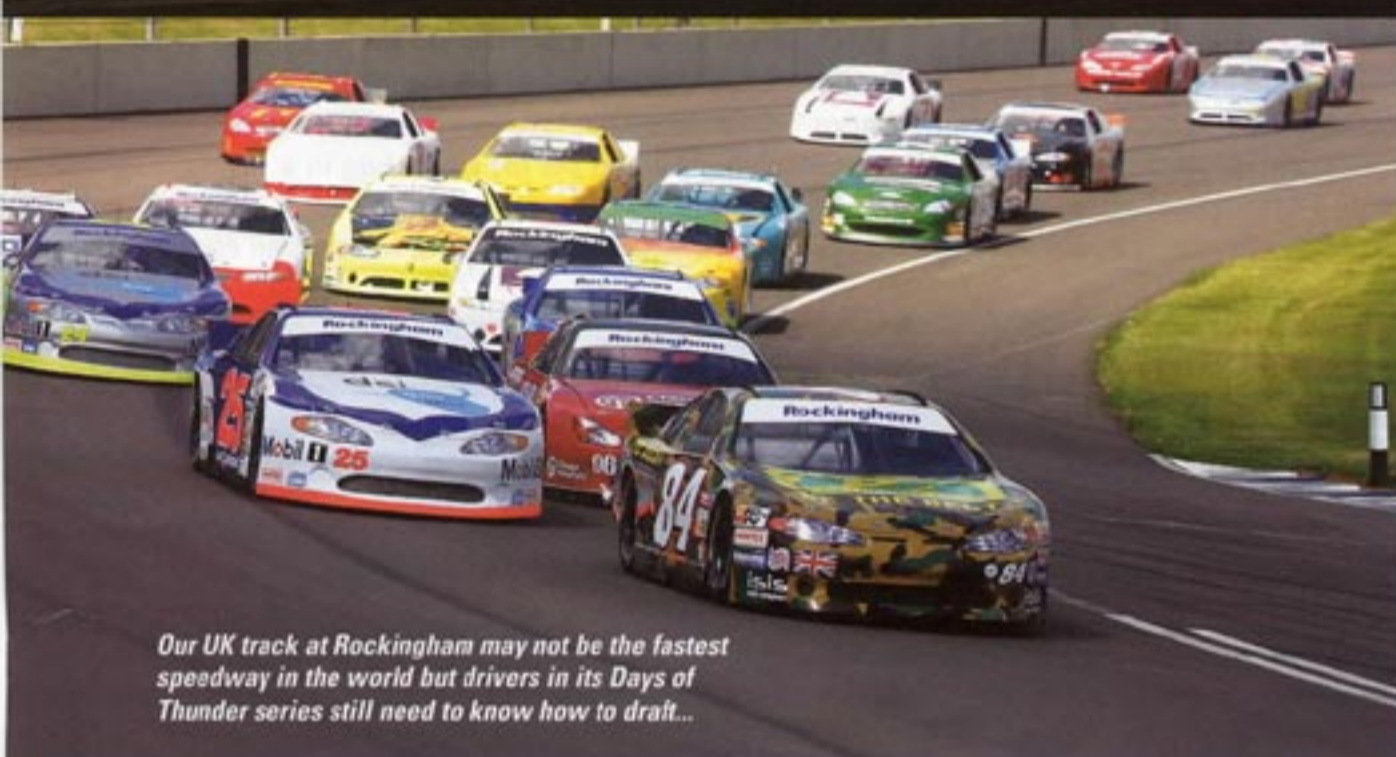
Three lines of cars at Talladega in April this year. (Photo courtesy Autostock/Ford Motor Co).

The cars don't have to be that aerodynamic to be able to draft - at Daytona even NASCAR's pickup trucks can work the air. In this shot the 03 truck is being hung out to dry.





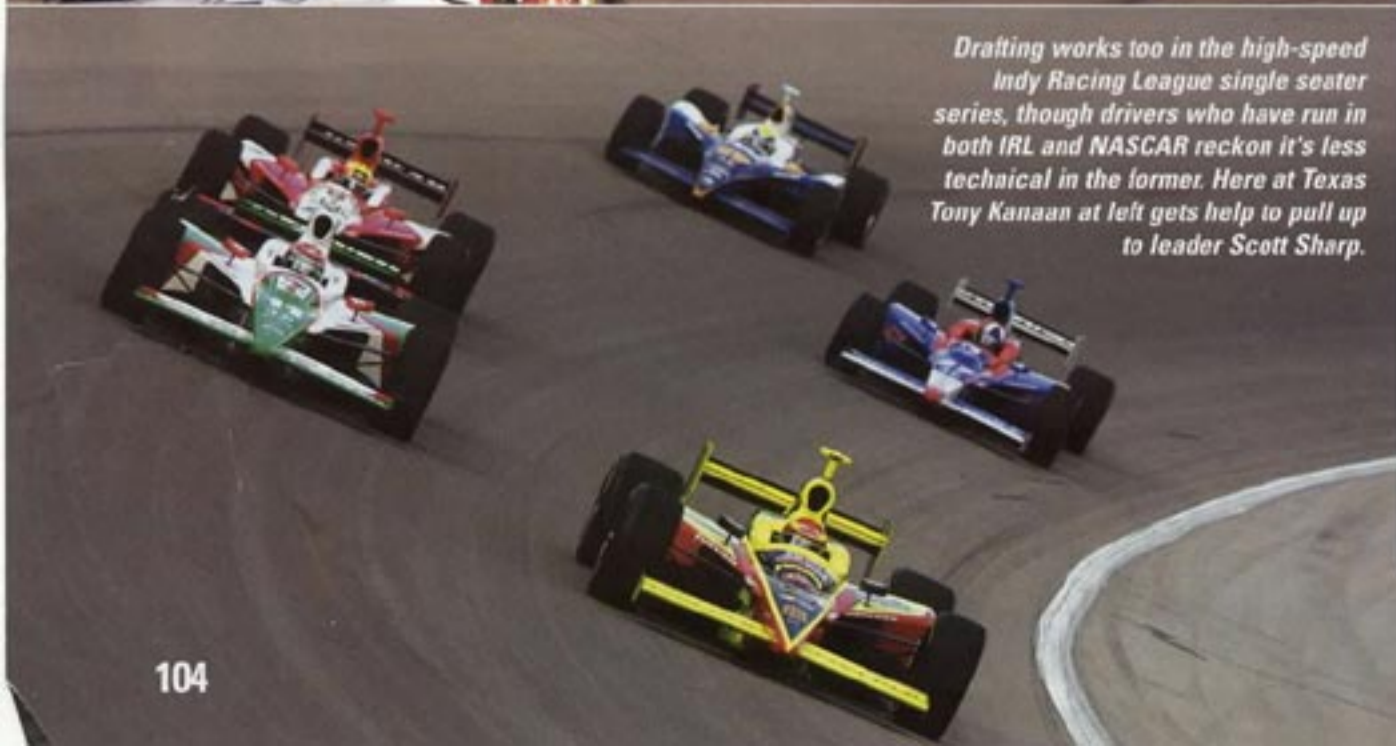
Earnhardt Jr again, this time in the Bud Shootout at Daytona, pushing Jimmie Johnson's no 48 car past Kevin Harvick.



Our UK track at Rockingham may not be the fastest speedway in the world but drivers in its Days of Thunder series still need to know how to draft...



Drafting works too in the high-speed Indy Racing League single seater series, though drivers who have run in both IRL and NASCAR reckon it's less technical in the former. Here at Texas Tony Kanaan at left gets help to pull up to leader Scott Sharp.



are nose-to-tail. Many drivers in NASCAR reckon there are benefits to be had from using the air coming off the side of race cars. Stewart eloquently describes 'side-drafting' by comparing it to a flock of birds in flight, "if you watch birds flying in a V formation, it's basically like that, or like watching a boat go through the water. It's basically the wake of the air. If you can stay in that V, you get a draft, what we call a side draft I guess, that once you can get up to somebody's rear quarter panel, it helps pull you along and pull you up past, but at the same time, once you pull ahead of that person, now they're in the V. It's something that's very tricky and it's an aspect that a lot of us have had to learn over the years."

Stewart is one of the few drivers in NASCAR that has also experienced high speed drafting in a single-seater, as he was formerly an IRL driver. He reckons the two skills are very different. "It's a lot more technical with the Cup cars because of how close you can run with each other. With the IRL cars, you would just line up straight behind a guy, get a run on him and go by. With the Cup cars it's a lot harder because you have to be real precise with your movements, and you always have to be aware that there are other cars around you all the time. It's not just one car versus another - it's one car versus 42 cars out there all in a big group."

In the UK there are precious few opportunities to see drafting in action, unless you watch the NASCAR-inspired Days of Thunder series at Rockingham Motor Speedway. Rockingham's 1.5-mile length and the 20 or so cars that run in Days of Thunder races do not of course produce the inches-apart action of a Talladega or a Daytona, but drafting skill is a vital part of the Days of Thunder racer's game. Several times you will see a leader pull out a gap in the races as those behind him battle with each other, until the two cars running second and third settle into a nose-to-tail formation, immediately making the most of the draft and pulling themselves back to the leader.

Stevie Hodgson, who has been a Days of Thunder driver since the series was created and now imparts his experience to newcomers during rookie training at the start of each season, reckons that a driver who can't work the draft won't be a winner, even around Rockingham

So when you hear drivers talking about the draft, they're not spouting hot air - they're planning their winning moves... (Thanks to NASCAR, Toyota and Ford for use of photos and graphics) ■