**INTRODUCTION**

Since cars have existed, so has the desire to prove whose is faster. Even Henry Ford was a fan—back in 1901, the future auto entrepreneur raced his custom-made, 26-horsepower Sweepsakes to victory, two years before he founded the Ford Motor Company.

Ford Motor Company is still involved in auto racing. Just as Sweepsakes set new standards for automotive performance and technology, setting a speed record of 116 kilometers per hour employing the first known mechanical fuel injection system, today’s race cars continue to seek out new materials or technologies that could help shave fractions of seconds from their finish times. In the most popular auto racing in the United States, the National Association for Stock Car Auto Racing (NASCAR), technological progress has been controlled by the racing organizers. Even in NASCAR, though, significant strides have been taken as the sport becomes as much an engineering competition as it is a driving contest.

**TECHNOLOGY AND NASCAR CONVERGE**

Auto racing covers a spectrum of vehicles that, by all appearances, are as different from one another as a skateboard is from a space shuttle. Representing the space shuttle would be vehicles competing in Formula One racing, an international sport known for its open-wheeled, streamlined cars that employ the most current—and expensive—technology and materials (Figure 1). Those vehicles will be covered later this year, in the second part of this series. The skateboards, which will be reviewed in this article, would be the autos driven in NASCAR, whose officials like cars to be made of good, old-fashioned steel and look as though they were bought from a dealer rather than pieced together by a team of engineers (Figure 2).

The NASCAR organizers are determined to prevent their sport, which began with bootleggers who raced from the law for a living and against one another for sport, from evolving into a technology showcase. “We’re under the belief that NASCAR is a driver series,” said Gary Nelson, former director of NASCAR’s popular Winston Cup series and now managing director of competition. If one type of car or equipment appears to be dominating the racing, “we make rules that kind of even things out,” he said.

Still, as NASCAR racing soared in popularity since the early 1980s and sponsors poured ever more money into the sport, the “stock” cars became stock in little more than name and outside appearance. The look of the racing teams changed, as well, as engineering and technology crept into the competition. Nelson, who earlier in his career was crew chief for Winston Cup champion Bobby Allison, worked with a 15-man crew composed mostly of mechanics. Now, the standard crew consists of as many as 100 men and women. Among them are a growing number of engineers, many of whom have been...
trained specially in the emerging area of motorsports engineering, where skills are emphasized in areas such as computational fluid dynamics (CFD), advanced materials and manufacturing, and dynamometer testing and methodology. At the same time, NASCAR is putting finishing touches on the new NASCAR Research and Development Center in Conover, North Carolina, where researchers will focus on improving safety, promoting competition, and reducing costs for competitors. Universities have begun to seek out partnerships with NASCAR teams, offering consulting services, hiring team members as instructors, and cooperating in safety studies.

Perhaps the most high-profile sign of the NASCAR revolution is its Rookie of the Year: Ryan Newman, who earned that title in November, holds a degree in engineering from Purdue University. His crew chief, Matt Borland, is also an engineer.

Many have speculated that the combination of academics and experience seen on Newman’s team will become the rule rather than the exception in NASCAR. So far, the shared knowledge has been a boost to Newman, who said his education helps him communicate better with his crew, and in the end, win races.

“You can’t be a successful team without engineers, or ‘number crunchers’ as they’re called at the tracks,” he said. “I’m one of those number crunchers and know what it’s like to rely more and more on computers and calculations.”

John Wehrly, technical manager of Dodge Motorsports and Mopar Performance Parts, who has been involved in auto racing for more than 40 years, looks forward to continued technological evolution in NASCAR and racing in general.

“The future of the way we operate in racing is very engineering oriented,” he said. “I think we’ll see more and more scientific professions in racing.”

**STEEL, YES. BERYLLIUM, NO.**

There are many influences in the materials and design of the cars that race in NASCAR. Some of the cars’ parts are required to be factory stock; others are designed and built in race team shops. All parts must comply with NASCAR rules, which often rigidly dictate what materials must be used. For instance, cars can use aluminum cylinder heads built by the manufacturer. No matter how much better the owner believes the car will perform if the cylinder head is made of another material, such as magnesium, Wehrly said, only aluminum is permitted.

Ryan Newman, a NASCAR driver who turned to an engineering degree for an edge on the track, graduated from Purdue University in 2001 and just a year later was named NASCAR’S Rookie of the Year. Before the new season begins on February 16 with the Daytona 500, Newman, who races for the ALLTEL team, took some time to answer questions for *JOM*.

**Q. How has your engineering education benefited you at the racetrack?**

**A.** It was a big help in my career as a racecar driver. I was probably a bit cocky and thought I knew all there was to know about the car, but I didn’t know a fraction of what I know or at least try to figure out now. I love debriefing after practice and qualifying in the hauler, discussing what the car was doing or what we thought we needed to go faster. The schooling I received has given me the ability to converse with my crew chief and the engineers back at the shop or even the guys working on the models. There’s so much you can learn about the car and to calculate and use that on the racetrack is amazing to me.

**Q. Are engineering degrees necessary on NASCAR teams now?**

**A.** I think it’s important for everyone, not just drivers, but everyone to have a good education. It doesn’t necessarily have to be in engineering, but that doesn’t hurt if you are in the racing business. It didn’t seem to matter as much way back, but with the way the sport is now, having an engineering degree doesn’t hurt—especially a crew chief. My crew chief, Matt Borland, has an engineering degree and actually worked for General Motors before joining Penske Racing. He’s a smart guy, but we have equally smart engineers on the ALLTEL team that contribute to our success. Having a degree can’t hurt and it’s something that can help with everything you choose to do in life.

I believe that my finishing school and earning an engineering degree boosted my career. I don’t know why, but sometimes people look and talk differently to you. I don’t feel any smarter, but that piece of paper makes a difference for sure.

**Q. Do you see your future in NASCAR or in more technologically advanced racing?**

**A.** NASCAR definitely is not what it used to be. It used to be that drivers were almost racing the exact same cars you would buy on the lot, but with added work. The sport has definitely changed over the last decade. Not a bad change, but a more technically advanced change. I’d say the technological aspect of the sport is going to grow. This is big-time motorsports and with all the sponsorship and marketing money involved you can’t afford to be behind and playing catch up.

**Q. What’s your impression of the safety measures taken recently in NASCAR? Do you believe the cars would benefit from improved crush resistance?**

**A.** I’m not one to preach on how safe or unsafe I think the cars are because that’s not my job. I feel that over the last few years NASCARS has really heeded up their safety concerns and have done everything they can to make the cars as safe as they can be for us and the speeds we’re running. Improving crush resistance of the cars may or may not be the way to go, but if it is, then I’m comfortable that NASCAR will do their best to abide to that. Right now, I know that I get in my No. 12 ALLTEL racecar each week knowing I feel safe and can do my job for 500 miles.

The body and chassis of the car have to be made of steel, he said, but when the team’s auto assemblers piece together components provided by the manufacturer, advantages can still be found in such features as the types of clamps used, the temperature of the welds, and the type of wire used. “Those things become very important, because the differences between the vehicles are so very, very small that your advantage