

Building A Race Car: Part 4

The perfect body

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Smoke and mirrors. Stock cars aren't stock anymore, but the bodies keep the fans thinking they came off the showroom floor. The fabricators are the magicians of the racing world.

Ask any race driver how much bodies play in overall handling and performance and each will say 50 percent or better. Harry Hyde told me one time that it took 200 percent effort to win races. He explained that drivers felt they were 50 percent of what it took to win, crews felt that they were 50 percent, engine builders knew they were at least 50 percent, and car builders knew that their bodies took 50 percent of the credit. Add it all up and you have 200 percent. Sometimes 100 percent just isn't enough.

Car builders sure do deserve at least 50 percent of the credit. In the early 1960s, Smokey Yunick started a trend in addressing air management. Air flow inside and outside a car is important. Everything from air cleaners, radiators, oil coolers, air boxes, spoilers, air dams, body sides and A-pillars all deal with some form of air management. Yunick's 1966 downsized Chevelle with belly pans, air foils, sealed duct work and lengthened and lowered bumpers all addressed areas that built speed. This caught the attention of both racers and NASCAR. The obvious had arrived. The manufacturers stepped up with support and the battle for aerodynamic advantage started. It still continues today.

Explaining aerodynamics would take a book. In fact, the history and rule changes that NASCAR racers have experienced would take 10 books. Our construction path takes us from body design, which includes drag, downforce and lift, to rules. When body construction begins, rules become the boundaries for all panel placement. NASCAR dictates roof height, deck height, window length, window height, spoiler size, rocker placement, air dam location, fender width and the list goes on.

Templates are a huge issue. NASCAR uses 11 different templates to keep teams



Specialized equipment such as the English wheel has been used for shaping since the 1800s. This model was reintroduced into Winston Cup shops in the late 1980s.

honest and focused. These templates are precision built and policed within one-third of an inch. Templates were originally used down the middle of the car to establish the stock contour of all makes. Additional templates were added as the teams became creative. Teams are in a constant search for advantages and NASCAR is in the constant search for conformity and equality. The more construction guidelines NASCAR establishes, the less body changes can be made to alter car characteristics.

A plan for body construction includes

many things. Number one is the type of track the car will run on. Short track, flat track cars need typical types of downforce and address these with wide flat fenders, roll door tops and defined quarter shapes.

Number two is the body construction itself. Short track cars concentrate on lower weight. This means the least amount of bracing in roofs, hoods and window treatments and lighter materials in body panels.

Number three is panel development. Teams use custom-generated panels, which use specialized equipment and techniques.



Above: Power hammers are specially designed for metal shaping and are used by many teams that find this method quicker than hammer forming or the English wheel. Above right: This is the side window of a Winston Cup Ford Taurus. Each piece is handmade to fit, meeting NASCAR measurements.



Their metal shaping skills insure panel fit and repair ability.

The material used in car construction is important to both structure stability and weight management. Properly located braces add structure strength. Even in exterior panel development, construction and strength depend on the material used to form the super structure. Panels are work hardened as the shape takes form, then welded together.

With this in mind, we are interested in the proper steel and aluminum used to produce NASCAR stock car bodies. Rules mandate the use of sheet steel .027-inch thick for the exterior skin. Two types of steel are used. Cold rolled sheet, series 1018, comes with a standard hardness or deep-drawn form. The dead soft or deep-drawn steel can be used where fabricators must shape the panels, such as front fenders or quarter panels. Series 1018 sheet that is not deep drawn is used in areas when simple form such as body sides between the wheels is needed. The cold roll sheet is used primarily for formed panels and is less open to roll buckles as commonly experienced when producing panels from flat stock.

Aluminum stock used for crush panels — the fillers between the steel firewall and floorboards and the exterior body — is .032-inch aluminum 3003 series. Spoilers are 3003 with .125-inch thickness. Windshield braces, cowl and air boxes are produced from 5052 T-3 sheet. The most experienced fabricators make and TIG weld each custom-made piece to fit properly.

Equipment has changed in the past years, which allows fabrication to develop panels perfectly. Shaping these panels allows teams to eliminate body fillers, such as Bondo, used to shape bodies in the early years. The introduction of the English wheels, power hammers, pullmaxes and planishing hammers allowed fabricators to shape panels easily with confidence. Skilled metal shapers became a premium with top teams, who secured their services for up to a \$100,000 a year.

We have danced around the floor. Now it is time to move into the spotlight. As we talked about in earlier months, each car has a pre-set alignment and height. These boundaries are necessary for body construction. Once the car is placed on the surface plate and set to proper alignment, common points have to be established to measure the body throughout construction. Most body builders today build short track downforce cars using extreme cambers with body offset. Offsetting the body makes the body panels symmetrical, left to right. Most body builders offset panels one inch to the left side of the car.

Manufacturers supply roof skins, hood skins, deck skins, noses, tails and formed windshields. But NASCAR templates dictate the placement of each panel. Just as in building a bridge, the blueprints and templates control the construction. The sequence is as follows: roof panel, quarters, deck lid, rear valance, windshield bed, hood, nose, rockers, side window treatments, roof flaps, side panels,

rear quarter halves, front fender halves and crush panels.

In the days of race on Sunday, sell on Monday, fans could buy stock cars like those on the track. Until 1986, stock cars utilized many stock parts. However, factory panels had to be stripped of framework before they could be used. Man hours soared. In addition, many new generation cars needed to be stretched to fit chassis and tread widths. As racers moved into the new era, the body hanging sequence stayed the same. But the metal work and templates became tighter. As cars were accepted into competition, many concessions had to be made. Hoods were raised, roofs were lengthened and decks were widened, which meant each panel had to be custom made. NASCAR looked at this and ultimately decided fabricators could make bodies that looked stock, from scratch.

Fixtures for panel reinforcement and jigs for exact duplication were necessary. These fixtures are used until body designs change or rule changes term them obsolete. Skin development is tedious without rule changes and model changes. But last year saw Ford teams under the gun with NASCAR approving bodies for the Taurus late in 1997. Fixtures, templates, patterns, and factory stampings slowed down teams and saw some teams doubling their fabricator staff just to prepare for the 1998 season. This year, Chevy teams will face the same problems in order to be ready for the Brickyard 400, the race where the new

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Monte Carlo is scheduled to be introduced.

From the simplest of paper patterns to compound front fenders, a fabricator's imagination is his only limit. Making cars simpler, lighter and easier to repair is the main objective. Fabricators set the pace with body innovations and NASCAR rushes to answer, keeping competition even. So you see that stock cars aren't stock any

more. It's smoke and mirrors.

Next month, we tackle body paint and graphics.

Our thanks to Hutcherson-Pagan Enterprises, Heavenly Bodies and the Bill Elliott Racing Team for opening their facilities for photos, and to Metal Craft Tools for its cooperation.



Left: Note the tail made of Kevlar, and the quarter panel metal work. The small patch above the tire is for clearance and is a compound shaped piece. Above: A short track car has very pronounced flat front fenders and flat quarter tops that are visible past the A-pillars. All of these create downforce.