MET WITH APPROVAL: The HANS device is one of only two head-and-neck restraint systems to have passed the new SFI performance specifications. It is also the only one that NASCAR has approved for use in its top three divisions.

Setting the Standard

As far as NASCAR is concerned, it's the HANS way or the highway.

Story and photograph by Doug Gore

When Dale Earnhardt died on the last lap of the 2001 Daytona 500, he was the fourth NASCAR driver within 12 months to succumb to injuries resulting from the same type of accident. All four drivers had hit the wall with their cars pointing almost perpendicular to the concrete, although the majority of their speed remained in the direction down the track along the walls. In each case, the rapid change in the component of the car's velocity that was perpendicular to the wall – the closing speed, if you will – produced deceleration forces on the drivers sufficient to produce basilar skull fractures. Simply put, the violent head movements produced by the impacts fractured the drivers' skulls, separating them from their necks.

The string of tragic losses culminating in Earnhardt's death prompted NASCAR to commission a far-reaching independent investigation into the Daytona accident, and to investigate what could be done to reduce the probability of similar injuries. To NASCAR's credit, these pro-active safety investigations are ongoing.

Eight months to the day after Earnhardt's death, NASCAR mandated head-and-neck restraint devices for all drivers in their top three divisions. At that time, two different devices were approved: the HANS (Head And Neck System), developed by Dr. Robert Hubbard at Michigan State University and his partner Jim Downing; and the Hutchens device, developed by restraint-system engineer Trevor Ashline at Safety Solutions and Richard Childress Racing engineer Bobby Hutchens.

These two safety devices functioned quite differently. The HANS tethered the driver's helmet to a rigid carbon-fiber collar, which looked something like a football player's shoulder pads. Held in place by the seat belts, the collar was designed to have only limited motion with respect to the car's seat. The Hutchens device tethered the driver's helmet to a series of straps around the driver's body that were also connected to his lap belt by a strap passing between his legs. This assembly was designed to move with the driver's body during a crash, but not to move with respect to his body and loosen up.

What the two designs had in common was that they tethered the driver's

helmet in ways intended to limit head motions in general and neck tension forces in particular to below accepted safe levels (less than 1,000 pounds) during a frontal impact.

At that point, scientific testing with crash dummies proved that both devices were effective at reducing neck tension loads during frontal and near-frontal crashes, and that neither device was effective at reducing neck loads during side or rear impacts, because neither device was designed for that purpose. (We now know that for protection during side and rear impacts, drivers need very rigid head and shoulder supports built into the driver's seat, as well as two side nets to catch the drivers head. For more on this topic, see "Improving Your Odds" on page 62.)

As the scientific crash testing continued to amass data, and that data was augmented by actual crash recordings taken with race car black boxes, differences between the performance of the two devices became increasingly apparent. Those differences helped prompt NASCAR to re-evaluate several systems last season and to work with the SFI Foundation to develop a set of performance standards for head-and-neck restraints.

Late last fall the SFI released a new minimum performance specification (Spec. 38.1) for head-and-neck restraint devices used in racing applications. According to SFI president Arnie Kuhns, "We developed this spec with the help of many industry experts, at the request of our member sanctioning bodies [i.e. NASCAR]. They needed a test procedure that would define whether a given system was acceptable for the purpose intended."

While the SFI does not release individual test results, they publish a list of products that have successfully passed their test requirements. Of the four head-and-neck restraint systems tested by SFI as of this writing, only two systems have met SFI's performance standards: the Hubbard/Downing HANS and Trevor Ashline's newly developed Safety Solutions R3.

The R3 is a carbon-fiber collar similar to the HANS device. Unlike the HANS, however, the R3 is strapped to the driver and travels with him during a crash. The intent is to help keep the driver's head, neck, and torso together and in consistent alignment.

The Hutchens device was one of two systems tested by SFI that did not pass their performance tests. Because of that, NASCAR announced in January that it would not approve the Hutchens device for use in 2005.

As of now, only the HANS device is approved by NASCAR for the 2005 season. Without NASCAR approval, the future of the new R3 device is unknown.