Death at the Track:
Fatalities on U.S. Short Tracks/Drag Strips from Head/Neck Injuries

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When the Charlotte Observer completed a second landmark study on motor racing deaths in the U.S. during the ten years after Dale Earnhardt's fatal accident at Daytona, the results showed the number of racing deaths increased. The Observer's study concluded "racing deaths aren't as rare as the racing world believes and that patterns were evident that might save lives."

It is the purpose of this study to document how one change in the pattern would indeed save lives: the universal use of certified Head and Neck Restraints by drivers on short tracks and drag strips.

The increase in deaths at U.S. race tracks in the ten years after Earnhardt was killed – compared to the ten years before his fatal crash – was significant. According to the Observer's study, from 1991 to 2001 the total number of driver deaths from crashes in the U.S. was 144. During the ten-year period after Earnhardt's death, the total rose to 171, an *increase* of 27 driver fatalities due to racing accidents.

This increase in fatalities escapes many people involved in motor racing, because they mistakenly believe all the safety improvements from the major series have trickled down to the sportsman competitors who race on weekends. That is not the case.

The Observer study looked at all types of motor racing facilities. And it included deaths to officials, spectators and crew members plus drivers who died from heart attacks during the course of racing events. But this study by HANS Performance Products is focused primarily on the deaths of drivers involved in crashes.

One of the patterns presented by the Observer study was the lack of safety at the facilities where weekend warriors are participating and where the most deaths are occurring -- on small ovals (both dirt and paved surfaces) and drag strips. In each of the ten-year periods of the Observer's study, the majority of the deaths occurred among drivers competing at these types of tracks.

Of the 171 fatalities from crashes in all forms of racing in the U.S. in the ten-year period following Earnhardt's accident, 126, or 73 percent, resulted from crashes on small ovals and drag strips commonly used by part-time sportsman drivers as well as professionals. This was a

dramatic increase of 27 percent when compared to the 99 drivers who suffered fatal injuries in crashes on these types of tracks in the ten years before Earnhardt was killed.

SAFER barriers and improved car construction have made a difference in major racing series, but these improvements are not readily available to the majority of short tracks and drag strips in the U.S. The most cost effective deterrent to fatal accidents is a certified Head and Neck Restraint, which can be used by any driver racing with a seat, helmet and safety harness.

Tragic Story

These alarming numbers tell a tragic story. While NASCAR's major traveling series – where certified Head and Neck Restraints are mandatory – suffered not one single driver fatality in the ten years after Earnhardt's death due to a renewed emphasis on safety, deaths from crashes on drag strips and short tracks totaled 126.

In reviewing the crashes in this ten-year period, we estimate as many as 27 percent of the deaths on drag strips and small ovals, or a total of 34 fatalities, could have been prevented by the use of certified Head and Neck Restraints.

To reach this conclusion, we used the anecdotal reporting, which included police, coroner and medical examiner reports listed in the Observer's study. We focused on descriptions of the accidents where the cause was reported as a broken neck or head injury. Further, we used the criteria of an initial frontal or offset impact as the critical element in the crash.

In addition, where the Observer's descriptions were limited by such descriptions as "hit wall" or "head injury," in most cases and where possible we documented the precise nature of the injury and cause of death by contacting the county coroner or the presiding medical examiner.

Although we make no claims to scientific reconstruction of these accidents, we think it's fair to use the cause of death in the case of head and neck injuries to apply our experience and conclude where a certified Head and Neck Restraint likely would have prevented the fatal injury when used in a vehicle with a proper chassis, seat, helmet, head surround or side nets and safety harness.

Over the past five years, we have conducted extensive surveys of drivers on short tracks and drag strips through our field representatives. Where not mandated by the rulebook, we have confirmed the use of certified Head and Neck Restraints is far from universal.

The bottom line: if all drivers wore certified Head and Neck Restraints, significantly fewer fatalities would occur on short tracks and drag strips. For those interested in a more detailed look at the facts and figures, a fully documented chart follows at the conclusion of this paper. Also, a link to the Observer study can be found in the list of references for this study.

Preventable deaths

An upward trend in deaths from crashes on small ovals and drag strips does not surprise those of us who test, develop and manufacture certified Head and Neck Restraints. We know how drivers manage to come up with an excuse not to use a piece of safety equipment documented to save lives.

On small ovals, drivers often convince themselves they are not going fast enough to warrant the use of an HNR. But the number of fatalities in general and the specific number of head and neck injuries confirms they are going fast enough.

Legends cars, miniature racers powered by motorcycle engines and not known for their top speed, are involved in fatal accidents, for example. Dale Lemonds died of a broken neck at Virginia's Langley Speedway when his Legends car hit the short track's wall in 2004. He was not wearing an HNR.

On drag strips, drivers often tell themselves they'll never hit a wall or barrier head on. The Observer report documents numerous incidents where dragsters hit the wall or a barrier, sometimes after leaving the drag strip. John Lingenfelter, famed for his car building, engines and driving, crossed the center line and had a heavy impact with the wall in his sports compact at Pomona in 2002. He never regained full consciousness and died from complications of his head injury 14 months later.

What constitutes enough acceleration and energy to cause a fatal crash? In its detailed two-volume study of Dale Earnhardt's fatal crash at Daytona, NASCAR consultants determined his car hit the wall at 160 mph and was suddenly slowed by 42-44 mph in just 80 milliseconds. The 42-44 mph difference from when he first hit the wall and the ensuing sudden deceleration is known as the Delta V.

Earnhardt died from a basilar skull fracture, almost invariably caused by excessive neck tension resulting from a driver wearing a safety harness and helmet whose head is unrestrained during a sudden deceleration. In the two seasons prior to Earnhardt's death, two drivers in the Championship Auto Racing Teams series (Gonzalo Rodriguez and Greg Moore) and two drivers racing in NASCAR (Adam Petty and Kenny Irwin) died from basilar skull fractures under similar conditions of sudden deceleration.

Certified Head and Neck Restraints are designed primarily to prevent this type of injury. No driver in an Indy car or in any of NASCAR's major touring series has been killed by a basilar skull fracture since the adoption of universal use of Head and Neck Restraints. The same cannot be said about short tracks or drag strips, where similar threats continue to plague drivers and their surviving families.

A short track driver can quickly go from 90 mph to 48 mph in a split second if he's turned into the wall – a Delta V of 42 mph and enough to cause a fatal head and neck injury.

The crash of veteran sprint car racer Jimmy Johnston of Ohio in 2002 was a case in point. He died "after slamming into a wall at Eldora Speedway," said the Observer report. "The coroner concluded he died of a basal skull fracture. He wasn't wearing a head restraint."

If a drag racer hits the wall and drops from 120 mph to 78 mph in a split second, that's enough to cause a fatal head and neck injury. Again, a Delta V of 42 mph.

Sudden Stops

We all know that it's not how fast you go in a vehicle, rather it's how fast you stop that can hurt you. Many racers fail to realize a driver doesn't have to be going superspeedway speeds to suffer a fatal injury with a sudden stop.

At this year's IMIS Safety and Technical Conference, with the help of the facilities at CAPE and some of the company's engineers coordinated by Caine Johnson, we hosted a demonstration to verify by high speed videotape and live sled testing that lower speeds can be fatal.

The first crash test was conducted using a dummy without a certified Head and Neck Restraint, but with a racing harness and helmet. The sled had a speed of 42 mph before the head-on crash, or sudden deceleration, and recorded 40 g's of acceleration upon impact, much of which was transferred to the dummy's unrestrained head and neck. The result is enough neck tension to cause a serious or fatal injury.

The universally accepted measurement of neck tension sufficient to cause fatal injury is 4,000 Newtons. The test conducted by CAPE at 42 mph and 40 g's acceleration upon impact resulted in 5800 Newtons of neck tension. That exceeded the standard for a fatal accident by 45 percent.

A high speed video and action of the dummy's head and neck revealed what happens in an abrupt stop with a Delta V of 42 mph and why it's enough to cause a serious or fatal injury due to either the excursion of the head hitting part of the car or the head excursion leading to a basilar skull fracture from excessive neck tension.

The test with a certified Head and Neck Restraint, in this case a HANS Adjustable, run at the same speed of 42 mph and with 40 g's of acceleration upon impact resulted in a 90 percent reduction of neck tension – a result far below the threshold for a fatal injury.

Next, a sled test was undertaken where the dummy was wearing an SFI-approved Head and Neck Restraint – in this case a HANS Adjustable. The crash simulation of a head-on crash happens in the blink of an eye – although the force of the impact is very evident. In this case, videotape confirmed how a certified Head and Neck Restraint reduced head excursion and neck tension to a level well below what can lead to a serious or fatal injury. The test underscored that serious or fatal injuries can be prevented when a driver has a strong chassis, a good seat with head surrounds, properly mounted harnesses and a helmet with an HNR attached and correctly mounted on the driver's shoulders.

To sum up: No matter what class of cars are involved, speeds on small ovals and drag strips are sufficient to generate a sudden stop that can be fatal. A significant number of lives can be saved with the universal use of certified Head and Neck Restraints.

REFERENCES:

The Charlotte Observer study “Death at the Track.”
http://www.thatsracin.com/2011/02/16/54997/database-death-at-the-track.html

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Drag Strip Deaths -- http://dragstripdeaths.webs.com/