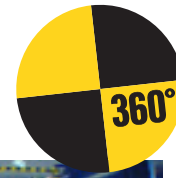
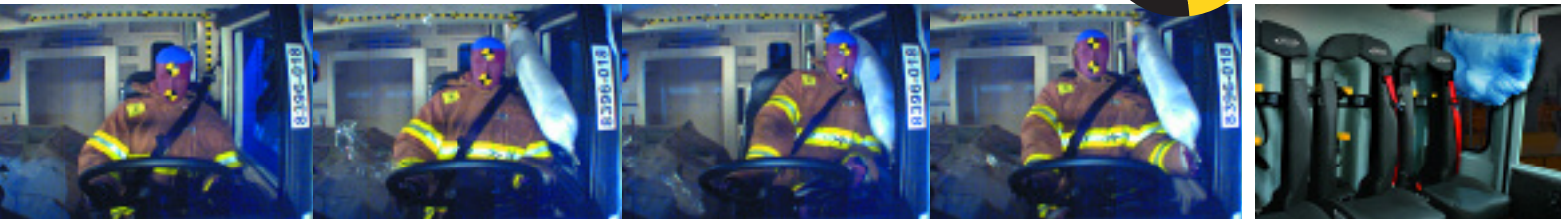


Pierce Side Roll Protection System

The to-ing and fro-ing just became a lot less risky.



PROTECTION
FROM EVERY
ANGLE™



By John Phillips

Photography supplied by the Center for Advanced Product Evaluation

rear air curtain

A firefighters's most frightening foe is a big honking fire. Well, that and heart attacks—still the leading cause of firefighter fatalities.

But what if it were just as easy to frustrate another source of fatalities—as many as one quarter of them annually, in fact? You'd be onboard in a heartbeat, right?

We're talking about traffic accidents en route, of course. And of those deaths, 60 percent will be linked to a truck that rolls.

Can't something be done about that?

As a matter of fact, it can.

Even if side rolls can't be eliminated, there's now a device that can make them a lot less deadly. It's called the Pierce Side Roll Protection System, and here's how it works: A sensor inside the cab monitors the truck's motions. If it detects an imminent roll, it initiates three events. First, it cinches every occupant's seatbelt, both in the cab and in the crew area. Second, it pulls the driver's suspension seat to its lowest position. And third, it inflates two side airbags—one across the driver's window, another across the first officer's—plus inside side air curtains in the crew cab.

Inflatable Tubular Structures (ITS) and crew cab air curtains are hidden in the trim above the door or attached to ABTS seats in the crew cab. During a roll, these deploy across the window and side of the vehicle interior to protect the driver's head during impact. This reduces movement, lowers the chance of head contact with the roof, and increases the survivable space. On a slow roll, the system accounts for the fact that you may already be leaning. In total, it activates in about the time it takes to blink. It remains inflated for ten seconds, enough for the longest duration accident.

Such safety features have been common on run-of-the-mill autos for years. It's ironic that they haven't been applied to high-risk rescue equipment. Until now.

At the Center for Advanced Product Evaluation in Indiana, engineers dressed crash dummies in firefighting regalia, then subjected them to repeated rolls in Pierce cabs equipped with the Side Roll Protection System. For the occupants representing 170- to 215-pound males, head and neck injuries were reduced by 97 percent. Ninety-seven percent. It's rare in life that any new product is as effective. Does your toothpaste reduce cavities by 97 percent?

The hardware for this system was first developed in 1996, at a company called Indiana Mills & Manufacturing, Inc. (IMMI), famous for its seatbelts for four decades. For the last 18 months, IMMI and Pierce have customized the system for use in all but one of Pierce's Custom Chassis—the first such application in any firetruck.

The system's brain comprises an electronic gyroscope and a solid-state sensing device—about the size of a car radio—that mounts in the truck's headliner. It monitors the vehicle's angle and rate of roll, and it recognizes the difference between low- and high-speed events. Suppose, for instance, you arrive at a scene and drive your truck slowly into mushy ground or into an unseen ditch. In that case, the sensor waits until the truck tips 60 degrees—the point of no

return—before triggering the protective devices. But if you're navigating a tight turn at 50 mph and the truck begins to roll, the sensor may well trigger as early as 40 degrees. That gives the restraints time to be in place by the 60-degree point of no return.

Under each occupant's seat is a gas cartridge connected to his seatbelt. When that cartridge is ignited—making a sound like a metal ruler slapping a desktop—the gas expands in seven milliseconds, driving a piston down a tube. At the limit of the piston's travel, a clutch engages to resist slippage. The belt is now tightened with as much as 300 pounds of force, and it will have snugged down by 120mm—about the length of a cigar. The idea is to minimize the movement of heads, shoulders, hips, and knees, thus reducing each occupant's risk of contact with hard interior surfaces.

The driver's suspension seat is ratcheted down in similar fashion, though it requires a bigger piston producing almost 2000 pounds of force. The seat travels four inches, bottoms out, then is locked in place.

Until they're fired, the side airbags are hidden in the window trim above the doors. Mounted on two tethers, each bag is three feet long and ten inches in diameter. After deployment, they remain inflated for ten seconds, offering protection through even the longest-duration accident. The bags reduce the risk of head injuries, of course, but also help keep arms and torsos inside the cab, no small matter given the likelihood of shattered side windows. According to the United States Fire Administration, 27 percent of deaths in traffic collisions have historically been linked to firefighters being ejected from their vehicles.

The system is triggered, belts are pretensioned, and the driver's seat is locked down in just .124 second. Meanwhile, the deployment of the airbags is momentarily delayed so that the front-seat occupants—who may already be leaning because of the truck's roll angle—can be pulled upright and are centered on their seats. Only then can occupants make the greatest use of the airbags' cushioning.

The final element of the system—low-tech but critical nonetheless—is Polydamp Acoustical Foam padding, applied liberally to the crew-cab surfaces most likely to contact occupants' heads and shoulders.

Engineers at IMMI subjected the Side Roll Protection System to all sorts of durability indignities—they froze it, scorched it, dunked it in water. So far, the only reliable way to trick it is to refuse to buckle up. Even then, the protection devices in no way imperil an unbuckled occupant.

The Side Roll Protection System is standard equipment on Pierce's Enforcer, Arrow XT, Dash, Lance, and Quantum chassis. Rear air curtains are optional (standard in Enforcer and Dash).

John has been writing about cars for 28 years, his work appearing in Conde Nast Traveler, Sports Illustrated, and other national magazines. He currently is an Editor at Large for Car and Driver magazine. John lives in rural Michigan, drives a used cop car, and has never been indicted, although he was asked to leave the town of Moose Factory, Ontario.

