VOLVO

VOLVO'S CONTINUAL PURSUIT OF SAFETY

Since Volvo's inception in 1927, three core values have helped dictate the direction of the company: quality, safety and environmental care. Therefore, continually striving to build cars that incorporate these values is one of the never-ending mission of Volvo engineers.

Volvo safety engineers have regularly made history with innovations including the industry's first three-point lap/shoulder seat belts in 1959 and the industry's first side impact air bags in 1995.

Another first has been instrumental in helping make Volvo cars among the safest on the road. After years of traffic research, Volvo established the industry's first vehicle accident investigation team in 1970. To date, Volvo's safety division has analyzed more than 25,000 accidents involving 40,000 drivers and passengers of Volvo cars. The 1998 70 and 90 series Volvo models bristle with safety inventions that are the result of this intensive study.

Maintaining the integrity of the vehicle's passenger compartment is a critical safety factor in the event of a collision. Every Volvo body and platform is designed to insulate vehicle occupants and prevent intrusion. The entire structure, including the roof, floor, side pillars and even the engine, is engineered to absorb impact energy and distribute it away from driver and passengers. In addition, the body is strengthened by the continuous laser welding of the roof rather than the conventional method of using spot welds.

Safety analysis data led Volvo safety engineers to conclude that side impacts cause grave injuries and a disproportionate share of deaths, even though these account for only 25 percent of all motor vehicle accidents. These findings inspired the industry's first side

impact protection system (SIPS), which made its original appearance in the 1993 850 and 960 models.

Side Impact Protection System

SIPS employs and adds to the vehicle's structural components to distribute impact energy away from occupants. The most important element of SIPS, the B-pillar (between the front and rear doors), is extremely strong to help resist deformation. High-strength tubular steel braces run across the vehicle floor, channeling forces away from the occupants. Other steel tubes in the seats absorb collision energy. Longitudinal braces reinforce the door, whose contour and surface design have been designed to minimize deformation and injury to passengers. Door hinges have a locking tab which helps hold them in place even if the hinges are damaged in a crash.

A new generation of SIPS is being introduced in the 1998 model year. The important B-pillar has been reinforced to further help resist deformation of the door in a side impact. There's also more padding on the new B-pillar, designed to provide greater protection against head injuries. Additionally, other structural elements in the floor and between the front seats have been added or improved for increased occupant safety.

Volvo's side impact air bags add further protection against upper torso and head injuries in side impact collisions. Every Volvo sold in North America has side impact air bags unobtrusively installed under the side bolsters of both front seats as standard equipment.

When triggered, the sensors use a completely mechanical system to send a pyrotechnic charge which activates gas generators located in the seatback. Expanding gasses from the generators inflate the SIPS bag with enough force to split the side bolster seam and allow the inflated bag to emerge. The side airbags inflate in 12 milliseconds from the time of first impact sensing, about three times faster than front airbags. The

lightning-fast deployment speed is necessary because there is very little . space between the side of the car and the occupants, unlike in a front impact.

Volvo's side impact protection, including SIPS and the side impact air bag, reduce injury in side impact collisions by approximately 40 percent.

Of course, every 1998 Volvo also has dual front air bags as standard equipment. Traveling in any car with a passenger side air bag, children should always be properly secure in the rear seat.

Front Seat Belts - A Volvo First

Three-point lap/shoulder seat belts are installed for every seating position. A Volvo engineer, Nils Bohlin, invented the three-point belts in 1958, which first appeared in 1959 Volvos before becoming the industry's standard design. For this life-saving invention, Mr. Bohlin was named to the Safety and Health Hall of Fame along with Thomas Alva Edison and other remarkable thinkers.

Front seat belts in the new 570 and V70 are made more effective with the inclusion of more powerful pyrotechnic pretensioners, which tighten around occupants faster when triggered in a collision.

A New High Mounted Brake Light

Also new in 1998 models is the eye-level brake light in the rear window. It now has light-emitting diodes that illuminate in one millisecond after the driver depresses the brake pedal. That compares to the 250 milliseconds needed for a conventional light bulb. At 55 mph, the faster LED illumination gives the driver in back of the car at least one car length more in which to brake-- perhaps enough to avoid a collision.

Child Safety

Volvo believes no child belongs in the front seat of a vehicle equipped with front air bags. All new Volvo models can be equipped with a child booster cushion built into the center armrest of the rear seat. The booster seats are designed for kids who weigh between 50 and 80 pounds and who are between 46" to 54" tall. Child-proof rear door locks and seat belt lockability for child safety seats are standard on all models.

As always, Volvo engineers are working on newer inventions that will soon find their way into production cars.

The Future Of Head Protection By Volvo

The Volvo Inflatable Curtain (VIC) currently being tested, is designed to be mounted in the vehicle headliner, running from the front to the rear side pillars. The curtain consists of eight protective air bag-like compartments that deploy in 25 milliseconds after sensors trigger the VIC system. Every occupant over 47.3 inches tall seated next to a door will obtain additional head protection from the deploying curtain. VIC works in connection with the SIPS system and SIPS airbags that deploy from the side seat back bolsters. Volvo is developing VIC in collaboration with Autoliv, its partner in developing the SIPS airbags.

Volvo Whiplash Protection Study

Volvo safety engineers are also tackling whiplash injuries, a frequent result of vehicle collisions. Whiplash results when an car occupant's head is thrown backwards, usually the result of low-speed rear-end collision. Neck pain, stiffness, tenderness, numbness and even neurological dysfunctions can result from whiplash injuries. Volvo's Whiplash Protection Study (WHIPS) includes the design of a new seat in an effort to drastically reduce such injuries.

Immediately upon activation, the WHIPS backrest and head restraint move backward parallel to the individual's motion. The entire upper body and head of the

occupant is cushioned in a balanced, gentle action while much of the crash energy is absorbed by seat. The head remains close to the head restraint to keep the distance between them small because that reduces the risk of whiplash. The backrest then tips backward to help reduce the typical forward rebound of the body which is a major cause of whiplash. The seat moves back about 1.5 inches during WHIPS activation. The seat back has also been designed to distribute crash forces more evenly along the back and neck to optimize protection of the spine. Autoliv is also collaborating with Volvo on the WHIPS system.

New Volvo Safety Center

There will be more innovations coming after these. Volvo is continuing to invest in new facilities to help foster the invention of further safety systems. The Swedish manufacturer is investing 650 million honor ($100 million) to build a new safety center at its Gothenburg, Sweden headquarters, adjacent to its Torslanda plant where the 570 and V70 are built. The first phase of the project is scheduled for completion in mid-1998. Many types of crash and other accident tests will be run in the center. Head-on collisions with other vehicles, roll-over accidents and other types of crashes will be performed.

In addition, Volvo is leasing a new supercomputer to simulate crashes five times faster than its present computers can. The new safety center and the supercomputer will provide a substantial increase in capacity for both real and simulated crash tests.

Computerized crash simulation will allow Volvo to reduce physical crash tests, but simulations will not substitute for physical tests or field studies. The main function of simulation is to test new designs at their early stages. Physical tests then verify the results of the simulations. Fewer physical tests lower costs and shorten lead times in developing new cars. Volvo will rent the parallel vector supercomputer from NEC.

Volvo will use the new facilities to test Volvo cars as well as Volvo trucks, buses and construction equipment in the new center. The center will continue to assure Volvo customers that they are buying one of the safest vehicles in the world.