Volvo Press Release:
Volvo Car Corporation presents new systems to avoid collisions with cars and pedestrians

Volvo Cars unveils a unique system that can help the car driver avoid the sort of low-speed collisions that are so common in urban traffic and in slow-moving traffic queues. If the driver is about to drive into the vehicle in front and does not react in time, the car brakes itself. The system is called City Safety and it is Volvo Car Corporation's ambition to apply the technology to prevent half of all rear-end collisions. Volvo is also showing three other smart systems that will help to avoid collisions with other vehicles and pedestrians.

Automatic braking when faced with a pedestrian also being developed

Volvo Car Corporation will be presenting two other future systems in the autumn of 2007 that will also help drivers to avoid accidents. The systems will be introduced onto the market within a few years. As of the end of 2007, Volvo V70, XC70 and S80 can be equipped with a collision warning system that brakes automatically if a rear-end collision with a moving or stationary vehicle is imminent. The system has been named Collision Warning with Auto Brake (CWAB).

The next development stage is a system that can also "see" people and brake automatically when a pedestrian steps out in front of the car. Like the newly-introduced CWAB, the future system will use radar and a camera to detect objects in front of the car. The radar unit has been upgraded with a wide-angle search area so that it can also detect pedestrians.
years. "The system offers benefits to all those involved. The risk of whiplash injuries is avoided or limited in the vehicle in front. The system can also help to reduce and at best eliminate the costs of repairs to both vehicles," says Jonas Ekmark, manager for Preventive Safety at Volvo Cars Safety Centre.

If the vehicle in front brakes suddenly and City Safety calculates that a collision is likely, the system will prepare the car's brakes to help the driver to avoid an accident by braking more effectively or taking evasive action. If the system senses that the driver needs additional help, the car will brake automatically through hydraulic pump activation.

According to statistics, 75 per cent of all reported collisions occur at speeds up to 30 km/h. Furthermore, the consequences of minor collisions are often so limited that they are not reported to insurance companies. However, even the smallest impact costs time and money to rectify. City Safety is active at speeds up to 30 km/h. If the relative speed difference between the vehicles is slower than 15 km/h, the system can help the driver to avoid a collision completely.

Between 15 km/h and 30 km/h the objective is to reduce the speed as much as possible before a collision occurs.

Laser sensors monitor the traffic in front

The system keeps an eye on the traffic in front with the help of a laser sensor that is built into the windscreen's upper section at the same height as the rear view mirror. It can detect vehicles that are up to 6 metres in front of the car's front bumper. City Safety is programmed to react to vehicles in front that are either stationary or moving in the same direction as the car itself.

On the basis of the distance to the object in front and the speed of the car itself, the system makes 50 calculations a second to determine what braking speed is required to avoid a collision. If the calculated braking force exceeds a given level without the driver reacting, it interprets this as an imminent danger of a collision. City Safety then helps to avoid or reduce the consequences of a collision by preparing the car's brakes or braking automatically and disabling the accelerator.

Certain limitations

City Safety has the same limitations as all optical systems in that the detection capacity can be limited by fog, snow or heavy rain. It is therefore necessary to keep the windscreen free of dirt, ice or snow. If the sensor is blocked, the driver is advised via the car's information display to clean the area. The system works equally well during the day and night.

"It is important to underline that the system does not relieve the driver of the responsibility from maintaining a safe distance to avoid a collision. The automatic braking system does not react until it considers that a collision is imminent. The system therefore helps to limit the consequences of or, in some cases, avoiding an imminent collision," says Jonas Ekmark.

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First a warning - then automatic braking

If the car approaches a pedestrian, a red warning light will come on first on the windscreen's head-up display. A warning signal will be heard at the same time. This helps the driver to react and, in most cases, an accident can be avoided.

If the risk of a collision increases further, the assisted panic braking is activated. The distance between the brake pads and the brake disc is reduced to provide a shorter reaction time. The hydraulic pressure in the braking system is also increased so that the most effective braking takes place even if the driver
does not press hard on the brake pedal. If the driver still doesn’t brake, and the system considers that a collision is imminent, the car’s brakes are activated automatically.

The automatic braking is designed to reduce the speed as much as possible thereby reducing the risk of injury to a pedestrian if a collision cannot be completely avoided despite braking. The automatic braking has the capacity to reduce the car’s speed by approximately 25 km/h. Depending on the situation and the car’s speed, this may mean in certain cases that a collision cannot be completely avoided.

“Accident statistics show that the risk of a passenger being killed increases dramatically if the collision takes place at speeds above 30 km/h. That is why it is so important for us to reduce the speed as much as possible even if the ideal would of course be to avoid an accident completely,” says Jonas Ekmark.

To avoid automatic braking in situations when the driver has the situation under control, Volvo Cars has programmed the system to activate automatic braking only when it becomes impossible to steer away from the collision. This could mean that it can be too late to avoid the collision completely, even if the maximum braking force is used, but it is still important to reduce the impact speed as much as possible. However, the red warning light and the audible signal is designed to help the diver to avoid the collision before the automatic braking is activated.

**Steering automatically to avoid a head-on collision**

Collision Avoidance by Auto Steering is a further development of Lane Departure Warning that will be introduced on the Volvo V70, Volvo XC70 and Volvo S80 at the end of 2007. Lane Departure Warning uses a camera to monitor the car’s position between lane markers. If a car wanders across any of the lane markers without using the lane change signal, the driver is warned by an audible signal.

Collision Avoidance by Auto Steering is significantly more advanced. The system is designed to help prevent a frontal collision caused by temporary distraction by using both a camera and radar to monitor the position of the car itself and the oncoming traffic.

If the car is about to move into the wrong lane and the system detects than an oncoming vehicle is on a collision course, the car is automatically steered back to a safe position in the original lane.

Collision Avoidance by Auto Steering is being developed and the high demands for reliability mean that Volvo Car Corporation’s experts are still assessing which degrees of steering wheel intervention are relevant and the exact speed range the system can operate within.

**Communication between cars results in fewer accidents**

Cars that can communicate with other vehicles and the surrounding traffic environment should enhance the potential for safer driving and fewer traffic accidents. For communication to work, it is necessary to have a standard “language” which makes it possible for all vehicles to talk to each other irrespective of make. There are currently several international projects that endeavour to contribute to this standardisation.

Together with other car manufacturers, Ford Motor Company is participating in the American CAMP (Collision Avoidance Metric Partnership) collaboration and the PReVENT project funded by the European Commission. Volvo Car Corporation is in above projects assessing the potential for car-to-car communication which could provide:

- Information from a car in front that the road surface is slippery a couple of kilometres ahead.
- A warning that the traffic is at a standstill further on.
- Coordination of automatic evasive measures if there is the threat of a collision.
- The potential for of driving "in convoy" where coordinated communication would allow the vehicles to be driven exceptionally close to each others on a motorway to provide an effective traffic flow and reduced fuel consumption.
- Volvo has a number of test vehicles from the CAMP collaboration that can communicate with each other. The driver in one car can receive information that another car has come across an obstacle and has slammed on the brakes - this makes it possible to brake in good time.

“With communication between vehicles, and between vehicles and the traffic environment, a large number of today’s accidents could be avoided. The major challenges are to find a standard "language" and the particular applications that are most urgent and effective,” says Jonas Ekmark.