PRESS RELEASE

April 14, 2008

RENAULT DESIGNS VEHICLES WITH OUTSTANDING ALL-ROUND PASSIVE AND ACTIVE SAFETY

Renault has always been concerned by road safety and has been actively involved for more than 50 years in the research and development of technologies aimed at improving the safety of its vehicles. The brand's commitment and legitimacy in this field is indisputable. Indeed, Renault's approach and expertise is based on lessons learnt from real-life accident situations and, with maximum five-star EuroNCAP crash-test ratings for nine of its vehicles, its range features a long list of models that deliver leading safety.

In addition to its exceptional engineering skills, Renault uses the extensive research carried out by the Accident Analysis, Biomechanics and Human Behaviour Laboratory (LAB[1]) to develop effective safety solutions that address real-life driving situations. Renault's road safety programme covers four main areas: prevention, correction, protection and education.

Protection in the event of impact is naturally of fundamental importance, yet absolute priority has to go to preventing accidents from occurring in the first place. Studies show that human error is involved in 80% of accidents, so the challenge consists in making the most of existing technologies to identify risk situations, warn the driver and provide assistance as required to correct errors.

Renault is constantly developing new safety systems aimed at avoiding accidents and protecting vehicle occupants. Its development emphasis is placed accordingly on better prevention, better anticipation and better education, without diminishing the responsibility of the driver.

Technology isn't everything, however. As a socially responsible company, Renault is also committed to several national and international awareness programmes that aim to educate the general public on safety issues.

Given the stakes associated with road safety issues across the world, Renault's commitment on this front is an ongoing endeavour. On tomorrow's cars, safety will be increasingly interactive, with on-board technologies improving detection of the vehicle's surroundings to inform the driver and anticipate the activation of safety systems. Renault also seeks to extend the same approach it employs in Europe to new markets where improving road safety needs to take the results of local accident studies and needs of customers into account.

[1] **LAB: the Accident Analysis, Biomechanics and Human Behaviour Laboratory of** PSA Peugeot-Citroën and Renault.

CONTENTS

Press information

Educational Fact sheets

1. Road safety, a global challenge

Road safety is a major social issue, both nationally and internationally. According to the World Health Organization (WHO), road accidents are the eighth biggest cause of death worldwide, and are expected to become the third biggest by 2020.

The European Union has set the target of bringing road deaths down from 50,000 in 2000 to 25,000 by 2010.

Thanks to its prime expertise and the advanced safety technologies featured across its product range, Renault has made a significant contribution to the steady improvement that has been achieved. For example, Renault's third-generation System for Restraint and Protection (SRP3, see below) has resulted in an 80% reduction in the risk of head and thorax injury.

Progress is encouraging, but two important points must not be overlooked. To begin with, safety results continue to vary widely from country to country, even across the 27 members of the European Union. Secondly, Renault places the driver at the heart of its approach to safety because driver behaviour remains a key factor in this domain.

2. Human-centred safety policy

Because human error is to blame in 80% of road accidents, Renault vehicle design is overwhelmingly human-centred. A sound understanding of human response is essential if we are to optimize the development of active safety systems capable of avoiding accidents, and passive safety systems aimed at protecting occupants should an accident prove unavoidable.

Two parameters are of fundamental importance:

- ***Reaction times:***

In the best possible scenario, an individual in good health will take 0.6 seconds to react to an emergency situation, though the average is closer to a second. At 50kph, even before the driver has started to brake, a vehicle will travel 14 metres in this time (equivalent to two pedestrian crossings). And once the pedal has been pushed, it will take the car a further 12 metres to come to a standstill.

- ***Field of vision***

As well as diminishing with age and fatigue, and under the influence of alcohol or drugs, field of vision also decreases with speed, from almost 180° at a standstill to 100° at 40kph and a mere 30° at 130kph.

Road safety can never simply boil down to a matter of equipment and technology. Driver-vehicle interaction is paramount, and must be constantly adapted to each situation. Realizing the importance of man-machine interaction, Renault has developed the concept of integral safety, which involves a global approach that covers technical, medical, ergonomic and social criteria, etc. This integral safety concept translates into very safe cars that implement advanced active and passive safety systems.

Human error, which is the cause of 80% of road accidents, breaks down as follows (source: LAB):
- 30%: poor perception of danger
- 20%: inappropriate decision or response to danger
- 20%: defective evaluation
- 10%: general failing
- 20%: imprecise interpretation

3. Safety: a pragmatic, global approach with four main focuses

Renault develops cars with excellent all-round active and passive safety, taking a design approach based on **real-life safety**, which means factoring in actual driving conditions in widely varying locations worldwide. Renault thus gives priority to the most effective prevention, correction and protection technologies, which are featured widely across its range. In addition to the three vehicle-oriented focuses of **prevention, correction and protection**, Renault also pioneers a fourth focus, namely a road safety **education** programme that addresses the broadest possible population of road users.

Prevention
Renault provides drivers with systems for **anticipating risks** (visual and audible seatbelt reminders, tyre pressure monitoring system, xenon headlamps, additional cornering lights, etc.) and for taking on auxiliary tasks automatically so that the driver can **concentrate on the road** (automatic headlamp and wiper activation, cruise control with speed limiter, etc.).

Correction
To cope with difficult or emergency situations, handling and braking performance are fundamental aspects of the vehicle's overall dynamic package and form the basis of active safety performance and accident avoidance.

Renault offers range-wide access to technologically advanced systems (ABS, emergency brake assist, ESC, ASR traction control, etc.) which **improve vehicle response in difficult or dangerous conditions**, and which compensate for inappropriate driver reaction (but without taking control out of the driver's hands). Renault accordingly offers emergency brake assist as standard for all its passenger car and LCV models. Renault also offers ESC (electronic stability control with CSV understeer control) on all new vehicles (New Twingo, New Kangoo, etc.) at a very affordable price (e.g. €300 in France).

Protection
To provide optimum protection for all passengers, whatever their build and wherever they are sitting in the car, **Renault designs and develops effective impact protection systems** which include structural features, airbags, seatbelts and headrests.

Two such Renault systems are particularly innovative:

- **Renault's unique SRP3 (third-generation System for Restraint and Protection)** combines dual seatbelt pretensioners (to hold the thorax and pelvis firmly in place and prevent the body from sliding forward, a phenomenon known as submarining), **load limiters** (to prevent the belt from cutting into the thorax) **and adaptive dual-volume airbags** (to dampen impact energy more effectively).
- **Dual side impact sensors and dual-chamber thorax/pelvis airbags**, an industry first on New Laguna.

Analysis of actual accidents repeatedly confirms the efficiency of these protection systems, and yields valuable data to help Renault engineers improve them further still. **Figures indicate that if all cars on the market were fitted with SRP3, a 30% reduction would be achieved in the number of people killed and seriously injured in road accidents (source: LAB).**

Education

Renault's road safety strategy extends beyond technical considerations to cover education as well. **Because the driver will always be the key factor in road safety**, the education of road users must be a priority mission. As a socially responsible company, Renault has been running education campaigns across all sectors of the population and age groups for many years now.

Renault's **Safety for All programme** addresses children and young people in 23 countries, using entertaining and informative content backed by active involvement from children, parents and teachers.

A further investment has seen the company enhance the road safety awareness of its own staff and encourage them to become responsible citizens thanks to the **'Renault Group Driver's Charter'.** This covers 130,000 employees in 30 countries and involves annual awareness programmes during the Road Safety Month in June, as well as educational programmes.

Last but not least, along with other major companies in the automotive industry and related fields, Renault is also a partner of the **Global Road Safety Initiative (GRSI)**, which provides financial backing for road safety initiatives in emerging countries.

4. LAB, the only laboratory of its kind in the world

Renault's expertise in the realm of safety draws on the experience of its research programmes that began as long ago as 1954 with the establishment of the Renault Physiology and Accident Analysis Laboratory. This later became the **Accident Analysis, Biomechanics and Human Behaviour Laboratory** (LAB) which was founded in 1969 and which is shared by Renault and the PSA Peugeot-Citroën Group. LAB runs an accident analysis database which is unique in the world based on the analysis of **14,000 accident-damaged vehicles, 25,000 victims and 63,000 injuries**.

The laboratory has three main objectives: to develop a greater understanding of the causes of accidents, to analyse the physical constraints that the human body is capable of withstanding and to study driver behaviour.

- ***Understanding the causes of accidents (accident analysis) to:***
  - Develop effective driver aids,
  - Determine the impact configurations that need to be taken into account when designing vehicles.

- ***Analysis of the physical constraints the human body can withstand (biomechanics) to:***
  - Develop effective protection and define new injury criteria.

- ***Study of driver behaviour to:***
  - Take into account different driver profiles to deliver enhanced comfort and safety.

What is biomechanics?
Biomechanics is the study of how the human body is capable of withstanding mechanical forces.

5. Resources allocated to develop Renault's safety policy

Renault's recognized skills and know-how in the field of safety are the result of a concerted safety policy. Renault invests **€100 million** on safety annually and employs **600 safety specialists** at three research and test centres.

At the Guyancourt centre (west of Paris), safety teams mainly comprise experts in digital simulation specially trained in computer assisted simulation. Some **4,000 virtual crash-tests** are performed every year.

At the Lardy centre (Paris region), real-life crash-tests are performed using a 35-metre long catapult. The Lardy centre performs around **400 physical crash-tests** annually.

The Aubevoye centre (Normandy) works on **running gear**, with testers measuring the dynamic characteristics of vehicles during their development. Roadholding evaluations are based on more than 300 criteria.

What does a crash-test involve?
All new models developed by Renault undergo several crash-tests. Each test vehicle is fitted with 70 sensors and is occupied by dummies worth €150,000 each. Vehicles undergo a raft of tests (front, side and rear impacts, and pedestrian collisions) to determine their resistance and their capacity to protect occupants. Each test involves over 300 hours of work. The test vehicle is crashed into obstacles by means of a 35-metre long catapult at the Lardy centre. Collisions are filmed and recorded by ultra-high speed cameras (more than 1,000 images per second). Test data is analysed to validate technical solutions capable of affording the best possible protection for vehicle occupants.

6. Key dates in Renault's safety record

Renault has a longstanding commitment to safety. Over half a century ago, Renault became the first carmaker to set up a physiology and biomechanics laboratory run by a doctor.

1898: Louis Renault's original Voiturette featured a geartrain transmission, more reliable and less dangerous than the day's more conventional chains or belts.

1909: A compressed air starter replaced the crank, responsible for many injuries.

1922: Renault's six-cylinder 18CV and 40CV models had brakes on the front wheels, and the 40CV could be fitted with Louis Renault's patented mechanical **servo-brake**, for stronger braking action.

1937: The Juvaquatre was the first Renault with **independent** front **suspension,** for better roadholding, and an all-steel **monocoque structure,** for better protection.

1951: The **Lardy centre** (near Paris) was set up to handle tests on all future Renault vehicles. This was where the first impact resistance tests were carried out.

1954: Renault set up a **physiology and biomechanics laboratory** run by a doctor, to help vehicle design teams develop safer cars. From this moment on, crash-tests would take on major importance in vehicle design and safety engineering.

1962: The **R8** was the first compact car to be fitted with **disc brakes on all four wheels**, a feature previously reserved for large cars.

1969: Renault and PSA Peugeot-Citroën set up the joint **Accident Analysis and Biomechanics Laboratory** (LAB).

1974: The BRV (Basic Research Vehicle) was developed **for studies into passive safety.**

1979: Renault presented **EPURE** (vehicle for research into road user and environment protection), featuring the concept of a non-deformable cabin, and allowing for pedestrian impact.

1985: ABS appeared on the R25.

1993: Driver airbag and seatbelt pretensioners appeared on Clio, R19 and Safrane.

1995: Mégane introduced the **Programmed Restraint System** (SRP1), which revolutionized the seatbelt by adding a load limiter, pretensioner and locking reel.

1996: ABS and **driver and passenger airbags** appeared across the whole Renault range.

1998: The second-generation Programmed Restraint System (SRP2) appeared, with driver and passenger airbags, load limiters, pretensioners and headrests with close-up protection.

2000: Scénic introduced **Emergency Brake Assist,** and Renault launched its Safety for All programme.

2001: Renault introduced ESC Electronic Stability Control on Laguna II, traction control and third-generation SRP. **Laguna II** became the market's **first car** to obtain the **top five-star rating** in the EuroNCAP crash-tests.

2002: Mégane II and **Vel Satis** obtained **five-star** EuroNCAP **ratings**.

2003: Espace IV and **Scénic II** obtained **five-star** EuroNCAP crash-test **ratings, with Espace IV scoring 35.11 out of a possible total of 37, the highest score ever achieved to date.**

2004: Five-star EuroNCAP crash-test **ratings** were achieved by **Mégane Cabriolet** and **Modus** (the first five-star car of its category)**.**

2005: Clio III obtained a **five-star** EuroNCAP crash-test **rating.**

2007: Laguna III obtained a **five-star** EuroNCAP crash-test **rating, with a record score of 36 out of 37.**

7. EuroNCAP

Renault is the only manufacturer to have seen nine of its vehicles obtain a five-star EuroNCAP crash-test rating. The first model in the world to achieve the top rating was Laguna II in 2001. It was followed by Vel Satis, Espace IV, Mégane II, Scénic II, Mégane Coupe Cabriolet, Modus, Clio III and Laguna III. In December 2007, Laguna III obtained the excellent test score of 36 out of a maximum 37.

These outstanding results speak volumes for Renault's expertise in the realm of passive safety.

The crash-test procedure run by the independent organization EuroNCAP features four separate tests:

- ***Front impact***

At a speed of 64kph (compared to 56kph under the European directive), the car collides with a deformable metal barrier simulating the front of another vehicle. For a better match to real-life collision conditions, the offset impact covers 40% of car width, on the driver's side. This test is scored out of 16.

- ***Side impact***

A mechanical ram is projected at a speed of 50kph against the driver's side of the test vehicle, simulating impact from another vehicle. This test is scored out of 16.

- ***Pole test***

Mounted on a trolley projected at a speed of 29kph, the car collides with a pole on the driver's side. This test adds two bonus points.

- ***Pedestrian impact***

This test assesses how dangerous the vehicle is to pedestrians (tibia, hip and head injury) in a frontal impact at 40kph. It is scored separately.

The maximum score across all tests is 34, although three additional points can be awarded for the presence of an audible seatbelt reminder function, bringing the maximum to 37. Depending on the score obtained by the vehicle, a rating of one to five stars is given, indicating its overall safety level. A score of 32.5 or better is required for a five-star rating.

The car being crash-tested is occupied by lifelike dummies fitted with sensors to evaluate injury to each part of the body. The seriousness of injuries incurred by each zone is colour-coded (red for 'very serious', brown for 'serious', orange for 'moderate, yellow for 'slight' and green for 'very slight').

What is EuroNCAP?
EuroNCAP is a Brussels-based organization that carries out precise studies into the consequences of accidents on drivers and passengers. It is co-financed by the FIA (Fédération Internationale de l'Automobile), the European Union, the governments of five countries (Germany, France, UK, Holland and Sweden), and three associations: ICRT (International Consumer Research & Testing), ADAC (Allgemeiner Deutscher Automobil-Club) and AIT (International Tourism Association). EuroNCAP's annual budget of around €6 million is spent on acquiring around thirty new vehicles and putting them through crash-tests.

PREVENTION

Road danger is not an inescapable fact of life. One way to make roads safer is to enhance user responsibility. Prevention therefore starts by helping the driver anticipate risks. In addition, Renault also provides equipment that performs auxiliary tasks automatically, enabling drivers to keep their minds on the road.

- **Visual and audible seatbelt reminders (SBR)**
- **Tyre pressure monitoring system**
- **Cruise control with speed limiter**
- **Automatic headlamp and wiper activation**
- **Xenon/bi-xenon headlamps**
- **Additional cornering lights**
- **Electronic alcohol test**

Visual and audible driver and passenger seatbelt reminders (SBR)

Situation

The seatbelt is the most important and effective protection system in the car, even at low speeds. If seatbelts were worn by 100% of vehicle occupants in all seats, 1,200 lives would be saved on French roads every year (source: LAB).
LAB studies reveal that seatbelts are only worn by 74% of front-seat occupants and 43% of rear-seat occupants involved in an accident, compared with official statistics indicating around 98% at the front and 82% at the rear.

Solution

A warning light comes on and a buzzer sounds if the driver's seatbelt is not buckled by the time the vehicle speed reaches 20kph. On some vehicles, there is also a passenger seatbelt reminder.
If the belt is not fastened within 30 seconds, the buzzer sounds at a louder volume for 90 seconds (in order to be heard above engine noise at more than 50kph). After two minutes, the warning lamp remains lit.

How it works

A switch in the buckle detects whether the belt is fastened or not. Based on information from the speedometer concerning the car's speed, the control unit switches on the audible and visual warning alarms.

Did you know?

In a collision against a wall at a speed of 50kph, it takes a force of more than two tonnes to restrain an adult weighting 75kg. The impact is equivalent to a fall from the third floor of a building.

Tyre pressure monitoring system

Situation
Tyres are the only part of the car in contact with the road. Unfortunately, they are all too often overlooked when servicing the car.

Solution
A dashboard light warns the driver if there is a pressure-related problem, such as under-inflated tyres, slow punctures or tyre pressures that are inconsistent with the vehicle's speed. A message explaining the problem (under-inflation, over-inflation, puncture, inappropriate pressure for speed) appears on the display. On some models, the display also shows the inflation pressure for each tyre. The tyre pressure monitoring system enables the driver to adapt speed to tyre pressure, avoid premature tyre wear and avoid blow-outs.

How it works
Pressure, temperature and acceleration sensors in each wheel permanently send data via a wireless link to the vehicle's central control unit which uses this information to analyse the situation and warn the driver of a puncture or an inflation-related problem.

Did you know?
Around 6% of fatal accidents on motorways involve a tyre blow-out caused by insufficiently inflated tyres or a slow puncture (source: AFSA, Association Française des Sociétés d'Autoroutes).

Cruise control with speed limiter

Situation

The cruise control with speed limiter, first introduced in 2001, permits speed limits to be adhered to.

Solution

Cruise control is often seen as a convenience function that also helps to reduce fuel consumption. However, it also contributes to enhanced safety by alleviating driving-related stress.

The speed limiter contributes to safety by making sure the speed does not inadvertently stray above the threshold set by the driver.

How it works

The cruise control with speed limiter function makes use of new-generation electronic accelerator technology, which has replaced the traditional throttle cable.

The driver sets the required speed using steering wheel-mounted controls (+ and –). An electronic control unit compares this with the actual speed of the vehicle as conveyed by the speedometer or sensed by wheel speed sensors.

In **cruise control** mode, the system keeps the vehicle at the set speed by adjusting the injection pump (on a diesel engine) or the micro-motor that controls the throttle valve (petrol engines). To exceed the pre-set speed, the driver only has to press on the accelerator pedal. Any action on the brake or clutch pedal also automatically deactivates the cruise control function.

In **speed limiter mode**, the system does not adjust the vehicle speed directly. Instead, it activates a micro-motor to set a hard spot in the accelerator pedal action, indicating that the set speed has been reached. But the driver can exceed this set speed by simply pressing a little harder on the pedal.

Did you know?

Around 25% of accidents are caused by the driver failing to appreciate the speed of his or her vehicle (source: LAB).

Some 95% of non-motorway fatal accidents take place at speeds of less than 130kph (source: LAB).

Automatic headlamp and wiper activation

Situation
Renault provides systems that automatically take charge of certain tasks, thereby enabling the driver to give full attention to the road.

Solution
Headlamps light up and wipers start automatically as required by the prevailing light and weather conditions. Wiper speeds adjust automatically to rainfall intensity.

How it works
Two sensors are mounted on the windscreen above the rear-view mirror: rain is sensed by an active infrared sensor with two transmitter diodes and four receiver diodes; light is sensed by a passive sensor with three lenses and three photo-electric cells.
The two transmitter diodes in the **rain sensor** send out four infrared beams. If there is water on the windscreen, the receiver diodes will only pick up partial beams. Sensor information is analysed by the system's control unit which instructs the central control unit to switch on the wipers at the required speed. The rain sensor takes readings every 2.5 milliseconds, and each reading is compared with the information collected over the five previous seconds for optimum response.

In the **light sensor**, three lenses focus light onto three photo-electric cells. Each lens picks up a different type of light: ambient light, forward light and tunnel light. The information is collated to manage transient zones between areas of light and shade.

Did you know?
There are between 20 and 30 different controls on a vehicle. It takes the driver two seconds to operate any one of them. A car travelling at 90kph will cover 26 metres in those two seconds. At 130kph, the distance covered is 36 metres.

Xenon/bi-xenon headlamps

Situation
When driving at night, the driver‘s capacity for anticipation is directly determined by the range of the headlamps. The farther he or she can see, the better the driver will be able to respond appropriately to an incident.

Solution
Xenon/bi-xenon lamps are highly efficient, delivering twice the light of halogen lamps using the same power consumption. They have a range of more than 100 metres, compared to an average of 40 metres in the case of halogen lamps. Their flux density is higher, but they do not dazzle drivers in oncoming vehicles. And they last five times longer than halogen lamps.

How it works
Xenon lamps are discharge lamps. This means that, unlike halogen lamps, they have no filament. Light is produced by an electric arc between two electrodes in a glass bulb filled with pressurized xenon, a rare gas. The electrical excitation required to produce this arc is obtained by a built-in electronic module that generates a starting voltage of 200,000V, followed by a steady AC voltage of 85V once the arc is established.
A bi-xenon headlamp has a discharge lamp plus a flap for switching between dipped and main beams. With double the light flux of a conventional halogen lamp, and a colour close to natural daylight, it performs dipped and main beam functions.

Did you know?
In Europe, 40% of fatal accidents take place at night, although night traffic represents just 10% of the total.

Additional cornering lights

Situation
On winding roads, an obstacle on the inside of a bend will be difficult to see with conventional straight-ahead headlamps.

Solution
Additional cornering lights light up the inside of the bend. They are automatically switched off at high speed or when reverse gear is engaged.

How they work
For an additional cornering light to be activated, the angle of the steeringwheel must be equal to or more than 40°, the speed of the vehicle must be less than 60kph and the dipped beam function must be selected. A steering wheel angle sensor relays the driver's instruction and the direction of the turn, wheel speed sensors inform on vehicle speed, while the light controls inform on the current light settings.
Cornering lights are switched off at high speed because there is no need for them, since the car will be negotiating long corners rather than tight bends, and normal headlamp lighting will be sufficient.
Additional cornering lights can either be of the fixed type, with a bulb that is directed at an angle of 40° (e.g., Modus, Clio III), or mobile via the bi-xenon headlamp module (Laguna III, Espace IV).

Did you know?
Modus was the first car in its category to be fitted with additional cornering lights, a system that was awarded the EPCOS-SIA 2005 innovation trophy.

Electronic alcohol test

Situation
In more than 10% of fatal accidents in Europe, the driver has a blood alcohol level above the legal limit. Alcohol is a key road safety concern.

Solution
Electronic alcohol tests inform drivers on their blood alcohol level and dissuade them strongly from taking the wheel if the test is positive. In France, this item is available as an accessory from the Renault network.

How it works
The electronic alcohol test takes a reading in three seconds and shows the result on a digital display. If the reading is equal to or above the legal limit, an alarm sounds. The device is highly precise, and gives consistent readings.

Did you know?
If all drivers with a blood alcohol level above the legal limit had refrained from driving, there would have been 26% fewer fatal accidents in France in 2006 (source: ONSIR, Observatoire National Interministeriel de Sécurité Routière).

CORRECTION

The inherent handling and braking qualities of a vehicle are fundamental factors of its overall dynamic, active safety and accident avoidance performance.

Even so, situations can arise which require technological intervention to compensate for driver errors. Support systems help the driver in difficult and dangerous situations, but do not take control out of the driver's hand.

- **ABS (anti-lock braking system) with EBD (electronic brakeforce distribution)**
- **Emergency brake assist**
- **ESC (electronic stability control) with CSV (understeer control)**
- **ASR (traction control)**
- **Active Drive chassis with four-wheel steering**

ABS (anti-lock braking system) with EBD (electronic brakeforce distribution)

Situation

Contrary to popular belief, ABS (anti-lock braking system) doesn't simply reduce stopping distances. It also optimizes braking performance and, above all, enables the driver to continue to steer.

Solution

By preventing the wheels from locking under emergency braking, ABS ensures that the tyres continue to perform their function of guiding the vehicle, meaning that the driver stays in control. EBD (electronic brakeforce distribution) divides braking power across the four wheels in accordance with the amount of grip available and depending on the load on each one, again helping the vehicle to stay on line.

In addition to controlling the ABS itself, the ABS control unit also acts as the nerve-centre for other electronic systems. ESC, emergency brake assist (hydraulic), traction control, cruise control/speed limiter, tyre pressure monitoring systems and many other systems all operate directly through the ABS control unit or use the information it supplies.

How it works

ABS inputs data from sensors in each wheel to monitor individual wheel speeds. If it detects lock-up on one wheel, a central control unit triggers hydraulic compensation to free it.

EBD is an electronic brakeforce distribution system incorporated in the ABS system. It replaces the traditional mechanical compensator that used to adjust the front/rear brake split. Unlike the former system, it is permanently active, and much more precise, inputting information from the ABS sensor and operating on the hydraulic system.

Did you know?

Since 2003, ABS has been a legal requirement for all new vehicles sold in Europe. All ABS systems across the Renault range come with EBD.

Emergency brake assist

Situation
LAB studies reveal that only 50% of drivers brake sufficiently hard for the ABS system to switch on in an emergency situation. Efficient brakes serve no purpose if the driver doesn't make the most of them.

Solution
Emergency brake assist compensates for deficiencies in the driver's action on the brake pedal. Studies show that drivers in emergency situations tend to apply insufficient pressure, or else they release the pressure too soon. Emergency brake assist remedies both of these deficiencies.
Other experimental studies show that emergency brake assist can shorten stopping distances by between 5 and 9 metres on a dry road surface (source: LAB).

How it works
The brake pedal activation velocity is measured and, if an emergency situation is detected, an amplifier raises the pressure in the brake circuit to decelerate the vehicle as effectively as possible. This extra pressure is held until the driver releases the brake pedal. Under very sharp deceleration, the emergency warning lights switch on automatically.

Did you know?
LAB studies show that emergency brake assist would reduce the number of road injuries by 10% and save the lives of 3,000 people in Europe, including 300 pedestrians. Renault offers emergency brake assist across its entire range (passenger cars and LCVs) as standard.

ESC (electronic stability control*)* with CSV understeer control

Situation
LAB studies show that 40% of road deaths occur in accidents that involve loss of control of the vehicle.

Solution
ESC (Electronic Stability Control*)*, also known as ESP (Electronic Stability Program, a registered trademark), helps the driver stay in control of the vehicle if it starts to stray from the chosen cornering line, but without taking control out of the driver's hands. In the case of Renault models, ESC is enhanced by an additional understeer control function which kicks in to correct understeer (loss of front wheel grip causing the car to head straight on towards the outside of a bend) in emergency situations.

How it works
The ESC control unit permanently analyses data from eight sensors, and compares these readings with a vehicle behaviour model stored in its memory. The instruction to turn from the driver is sensed by the steering wheel angle sensor and by a brake pressure sensor. In parallel, the control unit analyses the speed of rotation of each wheel thanks to their respective sensors and ensures that this information complies with the instruction from the driver and with the pivot speed of the vehicle. The system also includes a gyrometer (measuring pivot speed) and an accelerometer.
If the ESC controller finds that the actual vehicle trajectory has strayed from the desired trajectory, it instructs the ABS control unit to brake one or more wheels. If this is not sufficient to bring the vehicle back in line, the control unit acts on the accelerator to adjust engine torque.

Did you know?
If all vehicles were fitted with ESC, road deaths would fall by 16% and injuries by 10% (source: LAB).

ASR traction control

Situation
When pulling away or travelling in a straight line, slip in one wheel can give rise to loss of control over the vehicle.

Solution
Traction control prevents, or greatly reduces, wheel slip with a view to resuming normal traction performance. It is complementary to ESC.

How it works
The control unit monitors the frequency of pulses from the wheel sensors to detect any abnormal increase in wheel speed, indicative of slip. On pullaway with no slip, the pulse frequency from each wheel should increase gradually. A sudden increase in this rate indicates that the wheel is slipping, especially if the signal differs from that produced by the other wheels. When slip is detected, the traction control system acts on the brakes to brake the wheel in question.
In some situations (on ice, for example), traction control will also operate directly on the injection control unit to adjust engine torque; reducing engine power helps the wheels grip again.

Did you know?
Traction control also compensates for loss of grip caused by oil or a patch of ice on the road.

Active Drive chassis with four-wheel steering

Situation

For Renault, driving enjoyment has always gone hand in hand with safety. The Active Drive chassis with four-wheel steering is a perfect illustration of this philosophy.

Solution

The Active Drive chassis with four-wheel steering brings two main advantages:

- It decreases the turning circle for easier manoeuvring at low speeds,
- It decreases steering wheel angles to give more direct, specially calibrated response.

The Active Drive chassis with four-wheel steering gives New Laguna a 10% smaller turning circle (equivalent to that of a city car like Clio).

By enhancing steering precision, the Active Drive chassis with four-wheel steering ideally complements the car's electronic active safety systems (such as ABS and ESC) to make the car more responsive in avoidance manoeuvres.

How it works

The Active Drive chassis with four-wheel steering acts on the dynamic control of the vehicle. A sensor on the steering column sends steering wheel angle information via the CAN (computer area network) to the 4WS (four-wheel steering) control unit which is located behind the rear axle and which also inputs vehicle speed information from the ESC control unit. The 4WS control unit analyses steering wheel angle data to determine the driving style (sporty, avoidance situation, etc.). On the basis of these parameters, it sets the required angle for the rear wheels, which are turned by means of an electric actuator located on the rear axle. At speeds of less than 60kph, the rear wheels turn in the opposite direction as the fronts, up to a maximum angle of 3.5°. At speeds of more than 60kph, New Laguna ensures greater precision, with enhanced stability which enables it to corner as if it were on rails. By turning the rear wheels in the same direction as the fronts enables centrifugal force to be countered.

Did you know?

In addition to the driving enjoyment it delivers, the Active Drive chassis with four-wheel steering makes avoidance manoeuvres safer and more reassuring

.

PROTECTION

Safety is built into the DNA of every Renault. The entire Renault range is designed to afford protection to both the driver and passengers. To start with, the vehicle's structure is designed to protect vehicle occupants by absorbing much of the impact energy.

Renault was the first manufacturer to introduce seatbelt load limiters (1995) and controlled-vent front airbags (1997). Meanwhile, Renault's third-generation System for Restraint and Protection (SRP3) is still unique on the market.

- **Structure (very-very-high-elastic-limit steel/VVHELS)**
- **Third-generation System for Restraint and Protection (SRP3)**
- **Airbags**
- **Active anti-submarining airbag**
- **High-performance rear impact absorbing seats and headrests**
- **Dual side impact sensors**
- **Rear passenger protection**
- **Child safety systems**
- **Retractable roll hoops for convertibles**

Structure (very-very-high-elastic-limit steel/VVHELS)

Situation
To minimize the effect of a collision on occupants, the vehicle itself must absorb as much of the impact energy as possible.

Solution
The vehicle structure is designed to absorb impact energy by crumpling progressively. The cabin, on the other hand, is more rigid, experiences less violent deceleration and serves as a survival cell.

How it works
The distance separating the front bumper from the vehicle occupants is employed to absorb as much impact energy as possible. Thanks to a programmed crumple structure, the impact force is distributed across the hollow section main beams. For maximum efficacy, Renault uses very-very-high-elastic-limit (VVHEL) steels, which are two and a half times stiffer than traditional steels, and thus capable of absorbing more impact energy. A similar structure is found behind the passenger compartment along the boot, for protection in the case of impact from the rear.
Unlike the front and rear crumple structures, the cabin must resist intrusion. So it is engineered to be as rigid as possible, surrounded by reinforcing parts, to form a non-deformable cell capable of protecting occupants.
The doors are also reinforced with pressed steel sections, and padded with absorbent materials.

Did you know?
The use of very-very-high-elastic-limit steel for the body structure of New Laguna ensures lower weight, enhanced rigidity and improved impact protection.

Third-generation Renault System for Restraint and Protection (SRP3)

Situation
Renault's safety policy seeks to afford maximum protection for vehicle occupants in the event of a collision.

Solution
Renault's third-generation System for Restraint and Protection (SRP3) takes the form of a set of equipment that gauges the impact force and position of occupants to adjust protection and minimize the risk of injury.

How it works
The SRP3 control unit gauges the impact force in under 10 thousandths of a second, then several systems work in conjunction to achieve optimally effective protection.

- **The seatbelt**: two straps and three anchor points to hold the occupant in their seat.
- **Pretensioners** connected to the seatbelt buckle hold the belt straps firmly against the pelvis and thorax to prevent the body from moving forward.
- **Load limiters** slacken the pressure exerted by the belt on the thorax to prevent injury from the belt itself under violent impact. The maximum force exerted by the belt is 400kg for the front seats.
- **Controlled-vent airbags** in the steering wheel (for the driver) and dashboard (for the front-seat passenger) serve to dampen impact.

SRP3 also includes other systems (see separate fact sheet), such as an active anti-submarining airbag (see separate fact sheet), high-performance rear impact absorbing seats (see separate fact sheet), a collapsible steering column, and a collapsible pedal unit with double-shell padding.

Did you know?
Frontal impacts account for 61% of road accidents and 45% of deaths.

Airbags

Situation

Front airbags reduce the risk of serious head injury by 75% and the risk of serious chest injury by 65%. They are an integral part of Renault's third-generation System for Restraint and Protection (SRP3, see separate fact sheet).

Solution

Airbags finalize impact energy damping, after the seatbelts have absorbed the bulk of the impact energy experienced by the occupant. Today, all vehicles are equipped with two front airbags: one in the steeringwheel for the driver and the second in the dashboard for the front passenger. It has been demonstrated that the combined action of the airbag and seatbelt brings a 25% reduction in the number of driver deaths and a 15% reduction in the number of front-seat passenger deaths under frontal impact.
Other types of airbag exist: lateral airbags which protect the thorax and head of occupants in side impacts, rear lateral thorax airbags and curtain airbags which protect the front and rear of occupants' heads.

How it works

Impact direction and intensity is detected by a control unit which permanently monitors vehicle acceleration. If the impact exceeds a predetermined critical threshold, the control unit sends an electrical pulse to a pyrotechnic device that deploys the airbags almost instantaneously (30 thousandths of a second). The airbag has vents in it, enabling it to deflate rapidly (0.2 seconds) to slacken off the pressure it exerts on the occupant.
By detecting the impact direction, the controller can selectively trigger front and side airbags as required, for optimum protection.

Did you know?

Airbags will only be fully effective if the vehicle occupants are wearing their seatbelts.
Depending on its size, a modern vehicle may be equipped with up to nine airbags.

Active anti-submarining airbag

Situation
On coupés and coupé convertibles, it is not always possible to fit multiple seatbelt pretensioners, for technical and ergonomic reasons.

Solution
A bespoke airbag situated in the seat pan deploys under frontal impact to hold the pelvis in place and prevent the phenomenon known as submarining. This device was developed by Renault.

How it works
The seat bottom contains an airbag comprising two very thin metal sheets welded together around their entire circumference. This device resembles a simple pressed metal sheet, and is embedded in the foam of the seat cushion, where it cannot be seen or felt.
Like a conventional airbag, this sandwich contains a gas generator that can be triggered to produce a deformation of the metal sandwich. It performs two functions: by forming a hump under the seat, it prevents the pelvis from slipping forward (submarining). And because the very thin sheet metal is deformable, it serves to provide additional damping, thereby complementing the action of the seatbelt.

Did you know?
In a collision, vehicle occupants (especially children) have a tendency to slide underneath their seatbelt. This phenomenon, known as submarining, often results in injury to the abdomen, a particularly fragile part of the human body.

High-performance rear impact absorbing seats and headrests

Situation
Rear impacts account for 12% of road accidents and 2.4% of road deaths.

Solution
Renaults are fitted with seats and headrests specially designed to absorb rear-impact energy. This new technology marks a major step forward in protecting the neck against whiplash injury.

How it works
Instead of being mounted on rods that retract into the seat back, the headrest forms a single height-adjustable whole. So there are no rigid rods in the seatback. The whole of the occupant's back, neck and head are firmly held against the seat and headrest under collision conditions.

Did you know?
A headrest will only be optimally effective if properly adjusted, with the top of the headrest at the same level as the top of the head, and a distance of no more than 10cm between the neck and the headrest.

Side impact protection

Situation
Side impacts account for 16% of road accidents, but are responsible for 33% of deaths and 19% of serious injuries.

Solution
Available as a world first on New Laguna, the dual side impact sensor and thorax/pelvis airbag optimize protection in side impacts.

How it works
Two impact sensors, one in the front door and one in the central pillar, halve the trigger time of the new-generation thorax/pelvis airbag and head airbag. The thorax/pelvis airbag has two chambers, with volume and pressure adapted to biomechanical tolerances in these two areas of the body. It affords optimum protection even under violent impact conditions.

Did you know?
If all cars were fitted with this system, there would be 1,000 fewer road deaths per year in Europe (source: LAB).

Rear passenger protection

Situation
Research carried out by LAB has highlighted a strong propensity for rear passengers to slide underneath their seatbelt under impact (submarining).

Solution
Renault has developed a rear passenger protection system that provides a very high standard of protection.

How it works
Renault's rear passenger protection system includes a number of devices:
- **Coupled with an anti-submarining hump** (see below), seatbelt reels with pyrotechnic pretensioners prevent the pelvis from slipping underneath the belt in a collision situation.
- **Load limiters** calibrated at 600DaN for the outer rear seats bring a 20% reduction in the risk of serious or fatal thorax injury.
- **Rigid, vertically-mounted belt anchors and stems** improve belt efficacy under impact; the straps stay against the thigh rather than against the stomach.
- **Anti-submarining humps for all rear seats** prevent the pelvis from sliding forward underneath the belt (in which case the strap pushes against the fragile abdomen area instead of against the more sturdy bone structure). The humps in the bottom of all rear seats reduce the risk of injury to the abdomen.

Did you know?
Rear-seat passengers account for 12% of deaths and 18% of serious injuries in road accidents in France.

Child safety systems

Situation

Child safety is an issue in itself, addressed by far-reaching specific research at Renault. A suitable protection system, adapted to a child's shape and size, can substantially reduce the risk of injury or death in a road accident. When properly strapped into a seat with the back facing the direction of travel, a child aged less than nine months runs 88% less risk of serious injury (source: Prévention Routière).

Solution

A child's body is not just a scaled-down version of an adult's. And it differs considerably from the adult body in terms of suppleness, too. Children up to the age of 10 must be seated in special seats adapted to their anatomy.

How it works

A vehicle's child safety system comprises several devices:

- **Isofix child-seat anchor points** for front and rear passenger seats. The Isofix standard specifies the way a child seat should be attached to the vehicle with a view to preventing fitment errors and minimizing the risk of injury in a collision. The Isofix standard specifies two in-line anchor points at the intersection between the seat back and bottom. In addition, Renault fits a third anchor point for extra stability, preventing the seat from turning and tipping.
- **A selection of child seats** (by age group) is available as an accessory in the Renault network.
- **Convertible headrest** for children aged 3 to 10, to minimize the risk of neck injury.
- **Front passenger airbag disable switch**.
- **Locking of rear doors and windows** (electric) from a switch on the driver's door.

Did you know?

Research (Simpson et al, 2006) reveals that child systems are incorrectly used in 64% of cases.

It is for this reason that Renault was a driving force in the development and rollout of the Isofix standard, which first appeared in 1998 on Clio II and which is now featured throughout the Renault range. In an impact at 50kph, a child not strapped in becomes a projectile with a force of one tonne.

Retractable roll-hoops for convertibles

Situation
Because there is no roof, rear-seat passengers in convertibles are particularly vulnerable in the event of roll-over.

Solution
In a convertible, the roll-over safety zone lies between the top of the windscreen and the roll hoops behind the rear-seat passengers. The roll-hoop height is therefore a key factor in rear passenger safety. Because high roll hoops detract from the elegance of a convertible, Renault has developed retractable hoops. Under normal conditions, they are concealed as headrests, and, indeed, will act as headrests in the event of rear impact. If the car rolls, the hoops extend automatically to protect the rear passengers.

How it works
A control unit analyses vehicle roll and pitch and triggers hoop deployment if the vehicle's inclination exceeds 50° laterally or 67° longitudinally. Hoop travel is 130 mm.

Did you know?
To test the efficacy of the automatic hoop deployment, the convertible is forced to roll by being propelled along a ramp that covers half the track surface. Deformation in the windscreen frame and hoops is analysed to determine the degree of protection afforded.

EDUCATION

Because human error is to blame in an estimated 80% of road accidents, Renault is consequently committed to a wide-reaching educational programme that addresses future drivers and road users from the earliest possible age.
Through this and other programmes, Renault acts as a socially responsible company, considering public education on road safety matters to be an integral part of its mission.

- **International Safety for All programme**
- **Renault, a socially responsible company strongly committed to road safety**

PRESS RELEASE

International Safety for All programme

Situation

Progress in the realm of road safety requires the mobilisation of all parties. Renault contributes to this collective effort by developing the most effective technologies possible. Yet however efficient these technologies may be, they can never entirely make up for driver shortcomings or errors. Human behaviour is the cause for almost 80% of all road accidents.

Solution

In 2000, Renault launched its international Safety for All programme. Its aim was simple: to help youngsters become aware of the key aspects of road safety from the earliest possible age and to encourage them to adopt a responsible approach to the issue of road safety. The Safety for All programme addresses young children (7 to 11), adolescents (12 to 15) and young drivers.

Children:

Renault has developed a 'Kids on the Road' teachers' pack for issue free of charge to primary schools. This kit allows teachers to produce tailor-made road safety-related lessons. Every year, an international children's drawing contest is organized on a set theme.

Adolescents:

In September 2003, Renault extended its Safety for All programme to the 12-15 age group, with the annual 'Express Yourself' poster competition which asks participants to design a road safety poster campaign. Renault uses the winning poster for a road safety campaign in the run-up to the school summer holiday period.

Young drivers:

Road accidents are the main cause of death in the 15 and 24 age group. Renault has developed a range of road safety awareness and driving tuition programmes in a variety of countries, either independently or in partnership with other associations.

Did you know?

Renault's international 'Safety for All' programme is the biggest road safety awareness operation ever run by a carmaker.

Over the last eight years, Renault's international 'Safety for All' programme has reached over ten million children and young people in 23 countries, thanks to its entertaining and informative content.

For further information: www.safety-for-all.com

PRESS RELEASE

Renault, a socially responsible company strongly committed to road safety

Situation

Road safety is a major social challenge. As an international group, Renault sees itself as a partner to authorities worldwide when it comes to improving road safety.

Solution

- Enhanced road safety awareness for staff

Renault staff members are ideally placed to serve as ambassadors when it comes to road safety. To this end, Renault has been behind a series of road safety-related programmes over the years that aim to improve the behaviour of its staff, to help than anticipate situations and to reduce accidents when travelling on private journeys or company business.

In 2003, Renault made a commitment to the French authorities with the introduction of a 'Renault Group Driver's Charter' which was sent to all its 130,000 employees. This charter encourages them to be safe, responsible motorists.

In addition to this initiative, the group organizes practical car and two-wheel driving lessons at its sites and subsidiaries aimed at enhancing the understanding of accident risks, as well as e-learning awareness programmes and road safety forums during the annual Road Safety Month each June.

Meanwhile, Renault and Vinci have signed a partnership agreement concerning sustainable development that commits both companies to minimizing the dangers relating to road safety and enhancing environmental respect. The objective of this agreement is to permit the pooling of experience and the development of joint activities aimed at reducing the social and economical consequences of road safety-related risks.

- Global Road Safety Initiative

Renault's road safety promotion endeavours are worldwide in scope. Through an action plan developed under the Mobility 2030 project, initiated by WBCSD (World Business Council for Sustainable Development), seven of the world's biggest automotive, oil and tyre companies (Renault, Ford, GM, Honda, Toyota, Michelin and Shell) launched the Global Road Safety Initiative (GRSI), budgeted with around €7 million over five years to develop road safety promotion operations in certain emerging countries, with the cooperation of government authorities.

Specific measures include:

- Publication of guides to good driving practices,
- Regional centres for training and knowledge transfer on road safety matters,
- Financial aid for local road safety projects,

This initiative is part of a broader programme on road safety promotion launched by the World Bank and a number of major corporations.

Did you know?
According to the World Health Organization (WHO), road accidents will be the third biggest cause of death in the world by 2020.

High-resolution photos relating to Renault's road safety policy can be downloaded from: www.media.renault.com > Photo Library > Safety

Media contacts:	Christophe Deville	+33 (0)1 76 84 64 83
	Delphine Guérin	+33 (0)1 76 84 23 90