

Honda Completes Development of ASV-3 Advanced Safety Vehicles

TOKYO, Japan, September 2, 2005— Honda Motor Co., Ltd. today announced it has completed development of Honda ASV-3 Advanced Safety Vehicles equipped to exchange positional information with other vehicles using Inter-Vehicle Communication technology. This was a central objective of the five-year (April 2001-March 2006) Advanced Safety Vehicle (ASV) Project led by the Ministry of Land, Infrastructure and Transport.



Honda ASV-3

Honda ASV-3 vehicles are equipped with several new advanced safety technologies developed by Honda, including a system that uses cameras and radar to provide drivers with information on approaching vehicles and obstacles in the road; a system that offers driver support through steering and brake assist; and an emergency response system designed to aid in rescue efforts in the event of an accident. Honda plans to conduct further research and development of technologies deployed in the ASV-3 research vehicles with a view to implementing them in mass production vehicles.

Honda ASV-3 vehicles represent the culmination of five years of progress since the introduction of the previous generation Honda ASV-2 safety technologies in 2000. In addition to image recognition technology used to analyze images captured by on-board cameras, and radar technology used to detect obstacles in the road, ASV-3 vehicles use inter-vehicle communication to ascertain the condition and position of automobiles, motorcycles and pedestrians relative to each other—an especially important capability in situations where cameras and radar alone may be insufficient to gather such data. The system supports motorists' decision-making by rapidly relaying information in a clear, easy-to-understand fashion. This includes audio and visual warnings for motorcycle riders and automobile drivers, and simple tactile signals for drivers such as vibrating the brake or accelerator pedal or applying torque to the steering wheel.

In addition to supporting driver perception, ASV-3 automobiles feature technologies intended to help prevent accidents, and support systems to help drivers avoid accidents by providing steering and brake assists when it is clear that the driver's maneuvers will not be sufficient to avert an accident. Honda has also developed a system that facilitates a speedy "mayday" response in the event of an accident through the exchange of audio and video information between the affected vehicle and an Operation Center, which can then facilitate a rapid response. Honda has applied research on brain function to overcome the fact that a motorcycle's size and shape can make it more difficult for a driver to detect than an automobile. This led to the creation of new motorcycle design concepts aimed at making motorcycles more visible to other motorists.

Honda places the highest priority on safety in the development of motor vehicles. In addition to providing drivers with driver safety training, Honda is proactively pursuing practical solutions in the areas of *active safety*—accident avoidance; *passive safety*— minimizing injuries in the event of an accident, and *pre-crash safety*—anticipating accidents and mitigating injuries when a collision is unavoidable. Honda has participated in the Ministry of Land, Infrastructure, and Transport-promoted Advanced Safety Vehicle (ASV) project since Phase 1 (April 1991- March 1996), and in that time has developed and commercialized a number of advanced safety systems such as Honda Intelligent Driver Support System, Collision Mitigation Brake System and Intelligent Night Vision System. Honda ASV-3 technologies feature further advances in active safety and pre-crash safety—progress toward the realization of Honda's goal of achieving "Safety for Everyone" in the real world—for motorcycles, automobiles and pedestrians alike.

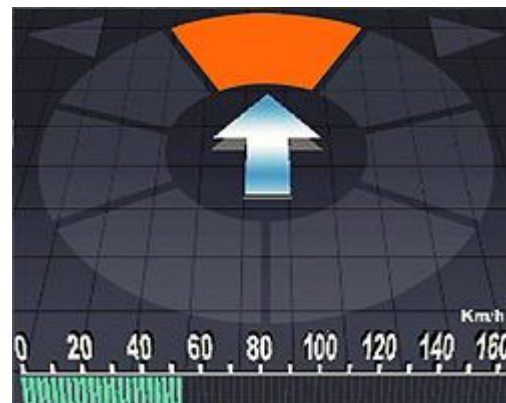
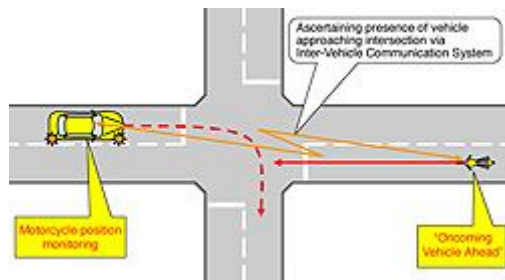
Honda is participating in ASV verification trials being conducted by the Ministry from July 4 to October 28, 2005, and plans to take part in the public demonstrations scheduled to be held in Hokkaido October 12-13, 2005.

- Honda ASV-3: Principal Technologies -

● Motorcycle and Automobile Communication Technology

< Oncoming Vehicle Information Assistance System >

- This system exchanges vehicle information between automobiles and motorcycles, such as position, direction and speed. Motorcycle riders can view information about vehicles near them on a display, and can receive information through an in-helmet audio system. Drivers can view information on the status of motorcycles in their vicinity and receive warnings on their navigation system display.



Example Motorcycle Displays

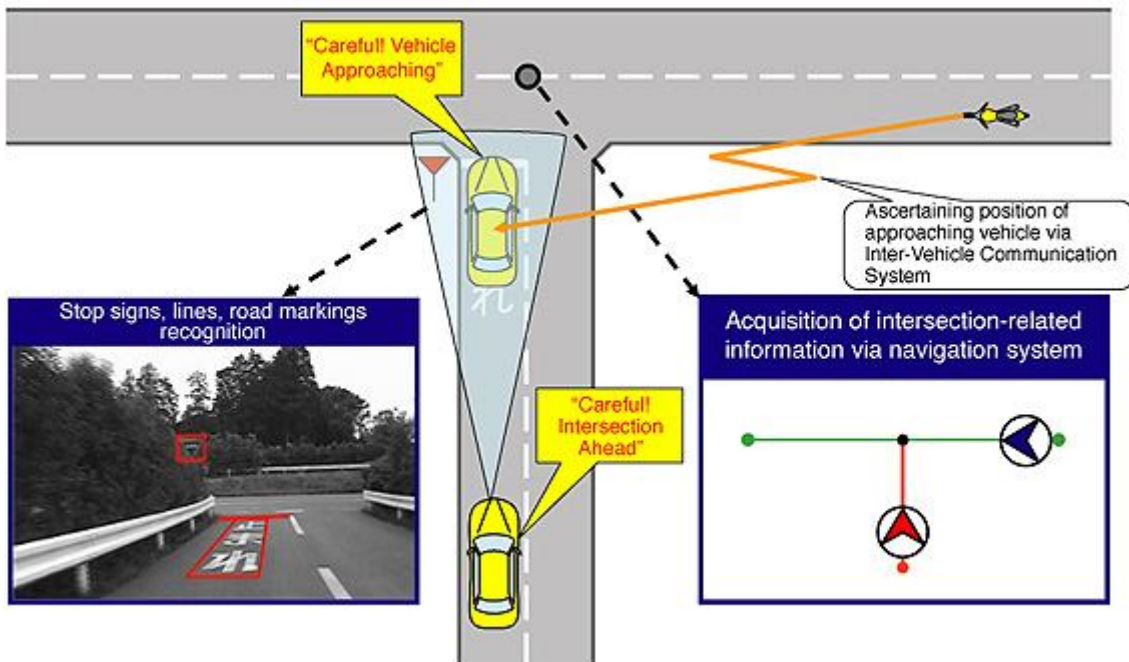
< Intersection Stop & Go Assistance System >

- Motorcycles -

- This system analyzes images from the camera mounted on the front of the motorcycle to detect stop signs and either line markings or road markings. If the rider does not slow down when approaching an intersection, a warning appears on the motorcycle's display screen, and an audio warning sounds in the rider's helmet, prompting the rider to decelerate.
- In addition, once the motorcycle has come to a stop, the Inter-Vehicle Communication System detects the position of any approaching vehicles, assisting the rider in determining whether it is safe to proceed through the intersection.

- Automobiles -

- Information on intersections that are without traffic signals is gathered from car navigation system data. Images from the vehicle's cameras are analyzed to detect stop lines and stop signs. Based on the vehicle's speed and distance to the stop line the system determines whether the vehicle is traveling at a speed that will enable it to stop by the time it reaches the stop line. If the vehicle is exceeding the appropriate speed, the system issues an audio warning while signaling the driver to slow down with a sensory warning via the application of gentle, intermittent braking.
- Once the automobile has come to a stop, the Inter-Vehicle Communication System detects the position of any approaching vehicles and assists the driver in determining whether it is safe to proceed through the intersection.



● Motorcycle Technologies

< Conspicuity Enhancement Designs >

FACE Design

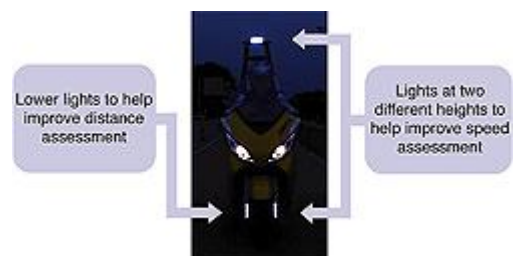
- The human brain exhibits a strong response to facial patterns, especially to the eyes and mouth. Honda's new FACE design for ASV-3 takes advantage of this to make motorcycles more noticeable to other motorists by modifying the front of the motorcycle so that it resembles a human face.
- The FACE design is the result of collaborative research and development efforts by Wako Research Center, the Asaka R&D Center, and Honda Research Institute Japan. In fact, brain function measurements taken with fMRI (Functional Magnetic Resonance Imaging) confirm that the FACE design elicits a response in the brain similar to that when a human face is seen. This design significantly improves motorcycle visibility.

LONG Design

- Since the light from a conventional motorcycle's headlights comes only from the center of the vehicle, it is often difficult to judge a motorcycle's distance and speed—often it seems to be farther away and moving more slowly than reality. To achieve nearly the same level of visibility as automobiles, ASV-3 motorcycles are outfitted with two sets of high-intensity LED lights at two different heights. This improves motorists' ability to judge a motorcycle's distance by approximately 10%, and improve the ability to assess its speed by approximately 20%, as compared with conventional motorcycles.



FACE



LONG

< Rear View Assistance System >

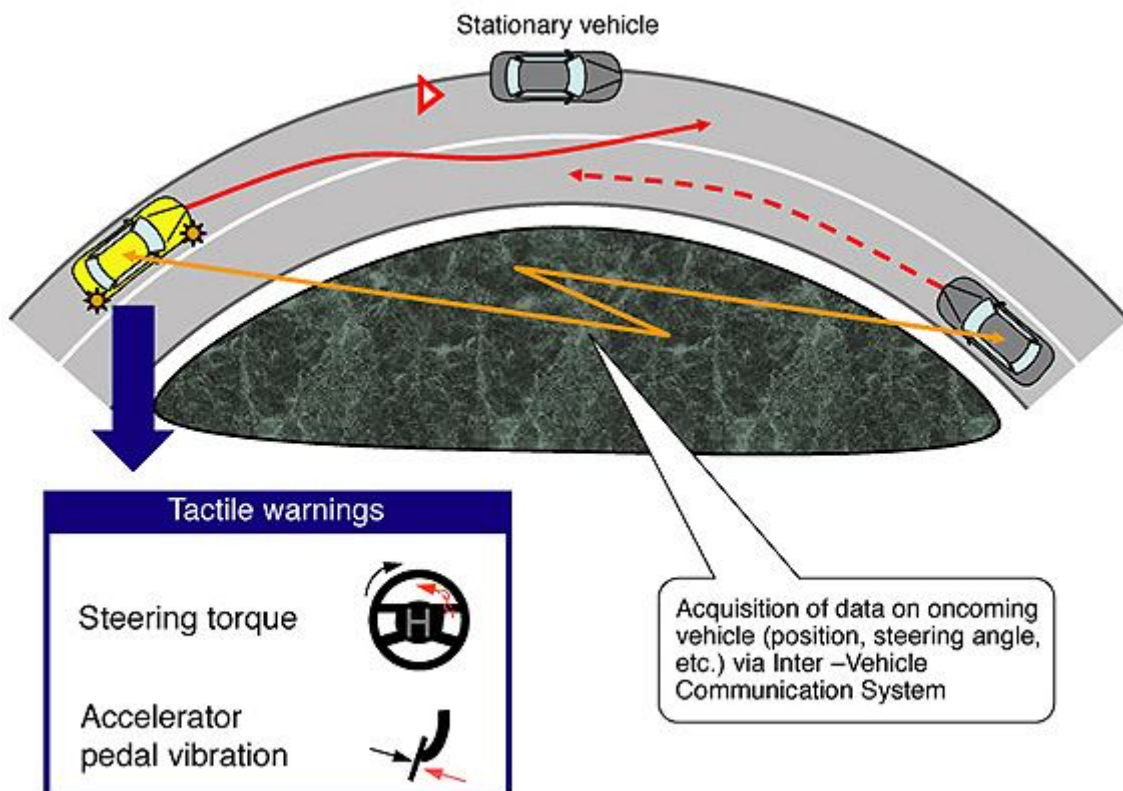
- The status of other vehicles approaching from behind is captured by a rear-mounted camera, and presented on the motorcycle's display. The system helps make maneuvers such as changing lanes safer by providing riders with information about vehicles approaching from the rear that are not easily seen in a rear view mirror.



● Automobile Technology

< Head-on Collision Avoidance Assistance System >

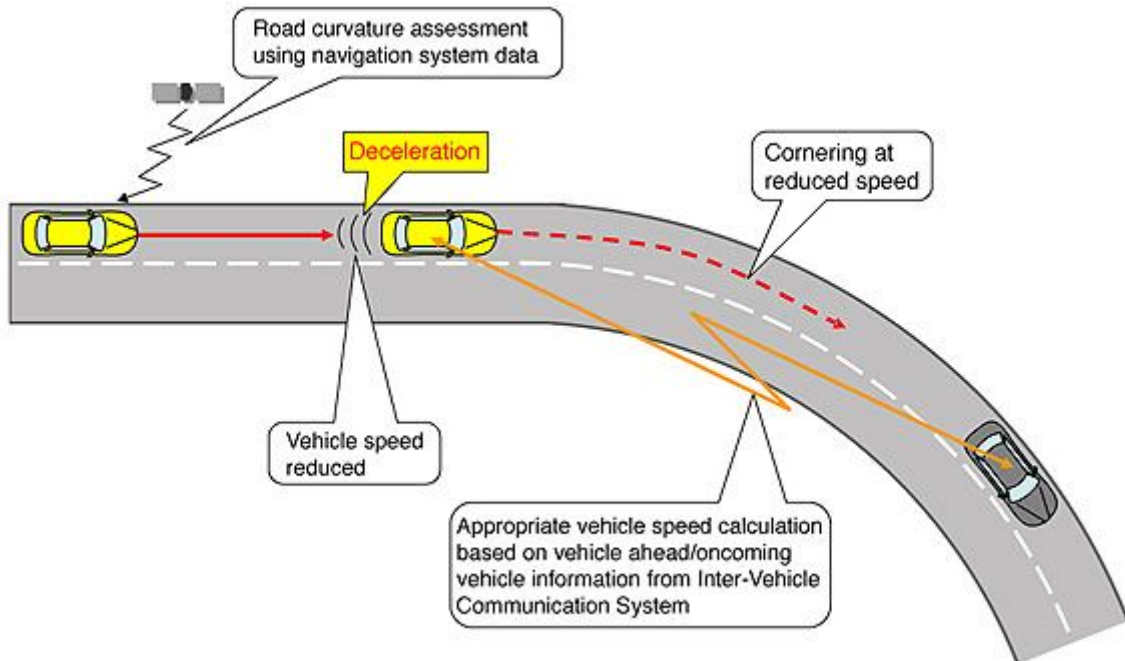
- When an approaching vehicle is hidden from view, for example around a blind curve, the system communicates with the oncoming vehicle to ascertain important information such as its position, speed, and steering wheel angle. If the driver begins to change lanes into the path of an oncoming vehicle, the accelerator pedal vibrates and torque is applied to the steering wheel (pulling in the opposite direction from the driver), sending a tactile warning that prompts the driver to return to his or her own lane.



< Cornering Speed Control System >

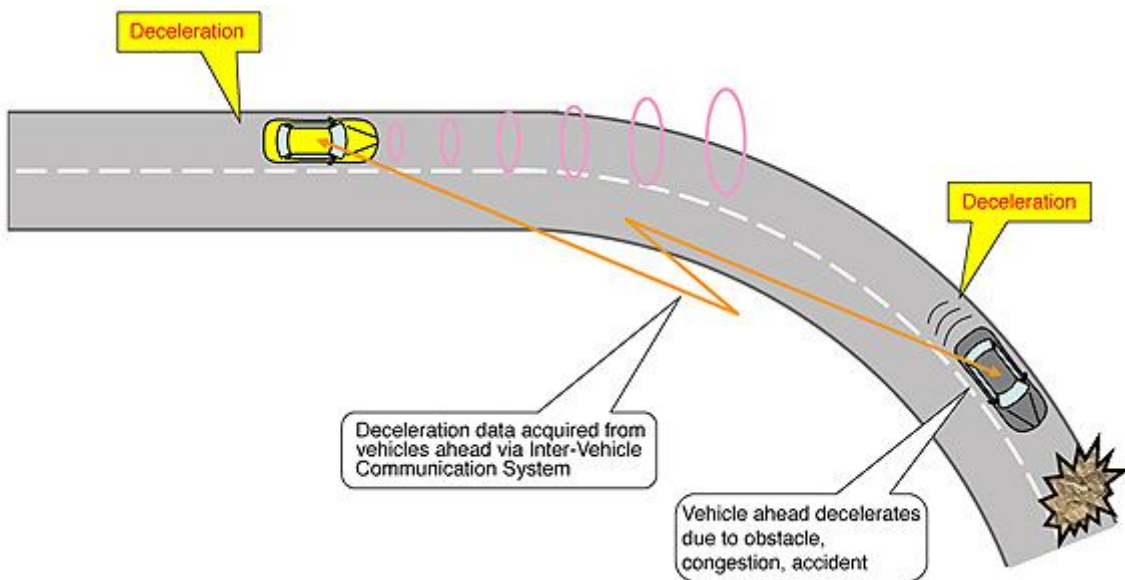
- As a vehicle approaches a curve, this system uses information from the vehicle's navigation system to assess the curvature of the road, and calculates the vehicle's appropriate speed. If the vehicle is traveling above that speed, the system applies the brakes to slow the car to the appropriate speed.
- When a vehicle encounters unexpected changes in road conditions, such as a lane closing or road work not reflected in the navigation system data, the system uses information acquired from vehicles ahead traveling in the same direction and oncoming vehicles to determine the appropriate speed for the current

road conditions.



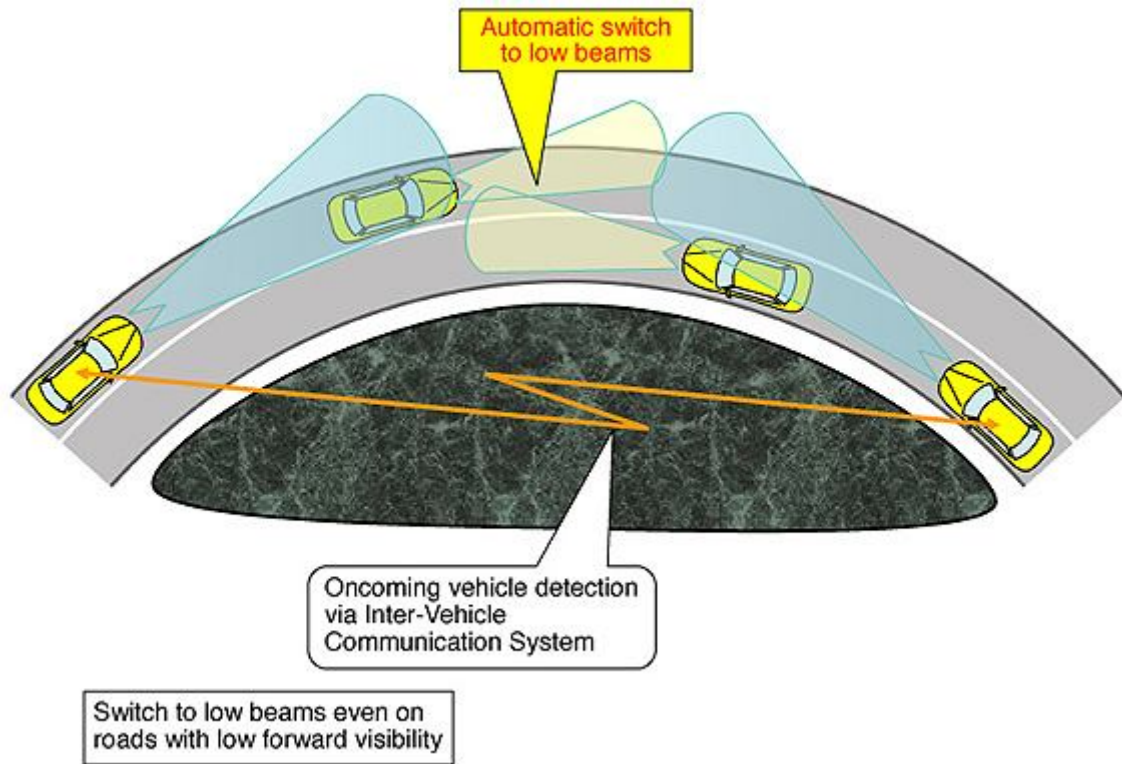
< Adaptive Cruise Control System >

- If a vehicle one or two vehicles ahead of the car slows down in a place such as a blind curve, where the vehicle can not be detected by radar, the Inter-Vehicle Communication System acquires deceleration data and calculates the appropriate speed for the car. If the car is traveling above the appropriate speed, the system issues an audio warning, and reduces the speed of the car.
- If the vehicle directly ahead of the car is detectable by radar, the system uses the radar information to calculate the appropriate speed for the car (as with the existing Intelligent Highway Cruise Control system).
- Using inter-vehicle communication technology in parallel with radar allows the system to acquire and report a broader range of information about the vehicle ahead.



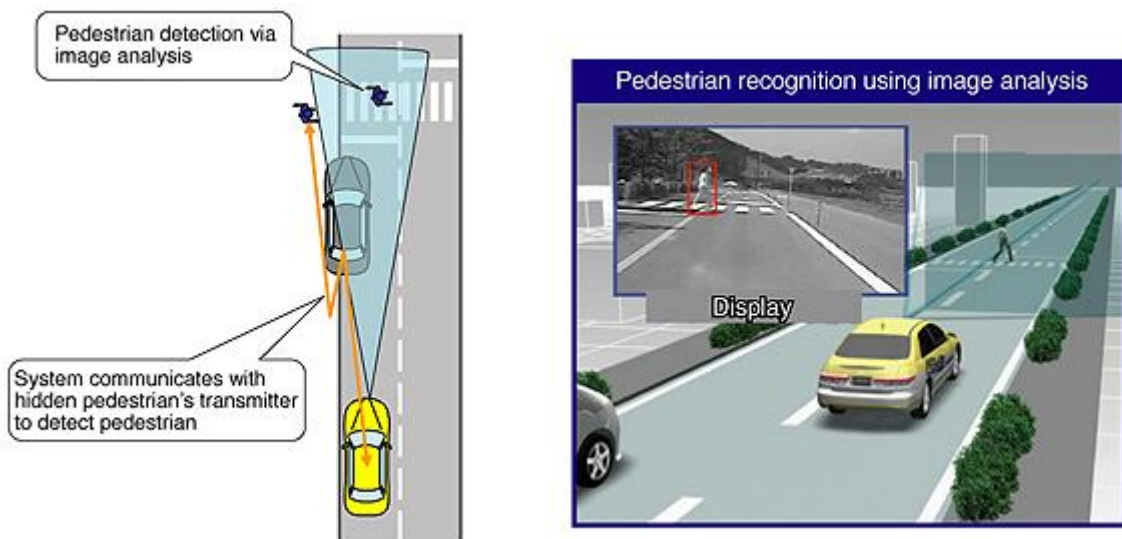
< Advanced Adaptive Frontal-Lighting System >

- Cars traveling at night exchange positional information via the Inter-Vehicle Communication System. As the vehicles approach a point close enough that one of the drivers could be blinded, the system automatically switches the headlights to low beam.
- Even when visibility is limited, the system automatically switches the headlights to low beam just before vehicles pass each other to avoid blinding the driver of the oncoming vehicle.



< Pedestrian Detection, Vision-Based Pedestrian Detection System >

- This system uses the Inter-Vehicle Communication System in combination with image analysis technology to detect pedestrians hidden from view who previously would suddenly appear on the road. The system issues the driver a warning and displays the pedestrian's location.
- The system communicates with a pedestrian's portable transmitter to detect his or her presence in cases where he or she may be blocked from the driver's view, alerts the driver by sounding a warning, and then displays the pedestrian's location on the navigation system screen.
- The system recognizes pedestrians by analyzing images captured by on-board cameras. If the pedestrian is located on the road, the system visually alerts the driver by placing a frame around the figure of the pedestrian displayed on the screen. Based on the vehicle's speed and distance to the pedestrian, the system determines if there is a risk of collision and, if so, issues a warning to the driver.
- This system uses the Inter-Vehicle Communication System in combination with image analysis technology to achieve early detection of pedestrians.



< Forward Obstacle Avoidance Assistance System >

- This system provides compensatory steering and braking assist when a driver is slow to take evasive action when unexpectedly confronted with another vehicle or object appearing in the vehicle's path.
- The radar system determines if another vehicle is in a driver's path. If the driver takes evasive action such as steering sharply away from the other vehicle, this system assists with steering and brake assists to support the driver.

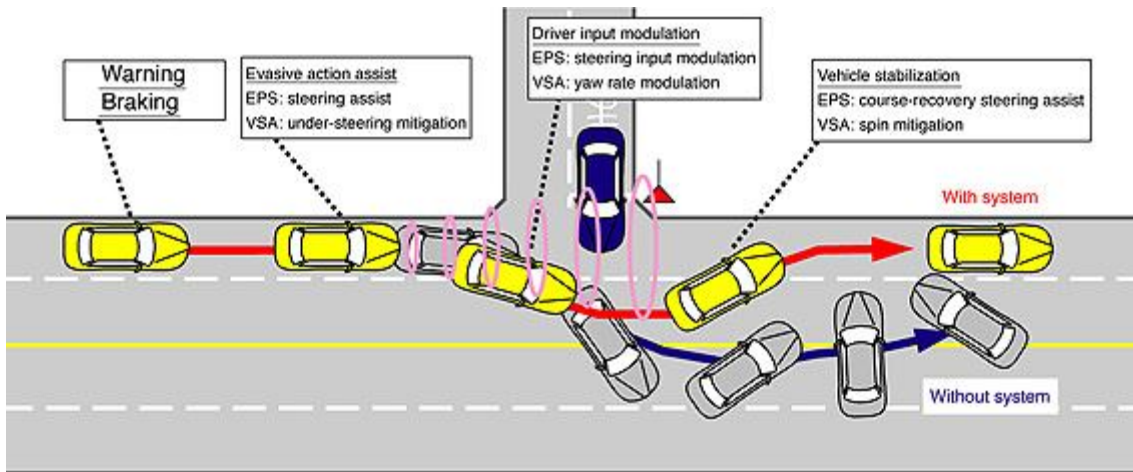
At the start of evasive action: the system provides steering assist to help the driver avoid the

obstacle.

During evasive action: the system reduces steering input to help prevent the driver from turning too sharply.

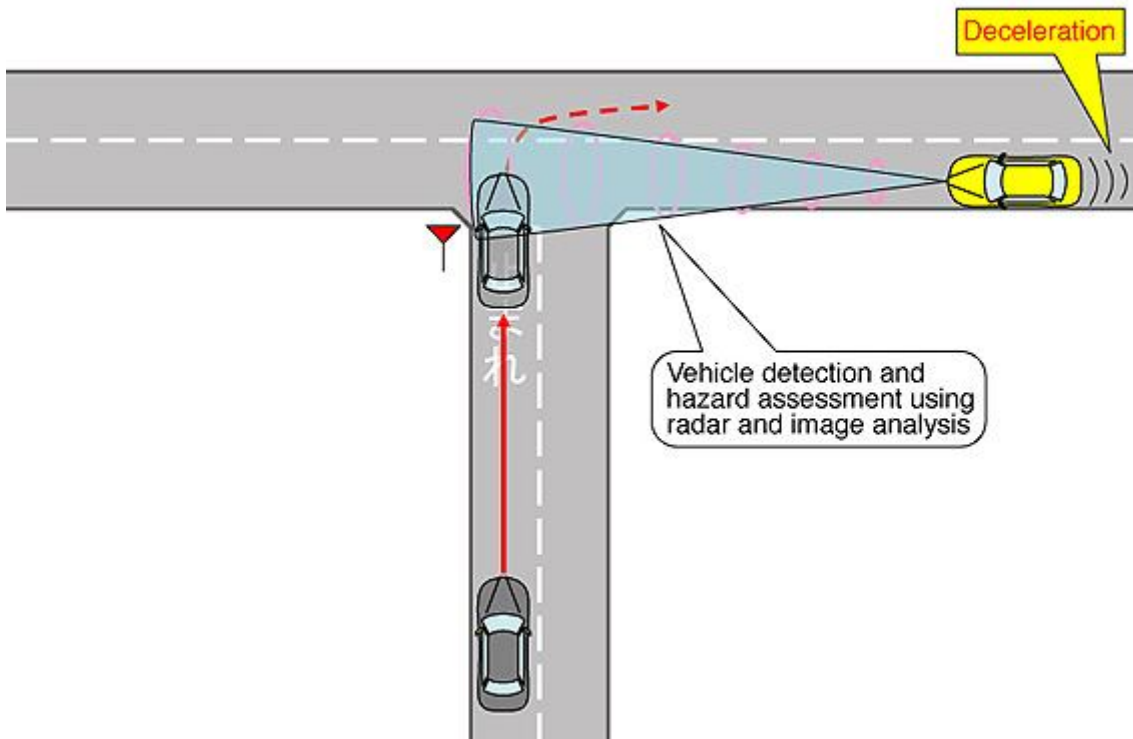
After evasive action: the system provides steering assist if the driver is slow to return the vehicle to its original course, helping prevent the vehicle from spinning out of control.

- This system assists drivers in taking evasive action, and then helps stabilize the vehicle.



< Intersection Collision Mitigation Brake System >

- This system uses on-board cameras, and radar to detect when a vehicle suddenly appears from the side, for example at an intersection. If the system determines that a collision may occur, it provides an audio warning and physically alerts the driver by intermittently applying light braking, and gently tightening the seatbelt.
- If the system determines that a collision is unavoidable, it prepares to mitigate damage and injuries which may result from impact by applying strong braking and firmly tightening the seatbelts to enhance the proper restraint of passengers.
- Honda has commercialized a system designed to mitigate vehicle damage and injuries in rear end collisions, the Collision Mitigation Brake System, which was first available on the 2003 model Inspire in Japan. This experimental Intersection Collision Mitigation Brake System goes further, adding response to potential lateral collisions.

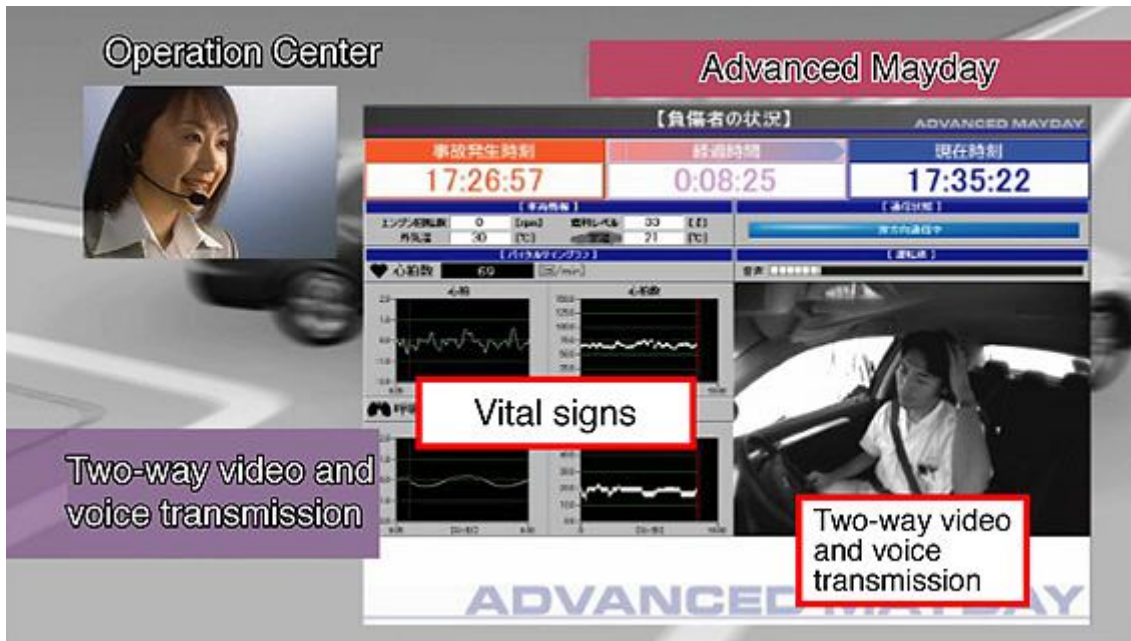


< Advanced Mayday System >

- Should an accident occur, this system automatically notifies the Honda Operation Center and transmits

an array of data about the accident, including the location, vehicle type, the deployment status of the airbags, and 15 seconds of video taken inside and outside the vehicle just before and after the moment of impact.

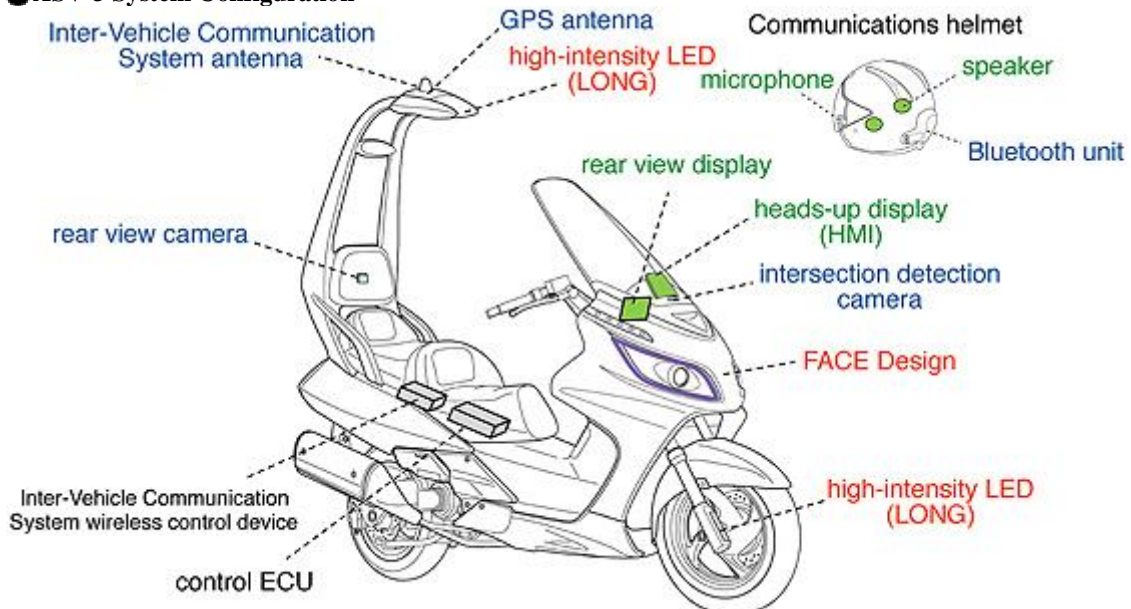
- Using two-way video and voice transmission, operators at the Operation Center can communicate with the occupants of the vehicle and assess their condition in real time.
- On-board body sensors enable the Operation Center to measure the driver's heart rate, respiration rate, and other vital signs.
- If an accident occurs out of range of mobile telephone signals, the Inter-Vehicle Communication System may be able to contact the Operation Center by relaying data through other vehicles.



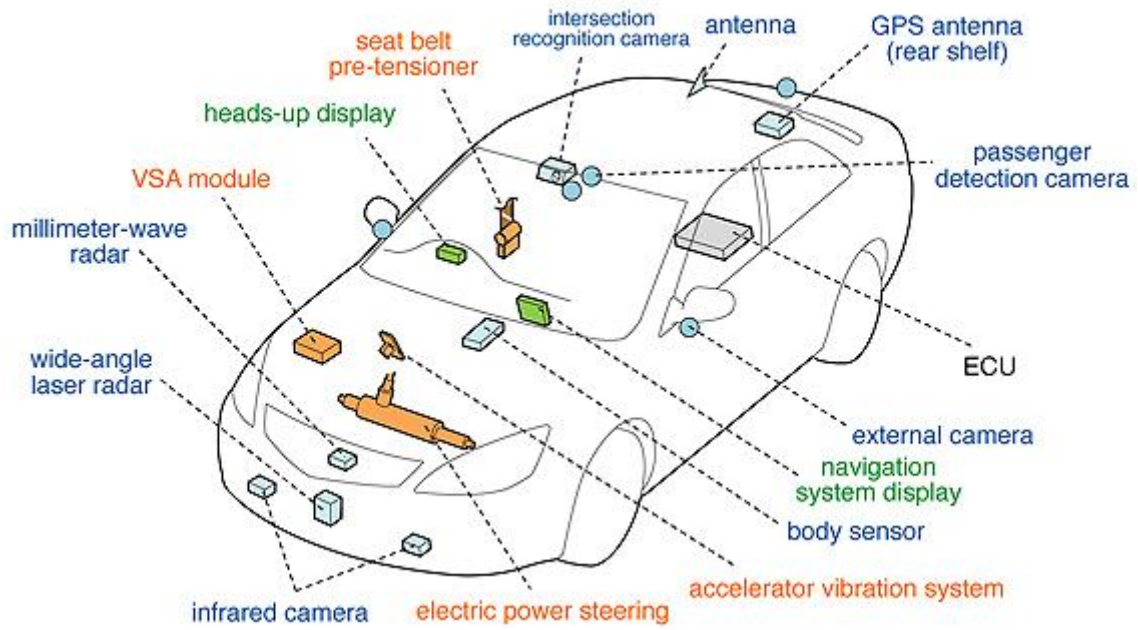
● Overview of Motorcycle/Automobile, Automobile/Automobile and Vehicle/Pedestrian Communication Systems

- The 5.8 GHz communications equipment featured on motorcycles and automobiles enables two-way, wireless transmission of data, such as vehicle type, position, direction, and speed.
- Portable communications devices which can be carried by pedestrians can wirelessly transmit the pedestrian's position.
- The system supports communications up to a maximum of 120 vehicles within a distance of up to approximately 200 meters.

● ASV-3 System Configuration



ASV-3 motorcycle system configuration



ASV-3 automobile system configuration