

Initiatives for Improving Traffic Safety

Fundamental Approach According to a World Health Organization (WHO) survey*, 1.25 million people worldwide died in traffic accidents, making them the ninth leading cause of death. While the number of deaths due to traffic accidents has been decreasing slightly in Japan, the United States and Europe, it has been constantly increasing in emerging nations and regions where traffic safety education and transportation infrastructure have not kept up with increases in the number of cars on the road. Unless countermeasures are implemented, traffic fatalities are predicted to become the seventh leading cause of death by 2030. In order to achieve Toyota's ultimate goal of Zero Casualties from Traffic Accidents, the development of safe vehicles is of course important, but it is also essential to educate people, namely drivers and pedestrians and to ensure safe traffic infrastructure including traffic signals and roads. Toward achieving a safe mobility society, Toyota believes it is important to promote an Integrated Three Part Initiative, involving people, vehicles, and the traffic environment, as well as to pursue Real-world Safety by learning from actual accidents and incorporating that knowledge into vehicle development. Toyota has also defined its Integrated Safety Management Concept as the basic philosophy behind technologies toward achieving the elimination of traffic casualties and is moving forward with developing such technologies.

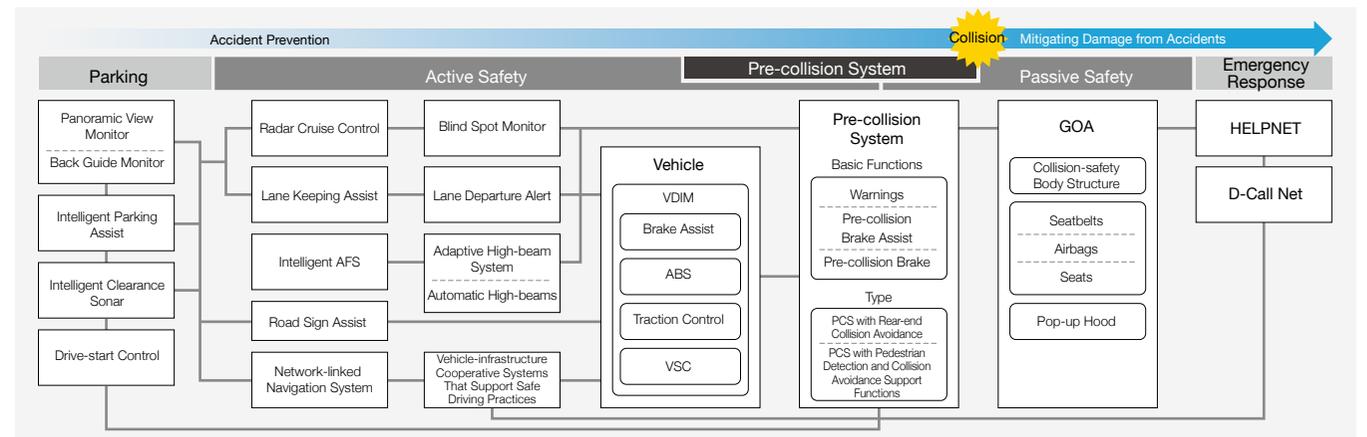
* Global status report on road safety 2015, WHO



Integrated Safety Management Concept

Toyota provides optimum driver support for each stage of driving, from parking to normal operation, the accident itself, the pre-and post-crash timeframe, and post-accident rescue. Toyota's approach is to enhance safety levels through strengthening intersystem coordination rather than seeing each one separately. This is what's behind our Integrated Safety Management Concept.

Integration of Individual Technologies and Systems



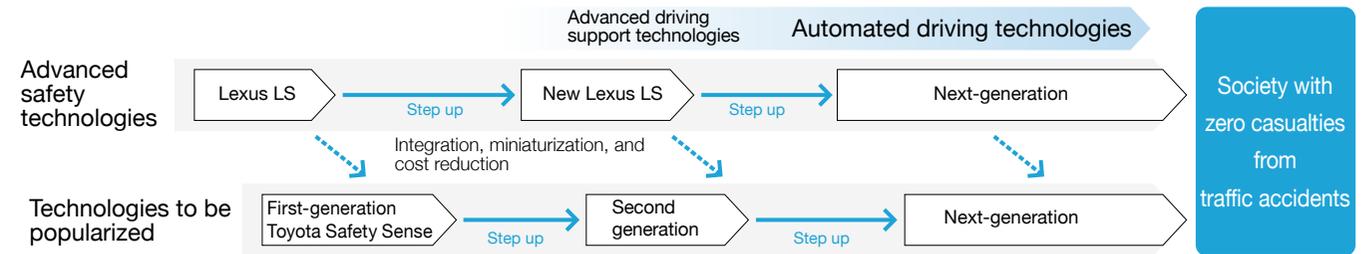
Popularization and Promotion of Safety Technology

Development

To achieve a society with zero casualties from traffic accidents, it is important to develop highly effective safe driving systems in the market as soon as possible and install them in as many cars as possible.

To achieve this goal, it is necessary to take the two-pronged approach of developing advanced safety technologies and capitalizing on the expertise developed there to then develop technologies to be popularized.

Popularization and Promotion of Safety Technology



Results for the Previous Fiscal Year and Major Initiatives for the Current Fiscal Year

Major Initiatives during FY2018 (result)

- Announced the effects of combining Toyota Safety Sense with ICS (Intelligent Clearance Sonar) in reducing accidents
- The number of cars with Toyota Safety Sense (first-generation) installed has topped 5 million globally
- The Parking Support Brake (for stationary objects, vehicles approaching in the rear, pedestrians in the rear) is designed to reduce accidents in parking spaces, and is fitted to the Lexus LS
- The Lexus LS is equipped with the Lexus Safety System + A, which incorporates PCS, the world's first active steering, and the "Lexus CoDrive" advanced driving assist technology

Major Initiatives during FY2019

- The more advanced, second-generation Toyota Safety Sense system is gradually being introduced into new models sold since 2018
- Full-scale implementation of the D-Call Net® and HELPNET's support for D-Call Net®
- Launched Version 6 of THUMS, our virtual human body model

Actual Status of Traffic Accidents and Toyota's Safety Technology

There were 3,694 traffic fatalities in Japan in 2017, a drop of 210 people over the previous year. This was the lowest number since the National Police Agency began keeping records in 1948. Going by road users, pedestrians accounted for the largest number of deaths, with the percentage of fatalities among the elderly (65 year or older) increasing yearly. Another emerging issue is accidents caused by drivers pressing the accelerator by mistake instead of the brake in parking lots, or driving the wrong way down expressways, which are both more common among the elderly. This is becoming a major social issue.

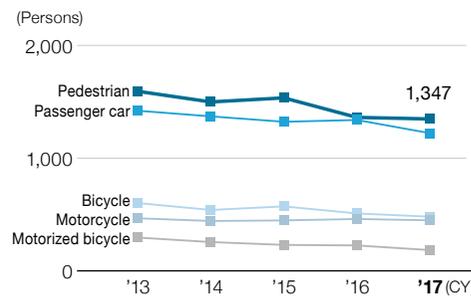
This is why more and more attention is being given to active safety technologies that help prevent accidents in addition to the existing passive safety features.

At Toyota, we are working on installing the Toyota Safety Sense system that packages multiple active safety systems, including automatic braking, on almost all our passenger vehicle models. We are also working on developing ICS, which helps prevent accidents caused by pressing the wrong pedal.

Automated driving technology, which is an aggregation of advanced driving support technologies, is expected to make a big difference in helping reduce the number of casualties from traffic accidents.

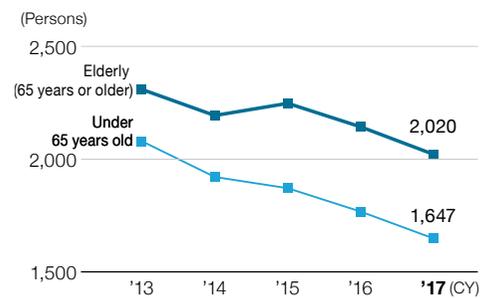
Toyota is placing the highest priority on safety and actively working on developing automated driving technologies, with the aim of achieving a world in which every person can enjoy mobility safely, easily, and freely.

Number of Traffic Fatalities by Accident Type



Source: "Status of traffic fatalities within 30 days of the accident in 2017" National Police Agency

Number of Traffic Fatalities of the Elderly (65 Years or Older)



Source: "On the number of traffic fatalities during 2017" National Police Agency

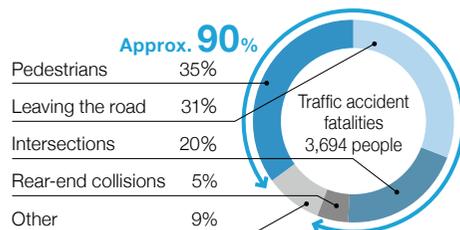
Active Safety

Toyota is developing Active Safety Systems that can keep cars and people free from accidents.

The Number of Vehicles with Toyota Safety Sense Has Topped 8 Million Globally

In 2015, Toyota introduced its new active safety package, Toyota Safety Sense, as a way to roll out safety systems that would contribute to greatly reducing deaths and injuries. Toyota Safety Sense is based on the idea of supporting the driver by assuming safe driving by the driver, reducing the number of accidents as well as helping mitigate damage in the event of an accident. We can work to help avoid collisions or mitigate damage from low to high speeds by packing multiple active safety functions. Our package is based around Pre-collision Safety (PCS), which works to either help avoid collisions with cars ahead or pedestrians, Lane Departure Alert (LDA), which contributes to preventing accidents caused by leaving the lane, Automatic High Beam (AHB), which helps ensure clear sight in front at night. With regard to the actual safety of cars with Toyota Safety Sense installed in real traffic environments, there was a reduction of about 50 percent in rear-end collisions and about 90 percent in combination with the ICS, which helps avoid collisions at low speeds, such as sudden acceleration or hitting other cars and collisions in parking lots (Toyota comparison). In November 2017, we completed Toyota Safety Sense (either as standard or as an option) for almost all passenger vehicles in Japan, North America, and Europe. The number of vehicles with Toyota Safety Sense now tops more than 8 million globally (as of April 2018). In other regions, we are progressively rolling it out to the market as we confirm the various regulations and traffic conditions in each area.

Comparative Rates of Fatal Traffic Accidents by Type

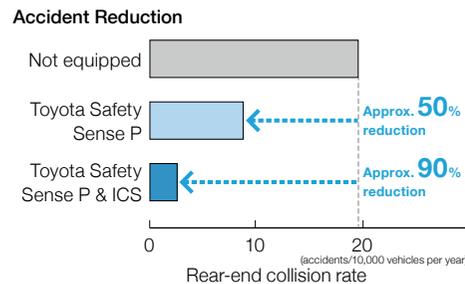


Source: "Concerning the Characteristics of Traffic Accident Fatalities for 2017" Traffic Bureau, National Police Agency

Number of cars with Toyota Safety Sense tops:

Approx. 8 million globally

Effects of Toyota Safety Sense P and ICS on Accident Reduction

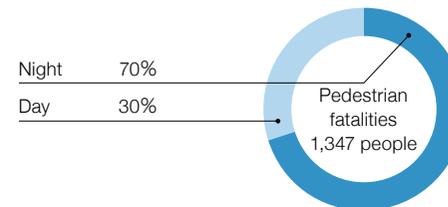


* The accident incidence rate is calculated by dividing the number of accidents by the number of vehicles in operation (converted from the number of vehicles sold based on the timing of sale). Subject vehicle series: Prius
 Survey period: December 2015—December 2016
 Survey subjects: approximately 247,000 vehicles, of which approximately 84,000 were equipped with Toyota Safety Sense P, and approximately 121,000 were equipped with Toyota Safety Sense P and ICS

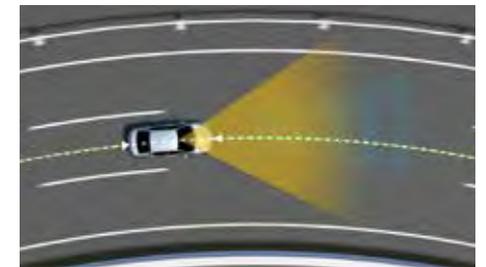
Second Generation Toyota Safety Sense Which Is the Active Safety Package Rolled Out from 2018

Toyota Safety Sense, now enhanced to its second generation, is being progressively introduced started from new 2018 models, mainly in Japan, North America, and Europe. The second generation uses two sensors to detect shapes and distance, the single-lens camera and the millimeter-wave radar, to prevent accidents and reduce the number of deaths and injuries from traffic accidents, and ease driver burden. The evolution of the second generation has been in the following three areas: (1) improving functionality through improvements to the performance of the camera and radar to expand the scope of hazard detection, (2) utilization of the advanced driving support feature Lane Tracing Assist (LTA), and (3) reduction of the size of the unit to improve ease of installation. For example, as we are expanding our coverage of serious accidents by adding nighttime pedestrians and cyclists to the scope of hazards detected by PCS, we can reduce the number of collisions between pedestrians and cars at night, which currently account for approx. 70 percent of all fatal pedestrian accidents and bicycle-car collisions, which account for approx. 75 percent of all fatal cyclist accidents. In addition, we package advanced driver support functions to reduce driver burden and improve convenience.

Pedestrian Fatalities (by Day/Night)



Source: "Concerning the Characteristics of Traffic Accident Fatalities for 2017" Traffic Bureau, National Police Agency



Lane Tracing Assist, advanced driving support technology



Pre-collision System with nighttime pedestrian detection



Pre-collision System with crossing cyclist detection

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ITS Connect, Cooperative Driving Support System

Launched in the autumn of 2015, ITS Connect features a cooperative driving support system which utilizes vehicle-to-infrastructure and vehicle-to-vehicle communication. The system acquires and alerts the driver of the information about the presence of cars and pedestrians that are in blind spots outside the field of vision of onboard sensors, and about traffic signals to help reduce accidents at accident-prone intersections.

In the future, by linking ITS technologies with control technologies, Toyota is aiming to realize automated driving that will enable every driver to enjoy mobility safely, easily, and freely.

Main Vehicle-to-infrastructure Communication Systems (DSSS: Driving Safety Support Systems)

Right-turn Collision Caution	While waiting to turn right at an intersection, drivers are warned by an audio and visual alert if they start to move forward when another car is approaching from the opposite direction or when a pedestrian is crossing the road to the right of the vehicle.
Red Light Caution	When approaching an intersection fitted with the appropriate equipment, if the signal is red and the driver does not ease off the accelerator, the system will warn the driver with an audio and visual alert.

Main Vehicle-to-vehicle Communication Systems (CVSS: Connected Vehicles Support Systems)

Communicating Radar Cruise Control	The system responds almost instantaneously to the acceleration and deceleration of vehicles ahead equipped with Communicating Radar Cruise Control. This allows two or more vehicles to maintain a safe distance and minimize speed fluctuations, making traffic flow smoother.
Emergency Vehicle Notification	When an ambulance is sounding its siren nearby, the system notifies the driver with an audio alert and displays the approximate location and distance to the emergency vehicle, as well as the direction in which it is moving. As of September 2018, these alerts can be received in and around Nagoya, Aichi Prefecture.

For details on intersections that are compatible with Driving Safety Support Systems, please see the following websites.

[Web https://toyota.jp/technology/safety/itsconnect/](https://toyota.jp/technology/safety/itsconnect/) [Web https://lexus.jp/brand/technology/itsconnect/](https://lexus.jp/brand/technology/itsconnect/)

Passive Safety

Passive safety combines a body structure that absorbs collision energy with devices that efficiently protect the vehicle occupants in order to minimize collision damage.

In 1995, Toyota set up unique, stringent internal goals related to passive safety performance called “Global Outstanding Assessment (GOA),” in order to pursue world-leading safety levels, and developed a collision-safety body and passenger protection devices. Since then, to maintain leadership in this field, Toyota has continued to advance GOA, improving the real safety performance of its vehicles in a wide variety of accidents.

Furthermore, to analyze the human body injury mechanism, Toyota developed Total Human Model for Safety (THUMS), a virtual human body model that simulates effects on human bodies that cannot be measured using dummies. THUMS has been utilized in predicting injuries to the various parts of the human body.

Impact-absorbing Body and High-strength Cabin

To reduce injury to vehicle occupants during a collision, it is crucial to prevent vehicle doors and other objects outside the vehicle from penetrating the cabin and to absorb the collision impact. The latest collision-safety structure consisting of an impact-absorbing body and a high-strength cabin incorporates the concept of “compatibility,” aiming to ensure the mutual safety of vehicles of different weights and heights if they collide.

Furthermore, in car manufacturing based on the “Toyota New Global Architecture (TNGA)” next-generation platform strategy, Toyota developed a vehicle body that demonstrates exceptional collision safety in frontal, side, rear, and even oblique frontal collision tests, based on the latest GOA. The newly developed body was adopted in the Prius launched in 2015, the C-HR launched in 2016, the Prius PHV, Camry, Lexus LC and LS launched in 2017, and the Crown and Corolla Sports launched in 2018.

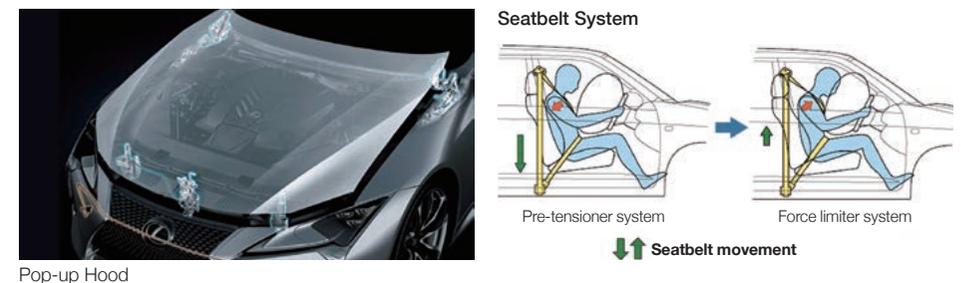
Setting Preventive Link Functions

Based on Toyota’s Integrated Safety Management Concept of increasing safety by linking individual systems, we are working on technology development for preventive link functions that operate protective devices in a collision by linking with the Pre-collision Safety (PCS) system.

We have developed functions that prepare to deploy the seatbelt mechanism or SRS* side & curtain shield airbags to protect the occupants when the PCS determines that a collision with another vehicle is likely, or prepare to deploy the pop-up hood to protect the pedestrian or cyclist when the PCS determines that a collision with a pedestrian or cyclist is likely.

The Lexus LS, which was launched in October 2017, has a function to prepare the side & curtain shield airbags and the pop-up hood, while the new Crown, which was launched in June 2018, has a function to prepare the seatbelt system and pop-up hood.

* SRS (Supplemental Restraint System): A system of supplementary restraints to protect occupants



THUMS Virtual Human Body Model

THUMS, the virtual human body model that allows computer simulation of the damage bodies receive when subjected to impacts, recreates the dynamic characteristics of the human body, including its shape, the strength of bones, and the flexibility of organs and skin.

We can forecast the extent of injuries sustained throughout the human body through THUMS, and since its development in 2000, it has been utilized in the technological development of passenger protection devices such as airbags, and to contribute to improved vehicle safety performance.

Since 2007, Toyota has been applying THUMS to injury analysis of accidents involving general vehicles as well as motor sports. In March 2017, Toyota signed a four-year joint THUMS-based research agreement with the Global Institute for Motor Sport Safety which presides over research on safety in motor sports.

Outside Evaluations of Safety

ASV++ (the highest ranking) in the JNCAP ¹ Active Safety Performance Assessment	Harrier, C-HR
Five Star Award (the highest ranking) in the JNCAP Passive Safety Performance Assessment	C-HR, JPN TAXI
TSP+ ² (the highest ranking) in the New Car Assessment Program of the Insurance Institute for Highway Safety (IIHS) in the U.S.	Camry, Corolla, Prius, Prius V, RAV 4, Lexus ES 350, NX, RC, RX
TSP (the highest ranking) in the New Car Assessment Program of the Insurance Institute for Highway Safety (IIHS) in the U.S.	Avalon, Yaris iA, Lexus CT 200h
Five Star Award (the highest ranking) in the NCAP ³ in the U.S.	Avalon, Camry, C-HR, Corolla, Highlander, Prius, RAV 4, Sienna, Yaris iA, Lexus ES, IS, NX, RX
Five Star Award (the highest ranking) in the Euro NCAP ³ in Europe	C-HR, Yaris
Five Star Award (the highest ranking) in the ANCAP ³ in Australia	Avensis, Camry, C-HR, Corolla, Kluger/Highlander, Yaris, Lexus CT, NX
Five Star Award (the highest ranking) in the ASEAN NCAP ³	Vios, Yaris, Yaris ATIV
Five stars (highest level) in the Latin NCAP ³	Corolla

¹ JNCAP (Japan New Car Assessment Program) offers vehicle safety information, published by the Ministry of Land, Infrastructure, Transport and Tourism and the National Agency for Automotive Safety and Victim's Aid. The information is intended to promote better vehicle safety.

² TSP+ is given to the most outstanding TSP vehicles.

³ NCAP (New Car Assessment Program) is a new car assessment program being carried out in various countries.
 • Period: Japan: April 2017–March 2018; United States NCAP: 2018 model year; United States IIHS: December 2016–November 2017; Other: January–December 2017

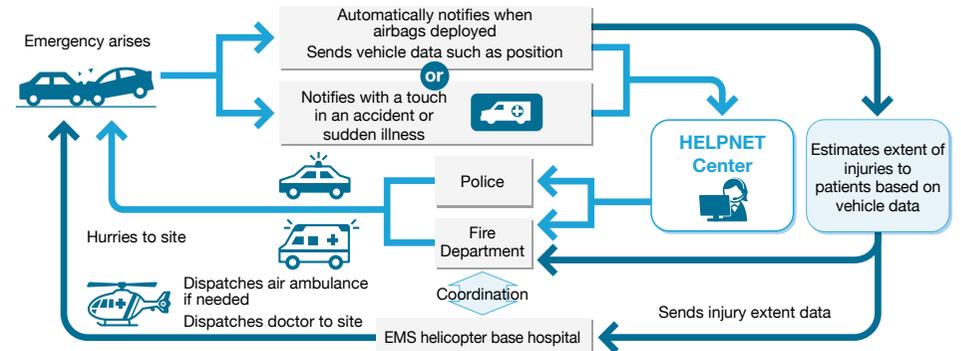
Emergency Response

Every minute counts in emergency response for accidents or sudden illness. In 2000, Toyota rolled out HELPNET[®] service, an emergency reporting system utilizing the G-Book information network (the current T-Connect) and G-Link. As of June 2018, HELPNET[®] has more than 1.7 million members. Under HELPNET[®], a dedicated operator will promptly contact the police or rescue services to arrange emergency vehicles in the event of a sudden accident or illness. It automatically contacts an operator when the airbag deploys and supports the D-Call Net[®] which makes quick deployment decisions for air ambulances, etc.

Emergency Reporting System (D-Call Net[®])

The D-Call Net[®] is one of the automated rescue alert systems that use connective technology in vehicles to further increase the ratio of lives saved in a traffic accident. When an airbag goes off in a traffic accident, vehicle data regarding the impact direction, severity of collision and whether seatbelts were fastened is automatically sent, where it is analyzed based on data from 2.8 million other accidents in Japan to estimate the likelihood of death or serious injury. This information is sent to the fire department headquarters and the EMS helicopter base hospital, allowing prompt decisions to be made sending an air ambulance or a ground ambulance, saving time before they can be dispatched and helping save more lives. Since November 2015, Toyota has been working with the Emergency Medical Network of Helicopter and Hospital (HEM-Net), Honda Motor Co., Ltd., and Japan Mayday Service Co., Ltd. (HELPNET[®]) to implement trial operation of D-Call Net[®], and started full-scale operation in June 2018.

HELPNET[®] (Airbag-linked Type) Illustration



→ HELPNET[®] Steps
 → D-Call Net[®] Steps

* Air ambulances may not be available depending on the location, time of day, weather, etc.
 * D-Call Net[®] will not respond when the HELPNET[®] button is pressed.
 * HELPNET[®] is a registered trade mark of Japan Mayday Service Co., Ltd.
 * D-Call Net[®] is a registered trade mark of HEM-Net (Emergency Medical Network of Helicopter and Hospital).

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Parking Assist

About 30 percent of all traffic accidents are said to occur in parking lots*. Checking around the car for safety and repeated steering maneuvers tend to burden drivers, which, along with pedal misapplication, can lead to serious accidents. Toyota has developed technology to improve visibility and to assist driving maneuvers during parking operations in order to prevent accidents and minimize damage.

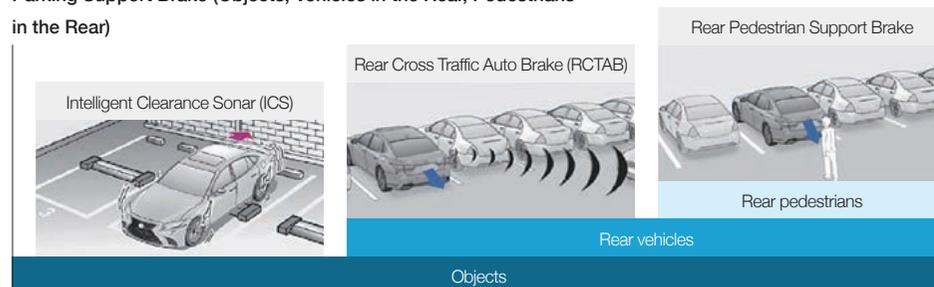
* Source: "Statistics of Parking Lot Accidents" (statistics from six prefectures in Tohoku Region) from the General Insurance Association of Japan

Parking Support Brakes Help Reduce Accidents in Parking Lots

Parking lots are busy with many people and cars, requiring careful awareness of surroundings and complicated driving techniques, which means they are also places where accidents are common. Toyota has developed the Parking Support Brakes (PKSB) system to further improve safety when parking, and equipped them on the Lexus LS, launched in October 2017.

In addition to the existing ICS, which reduces damage or avoids collisions with objects in the direction of movement front or rear and Rear Cross Traffic Auto Brakes, which prevent collisions with vehicles nearing the rear when backing out of parking areas, the PKSB system uses rear cameras to detect pedestrians behind the vehicle when reversing out, and if there is the risk of a collision, it sounds an alarm and operates the brakes automatically—a world first—thus avoiding or reducing damage from a collision. We are carrying out technology development from a range of angles to assist driving when parking as well. We have already brought to market Clearance Sonar, which alerts drivers to obstacles, Drive-Start Control, which limits sudden starts or sudden acceleration during gear-shift operations, Intelligent Parking Assist, which assists with steering when parking, Panoramic View Monitor, which shows images looking down from above the car to allow drivers to check the safety of their surroundings, Back Guide Monitor, which helps with smooth reversing parking using guidelines. These allow us to contribute to reducing driving burden in parking lots.

Parking Support Brake (Objects, Vehicles in the Rear, Pedestrians in the Rear)



Automated Driving

To help achieve Zero Casualties from Traffic Accidents, Toyota has been conducting research and development on automated driving technologies since the 1990s. Toyota's unique approach to automated driving, called the "Mobility Teammate Concept," seeks out a relationship between people and vehicles so they stand by and support one another as companions would do. Based on this philosophy, Toyota is aiming to help realize a world in which every person, including the elderly and the physically challenged, can enjoy mobility safely, easily, and freely.



Support for Initiatives at Collaborative Safety Research Center (CSRC), the U.S.

In January 2011, with the goal of establishing safer and more reliable transportation means, Toyota established the CSRC inside the Toyota Technical Center (TTC) located in the state of Michigan. The first-phase project was completed at the CSRC in March 2017. Over a five-year period, the CSRC started and completed 44 research projects jointly with 23 universities and research organizations, publishing more than 200 technical papers. Furthermore, the CSRC has been making its research results public through presentations at various vehicle safety-related conferences so that these results can be utilized by people engaged in the development of vehicle and traffic safety technologies.

In 2017, Toyota started a new second-phase project called "CSRC Next." This reflects Toyota's position that it is important to understand how humans will cope with advancing vehicle technologies. Toyota will invest 35 million dollars over five years, focusing on the issues related to and possibilities of autonomous driving and connected vehicle technologies. We intend to publish our research results publicly, contributing to safer vehicles industry-wide.

Detailed information: *Annual Report 2018* (p. 18)
https://www.toyota-global.com/investors/ir_library/annual/

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Initiatives Targeting People

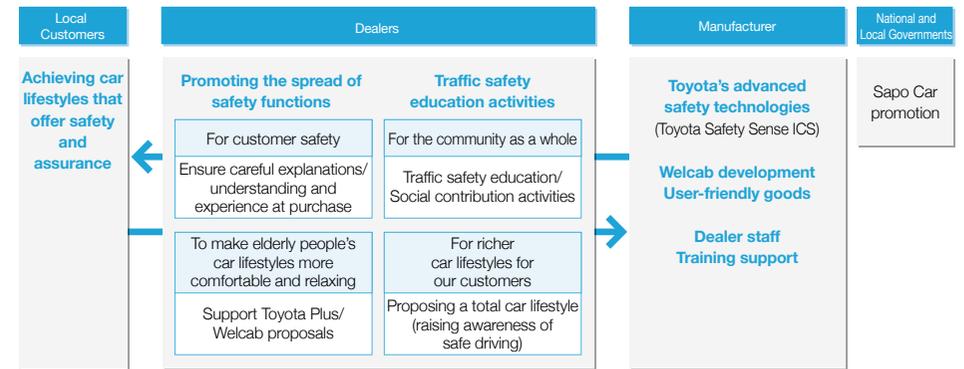
Believing that educating people is also important for preventing traffic accidents, Toyota started donating traffic safety teaching materials for small children by donating traffic safety picture books and story-telling card sets to children starting kindergarten and nursery school nationwide in the 1960s, in cooperation with Toyota dealers nationwide. Since then, Toyota has been holding the Toyota Safety School designed for small children every year. In 2005, we established the Toyota Safety Education Center Mobilias at the Fuji Speedway. We also hold Toyota Driver Communication, a safe driving technique seminar aimed at drivers. Overseas, Toyota affiliates are taking initiatives on education and edification, taking into account each country or region's traffic and accident situations, as well as people's awareness about traffic safety.

Additionally, capitalizing on its many years of traffic safety programs, Toyota is supporting efforts by local affiliates, for example helping train safe driving instructors in Thailand and Vietnam.

The Support Toyota Program Is Supporting Safety and Assurance through Technology and People

With the spread of the Safety Support Car ("Sapo Car") program recommended by the government, we are working with Toyota dealers to continue to spread our safety technologies further and keep our customers informed. This is why we are rolling out Support Toyota (the overall name for our safety and assurance activities) to help achieve car lifestyles that offer safety and assurance.

Starting with traffic safety education activities like our Machihotaru (City Firefly) Project, which recommends effective use of high beam headlights to drivers and wearing accessories made of reflective materials to pedestrians, we carry out ongoing license seminars on safety technology (ICS) for dealer staff as a way to increase experiences of safety technology at customer-oriented dealerships. In addition, at our Support Toyota Park event, which is held by dealerships to raise awareness of traffic safety, we work with local governments and others to get local residents to participate in a range of Support Toyota hands-on experience events that make use of facilities and courses such as a driving schools, promoting initiatives for the achievement of a zero traffic fatalities or injuries society.



For 50 Years, We Have Donated Traffic Safety Picture Books and Story Cards from One Concept That an Unchanging Belief Can Change the World

Our traffic safety education activities started back in 1969, which means 2018 is their 50th anniversary. There is a large spike in pedestrian deaths among seven-year-olds. This is why Toyota has been providing traffic safety picture books and story cards on the theme of "the dangers of running out into the road" to preschoolers. So far, we have given away about 144.07 million picture books and 1.66 million story cards. Our traffic safety programs will continue as we broaden its scope even further. As the times change, so do cars. But our hopes that our loved ones stay safe remains unchanging. Toyota's activities and programs will continue with this one unchanging wish. We believe that even small efforts, if done often enough, can grow into an engine of change for the world. "Safety is Toyota's wish. And all our wishes."



Traffic safety picture books/story cards presentation ceremony



Special 50th anniversary editions of our safety picture books and story cards

* "Traffic Accidents for Children and Others (five-year average from 2012 to 2016)" National Police Agency