



Toyota Corolla

2018

Highway Assist System



AD System Name	Toyota Safety Sense (ACC & LTA)	
Standard Active Safety Systems	AEB Car-to-Car	●
	AEB VRU	●
	LSS	●
	SAS	●
Available on	Toyota Corolla (2019) Toyota RAV4 (2019)	

Comments

Adaptive Cruise Control with Lane Trace Assist as part of Toyota Safety Sense on the Toyota Corolla gives the driver a moderate level of support while maintaining the impression of the driver being in control with the car assisting them. The system is readily perceived as a system to assist the driver which aligns well with the information provided.

The name "Toyota Safety Sense" does not indicate whether the system is a driver-assist system, but is not thought to be readily misunderstood. The limited scenarios tested provide a similar impression. The handbook mentions that the system is an assist system designed for motorways, but the system is not geofenced and can therefore be engaged on any road with distinct lane markings. The legally-required hands-off warning tells the driver to keep his hands on the wheel, but slight steering input is sufficient to suppress this warning. In case of no response to the warning, the system will simply shut down but will not bring the car to a controlled stop.

Within the longitudinal scenarios, the Corolla shows a high level of support in the slower-moving and braking car scenarios. When approaching a stationary car, and in the 'cut-in' and 'cut-out' scenarios, the system offers limited support, the driver being primarily required to handle the situation.

Lane Trace Assist (LTA) provides subtle steering support resulting in a good balance between the driver and the system in the S-bend scenario. In the absence of lane markings or other vehicles to act as a guide, LTA will change to a passive mode and will resume assistance when clear lane markings are detected.

Overall, the Toyota system is balanced with little risk of the driver over-relying on the system.

Human Machine Interaction

System Name	The system name, Toyota Safety Sense does not indicate whether this is an Assist System	
Official Manufacturer Information		
System Features	SPEED CONTROL	
	Automatic Speed Limit Adaptation	—
	Speed Adjustment for Road Features	—
	STEERING SUPPORT	
	Assisted Lane Change	—
User Manual	Description of Operational Design Domain (areas where the system can be used)	●
	Description of the Driver's Role	●
	Description of Adaptive Cruise Control Limitations	●
	Description of Lane Centering Limitations	●
	Description of Hands OFF Warning Sequence	●
<p style="text-align: center;">Hands Off Warning timeline</p> <p>The chart shows a timeline from 0 to 100 seconds. At 20 seconds, a grey box indicates the start of the warning sequence. Inside this box, a visual warning (eye icon) and an audible warning (speaker icon) are shown. A yellow bar at the bottom of the box indicates the shutdown time, which occurs at 20 seconds.</p>		

- Explained in user manual
- Feature fitted as part of the system
- ✘ Not explained in user manual
- Feature not available as part of the system

Comments

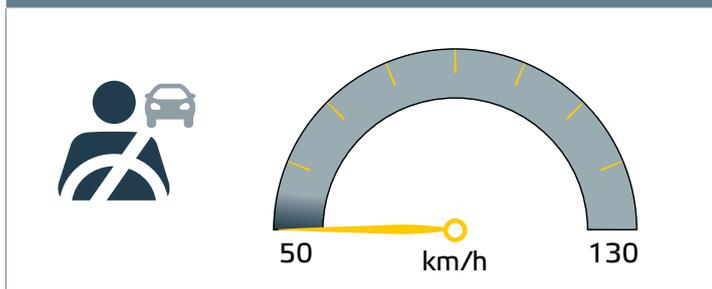
While the user manual clearly explains the limitations of the systems and where they can operate reliably, system use is not limited as geofencing is not implemented. The role of the driver during the use of the system is also clearly stated and is in line with the system design. Specific scenarios where the driver must be primarily in control or where no system response is expected are mentioned in the handbook.

Enabling of the systems is performed using a button on the steering wheel. Engaging the systems is simple and intuitive using a dedicated cluster of buttons on the steering wheel.

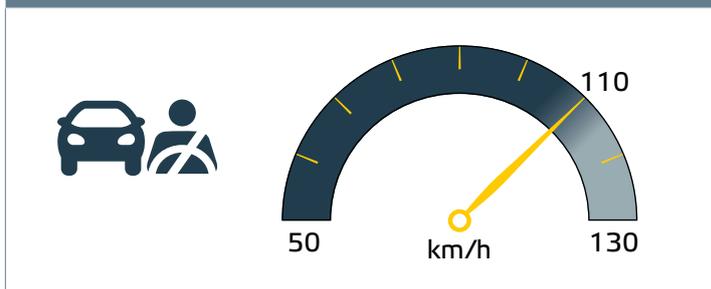
Marketing information from Toyota clearly explains the design and intended use of the systems.

Adaptive Cruise Control Tests

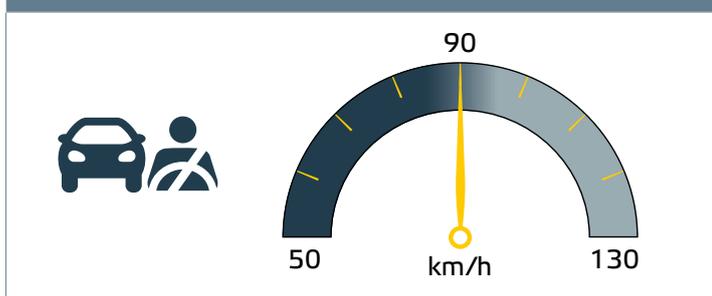
Approaching a stationary car



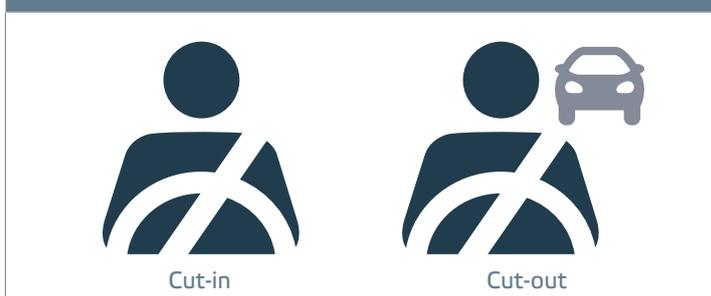
Approaching a slower moving car



Approaching a braking car



Car cutting-in or cutting-out ahead



VEHICLE PRIMARILY IN CONTROL
Level of support may result in over reliance



GOOD COOPERATION BETWEEN DRIVER AND VEHICLE
Balanced



DRIVER PRIMARILY IN CONTROL
Limited support provided by the system



NO SYSTEM SUPPORT AT ALL

ACC DESIGN LIMIT

ACC BRAKING

EMERGENCY INTERVENTION

NO RESPONSE

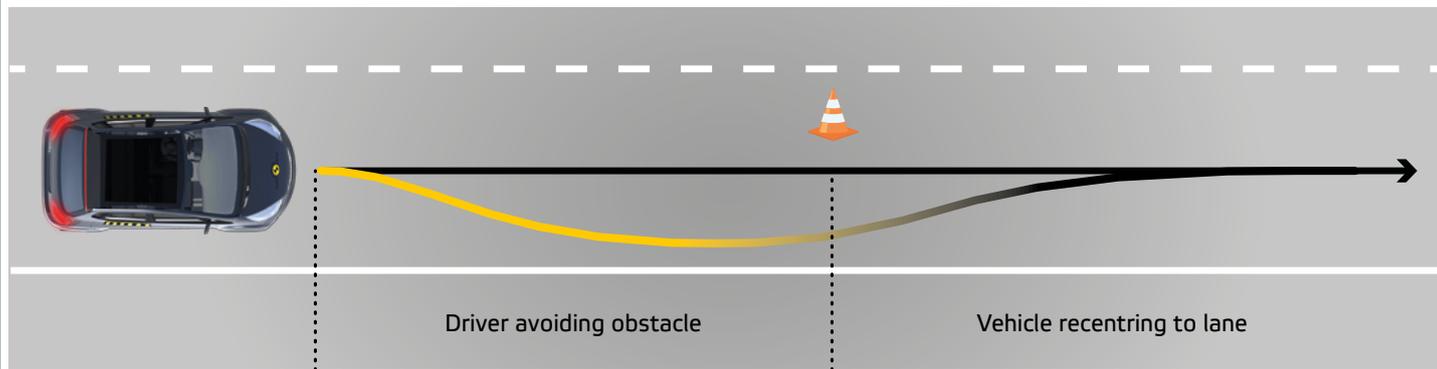
Comments

In the scenarios tested, Adaptive Cruise Control (ACC) responds to a stationary vehicle directly ahead and the ACC function will bring the car to halt up to 50 km/h after which the AEB/FCW system keeps supporting the driver up to the maximum speed assessed. In both the slower-moving and braking lead vehicle scenarios, the car responds well and provides full support across the test speed range. Limited or no system response was witnessed in the cut-in and cut-out scenarios which are critical and challenging due to the rapidly changing conditions. The driver has to be primarily in control in these scenarios, which is matching with the handbook information that clearly states that the system may not operate under these conditions. Warnings are issued to alert the driver of the possible crash in these cases.

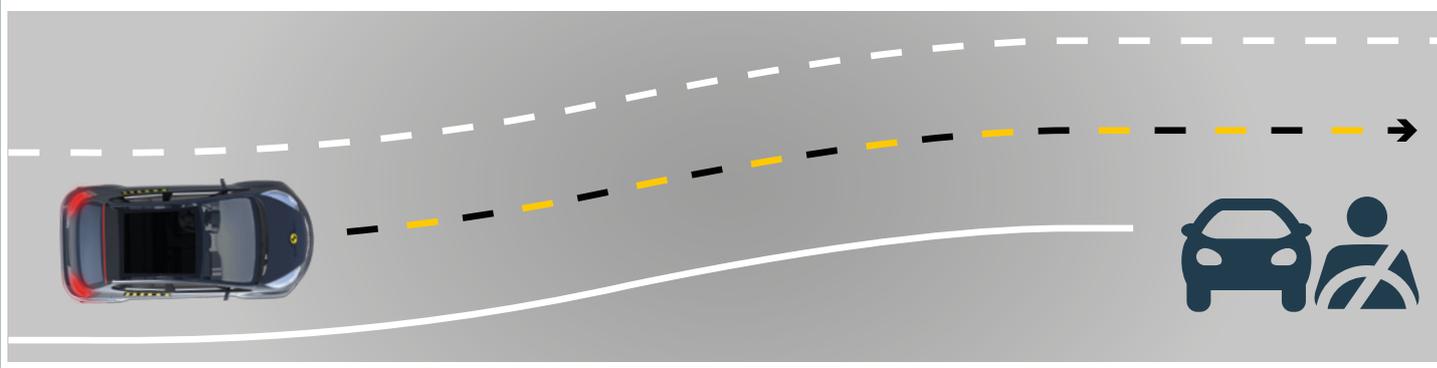
Overall the system performs moderately in the ACC scenarios and a good balance exists between the car and the driver. The driver clearly needs to stay alert and take appropriate action in more critical day-to-day scenarios such as the sudden cut-in situation.

Steering Support

Steering to avoid an obstacle



Steering in a S-curve



VEHICLE PRIMARILY IN CONTROL
Level of support may result in over reliance



GOOD COOPERATION BETWEEN DRIVER AND VEHICLE
Balanced



DRIVER PRIMARILY IN CONTROL
Limited support provided by the system



NO SYSTEM SUPPORT AT ALL

— STEERING SUPPORT PATH

— DRIVER STEERING PATH

Comments

In the scenarios tested, Lane Trace Assist gives the impression that the driver is in control and the car is supporting them by providing steering assistance, which encourages good driver engagement. Where a driver wants to reposition the car within the lane, for example to avoid an obstacle or increase clearance to adjacent traffic, the system readily accommodates driver inputs and subsequently continues to provide steering assistance.