‘Autopilot’ on the Tesla Model S gives the driver a high level of support with the vehicle primarily in control in both braking and steering scenarios. This results in a risk of over-reliance as, in some situations, the system still needs the driver to instantly correct and override the system.

The name “Autopilot” implies a fully automated system where the driver is not required. However, the limited scenarios tested clearly indicate that is not the case, nor is such a system legally allowed. The handbook mentions that the system is intended only for use on Highways and limited access roads, but the system is not geofenced and can therefore be engaged on any road with distinct lane markings. The legally-required hands-off warning requires no more than a gentle touch of the steering wheel to avoid system deactivation, rather than ensuring the driver is still in control. To avoid misuse, Tesla has implemented a so-called ‘one-strike-you-are-out’ where Autopilot is not available for the remainder of a journey if the driver fails to nudge the steering wheel occasionally.

In the braking tests, the Model S shows full braking support by the system in nearly all scenarios except for the cut-in and cut-out scenarios where there is limited vehicle support. The full system support in the stationary scenario may result in over-reliance. However, in the cut-in and cut-out scenarios, the driver is required to apply the brakes in due time, which may reduce the driver’s over-reliance on the system.

In steering support, the Tesla does not allow the driver to input any steering himself and the system will provide all the steering required in the S-bend scenario. When system steering limits are reached, the vehicle will slow down to make the turn, again eliminating the need for driver input. In the absence of lane markings, Autopilot will stay engaged and will try to steer a safe path. However, with the sensors the Tesla has, this is nearly impossible to do reliably and implies to the driver that the vehicle can take all corners which, again, may result in over-reliance.

Overall, the Tesla system is primarily in control with a risk of driver becoming over-reliant on the system.
Human Machine Interaction

<table>
<thead>
<tr>
<th>System Name</th>
<th>The system name, Autopilot, does not clearly indicate that this is an Assist System and could give a wrong impression about the system capabilities</th>
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</thead>
</table>

**Official Manufacturer Information**

![Image](image.png)

**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

**Hands Off Warning timeline**

- Visual Warning
- Audible Warning
- Controlled Stop

**Comments**

While the user manual clearly explains the limitations of the systems and the situations in which it should be used, the system design does not limit system use as geofencing is not implemented. The role of the driver during the use of the system is also clearly stated but is not in line with the system design where the driver cannot provide any steering input. There is no mention in the handbook of specific scenarios where the driver is primarily in control or where no system response is expected.

Enabling of the systems is performed using a menu on the touch screen. Engaging the system is simple and intuitive using a dedicated stalk on the steering column behind the steering wheel.

One marketing video from Tesla clearly explains the design and functionality of the system, but many other official videos show the car apparently driving autonomously, confusing consumers about the actual capabilities of the Autopilot system.
Adaptive Cruise Control Tests

**Approaching a stationary car**

- VEHICLE PRIMARILY IN CONTROL
  - Level of support may result in over reliance
- DRIVER PRIMARILY IN CONTROL
  - Limited support provided by the system

**Approaching a braking car**

- ACC DESIGN LIMIT
- ACC BRAKING

**Approaching a slower moving car**

**Car cutting-in or cutting-out ahead**

- GOOD COOPERATION BETWEEN DRIVER AND VEHICLE
  - Balanced
- NO SYSTEM SUPPORT AT ALL

**Comments**

In the scenarios tested, Traffic Aware Cruise Control responds to a stationary vehicle directly ahead and the ACC function will bring the vehicle to a halt up to the maximum speed assessed. In both the slower moving and braking lead vehicle scenarios, the vehicle also responds well and provides full support across the test speed range. Very late 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. Very late or no warning was issued to alert the driver of the possible crash in these cases.

Overall, the system performs well in the ACC scenarios, but as the vehicle is primarily in control up to the full speed tested (especially in the stationary vehicle scenario) there is an inherent risk of over-reliance in the system. The driver clearly needs to stay alert and take appropriate action in more critical day-to-day scenarios such as the sudden cut-in or cut-out situations.
Steering Support

Comments

In the scenarios tested, AutoSteer gives the impression that the car is in full control and the driver does not need to provide any input, which may reduce 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 resists driver inputs initially and then deactivates steering assistance.