



# Safety Plan Lane Assistance

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# Document history

[Instructions: Fill in the date, version and description fields. You can fill out the Editor field with your name if you want to do so. Keep track of your editing as if this were a real world project.

For example, if this were your first draft or first submission, you might say version 1.0. If this is a second submission attempt, then you'd add a second line with a new date and version 2.0]

Date	Version	Editor	Description
11192018	1.0.0	Sanghoon Lee	First Documentation

# Table of Contents

[Instructions: We have provided a table of contents. If the table of contents is not showing up correctly in your word processor of choice, please update it. The table of contents should show each section of the document and page numbers or links. Most word processors can do this for you. In Google Docs, you can use headings for each section and then go to Insert > Table of Contents. Microsoft Word has similar capabilities]

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# Introduction

## Purpose of the Safety Plan

[Instructions: Answer what is the purpose of a safety plan?]

This Safety Plan document define an overall framework for the Lane Assistance System. It includes the Assignment of Role and Responsibilities of Functional Safety.

## Scope of the Project

[Instructions: Nothing to do here. This is for your information.]

For the lane assistance project, the following safety lifecycle phases are in scope:

- Concept phase
- Product Development at the System Level
- Product Development at the Software Level

The following phases are out of scope:

- Product Development at the Hardware Level
- Production and Operation

## Deliverables of the Project

[Instructions: Nothing to do here. This is for your information.]

The deliverables of the project are:

- Safety Plan
- Hazard Analysis and Risk Assessment
- Functional Safety Concept
- Technical Safety Concept
- Software Safety Requirements and Architecture

# Item Definition

[Instructions:

**REQUIRED**

Discuss these key points about the system:

What is the item in question, and what does the item do?

**Answer is Lane Assistance System.**

- 1) It supports driver to have to know Car departure the lane.**
- 2) And it need to support the Steering to turn toward the Lane center.**

What are its two main functions? How do they work?

**Two main functions are exist on Lane Assistance System.**

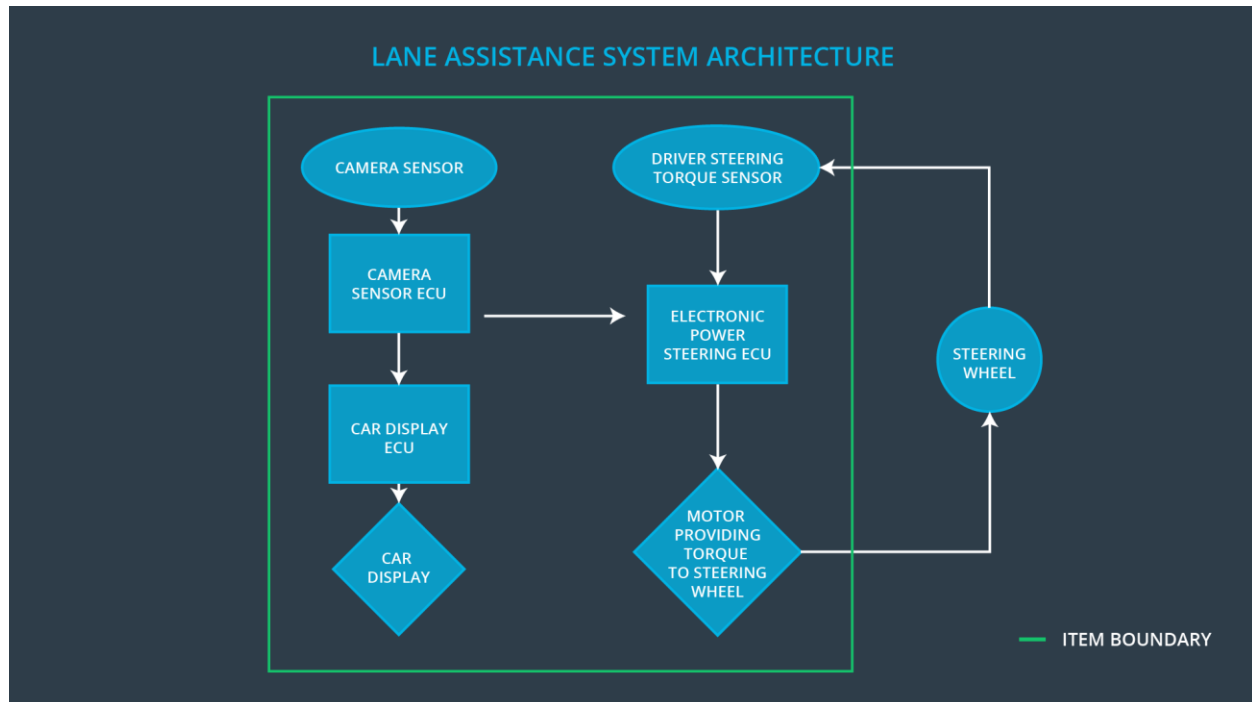
- 1) Lane Departure Warning Function shall apply an oscillating steering torque to provide the driver a haptic feedback.**
- 2) Lane Keeping Assistance Function shall apply the steering torque when active in order to stay in ego lane.**

Which subsystems are responsible for each function?

- 1) Camera Subsystem**
  - Camera CMOS Sensor**
  - Camera Control ECU Based on Zynq FPGA**
- 2) Electronic Power Steering Subsystem**
  - Driver Steering Torque Sensor**
  - PMSM(AC) Motor to provide proper torque to steering Wheel**
  - Resolver or Absolute Encoder to know the Motor's state.**
  - Electronic Power Steering ECU Based on Cortex-R5F or Cortex-R4F**
  - Inverter System to provide proper Power to drive Motor.**
  - Protection Circuit to prevent impulse voltage or electric current.**
- 3) Car Display Subsystem**
  - Car Display ECU Based on Cortex-A53 or Cortex-A15(Usually use at AVN part)**
  - Alert Driver with car position and steering state with Audio to use Linux ALSA Device Driver.**

What are the boundaries of the item? What subsystems are inside the item? What elements or subsystems are outside of the item?

The following diagram shows the interaction between different subsystems.



Boundaries include the 3 subsystems which were mentioned previously (Camera System, Electronic Power Steering System, Car Display System) and the Steering Wheel System. Only the Steering Wheel System is outside the Lane Assistance System.

#### OPTIONAL

Optionally, include information about these points as well. These were not included in the lectures, but you might be able to find this information online:

- Operational and Environmental Constraints. This could especially be limited to camera performance; lane lines are difficult to detect in snow, fog, etc

Sometimes the Road don't have any Lanes.

Sometimes the Lanes on Road are erased that makes it to detect difficult.

- Legal requirements in your country for lane assistance technology

Currently South Korea has any law about Autonomous Driving Car. However the government announced a roadmap about Autonomous Driving Car. Proper vehicle maintenance and inspections will also be available by 2020 and 2022, respectively. The company decided to create an insurance system by 2020, which will re-establish responsibility for Autonomous Driving Car Accidents. Mid-term project to be carried out from 2021 to 2025 will also be made. The authors also revised the Road Traffic Act to permit the use of video equipment such as mobile phones only for autonomous cars and to develop various mobile services. In the long-term project from 2026 to 2035, a new license for a self-driving vehicle or a conditional license was created to prepare for the development of fully autonomous vehicles.

- National and International Standards Related to the Item
- Records of previously known safety-related incidents or behavioral shortfalls

**The driver of the Tesla Model X died shortly after the crash.**

<https://www.bbc.com/news/world-us-canada-43604440>

# Goals and Measures

## Goals

[Instructions:

Describe the major goal of this project; what are we trying to accomplish by analyzing the lane assistance functions with ISO 26262?]

- 1) Identify risks and hazardous situations in the Line Assistance System Components Malfunction causing injuries to a person.
- 2) Evaluate the risks of the hazardous situations.

## Measures

[Instructions:

Fill in who will be responsible for each measure or activity. Hint: The lesson on Safety Management Roles and Responsibilities.

The options are:

All Team Members  
Safety Manager  
Project Manager  
Safety Auditor  
Safety Assessor

]

Measures and Activities	Responsibility	Timeline
Follow safety processes	All Team Members	Constantly
Create and sustain a safety culture	All Team Members	Constantly
Coordinate and document the planned safety activities	All Team Members	Constantly
Allocate resources with adequate functional safety competency	Project Manager	Within 2 weeks of start of project
Tailor the safety lifecycle	Safety Manager	Within 4 weeks of start of project



Plan the safety activities of the safety lifecycle	Safety Manager	Within 4 weeks of start of project
Perform regular functional safety audits	Safety Auditor	Once every 2 months
Perform functional safety pre-assessment prior to audit by external functional safety assessor	Safety Manager	3 months prior to main assessment
Perform functional safety assessment	Safety Assessor	Conclusion of functional safety activities

## Safety Culture

[Instructions:

Describe the characteristics of your company's safety culture. How do these characteristics help maintain your safety culture. Hint: See the lesson about Safety Culture

]

- 1) **High Priority:** safety has the highest priority among other constraints like cost and productivity
- 2) **Accountability:** processes ensure accountability such that design decisions are documented and traceable back to the people and teams who made the decisions
- 3) **Rewards:** the organization motivates and supports the achievement of functional safety
- 4) **Penalties:** the organization penalizes shortcuts that negatively effect safety or quality
- 5) **Independence:** teams who design and develop a product should be independent from the teams who audit the work
- 6) **Well defined processes:** company design and management processes should be clearly defined
- 7) **Resources:** projects have necessary resources including people with appropriate skills.
- 8) **Diversity:** intellectual diversit is sought after, valued and integrated into processes
- 9) **Communication:** communication channels encourage disclosure of problems

## Safety Lifecycle Tailoring

[Instructions:

Describe which phases of the safety lifecycle are in scope and which are out of scope for this particular project. Hint: See the [Intro section](#) of this document

]

For the Lane Assistance System Project, the following safety lifecycle phases are in scope:

- 1) Concept Phase
- 2) Product Development at the System Level
- 3) Product Development at the Software Level

The following phases are out of scope:

- 1) Product Development at the Hardware Level
- 2) Production and Operation

## Roles

[Instructions:

This section is here for your reference. You do not need to do anything here. It is provided to help with filling out the development interface agreement section.

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Role	Org
Functional Safety Manager- Item Level	OEM
Functional Safety Engineer- Item Level	OEM
Project Manager - Item Level	OEM
Functional Safety Manager- Component Level	Tier-1
Functional Safety Engineer- Component Level	Tier-1
Functional Safety Auditor	OEM or external
Functional Safety Assessor	OEM or external

## Development Interface Agreement

[Instructions:

Assume in this project that you work for the tier-1 organization as described in the above roles table. You are taking on the role of both the functional safety manager and functional safety engineer.

Please answer the following questions:

1. What is the purpose of a development interface agreement?
  - Clarify the responsibilities of the different parties involved in a functional safety project
  - Describe the work products that each company will provide
  - Help avoid disputes between companies
  - Clarifies who will be responsible for any safety issues in post-production
2. What will be the responsibilities of your company versus the responsibilities of the OEM? Hint: In this project, the OEM is supplying a functioning lane assistance system. Your company needs to analyze and modify the various sub-systems from a functional safety viewpoint.

]

## Confirmation Measures

[Instructions:

Please answer the following questions:

1. What is the main purpose of confirmation measures?
  - Ensure the Lane Assistance System Project conforms to ISO 26262.
  - Ensure the Lane Assistance System Project makes the vehicle safer.
2. What is a confirmation review?
  - Ensure the Projects complies with ISO 26262.
  - As the product is designed and developed, and independent person would review the work to make sure ISO 26262 is being followed.
3. What is a functional safety audit?
  - Make sure the actual implementation of the project conforms to the safety plan.
4. What is a functional safety assessment?
  - Confirms that the plan, design and developed product actually achieve functional safety.

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A safety plan could have other sections that we are not including here. For example, a safety plan would probably contain a complete project schedule.

There might also be a "Supporting Process Management" section that would cover "Part 8: Supporting Processes" of the ISO 26262 functional safety standard. This would include descriptions of how the company handles requirements management, change management, configuration management, documentation management, and software tool usage and confidence.

Similarly, a confirmation measures section would go into more detail about how each confirmation will be carried out.