

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]**

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| 23-May-2018 | 1.0 | Nishant Katariya | Initial Draft |
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**[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**](https://support.google.com/docs/answer/116338?co=GENIE.Platform%3DDesktop&hl=en)**, you can use headings for each section and then go to Insert > Table of Contents.** [**Microsoft Word**](https://support.microsoft.com/en-us/help/285059/how-to-create-a-table-of-contents-by-marking-text-in-word) **has similar capabilities]**

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# Introduction

## Purpose of the Safety Plan

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

Purpose of this safety plan is to provide the overall framework for safety related to Lane Assistance system. It also defines roles and responsibilities for functional safety of this item.

## 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?**

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

**Which subsystems are responsible for each function?**

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

**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**
* **Legal requirements in your country for lane assistance technology**
* **National and International Standards Related to the Item**
* **Records of previously known safety-related incidents or behavioral shortfalls**

**]**

The Item under focus of this project is Lane assistance system. The Lane Assistance System have two functionalities:

1. Lane departure warning
2. Lane keeping assistance

When the driver drifts towards the edge of the lane, two things will happen:

* the lane departure warning function will vibrate the steering wheel as a warning
* the lane keeping assistance function will move the steering wheel so that the wheels turn towards the center of the lane, it is kind of an action.

A more formal requirement of lane departure warning system is as follow “The lane departure warning function shall apply an oscillating torque to steering wheel to provide driver haptic feedback”. Putting simply the vehicle quickly rotate the steering wheel back and forth which creates vibration.

The **lane keeping assistance functionality** will automatically **assist** the driver to keep the lane; the steering wheel turns towards the center of the lane If a driver departs a lane without using a turn signal. Putting it formally “The Lane keeping assistance system apply the steering torque to stay in the ego lane”. Ego lane is the lane in which our vehicle is currently driving.

Fig 1.1 shows the Lane Assistance System Architecture at whole, all the subsystems and their boundaries on high level.

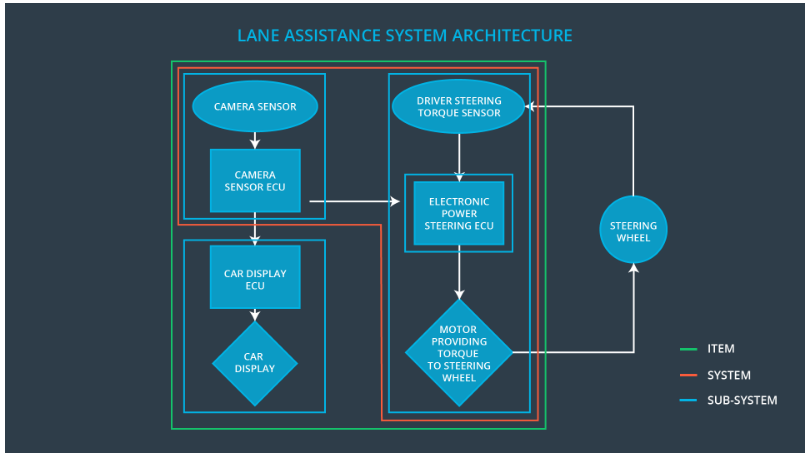


Fig 1.1

Camera sensor perceives the vehicle leaving the lane, it sends the signal to the Electronic power steering system request to turn/vibrate the steering wheel.

ECU (Electronic Control Unit) is a microcomputer that contains software and hardware specific to vehicle’s functionality.

The camera ECU have the hardware and software required for detecting lanes using computer vision techniques like machine learning or image processing.

camera sub system detects lane departures and request the steering wheel how hard to turn. The driver receives a warning on the vehicle display and also receives an alert via a steering wheel vibrating. Simultaneously, the wheel adds extra steering torque to help the driver move back towards the center of the lane.

As shown in fig 1.1 all the subsystems and systems are part of the Item except steering wheel which does not fall into the boundary of the item.

# 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?]**

The overall goal of this project is to assure safe operation of E/E components of Lane Assistance function as per the ISO 26262. Goals can be divided in 3 steps as follows:

1. Identify risk and hazards in the Lane Assistance System
2. Evaluate the risk of hazards
3. Lower risk using systems engineering.

## 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 | Safety Manager | 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**

**]**

It is important that technology malfunction is not the only one source of vehicle accidents. Social and organization factors play a very important role to ensure safety, we at our company follows a safety culture described in below points:

|  |  |
| --- | --- |
| High Priority | Safety is at the highest priority among other constrains like cost and productivity |
| Accountability | Ensuring accountability such that designs are traceable back to the team who made decisions. |
| Rewards | Organization promotes safety by providing with rewards. |
| Penalties | Organization penalizes the unsafe shortcuts |
| Independence | Responsibilities of the team are independent from other teams |
| * Communication | disclosure of problems is encouraged through different communication channels |

# 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**](#_sh22j99mm02k) **of this document**

**]**

**We are dealing with the new system and not the modification to existing system , so all the phases of the safety lifecycle mentioned under scope of the project will be considered. Concept phase, product development phase and Post production phase is part of the Lifecycle.**

# 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.**

**]**

|  |  |
| --- | --- |
| 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?**
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?**
2. **What is a confirmation review?**
3. **What is a functional safety audit?**
4. **What is a functional safety assessment?**

**]**

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.