

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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| 01/18/2019 | 001 | Vern Francisco | Homework for SDC NanoDegree |
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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?]**

**The Safety Plan defines roles and outlines the steps needed to achieve 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?**

**The item is a Lane Assistance System**

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

**The Lane Assistance System will have two functions:**

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
* the **lane keeping assistance function** will move the steering wheel so that the wheels turn towards the center of the lane

"the lane departure warning function shall apply an oscillating steering torque to provide the driver a haptic feedback."

"the lane keeping assistance function shall apply the steering torque when active in order to stay in ego lane"

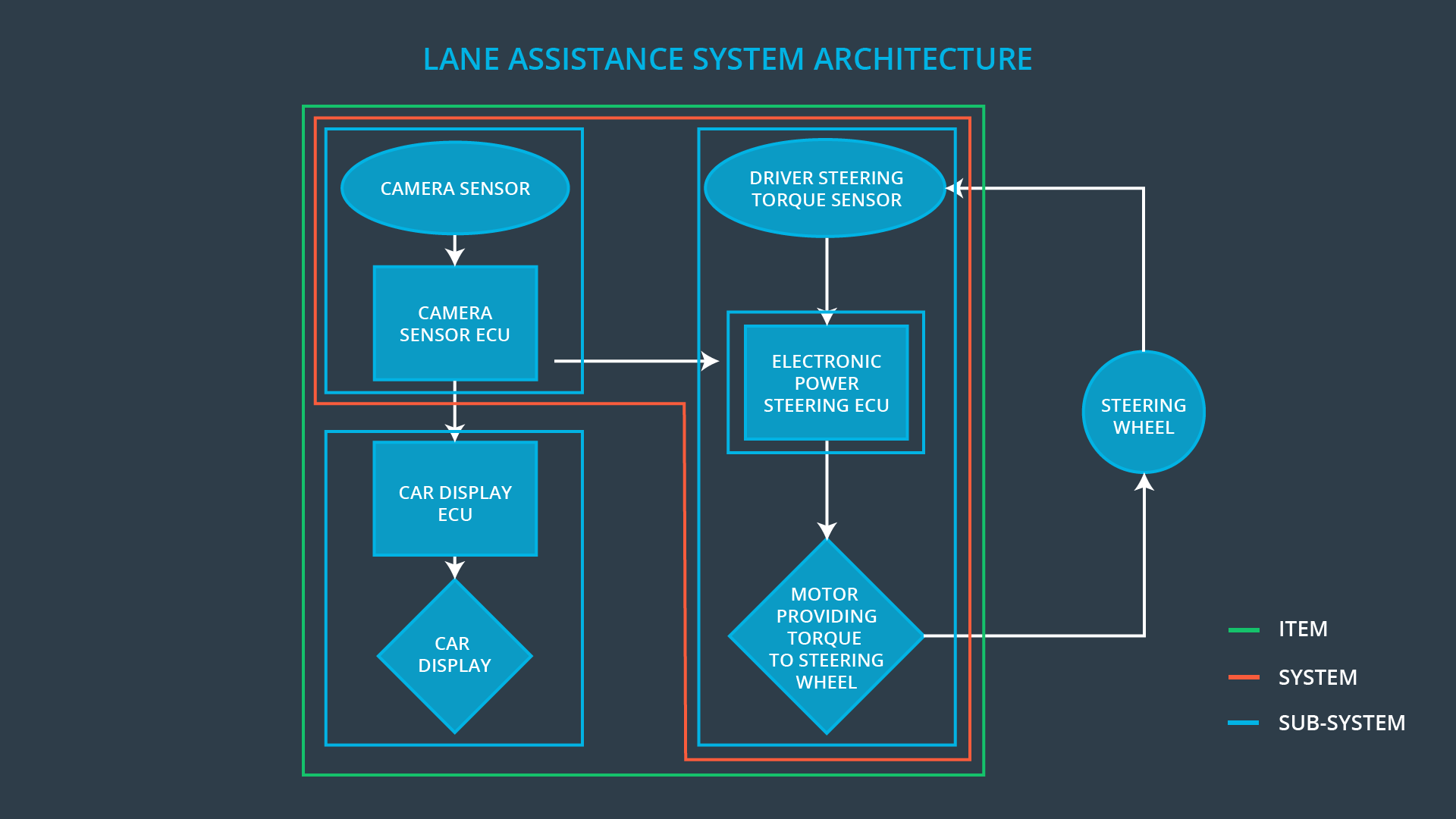
When the camera senses that the vehicle is leaving the lane, the camera sends a signal to the electronic power steering system asking to turn and vibrate the steering wheel.

The camera sensor will also request that a warning light turn on in the car display dashboard. That way the driver knows that the lane assistance system is active.

What if the driver wants to leave the lane? If the driver uses a turn signal, then the lane assistance system deactivates so that the vehicle can leave the lane. The driver can also turn off the system completely with a button on the dashboard.

The driver is still expected to have both hands on the steering wheel at all times. The electronic power steering subsystem has a sensor to detect how much the driver is already turning. The lane keeping assistance function will merely add the extra torque required to get the car back towards center. The extra torque is applied directly to the steering wheel via a motor.

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



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

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

in this case, the item is the lane assistance system

you can see that the item boundary was drawn to include three sub-systems:

* Camera system
* Electronic Power Steering system
* Car Display 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**
* **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**

**]**

# 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 main goal in analyzing the lane assistance functions with ISO 26262 is to reduce risk of lane assistance functions to acceptable levels**

## 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 |  | Constantly |
| Create and sustain a safety culture |  | Constantly |
| Coordinate and document the planned safety activities |  | Constantly |
| Allocate resources with adequate functional safety competency |  | Within 2 weeks of start of project |
| Tailor the safety lifecycle |  | Within 4 weeks of start of project |
| Plan the safety activities of the safety lifecycle |  | Within 4 weeks of start of project |
| Perform regular functional safety audits |  | Once every 2 months |
| Perform functional safety pre-assessment prior to audit by external functional safety assessor |  | 3 months prior to main assessment |
| Perform functional safety assessment |  | 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**

**]**

**The characteristics of the company’s safety culture are the following:**

**High priority- The company puts safety as its highest priority over controlling cost and increased productivity**

**Accountability-The processes in place ensure accountability and decisions can be traced back to the people and teams taht made the decisions**

**Rewards-The organization rewards the achievement of functional safety**

**Penalties-The organization penalizes shortcuts that jeopardize safety or quality**

**Independence-Teams who design and develop are independent from the teams who audit the work**

**Well defined processes-Company design and management processes are clearly defined**

**Resources-Projects have necessary resources as well as people with appropriate skills**

**Diversity-Intellectual diversity is sought after, valued and integrated into company processes**

**Communication-The company encourages disclosure of problems through its communications 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**

**]**

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:

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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.**

**]**

|  |  |
| --- | --- |
| 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.**

Safety Manager

* **Planning**, **coordinating** and **documenting** of the development phase of the safety lifecycle
* **Tailors** the safety lifecycle
* Maintains the safety plan
* Monitors progress against the safety plan
* Performs pre-audits before the safety auditor

Safety Engineer

* Product development
* Integration
* Testing at the hardware, software and system levels

**Please answer the following questions:**

1. **What is the purpose of a development interface agreement?**

**The purpose of a development interface agreement is to define the roles and responsibilities between companies involved in developing a product**

1. **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.**

* **]**Appointment of customer and supplier safety managers
* Joint tailoring of the safety lifecycle
* Activities and processes to be performed by the customer; activities and processes to be performed by the supplier
  + Customer: **Supply a functioning lane assistance system**
  + Supplier: **Analyze and modify the various sub-systems from a functional safety viewpoint**
* Information and work products to be exchanged
* Parties or persons responsible for each activity in design and production
* Any supporting processes or tools to ensure compatibility between customer and supplier technologies

# Confirmation Measures

**[Instructions:**

**Please answer the following questions:**

1. **What is the main purpose of confirmation measures?**
   1. **Ensure processes comply with the functional safety standard**
   2. **Ensure project execution is following the safety plan**
   3. **Ensure that the project really does make the vehicle more safe**
2. **What is a confirmation review?**
   1. **An independent person ensures that the project complies with ISO 26262.**
3. **What is a functional safety audit?**
   1. **Checks to make sure that the actual implementation of the project conforms to the safety plan**
4. **What is a functional safety assessment?**
   1. **Confirms that plans , designs and developed products actually achieve functional safety**

**]**

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.