

Safety Plan Lane Assistance

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# Document history

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# Introduction

## Purpose of the Safety Plan

The safety plan documents the process and the requirements for achieving functional safety in the creation of advanced driver assistance systems (ADAS). The plan defines the roles and responsibilities of team members, creating accountability for safety performance. Development interfaces are detailed in order to define responsibilities across different functions working on the project.

## Scope of the Project

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

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

The Lane Assistance System is an electromechanical system which provides two functions:

1. Lane departure warning: The system will provide haptic feedback through the vibrations in the wheel when the system detects unintentional departure from current lane.
2. Lane keeping assistance: The system will actuate vehicle controls to assist the driver in positioning the vehicle into the center of the current lane.

The system will only provide warnings and limited assistance to the driver. Limitations on the usability of the system will also be described based on the operating environment and scenarios for the vehicle.

Achieving this functionality will be done using computer vision algorithms on camera images. These images will be used to detect lane lines on the road. The camera control unit will calculate desired torque requirements and issue requests to the electronic power steering ECU. It will also issue lane departure warning requests to the electronic power steering ECU where the steering wheel should be vibrated to warn the driver. The camera control unit will communicate with the car display ECU to indicate its state (ON/OFF/FAULT) on car display.

The electronic power steering system shall receive torque requests from the camera ECU and actuate the power steering motor to achieve the desired response. The power steering motor shall also detect driver steering input and ensure that the ADAS system is only functional when the driver is in control of the vehicle.

The overall hardware system architecture is given below. The scope of the system is shown in the orange box and is made up of three sub-systems – Camera subsystem, Car display subsystem, and Electronic power steering subsystem - shown in blue boxes:



# Goals and Measures

## Goals

The goal of this project is to understand and implement the requirements of ISO 26262 for the lane departure and lane keeping feature as a use case. This includes identifying and quantifying the risks. The system will then be engineered per the standards of ISO 26262, with the safety requirements in mind. Risk identified as unreasonable, shall be dealt with and mitigated.

## Measures

|  |  |  |
| --- | --- | --- |
| Measures and Activities | Responsibility | Timeline |
| Follow safety processes | All Team Members | Constantly |
| Create and sustain a safety culture | Safety Manager (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

For our company, safety is the highest priority. Every employee has responsibility for safety, from the engineer to the CEO. We have a zero-tolerance approach to shortcuts which jeopardize the safety of our products. Our design and engineering teams work separately from our safety auditors, and every single employee undergoes safety standards training. Employees are encouraged to report potential problems instead of covering them up.

# Safety Lifecycle Tailoring

This project focuses on the design and product development stages, since no new hardware is required. This will include a hazard analysis and risk assessment, as well as a functional safety concept. After product development, we will validate the system ensuring it upholds the safety requirements.

# Roles

|  |  |
| --- | --- |
| 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 |

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# Development Interface Agreement

The purpose of the DIA is to thoroughly define the responsibilities and roles of all parties tasked with the creation of the product. All parties must agree on its contents before development begins. As a tier-1 supplier, our responsibility is to ensure the project conforms to ISO 26262 standards as detailed in the safety plan, as well as to develop prototypes and subsystem integration. Our customer, the OEM, is responsible for safety and design at the system level.

# Confirmation Measures

The main purpose of conformation measures is to ensure ISO 26262 standards are met, and that the product really increases a vehicle’s safety. During development, we’ll review progress making sure ISO 26262 is followed. A functional safety audit will be done, which is checking to make sure that the actual implementation of the project conforms to the safety plan. Finally, confirming that the design and implementation achieve functional safety will be done in our 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.