

Safety Plan Lane Assistance

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# Document history

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| Date | Version | Editor | Description |
| 2018-07-01 | 1.0 | Albert Zheng | First Draft of Safety Plan |
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# Introduction

## Purpose of the Safety Plan

The purpose of the safety plan is provide the defined framework for the functional safety of the overall 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 item in this plan is the Lane Assistance System.

There are two main functions in this item which are:

1. **Lane departure warning function** – the functionality that will vibrate the steering wheel if the driver drifts towards the edge of an lane
2. **Lane keeping assistance function** - the functionality that will turn the steering wheel towards the center of the line if the driver begins to drift away from the center of the line.

The following subsystems are responsible for the item functionalities:

1. Camera Subsystem:

This subsystem will be responsible for detecting the lane lines and the providing the sensing necessary to determine how far away the vehicle is from the center of the lane. This subsystem is divided into two components.

* 1. Camera sensor
  2. Camera sensor Electronic control unit

1. Electronic Power Steering Subsystem:

This subsystem will be responsible for sensing how much current torque is being used by the driver and then commanding the expected torque in order to steer the wheel back towards the center. This subsystem is divided into three components.

* 1. Motor which will provide torque to steering wheel
  2. Electronic Power Steering Electronic control unit
  3. Steering Wheel Torque Sensor

1. Car Display Subsystem:

This subsystem will be responsible for displaying the information on whether the system is active. This subsystem is divided into two components

* 1. Car Display Electronic control unit
  2. Car Visual Display

The following figure represents the item boundaries for the lane assistance architecture:



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# Goals and Measures

## Goals

## The goals of this project are:

1. Identify the risk and hazardous situations associated with the Line Assistance system that could potentially cause harm to a person
2. Evaluate the risks of the hazardous situations
3. Mitigate the risk of potential malfunctions to levels accepted by societal standards

## Measures

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

The safety culture should value all the following characteristics listed below:

* **High priority**: safety has the highest priority among competing constraints like cost and productivity
* **Accountability**: processes ensure accountability such that design decisions are traceable back to the people and teams who made the decisions
* **Rewards**: the organization motivates and supports the achievement of functional safety
* **Penalties**: the organization penalizes shortcuts that jeopardize safety or quality
* **Independence**: teams who design and develop a product should be independent from the teams who audit the work
* **Well defined processes**: company design and management processes should be clearly defined
* **Resources**: projects have necessary resources including people with appropriate skills
* **Diversity**: intellectual diversity is sought after, valued and integrated into processes
* **Communication**: communication channels encourage disclosure of problems

# Safety Lifecycle Tailoring

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

# 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 |

# Development Interface Agreement

The ultimate goal of the DIA is to ensure that all parties are developing safe vehicles in compliance with ISO 26262.

The responsibilities of the various people involved in the safety plan is as follows:

Project Manager

* Overall project management
* Acquires and allocates resources needed for the functional safety activities
* Appoints safety manager or might act as safety manager

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

Safety Auditor

* Ensures that the design and production implementation conform to the safety plan and ISO 26262.
* Must be independent from the team developing the project

Safety Assessor

* Independent judgement as to whether functional safety is being achieved via a functional safety assessment
* Must be independent from the team developing the project

Test Manager

* Plans testing activities
* Coordinates testing to show that the vehicle system works correctly

# Confirmation Measures

Confirmation measures serve two purposes:

1. a functional safety project conforms to ISO 26262
2. The project really does make the vehicle safer.

##### Confirmation review

Ensures that the project complies with ISO 26262. As the product is designed and developed, an independent person would review the work to make sure ISO 26262 is being followed.

##### Functional safety audit

Checking to make sure that the actual implementation of the project conforms to the safety plan is called a functional safety audit.

##### Functional safety assessment

Confirming that plans, designs and developed products actually achieve functional safety is called 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.