PDS

# Project Overview

This project aims to develop a safe solution for Auckland's traffic congestion. We aim to provide the workers and students of Auckland a safe and streamlined solution to their commuting problems. To do so, we have taken on the concept of a three-wheeled vehicle that can be operated under a LE1 car license. The goal of this design is to provide the swiftness and mobility of a motorcycle, whilst attaining the safety of a car. To achieve our goal, we will design four sub-systems which target the transmission of power (powertrain), manoeuvrability (turning system), control of motion (braking system) and the overall design and look (chassis). In the composition of these four sub-systems, we aim to maximise safety, efficiency, and accessibility.

# General Requirements

* Must be classed as a LE 1 vehicle (three-wheeled motorcycle, one front wheel) according to NZTA law.
  + Gross vehicle mass must not exceed one tonne.
  + Engine cylinder capacity must exceed 50mL OR maximum speed must exceed 50km/h.
* Must seat one person.
* Leaning of the vehicle must be achieved through hydraulic/pneumatic mechanisms.
* Must be powered by an internal combustion engine.
* Must be fitted with an exhaust silencer system in constant operation.
* Must have a foot-pedal clutch.
* Must use a foot-actuated brake system.
* Must feature storage space, charging ports, localised GPS, and hands-free technology.

# Functional Requirements

* Must be able to lean from vertical to a maximum lean angle of 45 degrees within two seconds.
* Must be able to turn at least three ±45 degree turning sweeps within one minute.
* The mechanism that controls turning must exert at least 500Nm of torque at all angles.
* Must have a range of 250km per one tank of gas.
* Must achieve a top speed of 125km/h.
* Must have a stopping distance of ≤33m from a speed of 60km/h in all conditions.

# NZTA Standards

* Must be fitted with two braking devices operated by hand or foot.
* Brakes must act on at least half of the wheels, balanced along the longitudinal axis.
* Must accommodate at least one main-beam headlamp, one dipped-beam headlamp, two forward-facing position lamps, one rearward-facing position lamp, one rear registration illumination lamp, rear reflectors on each side, and direction indicators.

# Physical Constraints

* The pressure of the turning system should not exceed 5MPa.
* The maximum force that can be exerted on the clutch pedal is 250N.
* The maximum force that can be exerted on the brake pedal is 400N.
* Brake pressure must have a maximum operating pressure that does not exceed 7MPa.

# Safety

* The protective structure must encase the driver without obstructing vision to the front, right, or left of the vehicle.
* Provide protection from external hazards and weather conditions.
* Must minimise the risk of fire or explosion.
* Must not cause emission of noxious gases or offensive fumes.
* Additional machinery or equipment must not increase the risk of collision.

# Accessibility

* The rider should be able to enter and exit the vehicle within 10 seconds.
* The vehicle should be easily accessible and not require heavy lifting to access.

# Maintenance

* Brake friction material thickness should be visible without disassembly, or when it’s not visible, wear shall be assessed by means of a device designed for that purpose.
* Must produce a one-page document summarising engine access and components to be maintained.
* The expected lifespan of 10 years at 10,000km per year.