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.