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

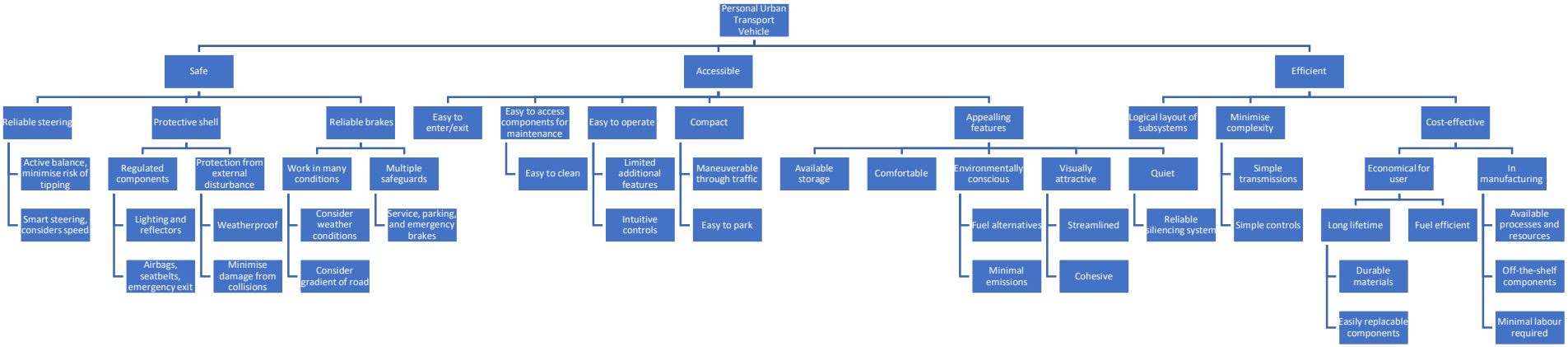
- The protective structure must encase the driver without obstructing vision to the front, right, or left of the vehicle.
- Provide protection from external hazards and weather conditions.
- Must minimise the risk of fire or explosion.
- Must not cause emission of noxious gases or offensive fumes.
-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


Personal Urban Transport Vehicle
Safe
Accessible
Efficient
Reliable steering
Protective shell
Reliable brakes
Easy to enter/exit
Easy to access components for maintenance
Easy to operate
Compact
Appealling features
Logical layout of subsystems
Minimise complexity
Cost-effective
Active balance, minimise risk of tipping
Smart steering, considers speed
Regulated components
Protection from external disturbance
Work in many conditions
Multiple safeguards
Lighting and reflectors
Airbags, seatbelts, emergency exit
Weatherproof
Minimise damage from collisions
Consider weather conditions
Consider gradient of road
Service, parking, and emergency brakes
Easy to clean
Limited additional features
Intuitive controls
Maneuverable through traffic
Easy to park
Available storage
Comfortable
Environmentally conscious
Visually attractive
Quiet
Fuel alternatives
Minimal emissions
Streamlined
Cohesive
Reliable siliencing system
Simple transmissions
Simple controls
Economical for user
In manufacturing
Long lifetime
Fuel efficient
Durable materials
Easily replacable components
Available processes and resources
Off-the-shelf components
Minimal labour required

	(July)Week 1					(August)		Week 2							Week 3							Week 4						
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
PDS, Plan & Objective Tree:																												
-Completed PDS, Plan, and Objective tree																												
Concept design of subsection																												
Individual Design :																												
Calculations and Verification:																												
-Morphalogical Analysis completed																												
Amalgamation of subsections:																												
- Final details adjusted and can begin the CAD																												
CAD and technical drawings:																												
Verification of total design:																												
- Calculations add to appendix with refrence to																												
equations and how they achieve the goals outlined																												
in the PDS																												
- CAD modles have been finished and are ready to																												
be assembled																												
- CAD drawings have been annotated																												
- Ready for Design check point (28th Sept 1pm)																												
Proposal write up																												
- Calculations and technical drawings added and																												
explained in the appendix																												
- Completed discriptions of each subsection																												
operates with each other and how.																												
(Morpgalogical Analysis explination)																												
Presentation:																												
-Complete speach for each section																												
-Rehears with the group to know when to speak																												
and when to stop																												


Week 5
Week 6
(Sept)
MID SEM BREAK START
MID SEM BREAK END
Week 7
Mon Tue Wed Thu Fri Sat Sun Mon Tue Wed Thu Fri Sat Sun Mon Tue Wed Thu Fri Sat Sun Mon Tue Wed Thu Fri Sat Sun Mon Tue Wed Thu Fri Sat Sun
24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27


Week8 (Oct) Week9 Week10 Week11 Week12
Mon Tue Wed Thu Fri Sat Sun Mon Tue Wed Thu Fri Sat Sun Mon Tue Wed Thu Fri Sat Sun Mon Tue Wed Thu Fri Sat Sun Mon Tue Wed Thu Fri
28 29 30 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30