

# Wheelchair Pod-car Transformer (WPT)

## Executive Summary

The WPT is an autonomous and electrically powered wheelchair that can transform into a pod-car. It provides independent, convenient and safe transportation for the mobility impaired citizens, aiming to push the boundaries of limitations set by age and disability.

### PROBLEM

Mobility constraints of the elderly and the disabled lead to lack of independence and inconvenient lifestyle.

- Immobility & Lack of Independence: 88.4% of people with disability prefer private modes of transport - Australian Monash University. The majority of mobility impaired citizens are reliant upon family/friends just to go out. In addition, special disability transportations are also required.
- Safety issues: One of the most popular mobility aids is the mobility scooter but the fall injury rate for older Australians from scooters had increased by 150% over the last decade – AIHW

### PRODUCT

The WPT is multifunctional (3 modes) and autonomous using transforming mechanisms and AI technology. Mode 1: All-terrain wheelchair with stair-climbing ability + barrier-free indoor and outdoor. Mode 2&3: semi or full-enclosure for shelter from weather conditions + safety on bike lanes/road

### OPPORTUNITY

The Australian Bureau of Statistics states that currently Australia has a population of 15% people aged over 65, and our aging population is growing. In addition, 6.9% of Australians use wheelchairs and mobility aids – AND.org.au

- Potential market of 21.9% (5.4 million) → projected to be over 26.8% of Australians in 18 years by the Australian Institute of Health and Welfare.
- Plus, leasing to people with temporary disabilities

The WPT is a niche product with only indirect competitors being autonomous cars, Scewo stair-climbing wheelchair and mobility scooters. The WPT integrates their functionalities into one unique product with transformable enclosures.

### TECHNOLOGY - Existing Technology Utilised

#### Safety:

- AI driverless technology using 4 cameras (360 degrees high resolution imaging), 4 RADAR (2 short-range and 2 long-range) and 1 LiDAR sensor (3D scanning) → speed control and eliminate human error



### Contact Information

Willoughby Girls High School

### School Year

Year 10

### Subject(s)

ISTEAM

### Development Stage

Start-up

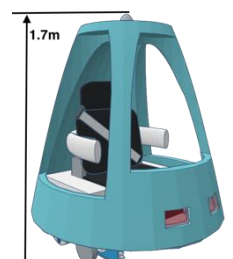
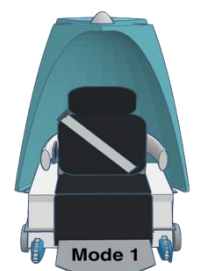
### Number of Team Members

4 – Karina, Sanaz, Brooklyn, Chris

### Prototype

Transformation modes of WPT:

1. Wheelchair
2. Semi-enclosed
3. Fully-enclosed



- **Airbags in the back, side and front covers triggered by piezoelectric sensor +**  
Durable material for the covers (carbon fibre + acrylic plastic windows)

#### **Mobility:**

- GPS system activated using in-built voice recognition technology (Google Assistant/Siri), touch screen and electronic braille accommodating visually and physically impaired users + All-terrain tracks for various ground surfaces and maximised mobility
- Electric motor with versatile charging mode compatible with household power outlets

#### **Comfort:**

- Rotatable covers with interlocking mechanisms for coverage from adverse weather conditions and comfortable cushioned seats

### **SUSTAINABILITY**

- Social:**
- 1 million disabled people (AND.org.au) + 1 in 8 elderly currently employed (NCVER). The WPT Supports their engagement in the society → increased productivity
  - 4.4% of Australia's population are wheelchair users and have experienced depression at some point in time. Independent mobility will improve mental health by reducing isolation.
  - No major infrastructural changes required: Space efficiency due to small and compact size, the WPT can travel on existing bike lanes

#### **Environmental:** Reduced emissions and toxic chemical waste with electrification:

- Aim to decrease: 383.3 megaton of Australia's annual carbon emissions due to vehicle exhausts – Dr.Saddler at ANU (2017)

#### **Financial:** Affordable pricing and low maintenance cost

### **INVESTMENT**

- Funding commitment in the form of lab access with R&D capabilities: to repurpose existing technologies and prototype the product for user testing
- Government support/partnership:
  - Legal classification & licencing of the WPT to allow access on roads and in buildings
  - Legislative changes: renaming bike lanes to mobility lanes will allow WPT & mobility aid users and bike riders to travel with safety and equality + more mobility lanes needed

#### **Two Potential Revenue Models:**

1. Private ownership: WPT will be sold at approximately \$11,250 based on the fact it is one third in weight of an electric vehicle, with the cheapest electrical vehicle ≈ \$28,000. The cost to manufacture our product is around \$9,000, and so a \$2,250 profit would be made for each WPT sold.
2. Mobility as service/Leasing program - based around normal car & mobility aid leasing models: Flat rate weekly charge with insurance would be about \$50 per week for temporary leasing arrangement, which means that we could get a return of our investment for one vehicle in about 3.5 years.

