

John Cleeland: “**Suspended podcars can add capacity and safety to the existing system**”

Bio: John Cleeland was educated at Swinburne Institute of Technology and Monash University.
* worked at VicRoads, Com. Dept of Works, RTA, 5 Municipalities and 5 Consultants.
* worked on Eastlink, Western Link & Southern Link; freeway, highway & traffic design.
* wrote “Road Traffic Issues, A Municipal View.” * has done 5 Australian Roads Surveys.
* initiated the Victorian Road Crash Location Database in 1968; * invented the concrete bathtub for bikes in 1996; * initiated 50kph in local streets in 2,000; * invented Streamlining Hoddle St in 2013; * has modeled two-phase intersections on you tube; * is preparing a Podcar Route to the Airport as a “Market-led Proposal” to Treasury; * web site: quicksafeintersections.com

Introduction

There are 9 things wrong with transport, have been for 54 years, but are easily fixed with suspended podcars by:

1. Generating **\$10B/year revenue** for the government
2. Adding capacity to streets to **remove all congestion**
3. Unrestricted speed that cuts off-peak **trip times in half**, all day
4. **Improved amenity** for arterial streets
5. Cutting exposure to **assaults**
6. **No traffic incidents** and vehicle reliability
7. Melbourne’s **road toll cut in half**
8. **Low energy** use
9. Reducing **noise**

Illustrations

show a **new generation** Metrino podcar and existing podcars:

- * **Ultra podcar** at Heathrow airport
- * Group-transit at **Morgantown**, West Virginia
- * **2GetThere podcars** at Mazdar City, Abu Dabi
- * **Skycube podcars** at SunCheong Wetland Center, Korea

All existing podcars can be **reliable, safe, clean and quiet** but improvements in the first **5 major aspects** are essential for the next generation like Metrino.

1. Revenue

Low weight vehicles are designed **suspended**, to achieve **low operating cost** of 5c/km and **low construction cost** of \$13M/km, including 3 stops/km, and 100 podcars/km, but we must charge **premium prices** (\$30 for two, compares to \$19 each for Skybus), and **100% profit/year** can be earned for the airport route, after provision for loans. In addition to the jobs to build and operate the route, the **profit creates another 11,000 jobs/year**. The alternative \$5B subsidy required for rail **loses 125,000 jobs**. The 5c/km compares to cost of 11c-25c for fuel, and 35c-220c total for a car. There are 50 similar routes in Melbourne where \$400M profit/revenue/year each can be made.

Traffic pricing is not very elastic: by dropping the price a small amount, the revenue might double, so it would be dropped to maximise revenue, gaining around 80% of car traffic. Note that the premium quality of travel would be better than for a car, with no restrictions on travel activity, unlike driving.

| City to Airport | | |
|------------------------|-----------|--------|
| Build | \$13M/km | \$443M |
| Annual Interest & Loan | | \$76M |
| Annual Cost | 5c/veh-km | \$105M |
| Annual Revenue | | \$539M |
| Annual Profit | | \$434M |

2. Congestion

Exclusive track **on poles** does **not reduce existing transport capacities**, and with wireless control for bunching at ½ second intervals, adds **8 lane arterial capacity** (64,000vpd) down any route, increasing capacity shown 4 times, effectively removing **all congestion restrictions**. Customers benefit, there is no need for unpopular demand management, and expected induced traffic can be accommodated. It is better to have extra service down as many streets as possible to deliver people closer to their desired destinations, rather than to have higher capacity down one route and create large, inconvenienced, pedestrian flows.



Driverless cars are already safer than normal cars, but they do this at the expense of capacity. A pedestrian, waiting to cross, causes a driverless car to slow to 10kph, reducing capacity below existing.

3. Trip Time

Off-line stops, with 5 parallel bays (10 podcars in reserve on the roof for peak demand), and grade separated interchanges (removing the capacity reduction of merging the cross route), allow **bypassing** of all serial delays caused by queuing at stops or intersections. **Suspended vehicles** on sharp curves, on steep grades and when stopping, **swing feet first** and are more comfortable than cars. Podcars can swing out at 25% on 30m radius curves at 100kph, remain flat on 100% grade and swing forward when stopping (feet first, not head first). **Average speeds of 60kph** allow enough gaps for merging. In-vehicle switching allows route change, like stepping from one foot to the other while skating. 100% grade reduces the stop footprint to 25m x 5m. Value capture is intended where businesses want customers to their doorstep and contribute cost and space. The total trip time is expected to be half the off-peak trip time, even in peak periods.



4. Amenity

Steep grades are needed at stops to keep the **footprint small**, avoiding **severance**. Stops must be at ground level to avoid expensive lifts, but 10% grades to stops would sever one side of a street from the other and be unacceptable as well as tempt louts to unsafely cross. Interchanges within existing street reserves need tight turn radii (3m minimum available) and steep grades. Suspended vehicles permit higher, slender, structures that **look better** than existing podcar structures and than **congested traffic**. 6m width of support structure at 7m elevation as shown in the illustration below from an Ultra Global Amritsar proposal is not acceptable but two 1m wide guideways at 10m height are just OK. With a major reduction in demand for car traffic, car lanes can be **replaced with exclusive bike lanes**, using a Dutch style design, making bike travel much safer, further reducing demand for car travel. Both the mode change from cars and the removal of the kerbside traffic lane make a major improvement to amenity on arterial streets.



5. Security

Personal podcars, **not shared with strangers**; vehicles **waiting at stops**; **switching between routes** without changing vehicles; stops **close to trip ends**; and **video monitoring**, inside and outside the podcar, **reduce exposure** and **number of assaults**. There are 1895 assaults per year on public transport, 1347 in cars, 11,617 on the street and this is not acceptable for PT. It is not known how many of the street assaults are at stops or during vehicle change. Podcar exposure is from home to the podcar stop, but you could drive to the podcar stop. Car exposure from parking to destination is not secured by video monitoring. Podcars must all be accessible and secure.

Metrino podcars (illustrated) are track powered, **suspended**, steel-wheeled, driverless, weigh only **300kg**, can average **60kph**, use 100% grades, and can carry 5 passengers, 2 bikes, a wheelchair or 400kg freight, and have a slender **10m high** guideway. A full size model has been built but it needs to be brought into production with a 1km test track, a stop and service bay, including regulatory approval.



6. Reliability

The guideway, intersections, stops and podcars need redundancy of critical components for reliability, and sensors for process control, to signal for preventative maintenance and for security. The plethora of sensors provided are selected to support extreme reliability, as part of high technology process control, a specialty not often seen in transport. While this sounds ambitious, driverless cars have already achieved much more complex tasks, but the road should catch up. In this modern age, the road could work together with the car and there would be no excuse for a car ever exceeding a speed limit, going through a red light, or failing to stop on a police instruction. Perhaps terrorism might prompt some action by the road regulators, even if safety has failed to do so. Better still, use suspended podcars with extreme reliability and control.

Ultra podcars are rubber-tyred, battery-powered, driverless, weigh **850kg**, travel at **40kph**, use 10% grades, can carry 4 passengers and have a **wide, flat track**. 21 podcars at Heathrow airport since 2011 have replaced 50,000 bus trips/year.



7. Safety

Morgantown has carried 80M passengers since 1975 with **no fatalities** (expected rate on the 14km route is **10 fatalities for cars**). I laugh at Rip Van Winkel but this perfectly safe system has been around for 42 years so what does that say about my concern for safety?

Morgantown group-pods are track-powered, rubber-tyred, driverless, weigh **4,000kg**, travel at **50kph**, use 10% grades, can carry 20 passengers and have **wide, flat, heated track**. (An inefficient

way to melt snow). 50c fares cover 60% of the cost but students and academics ride free (majority of demand is students).



8. Pollution

Minimum energy from **steel wheels**, energy agnostic **electric power**, **low vehicle weight**, smooth operation, and low drag and gravity tasks, **cuts CO2 emissions**. Metrino uses 8.4 times less energy/pax-km than trains, 10.6 times less than cars, 12.7 times less than buses, and 2.5 times less than Ultra. Electric power also cuts Particulates, NO2 & SO2. Only (low weight) podcars are acceptable for the environment.

2GetThere podcars have been at Masdar City Abu Dabi since 2010, are battery-powered, rubber-tyred, driverless, weigh **1,400kg**, travel at **40kph**, use 10% grades, can carry 6 passengers, and operate on a **wide flat track**.



9. Noise

Reduction of **tyre noise**, **engine noise**, and **warning devices** also improves **amenity**.

Skycube podcars have been at SunCheon International Wetland Center, Korea, since 2013, are track-powered, polymer-wheeled, driverless, weigh **2,250kg**, travel at **60kph**, use 10% grades, can carry 6 passengers, and operate on a **wide flat track**. Some Skycube podcars run empty because the system has serial queues as shown.



10. Why Suspended?

Every podcar system is more **reliable, safer**, has **less CO2**, and is **quieter** than existing transport.

| Item | Vendor | | | | |
|----------|---------|-------|------------|-----------|---------|
| | Metrino | Ultra | Morgantown | 2GetThere | Skycube |
| Profit | ✓ | X | X | X | X |
| Capacity | ✓ | X | X | X | X |
| Speed | ✓ | X | X | X | X |
| Security | ✓ | ? | X | ? | ? |
| Visual | ✓ | X | X | X | X |

All are reliable, safe, clean & quiet

But, if you want a **new government revenue source**, or to **remove all congestion**, or to **cut trip times in half**, or to **reduce assaults**, or to **improve visual amenity**, we need to **upgrade** existing podcar systems to a concept such as Metrino, that has a suitably high specification for all aspects, but that **requires a development stage**.

Postscript: In response to President Szwed's question, there are 10 concrete bathtubs on the Western Link bike path from Flemington Rd to Footscray Rd. Where the bike path goes under bridges, the 2-year flood level (tide is critical) is up to 1.5m above the path. A concrete bathtub protects the path from flooding. It is equipped with power, pump, drainage, flood gate and spillway. The bike path has 2.4m height. The bathtub is too heavy to float away but not too heavy to sink in the Coode Island silt (CBR 0.5). Image from Google Maps.



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