

February 2012



# PRT Developments

Prof Martin Lowson FEng



# PRT: Current Position

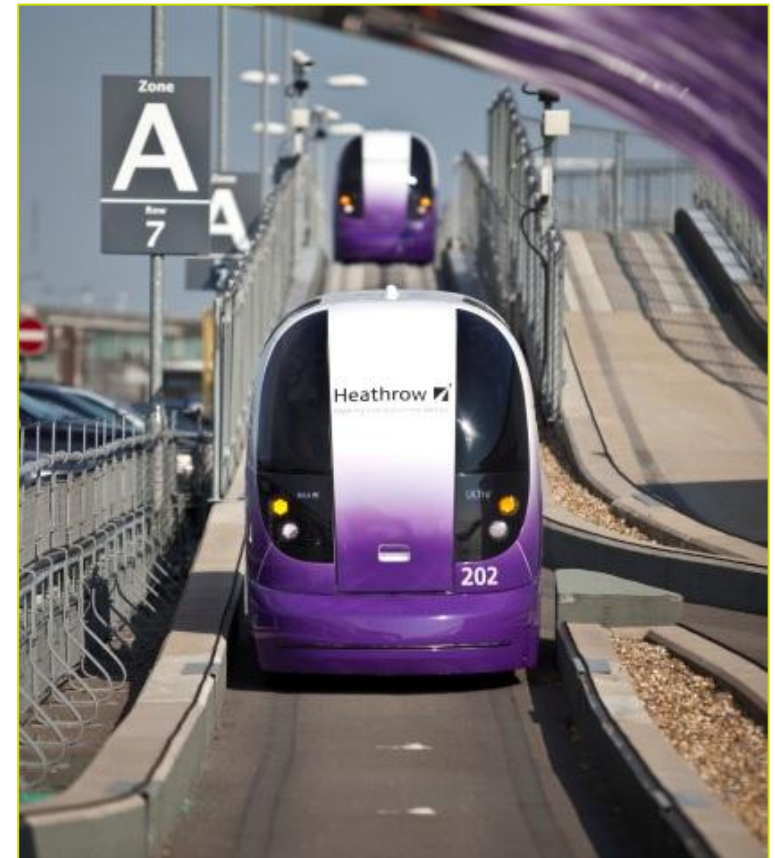
- Three established suppliers Vectus, 2getthere, ULTra
- Carrying passengers full time in the MASDAR Eco City in Abu Dhabi and at London's Heathrow Airport
- Extremely positive response from passengers
- A new component in the transport mix



# Outline



- Motivation
- Background
- Short Video
- Passenger Response
- Features
- Future Possibilities
- Conclusions



# Motivation



“Individual mobility is a major driver of personal growth and economic well being”

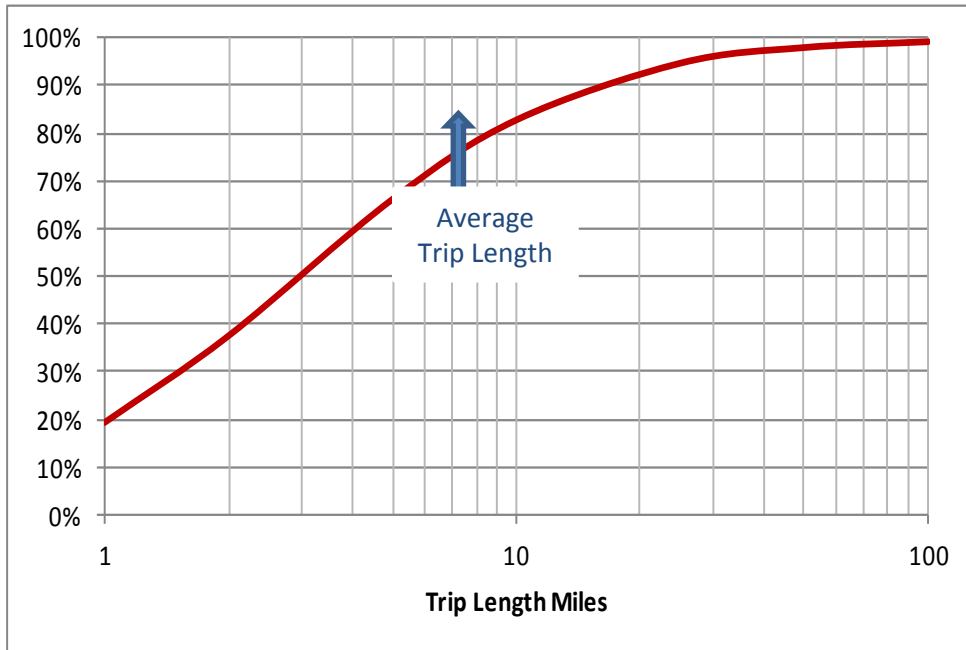
Dr Julia King

Passenger km per person in the UK reduced by 10.4% between 2000 and 2010  
(NTS 2011)

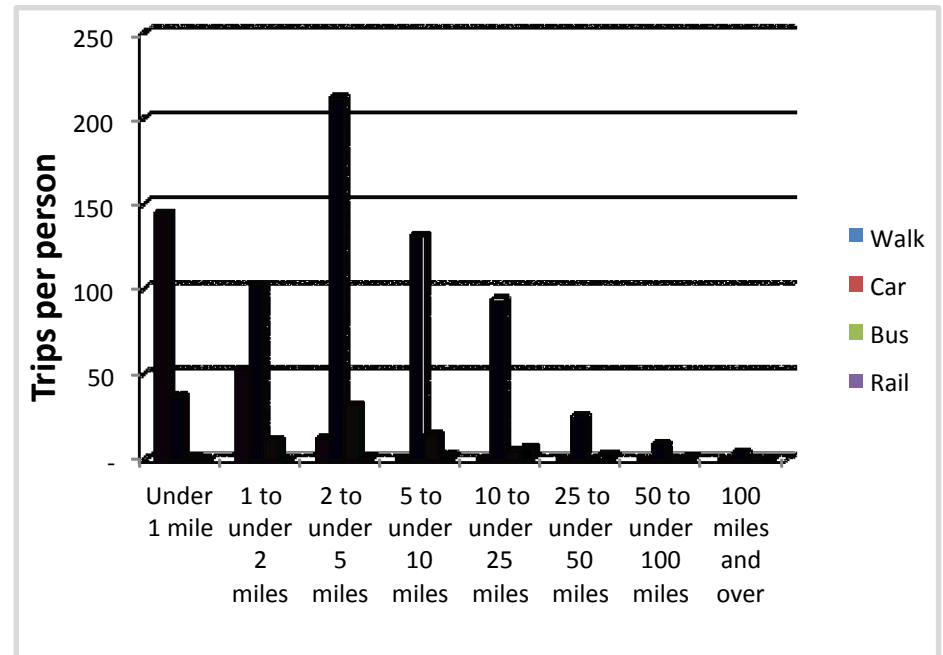
# National Travel Survey 2011



## Cumulative Trips by Distance



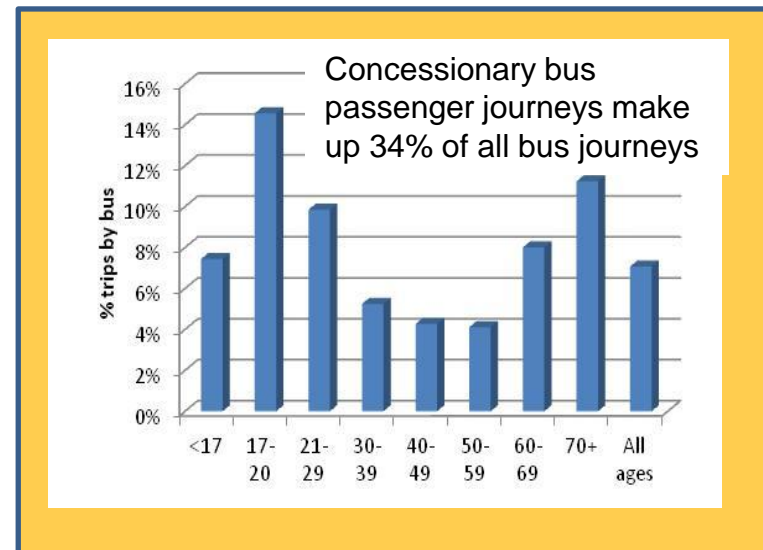
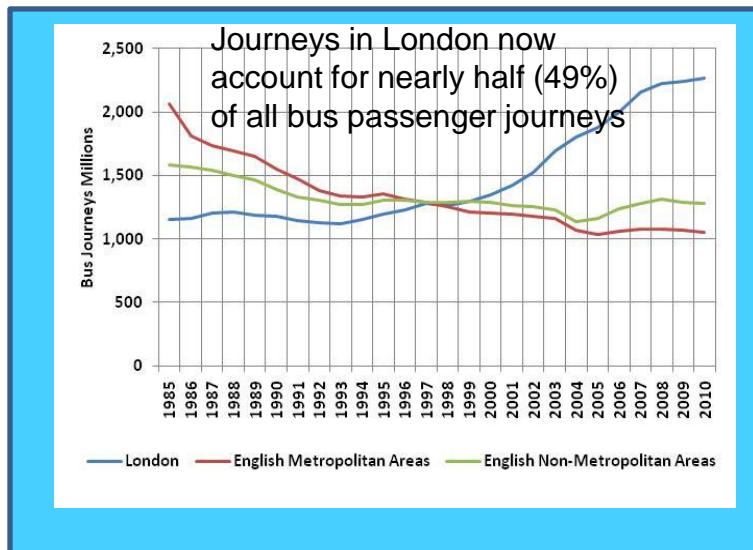
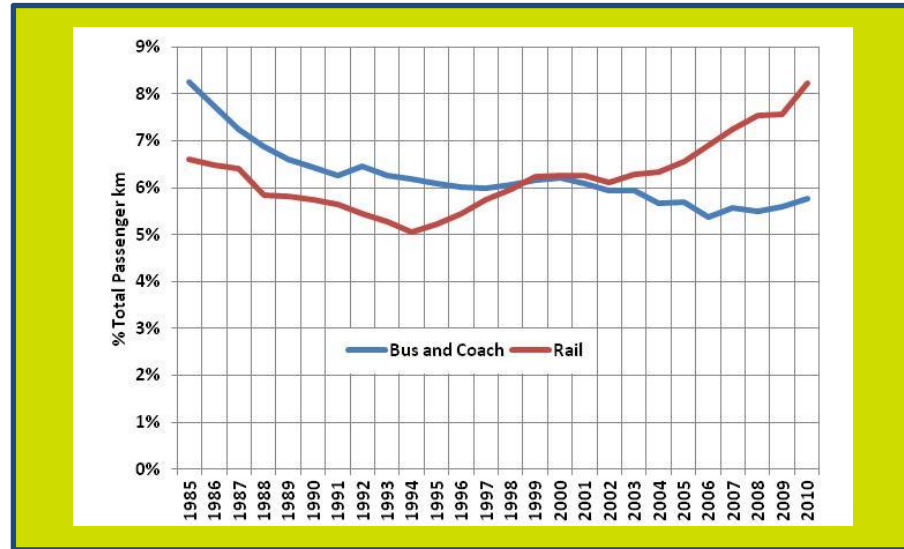
## Trips by Mode and Distance



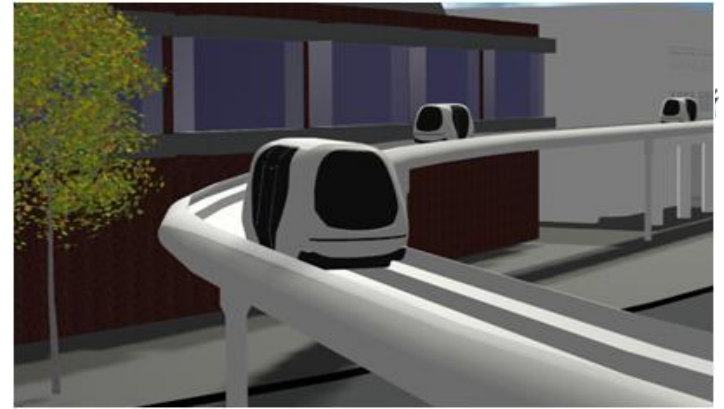


# Bus and Rail Trends (NTS 2011)

Nearly half (48.4%) of all bus revenue is provided by Government support - Annual Bus Statistics 2010/2011



# Objective



## ULTra: Urban Light Transport:

Started January 1995 at University of Bristol

To define an urban transport system for the next century, meeting future needs for flexible personal transport, while being highly acceptable in an urban environment.

# The Ideal Transport System



	<b>Car</b>	<b>Public Transport</b>
Available on Demand	Yes	No
Goes everywhere	Yes	No
No Stops	No	No
Environmentally friendly	No	?
Safe and Secure	?	?
Low Cost	Yes	?
Integrates with other modes	No	?



# Requirements

- Available on demand
- Goes everywhere
- Non Stop
- Environmentally Friendly
- Safe and Secure
- Low Cost
- Integrates with other modes

## ULTra

Yes

?

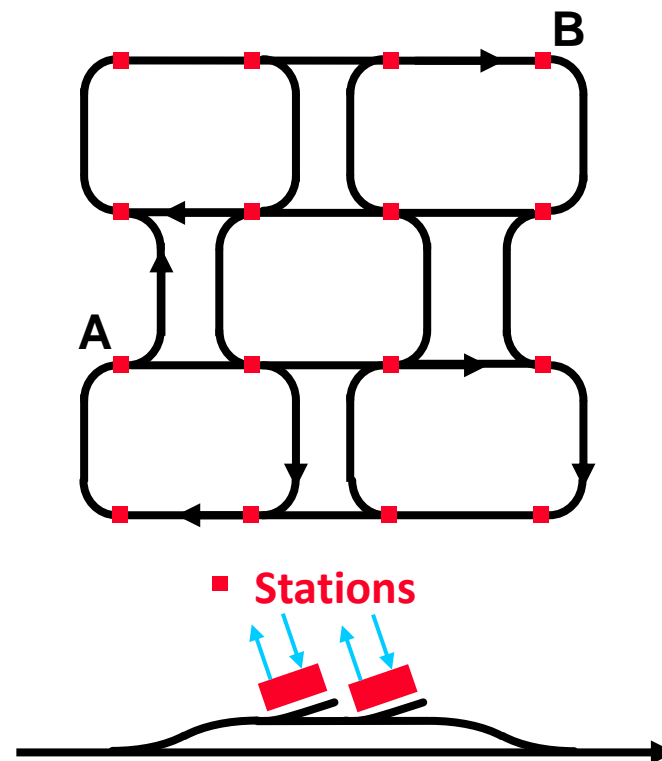
Yes

Yes

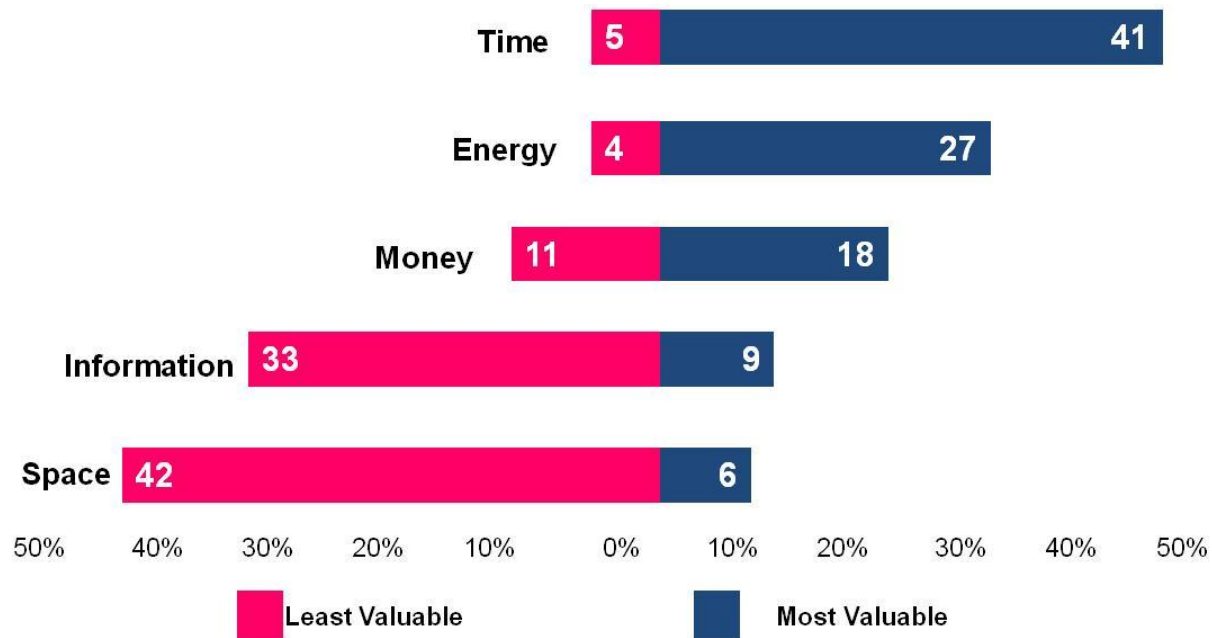
Yes

Yes

Yes

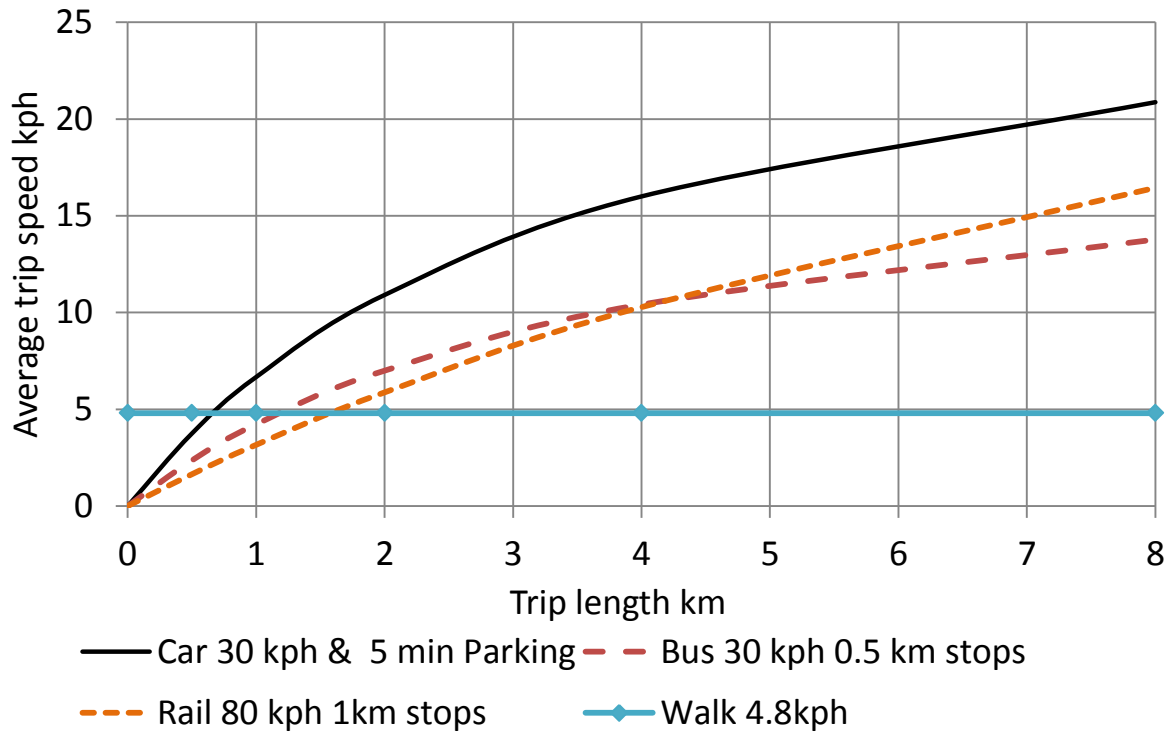
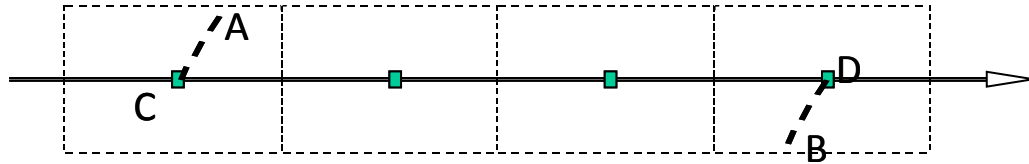


Per cent responding to question:  
*'Which one of the resources is most/least valuable to you in everyday life?'*



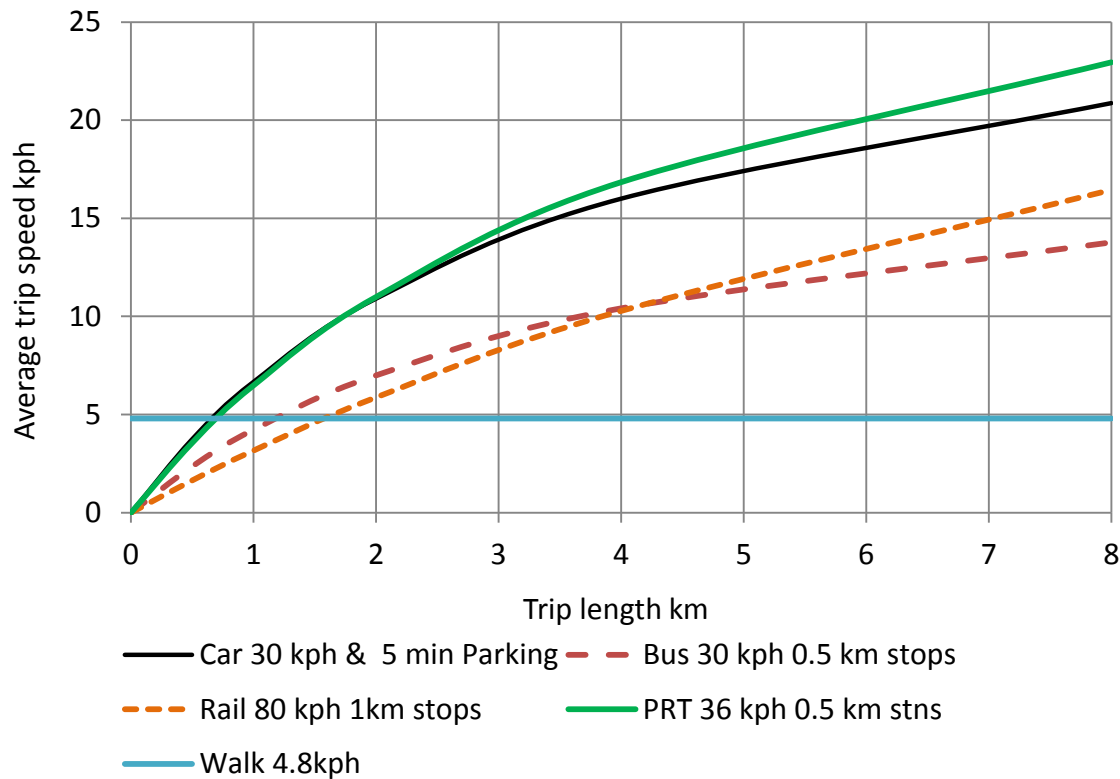
Source: *What the citizen wants: Planning for consumer change Henley Centre 2006*

# Overall Trip Speed vs Distance



Time benefit for typical trip by car vs bus/train: 10 minutes

# Overall Trip Speed vs Distance



## Heathrow Comparison

	Walk time mins	Wait time mins	In-vehicle time mins	Total mins
Shuttle Buses	2.9	3.1	9.8	15.8
ULTra	0.6	0.2	5.4	6.2

# Heathrow issues



- Congestion
- Space restrictions
- Pollution problems
- Capacity restrictions
- Passenger Service Issues



# Heathrow pod



Heathrow pod is open for business



# Heathrow pod



- The Heathrow pod is up, running and since opening on 18 April, has carried around 200,000 passengers
- Once full service was introduced on 7<sup>th</sup> May the Heathrow car park buses were removed from operation
- Currently runs:
  - 22 hours weekdays
  - 20 hours Saturday
  - 21 hours Sunday



See: <http://www.ultraglobalprt.com/photos-videos/videos/>



## Heathrow pod performance

		Operated	Full System Availability	Journeys
May	16533	614 hours	98.5%	
June	17861	646 hours	97.3%	
July	17892	667 hours	98.2%	
August	17148	670 hours	99.0%	
Sept	21695	646 hours	98.6%	
Oct	21527	667 hours	99.8%	
Nov	21346	667 hours	99.1%	

**Average time from journey request to start is only 8 secs, compared to a typical 5-10 minute wait for the shuttle bus**

# Passenger reactions



The future has arrived!

Super cool !!

Fun!

Very impressed

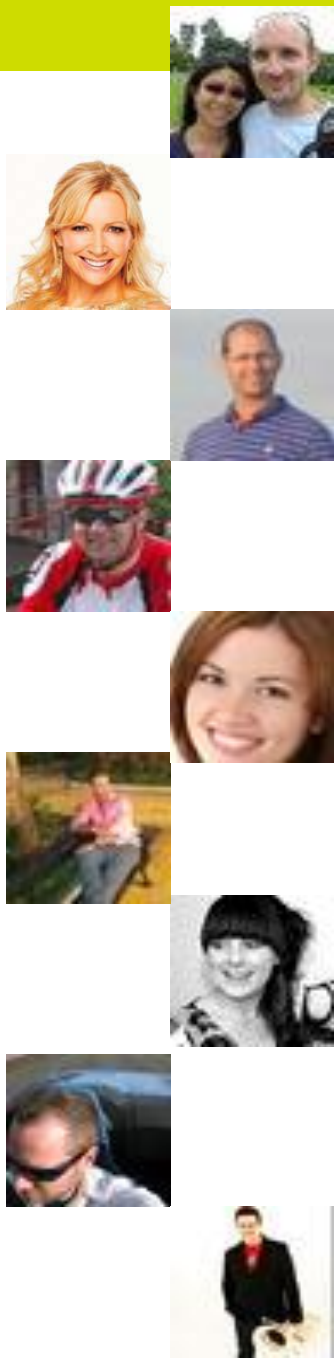
Awesome!!

I love these things.

Amazing

A transport revelation.

Greatest mode of transport known to man!

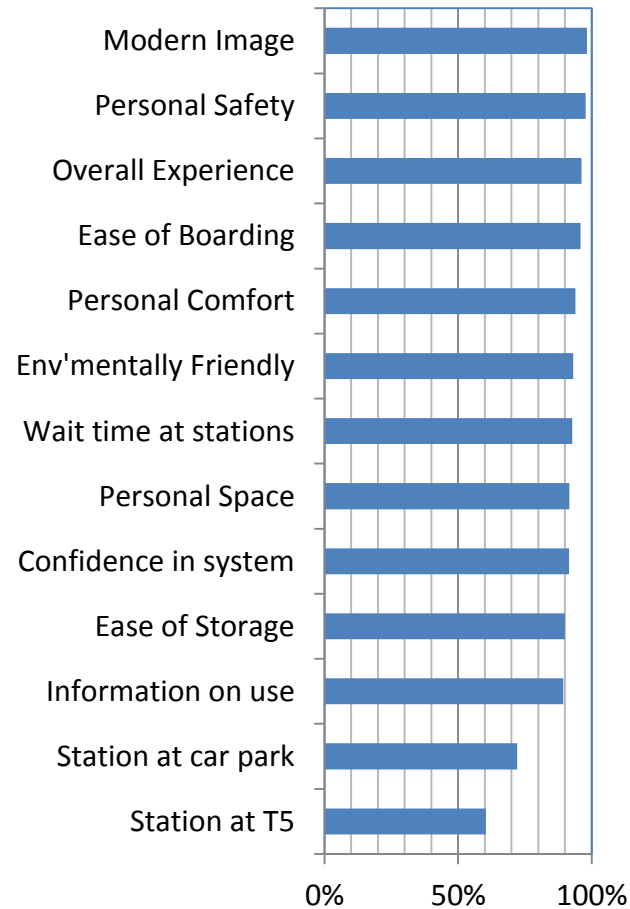


# Passenger Ratings

Survey of 314 Heathrow Pod users conducted in May 2011 as part of the EU City Mobil Project.



**% Users rating PRT as good or excellent**



# Proving the benefits of a PRT system



- Service
  - Predictability
  - No waiting
  - Reduced journey times
  - Experience
- Environment
  - Reduced emissions – NOX, CO2, PM10
  - 50,000 bus trips per year eliminated



## Wide range of revenue streams

- Land-use savings, combined with increased land values and accessibility;
- No disruption of airport services during installation and testing;
- Increased office rents;
- Reduction in traffic congestion (emissions & road wear);
- Passenger travel-time savings & way finding benefits;
- Increased staff productivity;
- Sponsorship & advertising;
- Third party partnerships (e.g. hotel user access);
- Operational savings;
- Low CapEx (vs. APMs) – reduced interest payments.





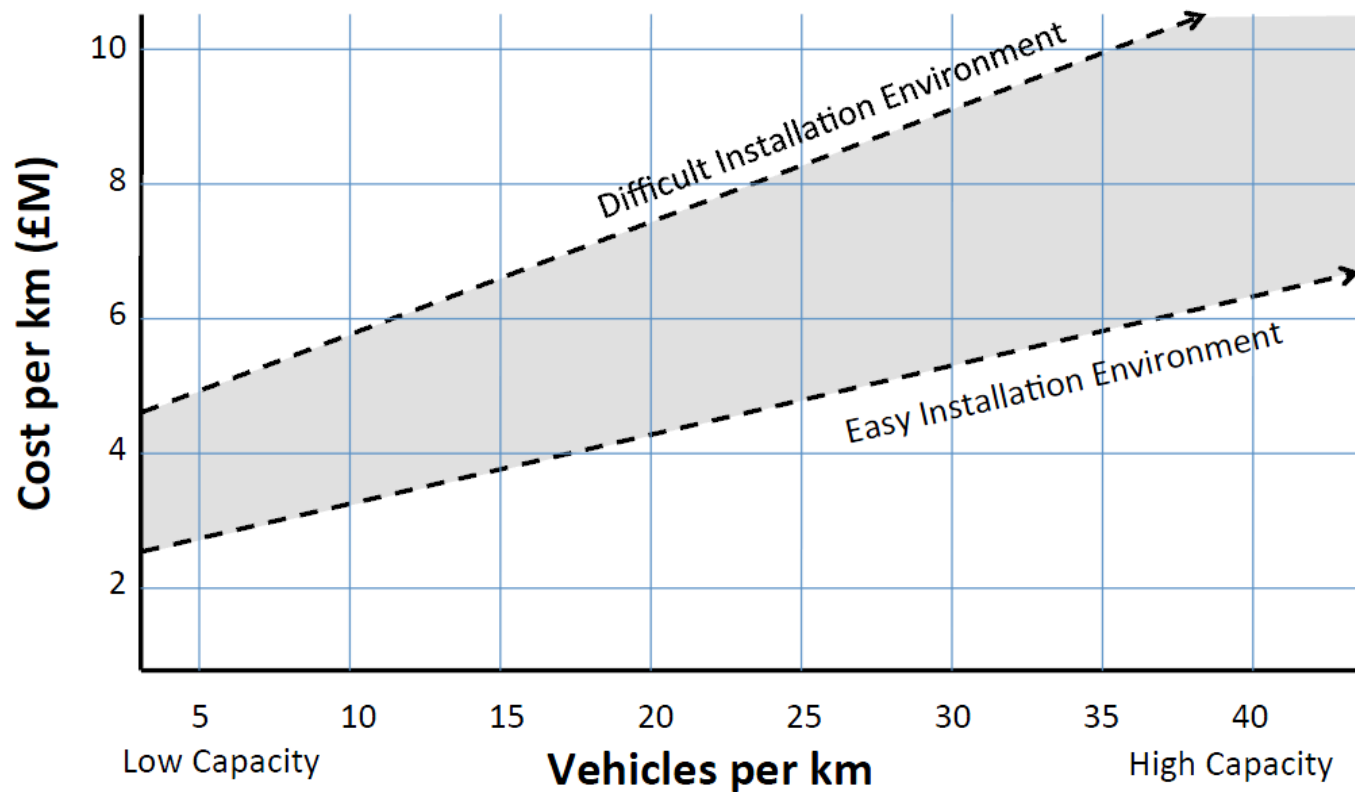
## Understanding PRT capital cost

No single per-km cost is accurate representation

Cost depends on:

- 1) Site conditions
- 2) Demand to be served (capacity)
- 3) Location (e.g. India vs. UK vs. US, etc)

## Understanding PRT Costs





## But...3-5 times cheaper than APM/Rail

- Light rail system at Toronto International Airport link cost nearly **£38m per km**
  - An Ultra system would have cost £9-10m per km (based on 2010 figures).
- The Birmingham AirRailLink cost over **£14m per km** to refurbish recently
  - To build a PRT from scratch for the same route would have cost under £10m per km and offered passengers their own door-to-door pod service.
- The light rail line in Montpellier cost **21.8m Euros per km**
  - A PRT system would have cost 5.6m to 9m Euros per km (EDICT 2004 figures)
- The Oakland Airport Connector, in San Francisco, California, a transport system that's been proposed since the 1970's, and due to begin building soon, has been costed at **£32m per km**
  - Estimated cost of £6-8m per km if built as a PRT system.

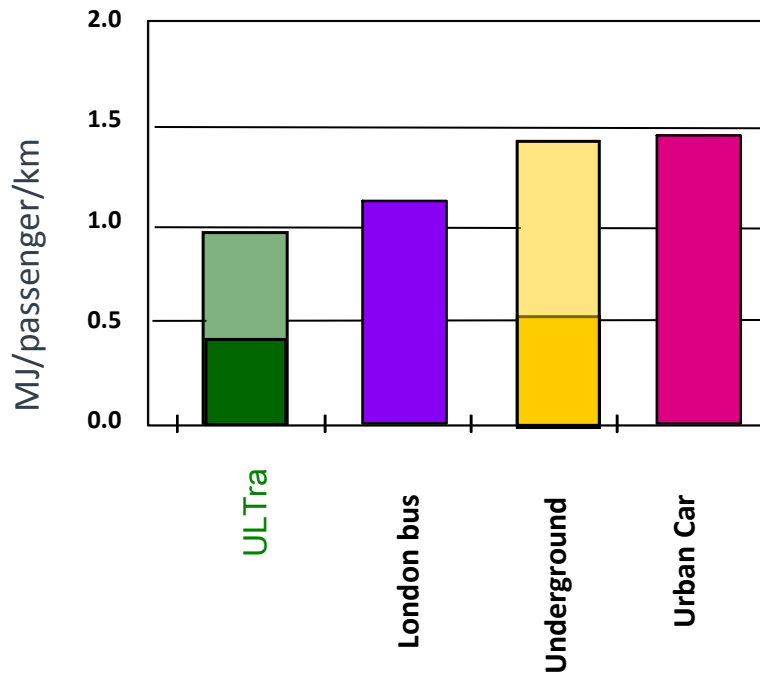
## More reliable...



<b>System</b>	<b>Availability</b>
Heathrow Pod	99.0% (average July-present)
Heathrow Express	98.0% (2010/2011)
London Underground (LUL)	95.6% (2010/2011)
Docklands Light Rail (DLR)	97.4% (2010/2011)
Tramlink	98.6% (2010/2011)
Overground	94.8% (2010/2011)

The comprehensive development and testing programme has delivered exceptionally high levels of system performance at Heathrow Pod when compared to other transport systems

# And More Sustainable



UK Data. Assumptions:

- Average passenger loads
- Well to wheel (darker shading - direct electricity use only)

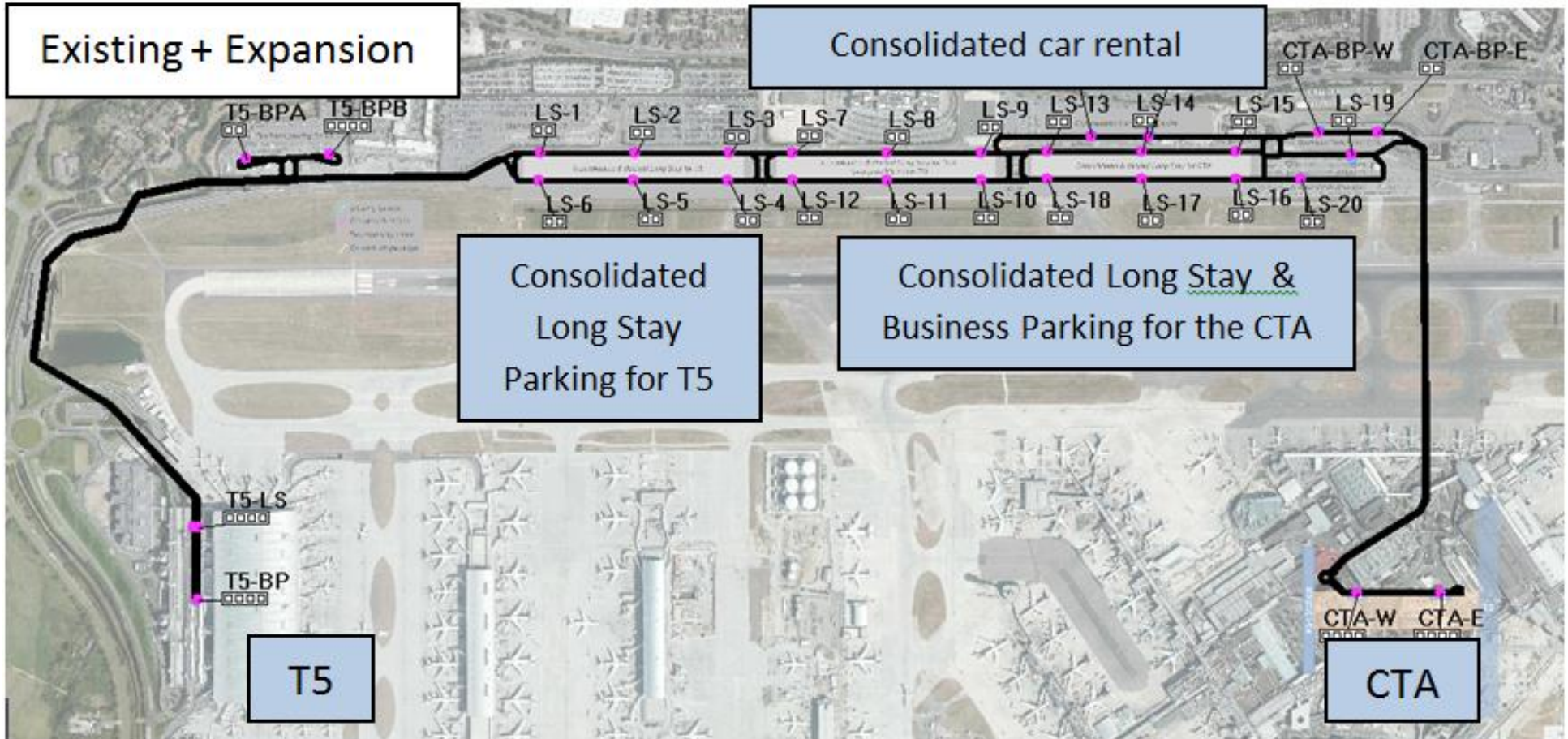
- Light-weight electric vehicles
- Only move when there is user demand
- Avoid 'stop & go' waste
- No on-site emissions
- Low external noise
- Low embodied energy

# Next steps for Heathrow

- Already much loved/established member of Heathrow transport offering
- Conducting detailed feasibility work for expansion to T1,2,& 3



# Early expansion alignment





# Heathrow issues



- Congestion
- Space restrictions
- Pollution problems
- Capacity restrictions
- Passenger Service Issues

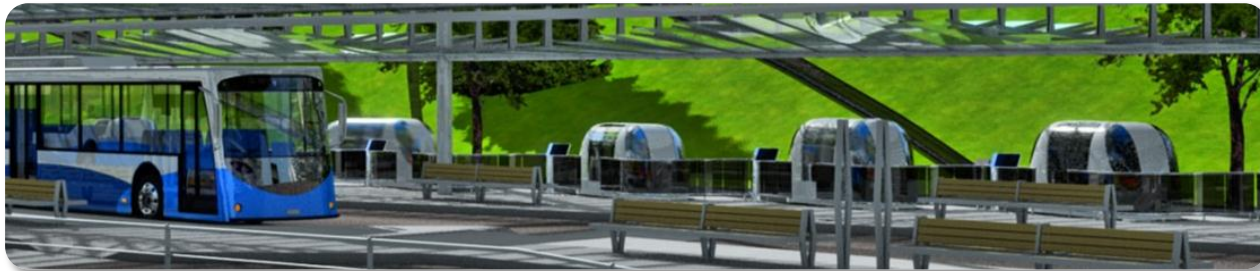


are the same as the issues faced by other airports, cities, business parks, college & university campuses, and residential areas – which is where the next opportunities lie.



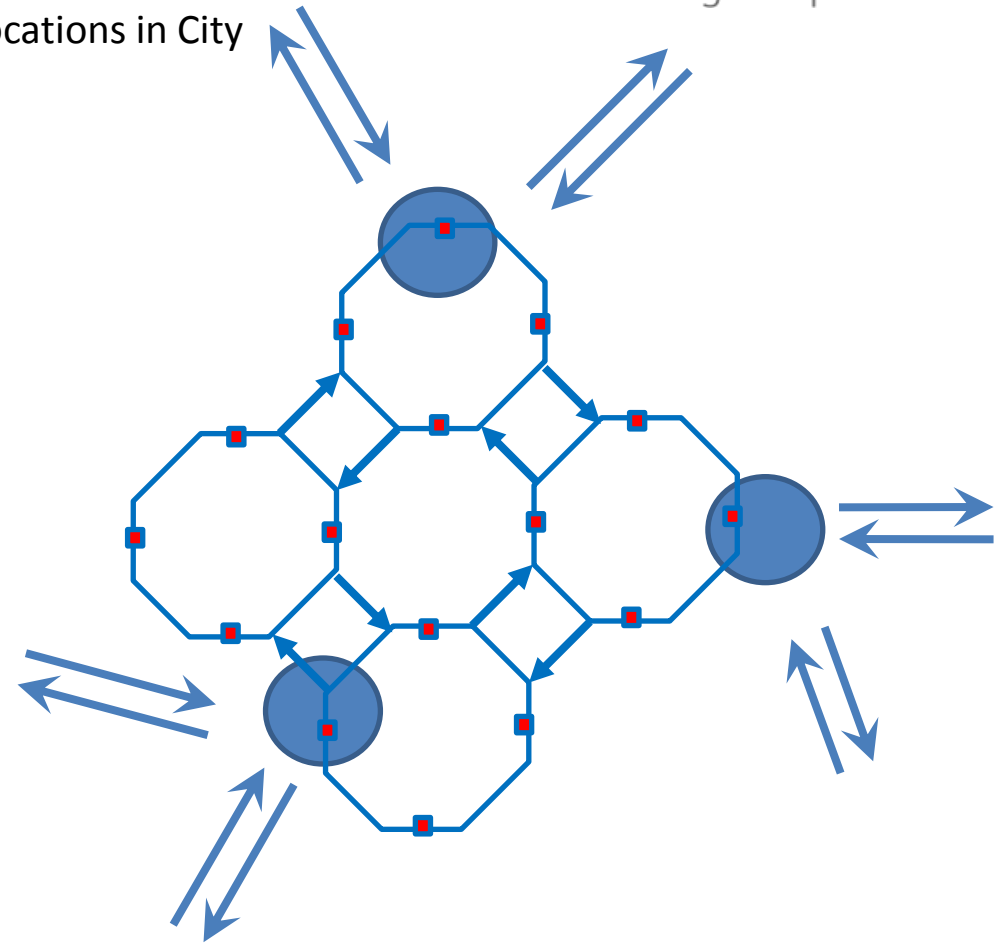
## Enhancing public transport

- Independent studies by Arup and ITS Leeds show significant benefits to existing bus & rail services when they are supported by an on-demand PRT network.
  - **Cardiff (UK):** A PRT system covering the last 2km to the Bay area would increase patronage by >100% on existing bus & rail services.
  - **Gateshead (UK):** a 21km PRT network serving the inner city would increase the use of rail travel by 168% in the peak and 232% in the off-peak.



## PRT to Support Transport Hubs

- PRT network connects transport hubs to major locations in City centre
- Transport hubs service
  - Rail
  - Buses
  - Park and Ride
  - Rental Cars
  - Taxis
- A new opportunity?



## Scalability

- ULTra was designed to be effective at large scales
- Outstanding flexibility in design
- Central scheduling - Autonomous control
- Simulations satisfactory to 1000 vehicles, 30 sq km
- More intensive use will require technology to provide shorter headway – several alternatives available
- Heavy usage would require multiple tracks
- Largest applications likely to require cellular networks
- But no plan to install very large networks in the near term



# Bath Park & Ride with ULTra PRTB

Newbridge  
P&R

Royal United  
Hospital

Route indicated follows disused railway line, minimising impact and cost of PRT guideway. Furthermore, the small-scale infrastructure can be designed to complement the needs of cyclists, pedestrians and local residents.

Oldfield Park  
Rail Station

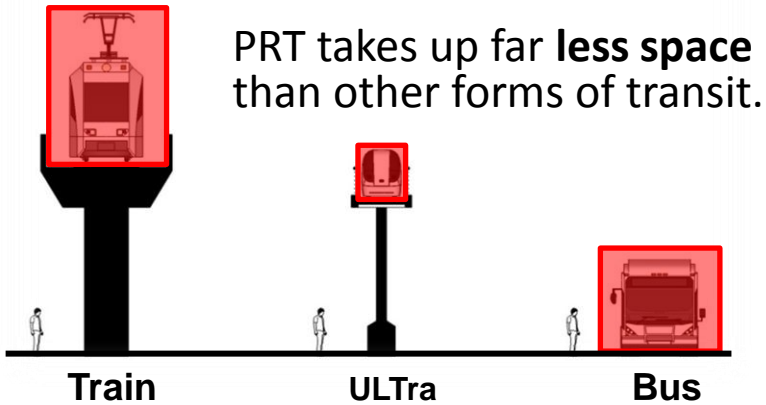
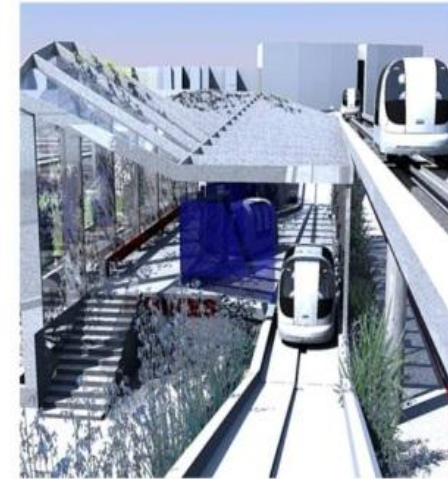
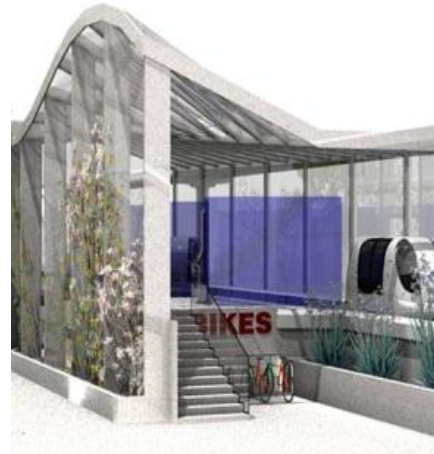
Bath Spa Rail &  
Southgate Centre

## Summary – System Details

- Number of Stations: 8.
- PRT distance from Newbridge P&R to Bath Spa Rail: 4km/2.5miles.
- Total length of PRT guideway lanes: 12.8km
- Estimated number of vehicles required: 140
- Overall capital cost estimate: £50-60 m



# Infrastructure design suggestions for Bath





# Onwards and upwards for Ultra

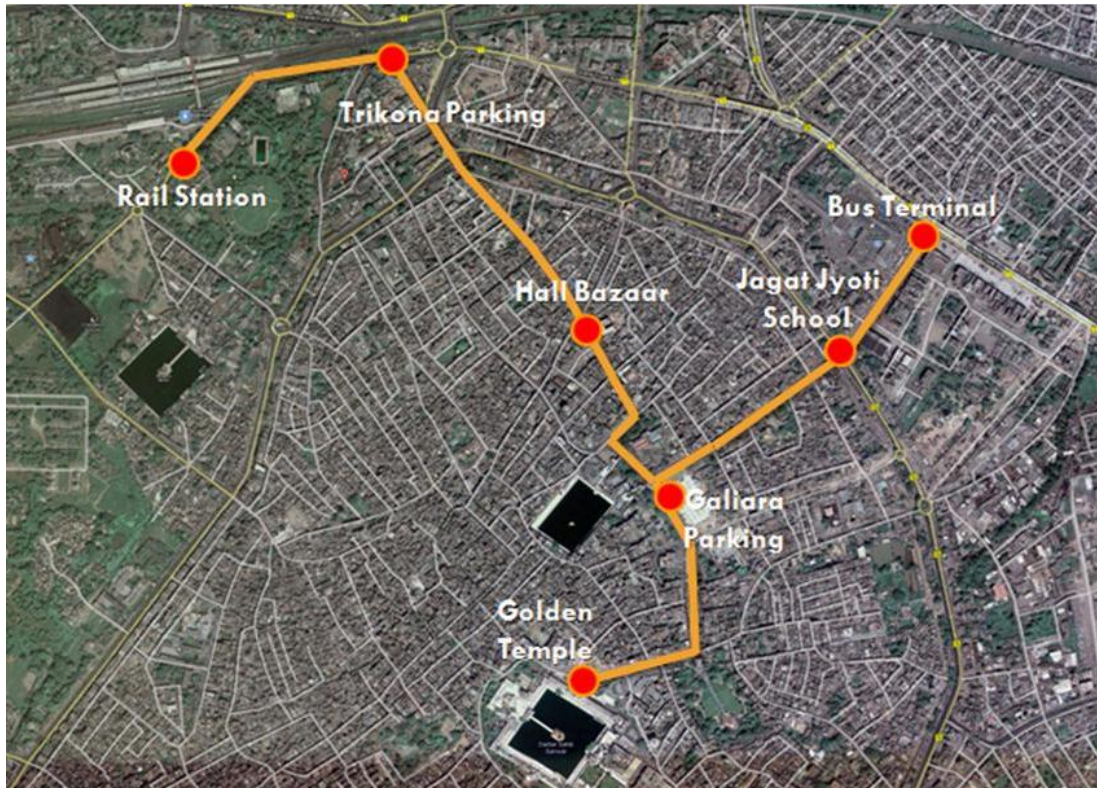


- Reliability demonstrated – learning curve surmounted
- Exploring applications around the world with potential partners keen to deploy this innovative technology
- Ultra PRT's India partner: ULTra Fairwood
  - Developed proposal for link to Amritsar Golden Temple.
  - Compared to Heathrow – lower cost per mile



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# Amritsar details



- The first urban application of PRT.
- Up to 100,000 passengers a day
- 8km / 4.8 mile elevated guideway
- 7 stations
  
- Takes 35% of daily visitors to the Golden Temple
- Saves up to 30 minutes on the current journey times

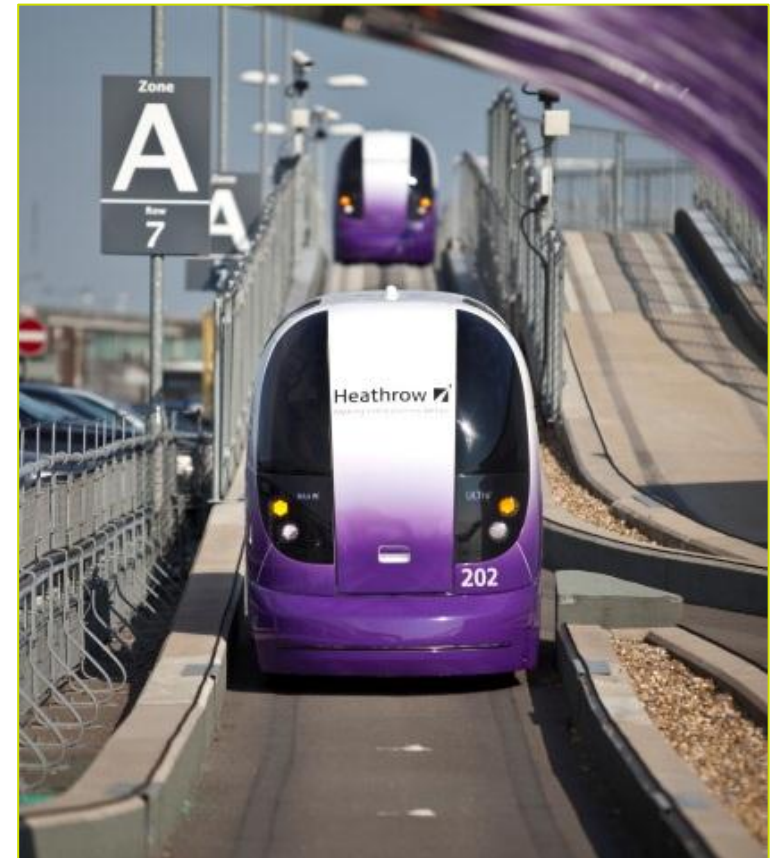
The world's largest PRT system to date, entirely privately financed.

Due go live in 2014.

# Conclusions



- Heathrow pod: open since April, great performance & feedback to date.
- Demonstrates benefits and addresses issues common to many transport applications
- World wide opportunities in a wide range of applications, including airports, cities (especially feeder/distributor) & campuses.





Thank You



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