The role of automated transport in the mobility of the future

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The focus on cities

- European Cities
  - 60% of population
  - 85% of economic activity
- Urban transport systems in the EC15
  - €100bn p.a. congestion costs
  - 100,000 premature deaths p.a. from air pollution
  - and 50,000 p.a. from noise
  - 13,000 deaths p.a. on urban roads
  - and 210,000 serious injuries
  - 30% of urban households without cars
  - 14% of all CO₂ emissions
- Urban travel cannot be just a local government problem
The EC definition of sustainable transport

- **Social**
  - Provides basic access and development needs
  - Supports safety, human & ecosystem health
  - Promotes equity within and between generations

- **Economic**
  - Is affordable, fair and efficient
  - Supports the economy, regional development

- **Environmental**
  - Limits emissions and waste within ability to absorb
  - Uses resources within renewal, replacement rates
  - Minimises impacts of noise and use of land
The logical structure for transport policy formulation

- Developed to provide a structure for the EC Decision-Makers’ Guidebook
  - www.konsult.leeds.ac.uk
- Encouraging a logical sequence for problem solving
- While accepting that conventional decision-making is not necessarily so sequential
The main focus of debate
- Possible solutions
- Which policy instruments work best
- How to combine them into an effective strategy
A growing range of policy instruments

- Management
  - Car and bicycle clubs (sharing)
  - Walking buses
- Information
  - Trip planning systems
  - In-vehicle real time guidance
- Awareness
  - Personalised travel advice
  - Company travel plans
- Pricing
  - Road pricing
  - Private parking controls
Automated transport systems

- Cybercars
  - Driverless vehicles, electronic guideways
- Personal rapid transit
  - Driverless vehicles,
  - Segregated guideways
- High tech buses
  - Electronic guideways
  - Driven on city streets
- Dual mode vehicles
  - Automated following
  - Driven on city streets
- Advanced city cars
  - Small, low emission
  - With ADAS facilities
Developing a strategy

- No one policy instrument will be sufficient alone
- An effective strategy
  - Uses the full range of policy instruments
  - Ensures that each policy instrument reinforces the others
  - Uses one policy instrument to help overcome the barriers to using another
The PROPOLIS results
[Seven European cities]

- Public transport speed, service and fare improvements contribute well
  - But encourage longer distance travel
- Pricing of car use achieves significant benefits
  - But may encourage relocation
- Alternative land use policies have little impact alone
  - But can support public transport and pricing measures
- Infrastructure schemes can provide benefits
  - But only if designed to be cost-effective
  - And consistent with the overall strategy
The Optimal Strategies Study results [Six UK cities]

- Optimal strategies typically involve
  - Substantial reductions in fares area-wide
  - Increases in service frequency within urban areas
  - Peak period city centre cordon charges
  - Low cost increases in road capacity

- Optimal strategies typically cost more
  - But strategies with no net financial outlay can be achieved for only 15% lower benefit
  - Typically involve a 15% reduction in car use
  - And have benefits of €5000 to €10000 per capita by comparison with current strategies
The role of the CityMobil predictive tests

- To assess the likely contribution to urban transport policy objectives of each of the four technologies
  - If applied at a significant scale
  - On their own or with complementary policy instruments
- To contribute to an *ex ante* evaluation of these technologies
- To complement *ex post* evaluations of specific applications
- In four representative European cities
  - Tyne and Wear (UK) (1,100k): a polycentric conurbation
  - Madrid (ES) (3,200k): a very large monocentric city
  - Trondheim (NO) (200k): a small monocentric city
  - Vienna (AT) (1,600k): a large monocentric city
## The tests conducted for each city

<table>
<thead>
<tr>
<th>Exogenous trend applications</th>
<th>Medium growth</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Do nothing</td>
<td>M0</td>
<td></td>
<td>H0</td>
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<table>
<thead>
<tr>
<th>New technologies</th>
<th>With other policies</th>
<th>Without other policies</th>
<th>With other policies</th>
<th>Without other policies</th>
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<tbody>
<tr>
<td>Cybercar (inner city)</td>
<td>MW1</td>
<td>M1</td>
<td>HW1</td>
<td>H1</td>
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<tr>
<td>Cybercar (or PRT) (PT feeder)</td>
<td>MW2</td>
<td>M2</td>
<td>HW2</td>
<td>H2</td>
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<tr>
<td>PRT</td>
<td>MW3</td>
<td>M3</td>
<td>HW3</td>
<td>H3</td>
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<tr>
<td>High tech bus</td>
<td>MW4</td>
<td>M4</td>
<td>HW4</td>
<td>H4</td>
</tr>
<tr>
<td>DMV (city wide)</td>
<td>MW5</td>
<td>M5</td>
<td>HW5</td>
<td>H5</td>
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</table>
Gateshead Tyne and Wear

Local Transport Plan
Tyne and Wear

Facts and Monitoring Handbook
Inner city cybercar

- 20.7km of track
- 30 stops
- 0.6km typical distance between stops
- In 8 MARS zones
Inner city cybercar

In 2035, introduction of cybercar results locally in:

- **Car**—2% peak decrease, 8% off peak decrease
- **Bus**—7% peak decrease, 23% off peak decrease
- **Rail**—89% peak increase, 48% off peak increase
- **Slow**—4% peak decrease, 14% off peak decrease
Cybercar PT feeder

<table>
<thead>
<tr>
<th>Cybercar feeder scheme</th>
<th>Track length (km)</th>
<th>Stops</th>
<th>Typical distance between stops (km)</th>
<th>MARS zones</th>
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<tbody>
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<td>6</td>
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<td>8</td>
<td>5.5</td>
<td>10</td>
<td>0.4</td>
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</table>
Cybercar PT feeder

In 2035, introduction of cybercar results locally in:

- Car– 8% peak decrease, 30% off peak decrease
- Bus– 36% peak decrease, 50% off peak decrease
- Rail– 193% peak increase, 170% off peak increase
- Slow- 29% peak decrease, 45% off peak decrease
Inner city PRT

- 20.7km of track
- 56 stops
- 0.3km typical distance between stops
- In 8 MARS zones
In 2035, introduction of PRT results locally in:

- **Car**– 4% peak decrease, 15% off peak decrease
- **Bus**– 12% peak decrease, 43% off peak decrease
- **Rail**– 168% peak increase, 232% off peak increase
- **Slow**– 9% peak decrease, 30% off peak decrease
High-tech bus

Route length of 51km
18 stops
3km typical distance between stops
18 MARS zones
High-tech bus

In 2035, introduction of High-tech bus results locally in:

- Car: 0.8% peak decrease, 1.6% off peak decrease
- Bus: 44% peak increase, 88% off peak increase
- Rail: 2.4% peak decrease, 3.5% off peak decrease
- Slow: 4% peak decrease, 6.8% off peak decrease
## Business case results

<table>
<thead>
<tr>
<th></th>
<th>PRT</th>
<th>City Centre</th>
<th>Cyber</th>
<th>Feeder</th>
<th>HTB</th>
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<td>29.3</td>
<td>34.6</td>
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<td>base year op costs (€M)</td>
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<td>2.9</td>
<td>3.3</td>
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<tr>
<td>PV cost (€M)</td>
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<td>88</td>
<td>102</td>
<td>652</td>
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<tr>
<td>base year benefits (€M)</td>
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<td>15.8</td>
<td>16.8</td>
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<tr>
<td>PV benefit (€M)</td>
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<td>354</td>
<td>549</td>
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<td>BCR</td>
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**Tyne and Wear summary results**

- PRT in the city centre
  - Has best BCR
  - Reduces car use in the centre more than Cybercar

- Cybercar (or PRT) feeder
  - Has the greatest local effect on car use
  - But also significantly reduces walking and cycling

- High Tech Bus radial services
  - Have limited impact on car use and negative BCR

- Complementary policies
  - Reinforce these impacts
  - But PRT and Cybercar perform well with or without them
Madrid summary results

- Central area technologies have limited impact – decline in importance of central area – trips to centre in decline
- High Tech Bus and Feeder systems reduce car trips the most
- All systems attract users mainly from slow modes and competing PT system
- Area wide fare reduction and road pricing have greater impact on car use than new technologies
Vienna summary results

- Central area technologies have limited impact
  - But PRT system reduces car use more than Cybercars
- Feeder systems reduce car trips the most
  - Particularly in peak periods
- All systems attract users mainly from slow modes and competing PT system
- Area wide fare reduction and road pricing have greater impact on car use than new technologies
Conclusions

- New technologies can contribute effectively to urban transport strategies
  - Given relatively low capital and operating costs
- But need to find appropriate niche markets in different cities
  - Suburban PRT or Cybercar Feeders to PT in larger cities
  - High Tech Buses on major medium density corridors
  - PRT distribution within centres of smaller cities
  - And probably services for major activity hubs
- It is essential that these are designed to complement, reinforce other strategy elements