Mobilicity cleans up in the 2012 LowCVP Urban Mobility Technology Challenge

The Mobilicity® transport system delivers radical innovations into the urban mobility scene. Mobilicity is an automated, driverless system for GRT or Group Rapid Transit. It functions as an advanced bus or taxi substitute in a wide variety of situations. This approach offers significant environmental benefits, allowing its users to address the major problems associated with urban mobility: congestion, air quality, noise and fossil fuel use.

It is therefore very exciting, and indeed very relevant, that it has been selected as a winner of the **2012 LowCVP Urban Mobility Technology Challenge**. Indeed the LowCVP Technology Challenge could have been configured to showcase Mobilicity as the recent competition is aimed to herald a new dawn in transport solutions.

This innovative GRT concept has a very wide range of potential applications; from small scale private estates through to entire city centres. An independent analysis carried out for the company estimates the global market for systems of this type to be worth more than $8 billion by 2026.

Mobilicity is much cheaper to operate than a conventional bus system and offers unrivalled flexibility in operation. The electric vehicles operate on any graded road surface and require no specific infrastructure; this is a major competitive advantage over its only current competition.

Background

The Mobilicity project had its first developments in 2002 when the parent company, Capoco Design Limited, reached its 25th year of incorporation since it was formed in 1977. The approach at Capoco is always to look forward so the company decided not to concentrate on a reprise of its past activities, but to investigate the fairly urgent requirements for future city mobility.

With this public transport background, it seemed natural to commission a research project into the needs of city transport over the next 25 years up to 2027. This was to take into account all the major trends acting on the transport scene as a whole. This particularly included population growth and the rural-to-urban drift. It was therefore logical to study the transport needs of the mega-cities that will increase in number as we move from a 50% urban share of a 6 billion global population, to a 65% urban share of a 9 billion global population.

To study these major trends in our transport world, Capoco collaborated with the Helen Hamlyn Research Centre, headed by Jeremy Myerson, at the Royal College of Art, London. Also part of the team was the famous Vehicle Design department of the RCA, led by Professor Dale Harrow.

The resultant Mobilicity system uses automated vehicles to provide sustainable mobility within large metropolitan areas. As mentioned, it has been designed to address the three major challenges of congestion, air quality and energy use. The 5 metre long vehicle offers up to 12 seats including one wheelchair space. It can also carry 12 standing passengers, giving a capacity of 24, all within the length of a premium sector car. These modules can operate in platoons of up to six units giving a total capacity of 144 passengers. Operated in this way, the passenger capacity per direction per hour can easily rival rail-based systems at a fraction of the roll-out time and infrastructure cost.

Technology

The greater part of the Mobilicity technology is proven as the innovation comes from the bundling of these advanced technologies. The foundation is the lightweight, aluminium framed vehicle that has been configured to suit its urban transport role.. Typical UK bus operations in today's cities carry from 9 to 16 passengers on average.

All versions are electric drive, with the launch version planned to be BEV since both the speeds and range will be low. The design has also packaged HEV versions, including a H2 version using a fuel cell generator.

The whole approach to the project has used a system engineering standpoint so that Mobilicity relies on sub-system suppliers to develop and supply the main assemblies. In the example of the critical automation system, the supplier is the French company, Robosoft. They concentrate on automation and have automated transport systems operating in a number of locations, carrying millions of passengers. The automation system itself covering the navigation, guidance and collision avoidance.

The service operation is planned initially in closed communities such as exhibitions or airports and later will be deployed in exclusive lanes, like BRT or Bus Rapid Transit. Once the technology is fully mature, the system will cover the majority of the central city areas. This will allow flexibility in both timetable and routing to offer the best of both worlds – personal mobility within a public transport system.

Energy

The first benchmark is the installed EV (motor & battery) power when compared to many car based systems. At only 1.2kW/passenger, it seems ridiculously low, but these power levels, that determine both acceleration and hill climbing, are well proven in collective, urban transport systems. This is perhaps only 1% of some EV car proposals.

The other great metric from the bus sector is a vehicle tare weight that can be as low as 70kg/passenger. Again this is perhaps only 10% of EV car based designs, which starts to show the great potential of the lightweight, EV pod, controlled by the most modern automation systems. It is a horizontal elevator.

The Mobilicity target is to halve this bus energy value and hence be around 15% of typical car energy use. The concept of lightweight, EV pods with optimised, automated operation offers an unrivalled opportunity to greatly reduce the energy consumption and hence CO2 creation.

Competition

Mobilicity has no direct competitors. Its closest rival is the PRT or Personal Rapid Transit sector. As an example, the Ultra PRT system, which uses a car-sized vehicle requiring extensive infrastructure, has considerable capacity and operational limitations compared to Mobilicity.

The primary competitor in the autonomous transport market is Ultra, as seen operating at Heathrow T5. Ultra is a PRT (Personal Rapid Transit) system which therefore retains the rider-ship characteristics of the private car, namely typically 1.2 to 1.3 passengers per vehicle. It is the length of a Fiat Panda, it is the weight of a Fiat Panda and its headway is somewhat more than a typically driven urban Fiat Panda. It therefore delivers less capacity than a small car in the transport metric of pphpd – passengers per hour per direction. Ultra will deliver automated traffic jams when applied in a dense urban environment.

Mobilicity exceeds these Ultra system capacity levels by around a factor of 20 during the critical periods of the rush hour. Despite the current great interest in small urban cars, the same is true of all the recent city mini-cars designs. It is not the vehicle length that sets the lane passenger capacity, it is the inter-

vehicle headway. This is constant, be it for a 5m large saloon or a 2.5m city car, and is the dominant factor in this vital transport capacity parameter.

The 2.5m saving in vehicle length is almost negligible when compared to the 25m inter-vehicle gap for a 2 second headway at 30mph. The smallest urban car only betters the limo by 10% on thru-put. Mobilicity will deliver a 2,000% improvement. So Mobilicity system will have a dramatic effect on the urban transport scene and therefore the overall city environment.

The safety issues are clearly paramount. Whilst the initial reaction to automated or driverless vehicle operation might be marked, the fact is that around 98% of all UK accidents are driver based. This explains the explosion of driver aids – lane departure, active cruise control, automatic braking, pedestrian location – that are appearing on our cars. Notably urban pedestrian accidents are still high and this is exactly the operational sphere where the automated Mobilicity will excel.

This gives an indication of both the expertise within the company about urban transport, but also the potential for CO2 savings.

There is a strong compound benefit from these technologies, not least the facility to totally control the duty cycle of the EV drive. This has great benefits on the total energy dissipation and the critical battery cycling profiles.

Partners

Both the business model and the full financial evaluation have had great attention over the past three years. Mobilicity do not plan to become either manufacturers or operators of these systems. The revenue stream is based on system scoping studies, system specification, project introduction management and royalty payments. The current commercial phase is to attract funding for the technology demonstrators. External investors are now being sought to fund the pilot system phase. The main discussions to date are with various Asian parties to introduce both this new transport mode and an entirely new transport manufacturing sector.

Editor's Notes:

Capoco Design Limited

The company, established in 1977, concentrates in public transport design projects across all the global markets and has products running in successful service on all the continents. These products centre on both city buses and long distance coaches. The bulk of the recent work has been new designs of low-floor city buses for Europe, Asia and North America.

The Capoco bus projects have taken about 65% of all UK city bus sales over the past fifteen years, with market leaders in all the market sectors. Within the UK, the Capoco bus designs carry around 3.3 billion passenger trips per year. Even in London alone, the ridership on Capoco buses is around 1.4 billion trips. Capoco also won the design competition for the New Bus for London run by Transport for London. Whilst Mobilicity has already received the Outstanding Design Award as part of the Michelin Design Challenge. This competition was part of the North American International Auto Show held in Detroit.