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A LOOK DOWN THE ROAD

How driverless cars will change Britain

Jason Millett

COO for Major Programmes & Infrastructure

Jason is responsible for Major Programmes and Infrastructure (MP&I) and is driving our goal to be the UK's leading programme manager by 2020. He has over 20 years' industry experience and leads on some of the UK's most significant projects alongside the largest global programmes. Under his leadership, MP&I has seen 43% growth over the last three years. He was CLM's programme director for the London 2012 Olympic and Paralympic Games, responsible for the delivery of the Games venues and the commercial closure of the most successful Olympics ever.

Prior to joining Mace he was CEO of Bovis Lend Lease while also holding the role of CEO of Catalyst Lend Lease.

Jason is an advisor to the Mayor's London Infrastructure Delivery Board, a fellow of the Chartered Institute of Building and the Association of Project Management.

Ian Parker

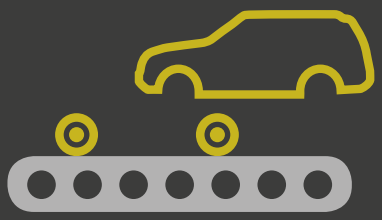
Director of Highways

Ian has 30 years' experience in the construction and infrastructure sector and has held a variety of senior corporate and project-based roles in engineering consultancy and project management organisations.

Ian joined Mace in 2003 as Marketing and Communications Director but since 2013 he has been responsible for the company's highways business, which is delivering projects ranging from the A14 Cambridge to Huntingdon improvement scheme and the Lower Thames Crossing to the Trans-Pennine Tunnel study and the Smart Motorways Programme.

Prior to joining Mace, Ian held executive roles in marketing, corporate communications and health and safety as well as senior project roles on major infrastructure schemes. Outside the UK he has led technical assistance projects in the Republic of Macedonia and the Slovak Republic where he was responsible for developing new highway management systems and technical standards.

By 2025 the car industry worldwide will be worth...



for road transport infrastructure [2]

6 weeks

average time Britons spend driving annually [3]

CONTEXT

2%
strategic roads

9%
local major roads

88%
local minor roads

1,865 miles
motorways

2,571 miles
Trunk A-roads

Recent history is speckled with companies and sectors positively disrupted by technological advances – our roads are surely next. People spend an average of 235 hours driving each year through a landscape that has largely remained unchanged since the days of Henry Ford.

The change that will come is something the UK Government is already thinking about, publishing its first report and action plan for driverless vehicles earlier this year. The report followed announcements from the likes of Google, Audi, Ford and Jaguar Land Rover – all of whom are making bold predictions about when driverless technology will move from concept to reality.

Despite the enthusiasm of an industry estimated to be worth £900bn by 2025, in the medium term it's still premature for drivers to start planning suitable pastimes to while away the hours spent speeding down the motorway with the vehicle in total control.

While consumer uptake can be capricious, our infrastructure sector is well placed to start anticipating how these technologies will shape our road network. So what are the short term priorities, and the longer term implications?

Autonomous vehicle technologies have been in use, in one form or another, since the mid-1980s. Emergency braking systems, self-parking technologies, adaptive cruise control and lane-keeping systems are now mature technologies. But, in Britain at least, we have yet to let the computers take over the business of driving altogether.

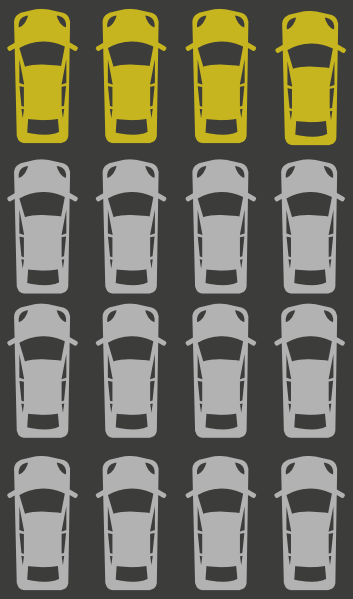
The first realistic situation for driverless technology is on our motorways, with their consistent geometric standards and absence of pedestrians and cyclists, making them a more predicatable environment for a computer to understand. Remembering that autonomy is about the relationship between the vehicle and the road shows the significant part the highway industry has to play in the driverless technology revolution.

1 – Tackling congestion

To date Highways England, the organisation responsible for England's motorways and trunk roads, has tackled congestion with 'smart' motorways. These provide drivers with better journey information, use variable speed limits and lane controls to maximise capacity. This technology is expensive, requiring continuous monitoring by control centre staff and creates physical 'clutter' through a proliferation of gantries and signs. It also requires enforcement and demands an increased driver concentration to respond to changing conditions along the route.

Autonomous technology can 'internalise' control of the vehicle in response to traffic conditions, regulating speed and managing routing to move the vehicle through congested sections of the network in the most efficient way without the need for external signage. With most new vehicles already equipped with GPS navigation systems, linking this technology with the vehicle's other control systems is within easy reach.

TODAY

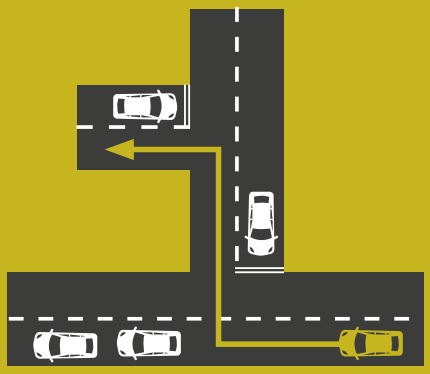


25%
of traffic congestion can be attributed to traffic accidents and vehicle breakdowns [4]

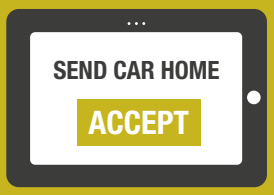
94%
of road deaths and injuries involve human error [5]

1,775
people were killed in reported road traffic accidents in Great Britain in 2014 [5]

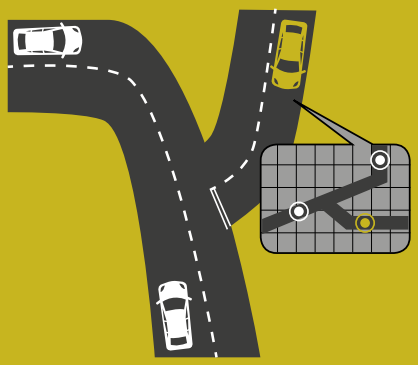
FUTURE



80%
increase in road capacity through more efficient driving patterns [6]



5.7bn
metres of space used for parking could be freed up in the USA alone [7]



90%
reduction in crashes could be achieved if driverless cars were adopted [8]

2 – Safety

It might sound counter-intuitive that relinquishing control can make your journey safer, but 94% of road accidents are caused by human error. Combining the speed control systems with those for maintaining distance between vehicles (using adaptive cruise control) and emergency braking to deal with unexpected obstructions has the potential to provide safe, driverless travel on our major roads.

Carrying out roadworks and maintenance on major roads comes with an increased risk. The situation requires more precise control of speed and lane position than normal to protect the workforce and reduce disruption. Long road tunnels – and a number are planned in the UK – can be disorienting for drivers and present certain psychological challenges which have safety implications. Both are situations that can be radically improved with technology.

Autonomous vehicle technologies have been in use since the mid-1980s... but, in Britain at least, we are yet to let computers take over.

3 – Environmental impact

In the UK there are over 600 specially designated areas (called AQMAs) which don't meet the national air quality objectives – many of which relate to road emissions. There is no doubt that driverless technologies present a significant opportunity to reduce impacts of air and noise pollution on local communities and other road users.

Areas subject to high levels of air pollution or particular noise sensitivity can be more effectively managed if speed is internally controlled. Driverless cars can achieve this gradual acceleration and deceleration, avoid excessive acceleration or breaking – traits that humans often display.

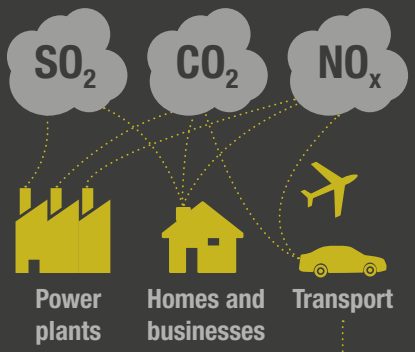
To achieve these areas of improvement the focus of development, in the short-term at least, should be on what society needs, rather than simply on what is possible. A focus on steady-state 'cruising' situations, such as motorways, rather than the more complex. We need to challenge and work with manufacturers to innovate in ways that solve the problems that better roads and more effective highway technologies cannot totally address.

Taking a leap forward in time, what possible benefits could autonomous vehicles offer us?

TODAY

600

Air Quality Management Areas (AQMA) in the UK [9]



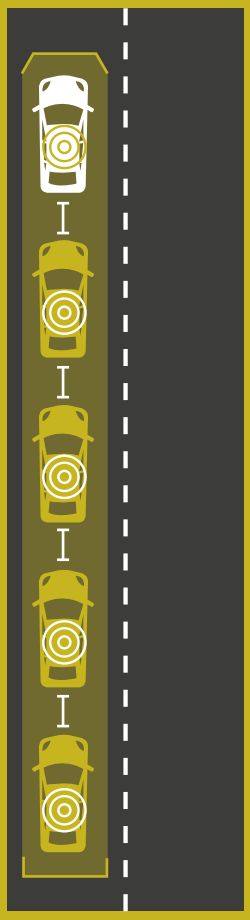
19%

of all greenhouse gases in the UK come from road transport in 2012 [10]

A VISION OF THE FUTURE

FUTURE

reduction in emissions [11]



20%

reduction in fuel use through vehicle platooning [12]

Driverless vehicles that can operate in conditions ranging from open motorways to congested city streets and narrow country lanes may remain a little ambitious for now, but when it does happen the results could be dramatic.

We will see:

- Physical signage, gantries and other roadside clutter across the road network reducing maintenance costs and visual impact.
- More effective use of motorway space through the 'platooning' of vehicles that can travel faster and closer together, with less environmental impact.
- Vehicles that will drop off and collect their drivers and passengers before heading out of town to park neatly in narrow parking bays designed to 'stack' vehicles in the most efficient way, potentially – according to work done by Professor Donald Shoup – freeing up over 5bn square metres of road real-estate in the USA alone.
- Road travel will become safer and journey times will become more predictable. Buses will run on schedule and trucks will always deliver 'just-in-time'.
- Speed limits will always be observed with each road having the flexibility to dynamically tailor its speed limits to conditions and volume of traffic.

Human error will be more-or-less eliminated on driverless sections of the road. Travel will be less stressful and the occupants of vehicles will be free to make better use of their time increasing productivity. Taking the scenic route will become a programming option and being stuck in traffic will no longer be a good excuse.

Over the next decade we are optimistic that we will find solutions that combine the best vehicle and road technologies to meet the needs of motorists while capturing the opportunities to provide a safer, more efficient, less polluting road network as a whole. But in the longer term, as with many new technologies, it is incredibly difficult to predict the precise flow their course will take.

Travelling by road will certainly become more efficient and safer: but it might just get to be a bit more boring. With Britain's love of the motor car, the time it will take for the public to adopt such a radical change in technology could well be the least predictable factor in the whole driverless technology debate.

[1] UK Department of Business, Innovation and Skills, UK to lead the way in testing driverless cars, 19 July 2015

[2] The Global Competitiveness Report 2014–2015, World Economic Forum

[3] 6 working weeks, UK Department for Transport, National Travel Survey, 2014

[4] UK Department for Transport, Strategic Road Network Statistics, January 2015

[5] UK Department for Transport, Reported road casualties in Great Britain, provisional estimates: January to March 2015

[6] Fehr & Peers (2014), Effects of Next-Generation Vehicles on Travel Demand & Highway Capacity, Fehr and Peers

[7] The High Cost of Free Parking, Prof Donald Shoup, University of California, 1997

[8] Preparing A Nation For Autonomous Vehicles, Fagnant and Kockelman, 2013

[9] UK Department of Environment, Food and Rural Affairs, Summary AQMA data

[10] 2013 UK Greenhouse Gas Emissions, Provisional Figures and 2012 UK Greenhouse Gas Emissions

[11] The Effects of Speed Measures on Air Pollution and Traffic Safety, Wim van Beek Et Al 2007

[12] The Aerodynamic Performance of Platoons: Final Report, Zabat, Stabile, Frascaroli, Browand, 1995 Berkeley Institute of Transportation Studies

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