GATEway Advisory Group Meeting

Project: GATEway

Location: Committee Room 3, Main Committee Corridor, House of Lords, London

Date: 10:00hrs – 15:00hrs Friday 4th March 2016

Attended by representatives from:	
	Organisation
	House of Lords
	TRL
	Gobotix
	Westfield Sportscars
	Oxbotica
	Royal Borough of Greenwich
	AA DriveTech
	Atos/Automotive Council
	BSi
	CCAV
	Dubai RTA
	IAM
	Metropolitan Police
	Mouchel
	Nissan
	Pinsent Masons
	RAC Foundation
	TfL
	Transport Systems Catapult
	TRW Conekt
	Digital Greenwich
	Royal College of Art
	RSA
	Telefonica
	University of Greenwich
Apologies:	
	Organisation
	Commonplace
	Innovate UK
	Shell
	Bird & Bird
	Brake

	GLA
	GM
	Highways England
	Mills & Reeve
	PACTS
Distribution:	
All attendees.	

MINUTES		**ACTION**
1.0	**Opening the Meeting**	
1.1	The Chairman for the meeting Lord Borwick of Hawkshead formally opened the meeting, welcomed attendees to the day, introduced himself and handed over to Professor Nick Reed of TRL to open the proceedings.	
2.0	**Introduction**	
2.1	Professor Nick Reed introduced the agenda for the meeting, highlighted a slight change in the timing for the break for lunch and explained that this was the first meeting under the terms of the contract.	
2.2	Around room introductions by all persons present.	
2.3	Professor Nick Reed informed all of the rules of the day – Chatham House Rules.	
2.4	Professor Nick Reed informed the Advisory Group that Jenny Stannard would be leaving the project on maternity leave and introduced Andy Frost, as Jenny's replacement on the project.	
2.5	Introduction to the project and background	
2.6	Recap of project members, loss of Phoenix wings to the project and introduction of the Westfield Sportscars (WSC) led solution for Trial 1, including Oxbotica and Heathrow Enterprises. The established Heathrow platform that was updated so it could be released from its guideway by Oxbotica with WSC as the build partner and system integrator. They had been appointed following a robust procurement process. The announcement of them joining the project had been the #1 story on the BBC for some time. Branding of the shuttle introduced.	
2.7	Overview of the route for Trial 1- varied from original presented. The trial would operate for 3 weeks of intensive trialling which would be followed by a longer period of demonstration. The shuttles would operate with a steward on board during operation.	
2.8	Trial 2 – Automated Valet Parking. Poor response to the ITP that had been issued at the end of October 2015. As a result of this TRL were working with other parties to look at an extended trial 3 as an alternative.	
2.9	Trial 3 - Automated van deliveries. Support urban supply chain through use of zero emission, low noise, and automated vehicles with demonstration of use case.	
2.10	DigiCar – trial to test behaviour with automation.	
2.11	Teleoperation of autonomous vehicle that had gone into safe mode or was stranded but could be moved under its old power.	

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2.12	Review of work programme. Project now due to complete by March 2017, at the end of which GATEway continues as an active automated vehicle test environment	
2.13	Introduction to the UK Smart Mobility Living Lab. Two projects that TRL were involved in were also taking place in the GATEway environment: MOVE_UK (~£5m R&D) with Bosch, TRL, JLR, Direct Line, The Floow and RBG; and ATLAS (£175k Feasibility) with Ordnance Survey, TRL, Sony, Oxford Technical Solutions, GOBOTiX and RBG. The aim is to create an open innovation environment for smart mobility testing, development and validation in collaboration between TRL and RBG that would enable the safe testing of autonomous vehicles and technologies in a complex real world environment.	
2.14	Conclusion of first part of Professor Nick Reed's presentation and invitation for questions: Q – Is there any feedback as to why there was no interest in Trial 2? A – OMEs approached were either 12-18 months away from being in a position to demonstrate the technology, did not want to demonstrate the technology to the project timelines or were not prepared to let their vehicles be used by the general public in a trial. Q– Are the trials legal in the UK? A - Yes, under the DfT Code of Practice the trials can either take place on a road or in a public place. The trials will be taking place in a public place.	
3.0	**Introduction to Westfield Sportscars (WSC)**	
3.1	Introduction to the 4-6 person, wheelchair compliant Heathrow shuttle WSC will be building for the trials. A safe platform with over 5 years' experience of operating 7 days per week 365 days per year. Fitted with an advanced battery management system (BMS) based on WSC's experience in EV racing. State of the art sensors and control developed by Oxbotica with over 130 man years' experience in autonomous vehicles, supported by their AV fleet management software and ring and ride app.	
3.2	Feedback from customers at Heathrow was good – experience similar to being in a cable car.	
3.3	Very energy efficient design – 0.55MJ per passenger per Km providing a 50% benefit over busses and trains and a 70% saving in emissions over cars, Also very quiet producing less than 35dB at 14 mph at 10m – quieter than the background noise in a library.	
3.4	Each shuttle is 3.7m long by 1.4m wide, weights 850kg and has a top speed of 25mph. They can carry a 450kg payload; have a 5m turning radius. 20% climb angle, 6.25% decline angle. Drive motors are currently Italian but likely to be UK. Battery system is currently Lead acid but will be Lithium Ion Phosphate system in the trials. The current inductive charging would be replaced by overnight charging via a 13A fused outlet and optional rapid charging system currently being developed by WSC. The braking system is regenerative with an electromagnetic 'hold off' brake and safety interlocks between doors, motors and brakes.	
3.5	Introduction to WSC – a 34 Year old British Company manufacturing Lightweight vehicles with experience in Formula E Battery Management System Technology, Petrol, EV, Hybrid and Hydrogen Fuel Cell Vehicle integration experience.	

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	WSC have European Small Series Type Approval Compliance for quality systems and exploitation and links with global Vehicle Certification Agencies for bespoke products. Extensive experience built on Aerospace, Rail and Automotive experience in Safety Cases. WSC have developed an agile British Supply Chain Solution – delivering, where possible a 100% British Product – the aim of the project. The WSC Project Manager is ex Boeing, Airbus UK, Bombardier, Trains, Mott MacDonald – (Astute Safety Case, CVF ARM, Highways Area 2,4,12, FiReLink Comms). The WSC Project Director is President of IFAW, Ex RR Main Board, Ex Lucas Main Board, Ex British Midland Main Board, Ex Chairman of Mettis, SRTechnics – Brings vast safety case experience.	
3.6	Introduction to Heathrow Enterprises: A 20 Strong Delivery Team have worked on the POD since conception 1995. In 2001 the test track was developed to test several PODs. In 2011 the system entered full operational Status at Heathrow Airport. They have an existing Safety Case and existing Vehicle and passenger data. Heathrow fully support the Business Case for the Project and have offered to provide facilities, infrastructure, resource and management expertise to make the project a complete success. Full support from main board. The shuttles have completed 3 million km of travel and moved over 1.5 million passengers.	
3.7	Brief introduction to Oxbotica – providing sensor technology and fleet management system.	
3.8	WSC explain that wind tunnel test – a world first – had been conducted. The vehicle had been tested at up to 80mph, a topple over test had been performed and air flow analysis had been conducted to look at battery cooling. Door operation had also been investigated. As a result of this modifications to the air flow around the battery and the door motor system. The BOM which consists of 3500 parts was being updated to deal with obsolete parts and supplier audit had been conducted. Talking with the VCA on parts to be used to achieve small series type approval. Final Specification of vehicle options 11th March 2016. Vehicle 1 ready for testing end of May/ Beginning of June – Existing mule vehicle modified. Trials Starting with RCA July with New vehicles.	
3.9	End of presentation – Q&A session: Q - How does the vehicle deal with rain? A - Looking to extend the wind tunnel tests to cover full environmental conditions Q - What crash testing has been done? A - Planning EuroNCAP style front/rear/side collision tests. Heathrow have	

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	already tested for impacts Q - What cybersecurity safeguards are in place? A - Imperial College and Westfield are reviewing these. Q - Considering any sounds for the vehicle? A - A range of options are under consideration, such as clicker system on wheels. Q - Will there be seatbelts? A – These will be added. Q - Greenwich area likely to have different demographics to Heathrow users. Any changes to accommodate that? A - Glazing/tinting options under review; ride height is changing, different battery management system. Q - Any thought to potential use in GCC countries with 50degC and sandy conditions? A - Also part of planned climate testing. Sand issue not considered to date. Q - How many shuttles are to be used? A - Seven but also possibility to use vehicles being built for Insight project. Q - Will the vehicle be capable of rerouting? A - Yes. Q - What happens in the event of breakdown? A - Will be capable of being towed or can be operated in a 'limp home' mode (depending on failure mode).	
4.0	**Introduction to Oxbotica**	
4.1	Formed 18 months ago to commercialise the work of the Oxford University Robotics group. Produced the UKs first licenced driverless car – a Nissan Leaf. Involved with the single unit in the LUTZ project. Involved in the Autodrive project which will see forty AVs in use in Milton Keynes. Providing software and sensors for the GATEway project. To-date 3D point cloud maps created for the two potential trials areas – Greenwich Peninsula and University of Greenwich Campus at the Maritime Museum. Will be utilising their Selenium autonomous control system and their Caesium Command and Control system. Working with Ocado to produce a proposal for Trial 3.	
4.2	End of presentation – Q&A session: Q - Can it deal with seagulls, bags etc.?	

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	A - Not specifically – will be programmed to be cautious. Q - Will you be trialling in different environments? A - Not straightforward to reprogram vehicle for a range of environments.	
5.0	**Insurance and Autonomy**	
5.1	A reminder of why Insurance and Risk Management matters 1.2 million road deaths globally X10 more seriously injured victims £15 billion industry (UK) but 93% of all motor accidents are impacted by human error …so huge potential for reduction in collision risk …and subsequent pain, death and suffering …and consequent savings in insurance premiums / hidden costs plus Potential to reduce operating and ownership costs by 80% Better use of scarce resources and reduction in congestion (On average cars are not used 95% of the time)	
5.2	Our key objectives are: To understand the critical risks; • Safety implications; • Liability potential; and • Insurance and cyber related implications of automated vehicle operations. • Working closely with TRL and other consortium members. Alongside this we: • Need to understand and deal with cybercrime risk; • Support the 'sharing' economy and emerging 'hub' nature of cities; • Need to understand growth in new technologies - Fuel and Autonomy; and • Implications on the wider Insurance Market (autonomy is a huge disruptor across the industry).	
5.3	'Motor' Policies are designed by and large to be 'All Risks' policies so cover 'everything' with specific exclusions, so allow for degree of flexibility. However sitting behind policies are detailed policy wordings that form the basis of the contract. Most, if not all, will have emerged from, or written at a time pre-dating current technological advances. Much has been developed through case law… Policies need to be overhauled and updated to reflect the new operating environment and technologies: Definitions, Exclusions and Conditions (e.g. keyless / driverless vehicles);	

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	3rd Party Motor Insurance is compulsory, and follows the RTA 1984, 1988. RTA bases a lot of its legislation on the driver (being 'responsible', 'in charge' plus licencing considerations, medical requirements, claims experience and convictions) together with construction and use. In the future this will need to be fundamentally re-written, including dealing with responsibility and ownership of vehicles.	
5.4	'Ownership' of the insurance: Some suppliers have already indicated they would assume responsibility for the insurance of their own manufactured autonomous vehicles. Extent of cover: Duration (i.e. time / warranty / purchaser limited). Breadth of Cover: Nature of risk is changing – from mechanical to 'computers on wheels'; Cyber security and protection will increase in importance. Underwriting and Pricing Implications: Reduction in frequency and severity reducing claims costs, and premiums; Insurers like to price based on 'big data' and looking backwards. Mind-set needs to change; Driver is key rating factor – this will shift fundamentally… Potential of disruption to existing Claims Models; Potential for a 1st party damage model – requirement for policy holders to recover directly from their own Insurer regardless of fault; Ban / limit subrogation of claims costs; and Level of minimum compulsory insurance cover / statutory accident benefit.	
5.5	End of presentation – Q&A session: no questions	
6.0	Stakeholder Engagement Update	
6.1	**Work Package Partners:** Commonplace: Public sentiment mapping and design feedback. Royal College of Art: Public and stakeholder attitudes explored through co-creation workshops. TRL: Public attitudes explored through qualitative interviews (pre- & post-trial). University of Greenwich: Pedestrian behaviour monitoring, evaluating and modelling.	
6.2	**Commonplace:** Commonplace site: Set-up Commonplace site for launch – potentially w/c 8th March	

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	Agreed screening questions for online recruitment for trials/workshops and interviews. Agree and commence promotional plan? Twitter harvesting methodology? Investigating best method – organic approach or purchase of data-stream or organic approach.	
6.3	**TRL:** Led by Stephen Skippon (formerly Shell). Pre- & Post- Trial Interviews. Draft prepared for discussion guides. Draft prepared for mini-questionnaires for interviews.	
6.4	**University of Greenwich:** Project Management: Staff in place University of Greenwich website running since 1st week in Feb Shuttle trial site Initiated discussions with Greenwich Park stakeholders and TRL? Status? Research development: Background research Work on identifying key research questions	
6.5	**Royal College of Art:** Desk Research into people's perspectives of autonomous vehicles. History of autonomous vehicle development (non-technical). Representations in sci-fi; state of the field; future concept vehicles. Literature Review (part complete). Human-computer interaction. Create taxonomy of issues. Media Review: Journalist & Public Comments, positive & negative, analysed into 20 categories Expert Interviews (part complete): Senior Researcher from RICA Automotive & Intelligent Mobility representative from TFL Engagement Plan: Synthesis of background research (in progress). Recruitment – who and how: Developed recruitment screening questions with TRL and Commonplace. To be used for any expressions of interest logged on Commonplace site. Aim: shortlist of people interested in workshops/interviews (TRL lead on	

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	recruitment). Research questions & actions (in progress). Engagement Plan deadline – Friday 11th March 2016.	
6.6	End of presentation – Q&A session: Q - Does design work cover the look and feel of the user app? A - Yes – will be looking at that.	
7.0	**Close of morning session – feedback and discussion:**	
	Q – Australian trials have applied fuzzy logic – any issues/plans? A – Scanning – visual inspection of the surface each journey. Q – Other projects, are you collaborating with them? A – Yes we are willing to collaborate and cooperate with the other projects. We are aware of the DfT project to coordinate outcomes and WSC are providing shuttles for Ventura project. Q – Regarding the Making Britain Great campaign, what are the projects aspirations? A – Trying to make sure the shuttle is 100% British supply chain, but this has its problems. Will be by the end of the project. All companies on the project are British.	
8.0	**Lunch**	
9.0	**Synthetic environment and teleoperation**	
9.1	Tender process run to secure provider for 3D database of Greenwich peninsula environment – contract awarded to Agility3. Draft study plan in development for simulator trials Research questions: 1. Where drivers have the right of way, do drivers approach a junction differently based on whether they encounter an AV (automated vehicle) or HDV (human driven vehicle)? 2. Where drivers are required to give way, do drivers enter a junction differently based on whether they encounter an AV or HDV? 3. Is there a difference in drivers' overtaking and following behaviour based on whether the lead vehicle is an AV or HDV? 4. Is there a difference in drivers' merging behaviour based on whether they encounter an AV or an HDV? 5. To what extent are these differences influenced by traffic density? 6. To what extent are these differences influenced by the proportion of AVs in the driven environment?	
9.2	End of presentation – Q&A session: Q – How do the test candidates know they are encountering an autonomous vehicles? A – CAD models of the vehicles used in the trials are being supplied to Agility3. Clear glass will be shown so it can be seen that there is no driver.	

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	Q – What is the test environment? A – Peninsular and the UoG Campus location, which has a rich mix of environment and user.	
9.3	Teleoperation	
9.4	The premise is that the vehicles are autonomous therefore the driver should not have to take control of the vehicle or intervene in any way at any time or in any circumstances… Hence teleoperation – the ability to move the vehicle (as long as it still has battery and motor function) remotely, using very low resolution cameras that would be found on a smart phone and minimum data transfer. Q - What will be the hackability of the tele-operated vehicle? A - Can use standard 256-bit encryption libraries – in discussions with encryption company about even more secure systems. Challenge is to take care over what systems are exposed to hacking.	
9.5	End of presentation – Q&A session: Q - What about the code of practice for teleoperation? A - All tests are to be conducted on secure private property so code of practice not so relevant (but all care will still be taken to ensure safety). Q - Other adaptations to the shuttle? A - Will have windscreen wipers for visibility and trialling a horn for pedestrian warning.	
10.0	**Real World Trials**	
10.1	Focus on the locations for Trial 1: The Greenwich Peninsular – Thames Pathway, behind the O2 from the Intercontinental Hotel to the Ecology Park. East Parkway linking to the Emirate cable car. O2 – linking North Greenwich Tube Station. The University of Greenwich Maritime Museum campus site. Work is ongoing to produce the Safety Standard for all three trials. This will supplement the high level guidance. The environments provide mixed modes of transport that the service is looking to link and provides good pedestrian and cyclist interactions.	
10.2	End of presentation – Q&A session: It was stated that the Trials must take care to avoid brand confusion over official TfL services and GATEway research project. Q - CityMobil 2 project required passengers to register – will this feel like a service if this is a requirement? A - In the longer period of demonstration/trialling (6 months), it is likely participants will need to be registered users with limited engagement. We are looking at mixed mode trials. Some participants will be invited in the 3 week intensive trial which we may open up further.	

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	Q – Will you be exploring whether people are prepared to pay for an AV service like the ones you will be demonstrating in the trials? A – More so in the extended 6 month demonstration – the Intercontinental Hotel is keen to explore this facet. Q - What happens when events or building work interfere with the trial? A - Consortium is in regular contact with AEG and other landowners on this to minimise disruption. Q - Will you be looking at whether people have changed mode as a result of the presence of these vehicles? A – Hopefully yes – we will explore this more robustly in the extended demonstration. Q - Are you doing anything for blind users? A - Links to Insight project specifically on this issue. A - Royal College of Art will be recruiting participants with a range of disabilities. It was noted that Google's video of a blind user of an automated vehicle went viral.	
11.0	**GATEway Exploitation**	

11.1	Exploitation team meetings:
	
	Have agreed terms of reference - purpose, approach, outcomes:
	
	Purpose:
	
	• Deliver positive commercial, social and academic outcomes for partners
	• Identify & protect IPR (individual partner, joint)
	• Articulate capabilities & offerings
	• Provide structured approach
	• To record activities and outcomes
	
	Approach:
	
	• Agree and prioritise responsibilities and actions to:
	• Scope & develop potential products/services
	• Identify, support & track actions to achieve exploitation
	• Identify events/exhibitions/publications
	• Seek and receive input from advisory panel
	• Engage externally to with the market, academia, public sector, national & international
	
	Outcomes:
	
	• To provide regular updates to the GATEway Board
	• Track KPIs of project IP & activity
	• Improve outcomes for exploitable IP
	• Quantified exploitation of opps & findings
	• Dissemination of partner:
	  • products and services to the market
	  • Academic knowledge
	  • Enhanced service provision
	
	Partner exploitation plans:	

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	Update on the partner's expected exploitable knowledge Activities to date Project documentation Opportunities for collaboration – two modes: Technology agnostic: 'Greenwich autonomous transport environment' telecoms, smart city, sentiment analysis, insurance, teleoperation, supervisory control And Technology specific: supporting the project technology pod deployments, nationally and internationally integration with other AV technology (teleoperation) Developing the offerings…	
11.2	Exploitation Opportunities – Exploitation Plan ▪ Test and evaluation methodologies & benchmarking criteria for autonomous vehicles in complex live urban environments "the UK Standard" ▪ Autonomous vehicle control software development through the specific experiences of operating in the test environment (live conditions) ▪ Supervisory systems for autonomous vehicles ▪ Remote operation of autonomous vehicle systems which require human intervention and the identification of development needs to meet test protocol criteria ▪ A validated synthetic test environment (G-SAVE) to examine interactions between drivers and autonomous vehicles in a driving simulator environment. ▪ An in-depth understanding of human responses to autonomous vehicle movements in shared environments ▪ An analysis of cyber security risks, mitigations and strategy for robust the protection of autonomous vehicle control systems	
11.3	Next steps: ▪ Expand detail and scope of opportunities ▪ Individual business opportunities (expand on above) - What, how, why? - Partner responsibility to deliver and report progress (tracking forms) ▪ Consortium partnership opportunities - Whole consortium or sub-groups - Develop and communicate the vison - Identify and articulate additional opportunities - AV strategy and implementation	

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	- Turnkey AV PRT solutions - Building on a proven PRT technology platform - Greenwich 'Living Lab' test environment & smart city link - …other	
11.4	End of presentation – Q&A session: Q - Is this a UK solution only? A - Looking to commercialise more widely. A - Talking to EU, US, China using Westfield's international dealer network. An offer was made to connect the GATEway project to the Automotive Council. It was suggested that the Advisory Group can be used more – please share materials sooner where possible.	
12.0	**Working Groups**	
	At the previous meeting there had been general agreement that three meetings over the life of two year project was insufficient There was also suggestion of working groups - Legal/insurance? Road safety? Technology? Location? Planning? Please let me know your thoughts. So proposed meetings going forward - May 2016, October 2016 and February 2017. Again please let me know your thoughts.	Next meeting likely to be May 2016 at Greenwich with demonstration of shuttle.
13.0	**AOB**	
14.0	**Closing address by Lord Borwick**	