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CLIENT PROJECT REPORT CPR1821

Provision of information and services to perform an initial assessment of additional functional safety and vehicle construction requirements for L7e-A heavy on-road quads

Report of phase 1 of project with initial proposal for potential regulatory change subject to Cost Benefit Analysis (CBA)

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Prepared for:	European Commission, DG ENTR/B/4, Directorate General Enterprise and Industry, European Commission
Project Ref:	Framework contract No. 121/PP/2011/FC - Specific Contract S12.655048

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Executive Summary

In the new Framework Regulation for L-category vehicles (Regulation (EU) No 168/2013), 'L7e-A' was introduced as a new sub-category. Different to other L7e sub-categories, a key parameter of L7e-A vehicles is that they are not restricted to ≤90 km/h. They do however have a power limit of 15 kW.

In the future it is likely that there may be a shift to a greater number of L7e-A vehicles being used on European roads, driven by the cost of fuel, a need to decrease CO_2 emissions and an associated drive to make vehicles lighter, which in turn may encourage the greater use of L7e-A vehicles as substitutes to current small M_1 vehicles. This may be encouraged further by the current European legislation which does not require as many safety standards for L7e-A sub-category vehicles as for M_1 category vehicles, e.g. frontal and side impact tests are not required for L7e-A. In addition, a new 'Ultra Small Mobility' vehicle approval framework has been introduced in Japan in January 2013. This overlaps with the EU's L-category legislation and may potentially encourage vehicle manufacturers to enter the EU market with vehicles developed for the Japanese approval category.

In light of this, Article 74 'Amendment of the Annexes' of Regulation (EU) No 168/2013 states that:

> *"Without prejudice to the other provisions of this Regulation relating to the amendment of its Annexes, the Commission shall also be empowered to adopt delegated acts concerning the amendments to:*
>
> *(i) Annex II (B) and (C) as regards the introduction of additional functional safety and vehicle construction requirements for subcategory L7e-A heavy on-road quads;"*

Related to future policy studies and new EU regulation, to address this article, the aim of this on-going project is to gather evidence to assess whether or not additional type approval requirements are needed for the L7e-A heavy on-road quads and, if so, what requirements are needed. The project is divided into two parts. This report details the results of the first phase of the project.

An initial proposal for possible additional type approval requirements for L7e-A heavy on-road quads has been made, subject to a cost-benefit analysis (impact assessment). The proposal is based mainly on a comparison of the regulatory requirements for L7e-A and M_1 category vehicles and stakeholder consultation and also, to some extent, on a small amount of information gathered from a literature review. The scope of the proposal is only for L7e-A sub-category vehicles which are car-like, i.e. those which have an enclosed driving and passenger compartment accessible by a maximum of three sides.

It should be noted that further work is required to perform a cost-benefit analysis (impact assessment) and to detail changes where there are problems to apply directly M_1 vehicle category regulations to L7e-A vehicles, for example those for protection in frontal impacts (Regulation (EC) 661/2009, UN Regulation 94) and pedestrian protection (Regulation (EC) 78/2009).

1 Introduction

In the new Framework Regulation for L-category vehicles (168/2013), 'L7e-A' was introduced as a new subcategory. Different to other L7 subcategories, a key parameter of 'L7e-A' vehicles is that they are not restricted to ≤90 km/h. They do however have a power limit of 15 kW.

In the future it is likely that there may be a shift to a greater number of L7e-A vehicles being used on European roads, driven by the cost of fuel, a need to decrease CO2 emissions and an associated drive to make vehicles lighter, which in turn may encourage the greater use of L7e-A vehicles as substitutes to current small M_1 vehicles. This may be encouraged further by the current European legislation which does not require as many safety standards for L7e-A subcategory vehicles as M_1 category vehicles, e.g. frontal and side impact tests are not required for L7e-A. In addition, a new 'Ultra Small Mobility' vehicle approval framework has been introduced in Japan in January 2013 (see section 2.6). This overlaps with the EU's L category legislation and may potentially encourage vehicle manufacturers to enter the EU market with vehicles developed for the Japanese approval category.

In light of this, Article 74 'Amendment of the Annexes' of Regulation (EU) 168/2013 states that:

'Without prejudice to the other provisions of this Regulation relating to the amendment of its Annexes, the Commission shall also be empowered to adopt delegated acts concerning the amendments to:

(i) Annex II (B) and (C) as regards the introduction of additional functional safety and vehicle construction requirements for subcategory L7e-A heavy on-road quads';

(ii) Annexes II and V in order to introduce regulatory act references and corrigenda;

(iii) Annex V (B) in order to change the applicable reference fuels;

(iv) Annex VI (C) and (D) in order to take account of the results of the project referred to in Article 23(4) and adoption of UNECE regulations.

Related to future policy studies and new EU Regulation, to address this article, the aim of this project is to gather evidence to assess whether or not additional type approval requirements are needed for the L7e-A heavy on-road quads and if so what requirements are needed.

The project is on-going and divided into the following two phases and tasks:

- Phase 1: Oct 2013 to March 2014
  - Task 1: Literature review
  - Task 2: Stakeholder consultation to help determine expected future use of L7e-A vehicles and their likely safety levels and features
    - Selected stakeholders
    - All stakeholders

    - Task 3: Compare current regulatory requirements and safety levels of M_1 and L7e-A vehicles and prioritise future actions
    - Task 4: Report
- Phase 2 (timing and details to be determined following the completion of phase 1)
    - Accident analysis to complete prioritisation of safety requirements for L7e-A vehicles
    - Work to help determine increase in safety levels of current L7e-A needed to meet M_1 standards
    - Cost benefit analysis
    - Report

This document presents the results from first phase of the project. An initial proposal for additional type approval requirements for the L7e-A subcategory vehicles with enclosed compartments is made based mainly on a comparison of regulatory requirements for M_1 and L7e-A vehicles and stakeholder consultation, and also, to some extent, on a small amount of information gathered from a literature review.

It should be noted that all items in this initial proposal are subject to the outcome of an impact (cost benefit) assessment, which is intended to be performed in the second phase of the project.

Article 74 defines the scope of the project as L7e-A heavy on-road quads. This includes both A1 and A2 sub-sub-category vehicles. However, the focus of this first phase of the project has been on 'car-like' L7e-A vehicles, i.e. those with an enclosed driver and passenger compartment accessible by a maximum of three sides, and the A2 sub-sub-category. The reasons for this are explained in Section 4.3.

2 Literature review

A literature review was performed to gather information available required for the project.

The results of this review are reported below in the following sections:

- L7e-A and other L7e subcategory definitions: Section 2.1
- Expected characteristics of L7e-A vehicles: Section 2.2
- L7e category vehicle accidentology: Section 2.3
- Expected use of L7e-A vehicles: Section 2.4
- Safety performance levels of some L7e vehicles: Section 2.5
- Japanese regulatory situation: Section 2.6

Following this there is a discussion section.

It should be noted that the amount of literature found for L7e vehicles was small and virtually no information could be found for L7e-A sub-category vehicles specifically. This was because this is a new vehicle category and virtually no vehicles of this type exist today, apart from prototypes. However, information found on L7e vehicles is still reported below to give some background and indication of the characteristics, expected use and safety performance levels of L7e-A vehicles.

As an overall introduction it is interesting to note the approaches to the issue of urban mobility as a whole. In general, to some extent there appear to be two approaches.

The first is to have low mass speed restricted vehicles which operate only in lower speed environments and hence have the advantage that they do not need to meet the high safety levels mandated for higher speed vehicles which operate in all speed environments including high speed ones. In principle, this approach is currently being implemented in Japan through the introduction of the new 'Ultra Small Mobility' vehicle approval framework in January 2013. This approach is also discussed by Cahill et al. (2012), who considered regulatory requirements for low-mass urban micro-cars for emerging market megacities. Cahill proposed the implementation of a new vehicle classification for 'Urban Microcars' based on the EU L7e heavy quadricycle norm but amended for driving conditions in many emerging economies, especially where such steps advance key sustainability objectives. From the safety viewpoint, Cahill suggested that these vehicles should be restricted for use on roadways with posted speed-limits up to 65 km/h along with restricted access to some portions of expressways within city limits during peak commuting hours. For these vehicles Cahill proposed increased occupant and pedestrian safety regulatory measures based on the current EU L7e heavy quadricycle norm.

The second approach is to have vehicles which can operate in all speed environments. These vehicles should be capable of sufficient speed to be used on national routes, e.g. expressways, but have good environmental performance, i.e. high fuel efficiency and/or low emissions. However, because of their high speed use, in principle, they have the disadvantage that they would also need to meet the high safety levels mandated for higher speed vehicles, because they are likely to be involved in accidents at these higher speeds.

2.1 L7e-A and other L7e subcategory definitions

Please note that both the L7e and L6e category definitions are described because part of the L7e category definition is that the vehicle is not in the L6e category.

Table 1 below shows the current regulatory definitions in Directive 2002/24/EC for L6e and L7e category vehicles.

Table 1: Current European definitions for categories L6e and L7e, Directive 2002/24/EC, Chapter I, Article 1, Section 3.

Category	Classification criteria
L6e Light quadricycle	4 wheels Unladen mass ≤ 350 kg (not including batteries of electric vehicles) V_{max} ≤ 45 km/h Engine Vd ≤ 50 cm^3 (PI internal combustion engine) P_{max} ≤ 4 kW (non-PI internal combustion engine, electric motor) (electric vehicles: maximum continuous rated power; combustion engine vehicles: maximum net power)
L7e Quadricycle	4 wheels Not **L6e** Unladen mass ≤ 400 kg (not including batteries of electric vehicles), 550 kg (vehicles intended for carrying goods, not including batteries of electric vehicles) P_{max} ≤ 15 kW (maximum net engine power)

On 4th October 2010, the European Commission adopted a proposal for a Regulation of the Council and European Parliament on approval and market surveillance of two or three-wheel vehicles and quadricycles, frequently referred to as 'the L category codecision act'. As a result of this and the CARS 21[1] agreement, the regulation for L category vehicles is currently being reviewed and updated. The forthcoming definitions in Regulation (EU) No 168/2013 for L6e and L7e category vehicles are summarised in Table 2 below.

[1] European Commission, Enterprise and Industry Directorate-General (2006). CARS 21 Final Report, A Competitive Automotive Regulatory System for the 21st century from http://ec.europa.eu/enterprise/sectors/automotive/competitiveness-cars21/cars21/

Table 2: Forthcoming European definitions for categories L6e and L7e, Regulation (EU) No 168/2013, Annex I

Category	Sub-category	Classification criteria	Special categories
L6e Light quadricycle	**L6e-A** Light on-road quad	4 wheels Not **L6e-B** V_{max} ≤ 45 km/h Mass in running order ≤ 425 kg Engine Vd ≤ 50 cm^3 (PI engine), 500 cm^3 (CI engine) Seating positions ≤ 2 P_{max} ≤ 4 kW (electric vehicles: maximum continuous rated power; combustion engine vehicles: maximum net power) Dimensions (L, W, H) ≤ 4000 mm, 2000 mm, 2500 mm	
	L6e-B Light quadri-mobile	4 wheels V_{max} ≤ 45 km/h Mass in running order ≤ 425 kg Engine Vd ≤ 50 cm^3 (PI engine), 500 cm^3 (CI engine) Seating positions ≤ 2 Enclosed driving and passenger compartment accessible by maximum three sides P_{max} ≤ 6 kW (electric vehicles: maximum continuous rated power; combustion engine vehicles: maximum net power) Dimensions (L, W, H) ≤ 3000 mm, 1500 mm, 2500 mm	**L6e-BU** Utility purposes **L6e-BP** Passenger transport
L7e Heavy quadricycle	**L7e-A** Heavy on-road quad	4 wheels Not **L6e**, not **L7e-B**, not **L7e-C** Not **L7e-A1** (**L7e-A2**) Mass in running order ≤ 450 kg Seating positions ≤ 2 straddle seats (**L7e-A1**), 2 non-straddle seats (**L7e-A2**) P_{max} ≤ 15 kW (electric vehicles: maximum continuous rated power; combustion engine vehicles: maximum net power) Designed for transport of passengers only Handlebar to steer (**L7e-A1**) Dimensions (L, W, H) ≤ 4000 mm, 2000 mm, 2500 mm	**L7e-A1** Heavy on-road quad **L7e-A2** Heavy on-road quad

Category	Sub-category	Classification criteria	Special categories
	L7e-B Heavy all terrain quad	4 wheels Not **L6e**, not **L7e-C** Not **L7e-B1** (**L7e-B2**) Mass in running order ≤ 450 kg (transport of passengers), 600 kg (transport of goods) Ground clearance ≥ 180 mm V_{max} ≤ 90 km/h (**L7e-B1**) P_{max} ≤ 15 kW (**L7e-B2**) (electric vehicles: maximum continuous rated power; combustion engine vehicles: maximum net power) Wheelbase to ground clearance ratio ≤ 6 (**L7e-B1**), ≤ 8 (**L7e-B2**) Seating positions ≤ 2 straddle seats (**L7e-B1**), 3 non-straddle seats of which 2 positioned side-by-side (**L7e-B2**) Handlebar to steer (**L7e-B1**) Dimensions (L, W, H) ≤ 4000 mm, 2000 mm, 2500 mm	**L7e-B1** All terrain quad **L7e-B2** Side-by-side buggy
	L7e-C Heavy quadri-mobiles	4 wheels Not **L6e,** not **L7e-B** Not **L7e-CU** (**L7e-CP**) Mass in running order ≤ 450 kg (transport of passengers), 600 kg (transport of goods) V_{max} ≤ 90 km/h P_{max} ≤ 15 kW (electric vehicles: maximum continuous rated power; combustion engine vehicles: maximum net power) Enclosed driving and passenger compartment accessible via maximum three sides Seating positions ≤ 2 non-straddle seats (**L7e-CU**), 4 non-straddle seats (**L7e-CP**) Exclusively designed for the carriage of goods with an open or enclosed, virtually even and horizontal loading bed that meets additional criteria (see original document) (**L7e-CU**) Dimensions (L, W, H) ≤ 3700 mm, 1500 mm, 2500 mm	**L7e-CU** Utility purposes **L7e-CP** Passenger transport

Note: When sub-sub-category is shown in brackets preceding criterion applies to that sub-sub-category only. To be classified in sub-sub-category, vehicle must fulfil all criteria for that sub-sub-category and general sub-category criteria.

It should be noted that for this project only L7e-A heavy on-road quadricycle vehicles, as defined in Table 2 above, are considered.

2.2 Expected characteristics of L7e-A vehicles

In this section the main characteristics of some current, past and prototype 'car-like' L7e vehicles are summarised (Table 3) to give some idea of what the characteristics of an L7e-A vehicle of the future may be and how it compares to current 'car-like' L7e vehicles.

Please note that the information presented was found mainly on the internet and hence its accuracy cannot be guaranteed.

Table 3: Characteristics of current, past and prototype 'car-like' L7e vehicles.

Vehicle	Max power (kW)	Max Speed (km/h)	Weight (kg)	Likely category	Comments
Renault Twizy	13	80	375	L7e-C	Current electric vehicle
Renault Twizy F1	13 (72 burst)	110	564	N/A	One-off prototype vehicle not intended for production. Power from KERS available for 14 sec only.
Axiam 500 Kubota diesel	12.9	45	350	L7e-C	Current vehicle
Mia electric car	18	100	764 including battery	M1 Too heavy and powerful for L cat	Current vehicle
Gordon Murray T.27	25	105	680 including battery	M1	Electric car. Power and probably mass too large for L7e category.
FMR Tg500 (Messerschmitt)	15	126	350	L7e-A	Historic car built in the 1960s Engine: 2 cylinder two stroke 494 cm3 Note: websites do not agree on max power, some state ~ 17kW
Norster 600R	15	Around 95	Around 532	L7e-A	Current vehicle. Mass data indicates too heavy for L7e-A cat according to new and old definition, but seems to be approved as

Vehicle	Max power (kW)	Max Speed (km/h)	Weight (kg)	Likely category	Comments
					"intended for carrying goods". Also note, power is 25 kW with unrestricted engine so perhaps max speed quoted is for 25kW power.
GEM e2	15.4	40	509 including battery	?	US electric vehicle, perhaps could be in L7e-C category if max continuous power restricted
Kewet Buddy Electric	13	80	400	L7e-C	
Mega city 4 seat	13	64	400	L7e-C	
Opel RAK-e	10.5 (36.5 burst)	120	380	L7e-A2	Prototype electric concept vehicle, (will perhaps become production vehicle in future).
Audi urban concept	15	~95-100	480	L7e-A2	Prototype electric concept vehicle, (will perhaps become production vehicle in future).
VW NILS	15 (25 burst)	130	460	L7e-A2	Prototype electric concept vehicle, (will perhaps become production vehicle in future). Vehicle has ESP (Electronic Stabilisation Programme)
IMA Colibri	24 (peak)	120	440	L7e-A2	Prototype electric concept vehicle, according to manufacturer will pass Euro NCAP crash test
Nissan new mobility concept EV	8	80	450 with batteries	L7e-C	New Micro Mobility electric vehicle (EV) in Japan.
Honda micro commuter prototype	6	70	570 with batteries	L7e-C	New Micro Mobility electric vehicle in Japan
Suzuki Wagon R	47	?	910	M1	Japanese Kei car

It is interesting to note that no current production vehicles were found that would fit in the new L7-A category. The only vehicles found that would fit into this category were prototype electric concept vehicles and an historic vehicle (FMR Tg500 (Messerschmitt)). All of the current production L7e vehicles found, besides some for which there was not confidence in the performance parameters, would fit into the L7e-C vehicle category because they have a maximum speed less than 90 km/h. However, a number of prototype electric concept vehicles were found that would fit into the L7e-A sub-category, specifically the L7e-A2 sub-sub-category. This indicates that a number of manufacturers believe that there may be a market for this type of vehicle in the future.

Another interesting point is when the information in the Table above is considered in conjunction with the basic physics of vehicle motion.

The maximum vehicle speed is determined by the power available to overcome the retarding forces, namely air resistance and rolling resistance. Air resistance is the main factor and is a function of the speed cubed:

$$P_d = \mathbf{F}_d \cdot \mathbf{v} = \tfrac{1}{2}\rho v^3 A C_d$$

Rolling resistance is a function of vehicle mass:

P_{rr} = c m . v where c is a constant

Therefore total power required

$$P_T = c.\ m\ .\ v + \tfrac{1}{2}\rho v^3 A C_d$$

When this relationship is considered in conjunction with the fact that the max power of an L7e category vehicle is ≤ 15 kW and the performances of current production vehicles, it is clear vehicles in sub-category L7e-A will need to have a very low aerodynamic drag to be able to have a maximum speed ≥ 90 km/h. In turn, this means that it should be possible to make these vehicles very CO_2 efficient, in terms of fuel (electric) consumption, which is a strong driver for the design of future vehicles. However, it should be noted that there are many other factors in addition to the basic physics that need to be taken into account, such as vehicle stability, when designing a CO_2 efficient vehicle that has a maximum speed ≥ 90 km/h.

2.3 L7e category vehicle accidentology

Very little literature could be found on L category quadricycle accidentology on the whole, with even less for the L7e category and none for the L7e-A sub-category. This is because there are no/few current production vehicles available in the L7e-A sub-category, as shown in the previous section, and hence there are no vehicles of this type on the road. A good summary of the information available for L category quadricycles is given in a report by TRL which details the results of a desktop study to assess the ease with which bodied quadricycles and tricycles could meet the same regulatory requirements as normal (M_1) cars (Hardy, Carroll, & Pitcher, 2009). This study highlights the following pieces of information.

The first is an Austrian accident study (Gwehenberger, Reinkemeyer, & Kühn, 2008) relating to L6e category vehicles. According to Austrian statistics, the number of fatalities per vehicle was nearly three times greater for a quadricycle than for a

passenger car. Also, the number of fatalities per injury accident was almost nine times greater for light weight vehicles than for passenger cars.

In contrast, data from the French national statistics (ONISR) showed that the fatality rate per million vehicles was slightly better for light quadricycles (86) than for cars (102). There are many possible factors which could explain this discrepancy, such as age and experience of the drivers, different quadricycle vehicle fleet, occupancy rate, distance travelled (i.e. exposure), etc.

The TRL study also examined GB accident data but the number of identifiable quadricycle accidents (24) and casualties identified (23) was too small to be able to perform any meaningful analysis.

In summary, no meaningful accident data was found for the L7e-A category and the data found for L category quadricycles did not provide consistent conclusions.

2.4 Expected use of L7e-A vehicles

No literature could be found that reported specifically on the expected use of L7e-A category vehicles in the future. However, some literature was found regarding the current and expected use of 'car-like' L7e category vehicles. Bloomberg (Jie & Horie, 2012) indicates strongly that they are likely to be used mainly as urban micro-cars. Other papers, such as Cahill et al. (2012), which consider regulatory requirements for low-mass urban micro-cars for emerging market megacities, also indicate that 'car-like' L7e category type vehicles are likely to be used mainly in urban environments. However, it should be noted that a European Commission consultation document (EC, 2009)for a framework regulation, on type-approval of two and three wheel motor vehicles and quadricycles, reported that the quadricycle market is currently localized mainly in France, Italy and Spain with many light quadricycles (L6e) used in a car-like fashion in rural areas and heavier quadricycles (L7e) used mainly as utility vehicles in the small streets of urban areas (European Commission document).

In summary, from the literature it was concluded that the expected use of 'car-like' L7e vehicles will be mainly as urban micro-cars with a small number being used in a 'car-like' manner in rural areas. However, it should also be noted that as a result of stakeholder consultation, reported in Section 2.6 below, it is expected that L7e-A heavy on-road quads are likely to be used as commuting vehicles designed for travel on all types of roads, including national routes. This is also supported by the fact that a number of manufacturers have shown prototype electric powered vehicles that would fulfil this role; e.g. Opel RAK-e, Audi urban concept, VW NILS and IMA Colibri; see Section 2.2 above.

2.5 Safety performance levels of some L7e vehicles

Hardy et al. (2009) reviewed all safety related Directives applicable to passenger cars, quadricycles and tricycles, identified the where the greatest difference in safety performance requirements between quadricycles and M_1 category vehicles existed and where it was considered technically difficult for quadricycles to meet the higher standard. The main findings of the work were:

- Many of the quadricycle manufacturers are providing significantly higher levels of safety than the minimum that legislation requires of them, particularly with regard to crash safety. Available results show that some vehicles have been close to passing a M1 frontal or side impact test.

- The M_1 type approval requirements that would be most difficult to meet for quadricycles were anticipated to be those associated with the frontal and lateral impact tests. These were also thought to be the requirements where there would be the greatest risk if no changes were made.
- The additional costs of full compliance with M_1 vehicle requirements was estimated to be in the range of up to £1000 with a likely weight increase of 20 kg. The majority of this increase would be associated with the frontal impact requirements. However, it was noted in the report that there could be considerable uncertainty in this estimate. This note should, in the current authors' opinions, be emphasized.

Other interesting points raised in this report were:

- The M_1 frontal impact test approximately represents a collision with a vehicle of similar mass. Therefore, even if the M_1 frontal impact crash test requirements were enforced for L7e category vehicles their safety performance level would still not be as high as for M_1 vehicles because of their lower mass.
- The main areas identified where quadricycle safety performance requirements and levels differ from M1 requirements are:
    - Frontal impact
    - Side impact
    - Pedestrian impact which is particularly important as it is envisaged that L7e-A category vehicles are likely be used as urban micro-cars and commuting vehicles (see Section 2.4.)

Other literature found generally supports the findings of Hardy, in particular that the main issues are: frontal, side and pedestrian impact. Also, the other literature found emphasizes the wide variation in safety performance levels of current L7e category vehicles with some close to meeting M_1 requirements and some far away as illustrated by the examples below.

Kühn (2009) reported the results of frontal and side impact regulatory type tests on lightweight vehicles (Microcar MC1 dynamic with driver airbag and Ligier X-Too).

For the frontal impact test, the dummy injury criteria values were encouraging with only the neck moment not meeting the regulatory requirements. However, the steering wheel motion was much larger than the regulatory requirements.

For the side impact test, the dummy injury criteria were, again, encouraging with all regulatory requirements met with the exception of the lower rib deflection. However, there was a significant amount of intrusion into the vehicle and excessive head motion.

A frontal impact test to the Euro NCAP protocol (40% overlap Offset Deformable Barrier with test speed of 64 km/h; regulatory test speed 56 km/h) of the Reva G-Wiz electric car was performed for the BBC Top Gear programme. The video of the test[2] shows a very poor performance of the car with much passenger compartment intrusion which would

[2] http://www.youtube.com/watch?v=M6NhuIS1RAE

have caused substantial occupant injury in a real-world crash. However, it should be noted that the speed of this test is considerably higher than that demanded for regulation, although nearly all cars achieve good performance in this test nowadays. Also, following the publication of the results of this test Reva improved the crashworthiness performance of this vehicle.

Renault has performed a crash test with their Twizy electric car to demonstrate its crashworthiness performance level. However, the test was not a standard regulatory test but was a full frontal test at 50 km/h into a deformable element. In the video of the crash test the vehicle's structure appears to perform well, but no dummy injury criteria values were reported.

In summary, the main areas identified where quadricycle safety performance requirements and levels differ from M1 requirements are:

- Frontal impact
- Side impact
- Pedestrian impact

Available crash test information in the literature shows that no current quadricycle could meet all M_1 vehicle category level regulatory requirements. Also, current performance levels are somewhat variable with some quadricycles having much higher performance levels than others.

It should be noted that the L7e class covers a wide range of vehicles. Because of this, one should bear in mind that the performance of other L7 vehicle subcategories is not necessarily indicative of the performance of future (current prototype) L7e-A vehicles.

2.6 Japanese regulatory situation

To provide further background information the Japanese situation regarding the new ultra small mobility category and Kei cars was reviewed. However, it should be noted that these vehicles would not fall into the L7e-A category; ultra small mobility vehicles because their top speed is less than 90 km/h and kei cars because their power is too high, i.e. > 15 kW (see Table 3). However, the history of the kei car is interesting in that safety requirements for it were introduced in a gradual manner to align with M_1 requirements currently. The authors believe that this is a good example of standards being set at a technically feasible level taking into account the characteristics of the vehicle and its operating environment.

2.6.1 Ultra small mobility vehicle category

The Ultra small mobility (超小型モビリティ) vehicle category is an experimental vehicle category which is a subset of the Kei car category of vehicle, and in certain situations requirements from the motorcycle category are also applied. The category has a range of requirements such as reduced power and size to permit greater fuel economy. This section details our interpretation based on the documents made available via the MLIT website (MLIT, 2013) as well a limited analysis of the Japanese Safety of Road Transport Vehicles Act (MLIT, 2014).

The ruling to permit Ultra small mobility vehicles came into force in January 2013 (MLIT, 2012). Since then many of the main Japanese car manufacturers have started to sell these vehicles. In addition, schemes to encourage their use have started, such as a car-

sharing system in the Minato Mirai district of Yokohama which started in October 11, 2013 (Future of ultra-small mobilities, 2014).

The ruling for these vehicles includes three parts; a main set of design requirements, a list of general requirements and a list of requirements which can be relaxed. The ruling also has additional items in these parts for vehicles ≤1,300 mm in width and those with a maximum vehicle speed ≤30 km/h.

A relaxation of requirements means that for approval for sale and use on the roads, the specifics of a design requirement do not need to be met precisely as laid out in the legislation. This is to allow manufacturers the freedom to develop technologies, to investigate their feasibility in these vehicles and to understand which requirements may need adaption. A relaxation does not necessarily mean that a safety device is not required although this is allowed in some cases.

At the culmination of an experimental period, the rules will be modified as found necessary based on the results of the experiment and the relaxations removed.

The relaxations do not go so far as to remove the crash testing requirements, which are a requirement for all M_1 cars including Kei cars. Instead it has been highlighted in the ruling that if the manufacturer only produces a small number of vehicles of a given model then the exemptions afforded to small series apply (MLIT, 2014). As this is an experiment it is likely that the intention is for manufacturers to only produce a small number of vehicles. Article 1.3 of the Safety of Road Transport Vehicles Act details the exemptions afforded to small series. These include many crash tests and are detailed later in this section below.

The main requirements for the overall design of Ultra small mobility vehicles are as follows (MLIT, 2012):

1. The length, width, and height must be smaller than Kei cars.
2. Vehicles must seat for 2 adults (including the driver) or the driver plus two children.
3. Rated motor output must be 8 kw or less (125cm^3 or less for internal combustion engine)
4. The vehicle will not be permitted to travel on motorways.
   Note: In Japan, these are generally toll roads with a minimum and maximum road speed of 50 km/h and 100 km/h respectively
5. The vehicle must be able to drive smoothly with traffic
6. The vehicle should not be fitted with a speed limiter

In addition to the overall design requirements the second area of the ruling details the following requirements for safety systems which must be fitted to all Ultra small mobility vehicles (超小型モビリティの導入促進 [Introduction to Ultra small mobility vehicles], 2013):

- They must have a system to warn the driver of nearby pedestrians
- They must have markings at front and rear indicating this is a special exception vehicle
- They must have rear-view mirror(s)
- They must have seatbelts
- They must have Kei car number plates

As well as the main requirements above, the ruling states that for the Ultra small mobility vehicles ≤ 1,300 mm in width additional criteria can be applied due to their similarity with two wheelers. It goes further to say that the manufacturer could register

the vehicle as a two wheeler. In this case there would be three additional requirements from the motorcycle legislation (MLIT, 2013):

- They must have headlights which automatically rotate to keep level with the road when banking
- They must be fitted with ABS
- They must be fitted with a lock which engages the steering or drive

The third part of the ruling are those requirements which can be relaxed, i.e. that can be adapted as required to understand what modifications may be needed to future legislation. Table 4 shows the standard safety criteria for Kei cars which are permitted to be relaxed for all Ultra small mobility vehicles:

Table 4: Relaxed safety standards for ALL Ultra small mobility vehicles (MLIT, 2014) (MLIT, 1951)

Requirement	Safety of Road Transport Vehicles Act
flame-retardant of interior materials	Article 20 paragraph 4
Seat attachment strength, shock - absorbing seat back attachment strength	Article 22 paragraph 3 and 4
Seat belt mounting strength, reminder	Article 22.3 paragraph 2 and 4
Seat space, seat size	Article 22 Paragraph 1 and 2
A part of the standard of ISO-FIX	Article 22.5
Door	Article 25 paragraph 3 and 4
Strength of front glass	Article 29 paragraph 2

For those vehicles which are ≤ 1300 mm in width and chosen to be registered as a powered two-wheeler by the manufacturer, Table 5 lists the additional articles which are permitted to be relaxed.

Table 5: Additional relaxed safety standards for Ultra small mobility vehicles ≤ 1300 mm in width registered as a powered two-wheeler (MLIT, 2014) (MLIT, 1951)

Requirement	Safety of Road Transport Vehicles Act
Lighting equipment	Article 32-41.5
Prime mover (double accelerator return spring)	Article 8 paragraph 3
Tachograph [this could possibly be an EDR or journey recorder]	Specific notice Article 89 paragraph 3
Security (steering lock, immobiliser, etc.)	Article 11.2, Specific notice 92 paragraph 3
Immobiliser	Specific notice Article 93 paragraph 2 and 3

And for the Ultra small mobility vehicles which are not capable of speeds over 30km/h Table 6 lists four more safety requirements which are permitted to be relaxed (MLIT, 2013).In regards to this slower version of the Ultra small mobility vehicles it is under consideration whether requirements for seat belts are needed at all, however this had not been decided at the time of writing.

Table 6: Additional relaxed safety standards for Ultra small mobility vehicles with a maximum vehicle speed of ≤30 km/h (MLIT, 2014) (MLIT, 1951)

Requirement	Safety of Road Transport Vehicles Act
Shock absorption of the instrument panel	Article 20 paragraph 5
Seat belt equipment and strength	Article 22.3 paragraph 1 and 3
Seat headrest equipment	Article 22.4
Shock absorption of the sun visor	Article 45, paragraph 3

Crash safety requirements

As mentioned above, the ruling does not expressly remove the requirements for crash safety systems, instead it has been highlighted in the ruling that if the manufacturer only produces a reduced number of vehicles of a given model then the exemptions afforded to vehicle models produced in a small series apply (MLIT, 2014). Table 7 lists the articles which are not required for small series.

Table 7: Exemptions afforded to small series by Article 1.3

Requirement	Safety of Road Transport Vehicles Act
Shock-absorbing steering system	Article 11, paragraph 2
Fuel leakage prevention system	Article 15, paragraph 2
High-voltage safety	Article 17.2, paragraph 4
Protection of driver, passengers and pedestrians (full-overlap, offset, frontal crash test)	Article 18, paragraph 2-5

As for side impact protection, although small series would remove the requirement for testing (see Table 8), it is mentioned in the ruling that manufacturers should experiment. It states in the ruling on the introduction to Ultra small mobility vehicle (2013) that if manufacturers find meeting side protection difficult, safety systems such as side impact protection beams or bars should be considered in the design.

Table 8: Possible exempt test for Ultra small mobility vehicles pending testing

Requirement	Safety of Road Transport Vehicles Act
Passenger protection in a collision (side impact)	Specific notice Article 100, paragraph 13

2.6.2 Kei cars

Following the Second World War manufactures in Germany were developing very small, efficient and affordable vehicles for the people. Japan decided to follow suit and so created a special vehicle category to encourage manufacturers to build them (Ozeki, 2014).

The economic benefits for users of Kei cars (軽自動車, Light car) included reduced or zero tax requirements, including: vehicle excise tax (3% rather than 5% for a larger car), Automobile weight tax (13,200 vs. 18,900 yen), insurance (18,980 vs. 22,470 yen), and annual road tax (7,200 vs. 29,500 yen) (Light car and its history, 2011).

The first Kei car requirements were published in July 1949 by the Ministry of Transport (currently: Ministry of Land, Infrastructure, Transport and Tourism) (Modestcars, 2014). Over the years these limits have changed to accommodate the demands of comfort, to match other traffic and for improved safety requirements (see Table 9).

Table 9: Kei car progression (Light Motor Vehicle Inspection Organization, 2014) (Light car and its history, 2011)

Year	Length x width (Max height = 2m)	Engine displacement	Engine power	Safety requirements and reasons for changes
1949	2.8m x 1m	4 stroke ≤ **150 cm³** 2 stroke ≤ **100 cm³**	Approx. 1.2 kW	
1950	2.8m x **1.3m**	4 stroke ≤ **300 cm³** 2 stroke ≤ **200 cm³**		Manufacture's input on feasibility
1951	**3m** x 1.3m	4 stroke ≤ **360 cm³** 2 stroke ≤ **240 cm³**		
1954	3m x 1.3m	**All** ≤ 360 cm³	Approx. 27 kW 36 hp) [Subaru 360)	
1976	**3.2m** x **1.4m**	All ≤ **550 cm³**	Approx. 40 kW (55 PS, 54 hp) [Subaru Rex VX]	Needed to meet emission legislation
1990	**3.3m** x 1.4m	All ≤ **660 cm³**	**47 kW** (64 PS; 63 hp)	Power for air conditioning
1994				**Full-width frontal impact 40 km/h**
1998	**3.4m** x **1.48m**	All ≤ 660 cm³		**Full-width frontal impact 50 km/h** Space for crumple zones **Side impact Mobile Deformable Barrier (MDB) 50 km/h**
2005				**Pedestrian (Head)**
2007				**Offset frontal impact (56 km/h)**
2013				**Pedestrian (leg)**

Although Kei cars have significant monetary advantages over conventional cars, they are not regarded as a different vehicle category in terms of safety. This position is supported by analysis by Hosokawa et al. (2013) who shows how Kei cars are represented equally in accident statistics in comparison to M and N category vehicles.

In April 1969 cars were required to have a driver-side seatbelt, in October Kei cars followed suit (Campingcar Park, 2013). Other seatbelt types and fitment requirements were applied to both car and Kei car equally over time.

Periodic Technical Inspection (PTI) for cars was started in 1951, Kei cars followed suit sometime later in 1973 as the benefit was not seen to be large enough (Light car and its history, 2011) until increases in the emission requirements.

A full-width frontal impact test was required for all new cars from 1994. Kei cars also had to meet these requirements. However, they performed it at 40km/h, rather than 50km/h for M1 vehicles (Tanaka, 2010). In 1998 the velocity for kei cars was increased to 50 km/h, and the kei car dimensions were extended to enable them to satisfy this severe impact condition. In 1998 Japan acceded to the UN ECE 1958 agreement (JASIC, 2014). From 1999 Kei cars were required to meet the same safety requirements as M_1 vehicles (Tanaka, 2010).These are a side impact mobile deformable barrier (MDB) test (UN Regulation 95), a pedestrian headform from 2005 (UN Regulation 127), the frontal impact ODB test at 56 km/h (UN Regulation 94) from 2007, and the pedestrian legform from 2013 (UN Regulation 127).

It should be noted that the Japan New Car Assessment Program (JNCAP) also drives safety in Japan, with manufacturers wishing to obtain good ratings in the JNCAP assessment. Kei cars have been assessed in JNCAP since 1999. In 2000, JNCAP started more comprehensive evaluation test program. The tests consisted of a full-width barrier tests at 55 km/h, an offset deformable barrier (ODB) test at 64 km/h, and a MDB side impact test at 55 km/h. At present, the same crash tests and assessments are applied to kei cars as to the other passenger cars.

A paper by Mizuno et al. 2013 reports that in Japan, the number of kei (mini) cars is increasing due to market demands resulting from environmental and economic concerns, and constituted 32% of the registrations of passenger cars in 2012. Mizuno also reported that, in all accidents, Japanese national accident data (2009) shows that the probability of fatal injury to occupants in kei (mini) cars (0.23%) was comparable to that of other size passenger cars (0.22%). However, based on data from ITARDA 2012 he reported that in car-to-car collisions, the injury risks to occupants are higher for kei (mini) cars compared to larger size cars. Figure 1 shows the probability of fatal and serious injuries to drivers for vehicle-to-vehicle collisions.

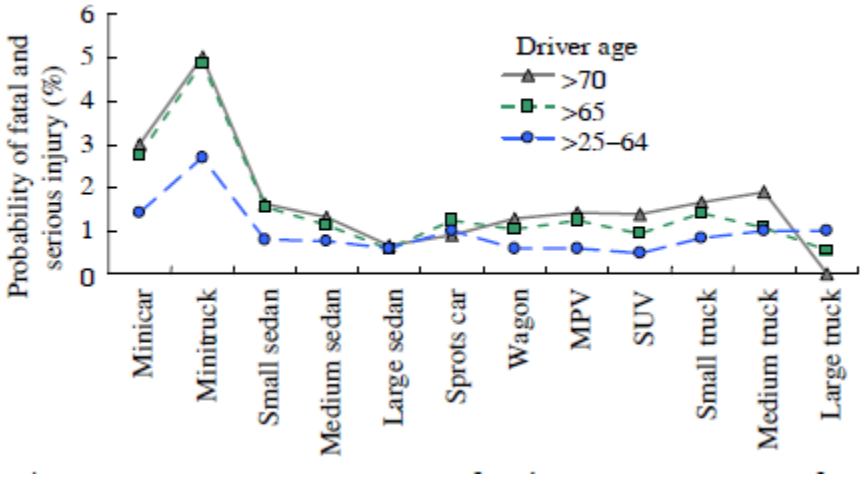

Figure 1. The probability of injuries to drivers for vehicle types in vehicle-to-vehicle collisions. Note A 'mini' car is the same as a 'kei' car.

They are higher for kei (mini) cars, particularly for elderly people. Mizuno reports that the reasons for this are that the safety of the kei (mini) car for various crashes is a technological challenge due to its small size and mass. This is because a small size does not allow much crush space, and a small mass leads to greater velocity changes in car-to-car collisions because of conservation of momentum. More specifically, from his investigation of frontal impact crash tests he reported that the restraint systems of kei cars are highly optimised using a pretensioner, force limiter and steering column collapse to deal with the high decelerations experienced in the full-width frontal test. He noted that to reduce dummy injury measures in this test, the seatbelt limiter force of kei cars (5 kN) is designed to be higher than that of larger cars (4 - 5 kN). This force level might be too severe for elderly people.

From accident analysis, chest injuries constitute the largest number of injuries among the body regions to drivers (ITARDA 2012). The main injury sources to the chest were the steering wheel and seatbelt. Many accidents occur at lower velocities than these crash tests. Moreover, kei cars are used in cities and impact velocities tend to be low. Therefore, in order to reduce the number of serious injuries, it may be necessary to consider the occupant protection of kei cars at lower impact velocities than the impact speed specified for the crash tests conducted in the regulation and JNCAP.

Also, for offset tests, Mizuno reported that intrusion of the passenger compartment tends to be large because of the limited size and hence crush space of kei cars.

3 Stakeholder consultation

Stakeholder consultation was performed in two stages. For the first stage, a limited number of stakeholders were selected and approached to gather appropriate information to enable TRL to develop a draft initial proposal (contained in Annex 1) for potential additional regulatory changes for L7e-A heavy on-road quads. For the second stage, this draft initial proposal and questions to gather further appropriate information were disseminated to all stakeholders for comment and a stakeholder meeting held in Brussels on 7th February to help gather all feedback.

A summary of the results of each stage of the stakeholder consultation is described in the sections below.

3.1 Selected stakeholders

Feedback was received from Ford, Renault and General Motors (GM). It should be noted that of these vehicle manufacturers only one currently has intentions to manufacture an L7e-A category vehicle in the near future.

Selected stakeholders were requested to answer the following questions:

- What is the expected market share or fleet size of L7e-A 'car-like' vehicles?
- How will they be used? For example, urban short journeys only?
- Who will drive them? What is the user demographic?
- What will be the base-line safety features and technologies that are likely to be fitted as standard – and therefore have no or very little cost to mandate for?

The stakeholders were also asked to comment on an initial proposal for possible regulatory change made by TRL on the basis of information available, namely a comparison of regulatory requirements for L7e-A and M_1 category vehicles and information in the literature, mainly the report of Hardy et al. 2009.

It is interesting to note that all respondents suggested that safety levels for 'car-like' L7e-A category vehicles should be at a level at or close to that of M_1. Indeed, one respondent suggested that if an L7e-A vehicle looks like a typical small car and is fast enough (i.e. > 90 km/h) to be driven on national routes, then it should have a similar level of safety to an M_1 vehicle. This respondent also suggested that customer expectations should be a factor in defining required safety levels, which effectively supported the suggestion above in that if the customer perceives an L7e-A to be a car, then its safety levels should reflect that.

The responses to the questions asked were:

- What is the expected market share or fleet size of L7e-A vehicles?

No information was supplied by selected stakeholders in response to this question.

- How will they be used? For example, urban short journeys only?

One manufacturer said they expected that their vehicle would be used as a commuting vehicle. One reason for this is that the vehicle will have sufficient speed to be used on all roads including national routes.

- Who will drive them? What is the user demographic?

No specific information was supplied by selected stakeholders in response to this question. However, from the answer above it could be inferred that the user demographic could be wide and not restricted to the younger or older persons because of the demographic diversity of commuters.

- What will be the base-line safety features and technologies that are likely to be fitted as standard – and therefore have no or very little cost to mandate for?

In response to the initial ideas for regulatory change made by TRL, one stakeholder noted that some of the additional requirements proposed were fulfilled already by some L7e-C vehicles. In contrast, other comments were made on the high cost of systems such as Electronic Stability Control (ESC). These comments provided information to help develop the draft initial proposal detailed in Annex 1.

3.2 All stakeholders

Most of the feedback from 'all stakeholders' was received in the stakeholder meeting in Brussels held on 7th February. The minutes of this meeting are contained in Annex 2 to provide additional information for the interested reader. There were 18 attendees from organisations such as ACEM, ACEA, JAMA, GM, Equal, Renault, Suzuki, Swedish Transport agency, VDE, BASt, etc..

In general, the feedback received supported the information provided by the selected stakeholders. In particular, the feedback received supported the expected use of L7e-A on-road quads. This was that these vehicles are likely to be used in a 'car-like' manner in the future, in particular for commuting type journeys including those which use national trunk roads. Also, the feedback received supported the approach taken for the project to derive the initial proposal for potential regulatory changes – see Section 4, namely that on basis that these vehicles will be perceived as and used like small cars, it is reasonable to expect they should have safety levels equivalent to small cars, i.e. small M1 category vehicles.

As a result of this stakeholder interaction, the draft initial proposal was revised to give the initial proposal described in the next section of this report.

4 Initial proposal for possible additional type approval requirements for L7e-A heavy on-road quadricycle vehicles, subject to a cost benefit analysis (impact assessment)

4.1 Approach

From the information gathered in the literature survey and the stakeholder consultation it appears that L7e-A 'car-like' heavy on-road quads are likely to be used in a 'car-like' manner in the future, in particular for commuting type journeys. A reason for this conclusion was that the maximum speed of these vehicles (≥ 90 km/h with an example of 120 km/h) is sufficiently high to allow these vehicles to be used on national trunk roads comfortably with also the likely offer of very good fuel efficiency because of low aerodynamic drag / rolling resistance – this has to be low to allow a vehicle with less than 15 kW power to have a maximum speed ≥ 90 km/h.

Therefore these vehicles are likely to be used in a car-like manner and therefore perceived as cars by the consumer, at least to some extent.

On this basis, i.e. they will be used like and perceived as small cars, it is reasonable to expect that they should have safety levels that are equivalent to that of small cars, i.e. small M_1 category vehicles.

It should be noted that this overall approach was supported by the EC and stakeholders.

4.2 Method

A comparison of regulatory requirements for M1 category vehicles and L7e category vehicles was made to identify the additional requirements for M1 category vehicles. This comparison was made between the requirements listed in the framework Directive 2007/46/EC Annex IV for type approval of M1 vehicles in unlimited series, namely items 1, 2A, 3A, 3B, 4A, 5A, 6A, 6B, 7A, 8A, 9A, 9B, 10A, 12A, 13B, 14A, 15A, 16A, 17A, 17B, 18A, 19A, 20A, 21A, 22A, 22B, 22C, 23A, 24A, 25A, 25B, 25C, 25D, 25E, 25F, 26A, 27A, 28A, 29A, 30A, 31A, 32A, 33A, 34A, 35A, 36A, 37A, 38A, 40, 42A, 43A, 44A, 45A, 46A, 46B, 46D, 46E, 50A, 53A, 54A, 56A, 57A, 58, 59, 61, 62, 63, 67, 68, 69, 70 and the requirements for L7e-A vehicles in Regulation (EU) 168/2013 for type approval of vehicles post circa 2016. However, it should be noted that type approval on a voluntary basis will be possible from mid 2014.

For each of the items for which there were additional requirements for M1 category vehicles, i.e. cars, a risk assessment was made for a 'do nothing' scenario. Following this, an assessment of the ease of meeting the additional requirements for 'car-like' L7e-A2 vehicles was made based on information obtained from the literature review, mainly (Hardy et al. 2009) and the selected stakeholders. In addition, guidance from the literature and expert judgement was used to assess the potential benefit of meeting the additional requirements for each item.

Finally, on the basis that these vehicles should have safety levels that are equivalent to that of small cars, a draft initial proposal was made for possible regulatory changes for car-like L7e-A2 category vehicles was made with the main reasons for the proposal noted. This draft initial proposal is shown in Annex 1.

The updated draft initial proposal was circulated to all stakeholders and a stakeholder meeting held in Brussels on 7th February to help gather all feedback. Following this, appropriate updates were made to the draft initial proposal to derive the initial proposal, which is described in Section 4.4 below. It should be noted that at this stage, application of the possible changes to L7e-A1 vehicles with an enclosed compartment as well as L7e-A2 vehicles with an enclosed compartment was considered.

4.3 Scope

Article 74 'Amendment of the Annexes' of Regulation EU 168/2013 states that without prejudice to the other provisions of this Regulation relating to the amendment of its Annexes, the Commission shall also be empowered to adopt delegated acts concerning the amendments to Annex II (B) and (C) as regards the introduction of additional functional safety and vehicle construction requirements for subcategory, '**L7e-A heavy on-road quads**'. The definition of the L7e-A 'heavy on-road quad' vehicle category is described in Section 2.1, Table 1.

Based on the approach described in the section above it was agreed with the EC project officer and stakeholders that the scope of vehicles for proposed additional functional safety and vehicle construction requirements should be 'car-like' L7e-A 'heavy on-road quad' vehicles. 'Car-like' can be more precisely defined as a vehicle with an enclosed driving and passenger compartment accessible by a maximum of three sides. The reasons that it was decided not to include 'non car-like' L7e-A heavy on-road quad vehicle within the scope were:

- 'Car-like' safety performance of these vehicles would not be expected by the consumer because riders and passengers of these vehicles would be exposed to the elements and expect to wear protective clothing as for riding a motorcycle or scooter.
- The market share of 'non car-like' L7e-A heavy on-road quad vehicles is likely to be small because without an enclosed compartment they will not fulfil the envisaged requirements of a vehicle for commuting, i.e. enclosed compartment for protection against weather, etc.
- Practically, in general, it would be difficult or not possible to design many of the additional protection measures envisaged, without an enclosed driver and passenger compartment.

Regarding the L7e-A vehicle subcategories the scope was more precisely defined as:

- L7e-A (i.e. L7e-A2 and L7e-A1) with an enclosed driving and passenger compartment accessible by a maximum of three sides

Currently, it is uncertain what form L7e-A1 vehicles with an enclosed compartment may take, if indeed any are ever built. Furthermore, it was recognised that some additional requirements under consideration, such as Regulation 12 and 94, which effectively assume a steering wheel is fitted, would probably require extensive modification for application to an A1 vehicle with handlebars. Because of this it was decided that the main focus of the work of this phase of the project should be the A2 sub-category, with some effort allocated for the A1 sub-category. If it becomes apparent, i.e. evidence is found, that vehicles in the A1 sub-category with an enclosed compartment, are likely to be designed and built, then more effort will be focused on this vehicle sub-category in the second phase of the project.

4.4 Priorities

The possible regulatory changes identified were prioritised in two ways. Firstly, the changes with high potential benefit (as assessed using guidance from the literature and expert judgement) were highlighted:

- Braking UN Reg 13-H
- Frontal impact UN Reg 94
- Side impact UN Reg 95
- Pedestrian impact Reg (EC) 78/2009
- Protective steering UN Reg 12 (although assumed met if UN Reg 94 met, except for headform impact on steering control).
- Safety belt anchorages UN Reg 14
- Seatbelt reminder UN Reg 16

Note: These items are highlighted in green in Table 4 below.

Secondly, the changes which some L7e category vehicles would already meet were highlighted. The idea of this was to highlight the possible changes which may be more acceptable to stakeholders, on the basis that some manufacturers have taken steps to meet them already.

Note: These items are highlighted in yellow in Table 4 below.

4.5 Initial proposal

Subject to an impact assessment, an initial proposal for potential regulatory changes for 'car-like' L7e-A heavy on-road quads is described in Table 4 below. It should be noted that the changes were proposed on the basis that these vehicles should have safety levels equivalent to those of small cars and that they are also subject to a cost benefit analysis, i.e. impact assessment.

The scope for the potential regulatory changes is defined more precisely as:

- L7e-A (i.e. L7e-A2 and L7e-A1) with an enclosed driving and passenger compartment accessible by maximum three sides

Currently, it is uncertain what form L7e-A1 vehicles with enclosed compartments may take, if indeed any are ever built. Therefore, for this first stage of the project, potential regulatory changes proposed for L7e-A vehicles which may not be applied easily to L7e-A1 sub-category vehicles are highlighted and the problems and reasons why noted. It is the intention that work should be performed to resolve these problems in the second phase of the project, if evidence is found that L7e-A1 sub-category vehicles with enclosed compartments are likely to be designed and built.

Table 10. Initial proposal for possible regulatory changes for L7e-A heavy on-road quads vehicles subject to an impact assessment

Notes:

1. Items which could not be applied easily to L7e-A1 sub-category vehicles are highlighted in orange.
2. Items which have been identified to have high potential benefit are highlighted in green – see Section 4.5 'Priorities'.
3. Items which some L7e category vehicles would meet already are highlighted in yellow – see Section 4.5 'Priorities'.
4. Items which were included in the draft initial proposal and have been removed from the final initial proposal below are highlighted in red and reasons given for this change.

Framework Directive 2007/46/EC: Annex IV applicable for category M1			**Initial Proposal (Subject to impact assessment)**	**Main reasons**	**Further work identified needed to determine final proposal including additional potential issues for implementation for L7e-A1 category vehicles**
Item	**Subject**	**Regulatory Act**			
5A	Steering equipment	Regulation (EC) No 661/2009 UNECE Regulation No 79	Make relevant parts of R79 mandatory, namely those related to power (electric) steering	1. From initial subjective analysis, CBA likely to be OK, 1:1, low cost but low benefit also 2. Stakeholders supported proposal because addresses potential liability issues if power steering fitted. However, power steering unlikely to be fitted because vehicles light weight	1. Detailed cost benefit analysis.
6B	Door latches and door retention components	Regulation (EC) No 661/2009 UNECE Regulation No 11	Mandate R11 with appropriate provisions to take novel door designs into account	1. From initial subjective analysis, CBA likely to be good 1:2 low cost, medium benefit. 2. However, further work required to decide how to address the issue raised by stakeholder that R11 may not be appropriate and hence design restrictive for some novel door designs.	1. Detailed cost benefit analysis 2. Work to address issue of novel door designs for which R11 may be design restrictive and not required because even if door opens occupants will not be ejected. A suggested solution by stakeholder is: for L7e-A vehicles with conventional doors (with vertical hinges) or sliding doors, the requirements for M1 from UNECE Regulation R-11 apply. For other non-conventional entrance systems, emergency escape systems should be present on both left and right side, e.g. a window easy to open, or easy to eject, or another technical solution.

Framework Directive 2007/46/EC: Annex IV applicable for category M1			Initial Proposal (Subject to impact assessment)	Main reasons	Further work identified needed to determine final proposal including additional potential issues for implementation for L7e-A1 category vehicles
Item	**Subject**	**Regulatory Act**			
9B	Braking of passenger cars	Regulation (EC) No 661/2009 UNECE Regulation No 13-H	Mandate R13-H with appropriate provisions to allow fitment of cost effective ABS, ESC and BAS brake features.	1. From initial subjective analysis, CBA likely to be OK, 3: 3, high cost and high benefit also 2. Stakeholders agreed that some form of ABS and ESC is required, but provisions are needed to allow fitment of cost effective versions of these.	1. Detailed cost benefit analysis 2. Work needed to determine provisions to allow fitment of cost effective versions of ABS, ESC and possibly BAS brake features. Note that fitting an ESC as mandated by R13-H is expensive because it requires appropriate electronic system (sensors, ECU) and electro-hydraulic hardware, hence costs need to minimised as much as possible without losing benefits of fitting systems.
12A	Interior fittings	Regulation (EC) No 661/2009 UNECE Regulation No 21	Make R21 mandatory	1. In particular needed as part of crash safety protection measures for impact with interior in an accident. 2. Initial CBA OK, 2:2, medium costs but medium benefits. 3. Fulfilled already by some L7e vehicles. 4. No major objections from stakeholders although unsure of cost	1. Detailed cost benefit analysis
14A	Protection of the driver against the steering mechanism in the event of impact	Regulation (EC) No 661/2009 UNECE Regulation No 12	Mandate R12	1. Initial subjective CBA good 2:3, medium costs, high benefits. 2. Fulfilled already by some L7e vehicles 3. No objections from stakeholders 4. Note: if R94 requirements met and steering mechanism has airbag, then many R12 requirements assumed met. 5. Note: if R94 not mandated, then introduction of this regulation more important, because includes electrical safety items as well and many L7e-A vehicles likely to be electrically powered.	1. Detailed cost benefit analysis. 2. L7e-A1 potential issue: likely to be difficult to design handle-bar type steering mechanism to meet many R12 requirements, in particular impact related ones.
15A	Seats, their anchorages and any head restraints	Regulation (EC) No 661/2009 UNECE Regulation No 17	Mandate prescriptions of R17 related to M1 apart from those concerning displacement of luggage.	1. Needed for strength of seats and their anchorages, and head restraints to underpin crash safety, in particular because of likely high decelerations because of low mass of vehicle.	1. Detailed cost benefit analysis.

Framework Directive 2007/46/EC: Annex IV applicable for category M1			Initial Proposal (Subject to impact assessment)	Main reasons	Further work identified needed to determine final proposal including additional potential issues for implementation for L7e-A1 category vehicles
Item	**Subject**	**Regulatory Act**			
				2. Initial subjective CBA good, 1:1/2. 3. Fulfilled already by some L7e vehicles. 4. No objections from stakeholders	
19A	Safety-belt anchorages, Isofix anchorages systems and Isofix top tether anchorages	Regulation (EC) No 661/2009 UNECE Regulation No 14	Mandate R14 assuming that amendment detailed in GRSP-54-19 Rev2 paragraph 5.3.8.8 is adopted, i.e. the one related to an exemption for fitment of ISOFIX for narrow vehicles provided that a 'vehicle specific' child restraint is available for that vehicle.	1. Likely high deceleration levels in impacts with other vehicles because of low mass, therefore, belt loads will be at least as high for L7 cat under 600 kg, hence should mandate relevant parts of R14 with regard to safety belt anchorages – note already mandated for L7e cat over 600 kg. 2. Very likely that these vehicles will be used to carry children, so safe child carrying capability should be mandated which R14 ISOFIX prescription with proposed amendment helps to achieve 2. Initial subjective CBA good, 1:2 low cost, medium benefit.	1. Detailed cost benefit analysis. 2. Check that it is still intended that the amendment noted will be adopted. 3. L7e-A1 potential issue: likely to be many problems related to this regulation for straddle type seat
20A	Installation of lighting and light-signalling devices on vehicles	Regulation (EC) No 661/2009 UNECE Regulation No 48	Make Reg 48 as prescribed for M1 mandatory.	1. To mandate fitment of hazard warning signal, reversing lamps and daytime running lamps in same way as for M1. 2. Initial subjective CBA OK, 1:1. 3. No objections from stakeholders	1. Detailed cost benefit analysis
25A	Power-driven vehicle's sealed- beam headlamps (SB) emitting an European asymmetrical passing beam or a driving beam or both	Regulation (EC) No 661/2009 UNECE Regulation No 31	Make R31 mandatory if sealed beam units fitted	1. If sealed beam units fitted should be type approved. 2. Unlikely it is that sealed beam units will be used on L7e vehicles, so essentially precautionary measure 3. No objections from stakeholders	1. Further check with stakeholders that acceptable, because detailed cost benefit analysis not possible.
25F	Adaptive front-lighting systems (AFS) for	Regulation (EC) No 661/2009 UNECE Regulation No 123	Make R123 mandatory, if adaptive front lighting systems fitted	1. If adaptive front lighting systems fitted should be type approved. However, probably unlikely that they will be fitted.	1. Further check with stakeholders that acceptable because detailed cost benefit analysis not possible.

Framework Directive 2007/46/EC: Annex IV applicable for category M1			Initial Proposal (Subject to impact assessment)	Main reasons	Further work identified needed to determine final proposal including additional potential issues for implementation for L7e-A1 category vehicles
Item	**Subject**	**Regulatory Act**			
	motor vehicles				
27A	Towing device	Regulation (EC) No 661/2009 (R55) Regulation (EU) No 1005/2010	Make Reg EU 1005/2010 mandatory	1. For break-down recovery useful to be able to tow vehicle. 2. CBA probably OK, 0:0, i.e. virtually no cost or benefit. 3. Propose not to mandate R64 for spare tyres, run-flat, etc, so vehicle more likely to need recovery, so some justification for towing device for recovery. 4. Note: Stakeholder opinion was varied on this item.	1. Further check with stakeholders that acceptable because detailed cost benefit analysis not possible.
31A	Safety-belts, restraint systems, child restraint systems and Isofix child restraint systems	Regulation (EC) No 661/2009 UNECE Regulation No 16	1. Make relevant prescriptions related to M1 for seatbelt reminder (SBR) mandatory. 2. If manufacturer fits ISOFIX (see R14), make relevant prescriptions related to M1 for CRS and ISOFIX mandatory.	1. No reason to suspect benefits of SBR for L7e-A not similar to M1 2. CBA OK, 2:3 good and fulfilled already by some L7e vehicles although some manufacturers would favour not made mandatory without exemptions as detailed 3. No stakeholder objections.	1. Detailed cost benefit analysis 2. Investigate possible SBR exemption proposed by stakeholder, for certain 4 point belts and other restraint systems which have to be worn to enable occupant to be comfortable and hence negate the need for a SBR. 3. L7e-A1 potential issue: likely to be many problems related to this regulation for straddle type seat.
32A	Forward field of vision	Regulation (EC) No 661/2009 UNECE Regulation No 125	Make R125 mandatory	1. With enclosed cockpit field of view requirements needed 2. Requirements should be met already so CBA, 0:1, OK. 3. Note: Issue raised by stakeholder of exemption for 'thin A pillars' no longer an issue because R125 allows these. Hence, there is now no stakeholder objections.	1. Detailed cost benefit analysis
34A	Windscreen defrosting and demisting systems	Regulation (EC) No 661/2009 Regulation (EU) No 672/2010	Mandate EC No 672/20210	1. Required to ensure adequate visibility 2. Most requirements should be already met so CBA should be OK, 1:2. 3. Fulfilled already by some L7e vehicles. 4. No stakeholder objections.	1. Detailed cost benefit analysis
35A	Windscreen wiper and	Regulation (EC) No 661/2009	Make EU Reg 1008/2010 mandatory	1. Required to ensure similar visibility requirements to M1.	1. Detailed cost benefit analysis

Framework Directive 2007/46/EC: Annex IV applicable for category M1			Initial Proposal (Subject to impact assessment)	Main reasons	Further work identified needed to determine final proposal including additional potential issues for implementation for L7e-A1 category vehicles
Item	**Subject**	**Regulatory Act**			
	washer systems	Regulation (EU) No 1008/2010		2. CBA should be OK, 1:1, because requirements not much greater than current ones. 3. No stakeholder objections	
36A	Heating systems	Regulation (EC) No 661/2009 UNECE Regulation No 122	Make part II of R122 mandatory if heater fitted	1. Required to ensure operational safety of heaters if fitted. 2. CBA should be good, 0:1, because current heaters should meet requirements if fitted 3. Does not cover electrical seat heaters, so additional requirements may be needed for operational safety of these 4. No stakeholder objections	1. Further check with stakeholders that acceptable because detailed cost benefit analysis not possible.
37A	Wheel guards	Regulation (EC) No 661/2009 Regulation (EU) No 1009/2010	Make EU Reg 1009/2010 mandatory	1. Required to reduce risk from spray and to VRU. 2. CBA should be OK, 1:1, because should meet already where required 4. No stakeholder objections	1. Detailed cost benefit analysis
38A	Head restraints (headrests), whether or not incorporated in vehicle seats	Regulation (EC) No 661/2009 UNECE Regulation No 25	Make R25 mandatory	1. Required to reduce risk from head restraints which need to be fitted for protection against whiplash injury. 2. CBA should be good, 1:2, because should meet already 3. No stakeholder objections	1. Detailed cost benefit analysis 2. L7e-A1 potential issue: likely to be many problems related to this regulation for straddle type seat
46E	Temporary-use spare unit, run-flat tyres/system and tyre pressure monitoring system	Regulation (EC) No 661/2009 UNECE Regulation No 64	**Do not** make R64 mandatory – note decision made in stakeholder meeting Feb 7th.	1. TPMS: TPMS for cars introduced as measure to help reduce CO2 emissions. Benefit for L7e-A vehicles will be much smaller, therefore decided in stakeholder meeting that measure should not be introduced. 2. Spare tyres, run-flat, etc: L7e-A vehicles are intended for short distance travel only so need is less. Towing device mandated for recovery will partially compensate for not mandating this (see	N/A

Framework Directive 2007/46/EC: Annex IV applicable for category M1			Initial Proposal (Subject to impact assessment)	Main reasons	Further work identified needed to determine final proposal including additional potential issues for implementation for L7e-A1 category vehicles
Item	**Subject**	**Regulatory Act**			
				item 27A).	
53A	Protection of occupants in the event of a frontal collision	Regulation (EC) No 661/2009 UNECE Regulation No 94	Make R94 mandatory but with changes to make test appropriate for narrow, low mass vehicles, e.g. possibly change overlap from 40% to 100%, or define overlap width, say 600 mm, ~40% of 1.5 m car.	1. Protection in frontal impacts of high priority from a benefit perspective, but issues with testing of narrow vehicles. 2. Cost benefit should be OK; 3:3 high benefit, high cost. 3. No fundamental objections from stakeholders.	1. Work to develop changes to make test appropriate for narrow, low mass L7e-A vehicles. 2. Detailed cost benefit analysis. 3. L7e-A1 potential issue: likely to be many problems related to this regulation for straddle type seat and/or handle-bar type steering mechanism.
54A	Protection of occupants in the event of lateral collision	Regulation (EC) No 661/2009 UNECE Regulation No 95	Make R95 mandatory with obligation to review after given period (2-3 years) because there is a possibility that current test may not be appropriate for all L7e-A vehicles within the proposed scope.	1. Protection in side impacts of high priority from a benefit perspective. 2. CBA analysis likely to be OK, 3:3, on the basis of current knowledge which shows that some current vehicles can meet or are close to meeting this standard already. However, further work is required to confirm this. 3. No fundamental objections from stakeholders.	1. Work to confirm that current R95 test is appropriate for L7e-A vehicles within the proposed scope. 2. Detailed cost benefit analysis.
58	Pedestrian protection	Regulation (EC) No 78/2009	Because pedestrian protection is a high priority and the current test procedures for M1, in particular for head impact, are not appropriate for some front-end designs proposed for future vehicles, it was agreed that appropriate regulation needs to be developed to ensure adequate pedestrian protection is implemented on these vehicles..	1. Pedestrian protection is a high priority in terms of benefit for these vehicles, because they will be used mainly in urban environments. Therefore regulation is required to ensure that these vehicles meet minimum requirements for pedestrian protection equivalent to those for M1. Unfortunately, direct application of Reg EC 78/2009 is not possible because of the front-end designs of some L7e-A category vehicles. 2. Stakeholders support proposal.	1. Work to develop appropriate regulation. Current ideas for way forward consist of modification of current M1 regulations and/or fitment of Automatic Emergency Braking systems which could provide benefits of a level equivalent to passive safety measures. 2. Detailed cost benefit analysis.

Framework Directive 2007/46/EC: Annex IV applicable for category M1			Initial Proposal (Subject to impact assessment)	Main reasons	Further work identified needed to determine final proposal including additional potential issues for implementation for L7e-A1 category vehicles
Item	**Subject**	**Regulatory Act**			
59	Recyclability	Directive 2005/64/EC	**Do not** mandate Directive 2005/64/EC – note decision made in stakeholder meeting Feb 7th.	1. Recyclability not within scope of project because not safety related item. 2. Recyclability requirements for these vehicles should be the same as for other L7 category vehicles to maintain consistent approach. 3. Stakeholders support proposal.	N/A
62	Hydrogen system	Regulation (EC) No 79/2009	**Do not** mandate Regulation EC 79/2009 – note decision made in stakeholder meeting Feb 7th.	1. There are no provisions for the safety of hydrogen components and systems for L category vehicles within R168/2013, as required within EC 79/2009 for M cat vehicles. However, it is not proposed to mandate additional requirements for this, at this time, but it is proposed that this issue should be considered and addressed as a whole for all L cat vehicles by a revision of R168/2013 and its delegated acts in an appropriate timescale. In the meantime, should the need arise, it should be possible to cover this issue under the 'New technology article' if L7e-A vehicles which use hydrogen need to be type approved. 2. Stakeholders support proposal.	1. Ensure that the EC are informed of this issue.
64	Gear shift indicators	Regulation (EC) No 661/2009 [1229/12-70] Commission Regulation (EU) No 65/2012	**Do not** mandate EU Reg 65/2012 EC – note decision made in stakeholder meeting Feb 7th.	1. Gear shift indicators not within scope of project because not safety related item. 2. Many vehicles expected to be electric and have continuous variable transmission (CVT) and hence no gears for operator to change. 3. Stakeholders support proposal.	N/A

5 Conclusions

An initial proposal for possible additional type approval requirements for L7e-A heavy on-road quadricycle vehicles has been made. The measures to be considered as derived from this list would need to be subjected to a cost benefit and comprehensive effectiveness analysis. The proposal is based mainly on a comparison of the regulatory requirements for L7e-A and M1 category vehicles and stakeholder consultation, but also to some extent on the small amount of information gathered from relevant literature. The scope of the proposal is only for L7e-A category vehicles which are 'car-like', i.e. those which have an enclosed driving and passenger compartment accessible by maximum three sides. The reasons that it was decided not to include 'non car-like' L7e-A heavy on-road quad vehicle within the scope were:

- 'Car-like' safety performance of these vehicles would not be expected by the consumer because riders and passengers of these vehicles would be exposed to the elements and expect to wear protective clothing as for riding a motorcycle or scooter.

- The market share of 'non car-like' L7e-A heavy on-road quad vehicles is likely to be small because without an enclosed compartment they will not fulfil the envisaged requirements of a vehicle for commuting, i.e. enclosed compartment for protection against weather, etc.

- Practically, in general, it would be difficult or not possible to design many of the additional protection measures envisaged, without an enclosed driver and passenger compartment.

It should finally be noted that further work is required to perform a comprehensive cost benefit analysis and to detail changes or adaptations to test protocols and relevant requirements where there are challenges to apply directly M1 vehicle category regulations to L7e-A vehicles, for example those for protection in frontal impacts (UN Regulation No 94) and pedestrian protection (Regulation (EC) 78/2009).

6 Acknowledgements

The authors would like to thank the individuals and organisations who have contributed their time, expertise and experience to this study. We would particularly like to thank all the stakeholders who provided information to develop the initial proposal, especially the selected stakeholders and those who attended the stakeholder meeting in Brussels on 7th February.

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8 Annex 1: Draft initial proposal for possible regulatory changes for 'car-like' L7e-A2 vehicles subject to an impact assessment.

Framework Directive 2007/46/EC: Annex IV applicable for category M1			**Regulatory Act L cat post 2016**	**Main additional requirements for cars**	**Risk assessment for do nothing scenario**	**Ease of meeting additional requirements, i.e. cost** **0 Little/none** **1-low** **3 -high**	**Priority** **Benefit based** **1 Low** **3 High"**	**Draft Initial Proposal** **(Subject to impact assessment)**	**Main reasons**
Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
1	Permissible sound level	"Directive 70/157/EEC	REPPR Annex IX refers to UN R9 for L7e	1. Test types similar but performance limits different. 2. Low speed noise for electric vehicles may be an issue in the future if only adopted for M cat	No additional safety risk			No change	1. Already similar tests but performance limits different 2. Not a major safety issue but note that if low-noise requirements introduced for M1 will need to be introduced for 'car-like' L7e-A2
2A	Emissions (Euro 5 and 6) light-duty vehicles/access to information	Regulation (EC) No 715/2007	REPPR		No additional safety risk			No change	1. Already similar tests but performance limits different 2. Not a major safety issue
3	Fuel tanks/rear protective devices	Directive 70/221/EEC							
3A	Prevention of fire risks (liquid fuel tanks)	Regulation (EC) No 661/2009 UNECE Regulation No 34	RVCR Annex IX	Slightly different but broadly similar requirements for tank. Note that front, side and rear impact tests in Part II not compulsory for M1. However, front and side impact tests performed in R94 and R95 respectively	1. If R94 and R95 adopted for L7e-A, requirements for L7e-A and M1 would be similar		1	No change	1. If R94 and R95 adopted for L7e-A, requirements for L7e-A and M1 would be similar
3B	Rear underrun protective devices (RUPDs) and their installation; rear underrun protection	Regulation (EC) No 661/2009 UNECE Regulation No 58	None	Not applicable unless rear part of vehicle exceeds 550 mm ground clearance over width not shorter than rear axle	No additional safety risk because of low size /weight of L7e-A cat vehicle			No change	1. Rear and front underrun not likely to be applicable for L7e-A, because point of regulation is for the safety purposes of impacting vehicle. 2. However, a similar requirement could be considered to ensure structure is present on the L7e-A vehicle for an impacting vehicle to interact with for the purpose of protection of the L7e-a vehicle and better compatibility.

Framework Directive 2007/46/EC: Annex IV applicable for category M1			**Regulatory Act L cat post 2016**	**Main additional requirements for cars**	**Risk assessment for do nothing scenario**	**Ease of meeting additional requirements, i.e. cost** **0 Little/none** **1-low** **3 -high**	**Priority** **Benefit based** **1 Low** **3 High"**	**Draft Initial Proposal** **(Subject to impact assessment)**	**Main reasons**
Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
	(RUP)								
4	Rear registration plate space	Directive 70/222/EEC	Repealed 30/7/2009 Directive 2009/62/EC To be repealed Regulation (EU) No 168/2013: Annex II, C 13 & Article 18						
4A	Space for mounting and fixing rear registration plates	Regulation (EC) No 661/2009 Regulation (EU) No 1003/2010	Regulation (EU) No 168/2013: RVCR Annex XIV	Smaller size requirements for L7e	No additional safety risk		0	No change	
5	Steering effort	Directive 70/311/EEC	Regulation (EU) No 168/2013: Annex II, B 13 and RVFSR (13) steeri-ability, annex XIV						
5A	Steering equipment	Regulation (EC) No 661/2009 UNECE Regulation No 79	Regulation (EU) No 168/2013: RVFSR Annex XIV	Steering control effort requirements and power steering requirements	Some additional risk in event that power steering fails if fitted.	Probably possible to meet with little effort and cost because likely that met already if power (electric) steering fitted because of manufacturer due diligence. 1	1	Make relevant parts of R79 mandatory, namely those related to power (electric) steering	1. From initial subjective analysis, CBA likely to be OK, 1: 1, low benefit but low cost also
6	Door latches and hinges	Directive 70/387/EEC							
6A	Vehicle access and	Regulation (EC) No 661/2009	None. Note reversing	Requirements to ensure vehicle characteristics similar, in terms of	Small risk of	Probably possible to meet with little effort /	1	No change.	1. EU 130/20212 could be design restrictive. Example is GM (Opel) RAK-e in which the door/sill

Framework Directive 2007/46/EC: Annex IV applicable for category M1			Regulatory Act L cat post 2016	Main additional requirements for cars	Risk assessment for do nothing scenario	Ease of meeting additional requirements, i.e. cost 0 Little/none 1-low 3 -high	Priority Benefit based 1 Low 3 High"	Draft Initial Proposal (Subject to impact assessment)	Main reasons
Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
	manoeuvrability	Regulation (EU) No 130/2012	device requirement in RVFSR Annex XIV section 1.2.2	structure height person has to clear to enter passenger compartment, reversing device and access steps / handholds if applicable.	problems due to unfamilar/ unusal features	cost because likely met already			is stepped over to access the passenger compartment. EU 130/2012 would require running boards or access steps.
6B	Door latches and door retention components	Regulation (EC) No 661/2009 UNECE Regulation No 11	None	Hinges must be fixed at front edges of doors and withstand set forces and inertial conditions	Additional risk of doors opening during crash	Probably possible to meet without substantial effort / cost, but should allow for novel door designs 1	2	TBD. Further work required to decide how to take novel door designs into account.	1. Further work required to decide how to mandate the principles of R11, i.e. ensure occupant ejection prevented and emergency escape allowed, and not be design restrictive for novel door designs.
7	Audible warning Directive	Directive 70/388/EEC							
7A	Audible warning devices and signals	Regulation (EC) No 661/2009 UNECE Regulation No 28	RVSFR Annex II. States L7e shall meet all relevant fitting requirements of Reg 28 for veh cat L5e.	Similar requirements	None forseen			No change	1. M1 Regulation already compulsory.
8	Indirect vision devices Directive	Directive 2003/97/EC							
8A	Devices for indirect vision and their installation	Regulation (EC) No 661/2009 UNECE Regulation No 46	Regulation (EU) No 168/2013: Annex I states UN R46 applies on compulsory basis	Same requirements	None			No change.	1. M1 Regulation already compulsory 2. Note request from manufacturer for derogation to allow cameras as substitute. It is unclear whether or not Regulation allows this already.
9	Braking	Directive 71/320/EEC							
9B	Braking of passenger cars	Regulation (EC) No 661/2009 UNECE Regulation No 13-H	RVFSR Annex III. States that L7e shall meet	Many additional requirements on brake characteristics, ranging from requirement of warning device for event of stored energy deficiency to	Significant risk for non-fitment of	Substantial effort and cost 3	3	TBD. Further work needed to find cost effective way of ensuring brake features (ABS, ESC, BAS, etc) and	

Framework Directive 2007/46/EC: Annex IV applicable for category M1			Regulatory Act L cat post 2016	Main additional requirements for cars	Risk assessment for do nothing scenario	Ease of meeting additional requirements, i.e. cost 0 Little/none 1-low 3 -high	Priority Benefit based 1 Low 3 High"	Draft Initial Proposal (Subject to impact assessment)	Main reasons
Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
			requirements of R78 for L5e.	performance characteristics. However, major differences to note are requirements for regen braking and BAS, and ESC, which includes ABS.	ESC and other systems assuming similar benefits of these systems as for M1.			performance more equivalent to M1 because these systems, in particular ESC have high cost. Fitting ESC would require appropriate electronic system (sensors, ECU) and electro-hydraulic hardware.	
10	Radio interference (electromagnetic compatibility)	Directive 72/245/EEC							
10A	Electromagnetic compatibility	Regulation (EC) No 661/2009 UNECE Regulation No 10	RVCR Annex VII. States shall meet all relevant requirements of Reg 10.					No change	1. Regulation for M1 already compulsory for L7e
12	Interior fittings Directive	Directive 74/60/EEC							
12A	Interior fittings	Regulation (EC) No 661/2009 UNECE Regulation No 21	RVFSR Annex XVII	Energy dissipating tests for materials used in areas that can be impacted by head and knee, retraction/detachment of projecting knobs/handle, handbrake position, roof and window closure.	Additional risk of injury for interior impact	Significant cost and effort 2	2	Make R21 mandatory	1. In particular needed as part of crash safety protection measures for impact with interior in an accident. 2. Initial CBA OK, 2:2, medium costs but medium benefits. Also, fulfilled already by some L7e vehicles.
13	Anti-theft and immobiliser Directive	Directive 74/61/EEC							
13B	Protection of motor vehicles	Regulation (EC) No 661/2009	RVCR ANNEX VI, L7e not fitted with	Reg 116 requires fitment of a vehicle alarm system (VAS) as well as the	Not a major safety			No change.	1. Not a major safety issue. 2. Could be consumer driven, for example, VAS fitted by choice by manufacturer to improve

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
	against unauthorised use	UNECE Regulation No 116	handlebars shall meet all relevant requirements of UNECE Reg 18 as prescribed for cat N2.	steering lock, etc, required for Reg 18	issue				insurance rating.
14	Protective steering	Directive 74/297/EEC							
14A	Protection of the driver against the steering mechanism in the event of impact	Regulation (EC) No 661/2009 UNECE Regulation No 12	No requirement. Not covered by RVFSR	1. Steering coloumn movement in 48.3 km/h frontal rigid barrier test 2. Body block test 3. head impactor test 4. No sharp edges 5. Electrical safety	Additional risk of injury in frontal impact	As for Directive 74/279/EEC, should be able to meet with little cost or weight increase. 2	3	Make R12 mandatory	1. Note that if also intend to mandate R94 requirement, then R12 requirements assumed met. 2. Note, if R94 not mandated, then introduction of this regulation more important, because includes electrical safety as well and many L7e-A vehicles likely to be electrically powered. 3. Initial subjective CBA good 2:3 and fulfilled already by some L7e vehicles
15	Seat strength	Directive 74/408/EEC							
15A	Seats, their anchorages and any head restraints	Regulation (EC) No 661/2009 UNECE Regulation No 17	RVFSR Annex XIII	1. Seat back and head restraint Energy Dissipation - Back of seat must be energy dissipating 2. Head Restraint performance. 3. Strength of seat back and adjustment systems 4. Strength of Seat Anchorage and the adjustment, locking and displacement systems – 20 g deceleration, 10g for RVFSR Annex XIII. 5. Luggage retention.	1. ˜ Significant increased risk of injury to occupants in the event of front or rear impacts, in particular because of likely high deceleration because of low mass of	Should be possible to meet with relatively little additional weight or cost increase 1	1/2	Mandate prescriptions of R17 related to M1 apart from those concerning displacement of luggage.	1. Needed for strength of seats and their anchorages, and head restraints to underpin crash safety, in particular because of likely high decelerations becasue of low mass of vehicle. 2. Initial subjective CBA good, 1:1/2, and fulfilled already by some L7e vehicles.

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Item	Subject	Regulatory Act	Regulation (EU) No 168/2013						
					vehicle.				
16	Exterior projections	Directive 74/483/EEC							
16A	External projections	Regulation (EC) No 661/2009 UNECE Regulation No 26	RVCR Annex VIII. States that all relevant requirements for M1 should be met but has concessions for different, (i.e. non car-like), designs.	Same requirements, if L7 vehicle car-like.	None		0	No change.	
17	Speedometer and reverse gear	Directive 75/443/EEC	1. Speedo: RVFSR Annex VIII references UN R39 2. Reverse: RVFSR Annex XIV						
17A	Vehicle access and manoeuvrability	Regulation (EC) No 661/2009 Regulation (EU) No 130/2012	None for access. Note reversing device requirement in RVFSR Annex XIV section 1.2.2	Vehicle access requirements	Some issues may arise regarding access of vehicles for 'not-so agile' persons.	Could be design restrictive, but probably low cost 1		No change.	1. Note same as item No. 6A - Introduced to regulate reverse gear. 2. EU 130/2012 could be design restrictive. Example is GM (Opel) RAKe in which the door/high sill is stepped over to acess the passenger compartment. EU 130/2012 would probably require running boards or access steps. 3. CBA not good because benefit small and could be design restrictive
17B	Speedometer equipment including its installation	Regulation (EC) No 661/2009 UNECE Regulation No 39	RVFSR Annex VIII section 1.2. - L7e cat shall, in absence of specific requirements	Similar requirements, but slightly higher accuracy requirements for M1	None foreseen			No change	1. Reg 39 compulsory already for L7e-A

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
			for vehicles of that category, meet all relevant requirements of UNECE Reg 39 as perscribed for L5e cat.						
18	Statutory Plates	Directive 76/114/EEC	To be repealed						
18A	Manufacturer's statutory plate and vehicle identification number	Regulation (EC) No 661/2009 Regulation (EU) No 19/2011	Annex II, B, 15 & Article 22 & Article 39 and RVCR Annex II (antitampering) and RVCR Annex III	Requirements appear to be different. For M1 plate contains info on max masses whereas for L cat it is noise level and engine power.	Not an important safety issue			No change.	1. Current requirements for L7, e.g. max engine power, appear more relevant than max mass for M1, although no reason not to add max mass.
19	Seat-belt anchorages	Directive 76/115/EEC							
19A	Safety-belt anchorages, Isofix anchorages systems and Isofix top tether anchorages	Regulation (EC) No 661/2009 UNECE Regulation No 14	RVFSR Annex XII. States that all vehicles having running mass > 600 kg should meet all relevant requirements of Reg 14 with regard to anchorages for safety belts as prescribed for M1.	RVFSR Annex XII specifies that all vehicles having running mass > 600 kg should meet all relevant requirements of Reg 14 with regard to anchorages for safety belts as prescribed for M1, so requirements the same for L7e-A with running mass > 600 kg. For < 600 kg, requirements are less.	Risk of seatbelt anchorage failure for vehicles with running mass < 600 kg.	Additional requirements should be met relatively easily for L7e-A with running mass < 600 kg 1	3	Make prescribed parts of Reg 14 with regard to anchorages for safety belts as prescribed for M1 mandatory, i.e. including those with running mass under 600 kg. If ISO FIX ftted must comply with prescribed requirements in R14.	1. Likely high deceleration levels in impacts with other vehicles because of low mass, therefore, belt loads will be at least as high for L7 cat under 600 kg, hence should make relevant parts of R14 with regard to safety belt anchorages compulsory for these vehicles as well. 2. Initial subjective CBA, 1:2 good.

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
20	Installation of lighting and light signalling devices	Directive 76/756/EEC							
20A	Installation of lighting and light-signalling devices on vehicles	Regulation (EC) No 661/2009 UNECE Regulation No 48	RVFSR Annex IX (For L3e R53 & R87, L1e R74)	Requirements appear to be broadly similar apart from differences such as the mandatory fitment of reversing lamps, hazard warning signal to M cat and not L7e cat.	Additional risk for non-mandatory fitment of reversing lamp, hazard warning signal.	Little effort/cost to fit. 1	1	Make Reg 48 as prescribed for M1 mandatory.	1. To mandate fitment of hazard warning signal and reversing lamps in same way as for M1. 2. Initial subjective CBA OK, 1:1. 3. Note: An idea for discussion: could allow fitment of L category components to help reduce costs.
21	Retro reflectors	Directive 76/757/EEC							
21A	Retro-reflecting devices for power-driven vehicles and their trailers	Regulation (EC) No 661/2009 UNECE Regulation No 3	RVFSR Annex IX. Also Reg 3 compulsory.	Same requirement	None			No change	
22	End-outline, front-position (side), rear-position (side), stop, side marker, daytime running lamps	Directive 76/758/EEC							
22A	Front and	Regulation (EC) No	RVFSR Annex	Same requirment	None			No change	

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
	rear position lamps, stop-lamps and end-outline marker lamps for motor vehicles and their trailers	661/2009 UNECE Regulation No 7	IX Also reg 7 compulsory						
22B	Daytime running lamps for power-driven vehicles	Regulation (EC) No 661/2009 UNECE Regulation No 87	RVFSR Annex IX. States Reg 87 compulsory if (daytime running lights) fitted.	Same requirement, if fitted. Will be fitted if R48 mandated.	None if R48 mandated			No change - adoption of R48 effectively adopts R87	1. If Reg 48 adopted, requirement the same.
22C	Side-marker lamps for motor vehicles and their trailers	Regulation (EC) No 661/2009 UNECE Regulation No 91	RVFSR Annex IX. Also, refer to Reg 91, but not compulsory	Same requirement if fitted.	None foreseen		1	No change - adoption of R48 effectively adopts R91	1. If Reg 48 adopted, requirement the same as for M1 which is discretionary for M1 vehicles
23	Direction indicators	Directive 76/759/EEC							
23A	Direction indicators for power-driven vehicles and their trailers	Regulation (EC) No 661/2009 UNECE Regulation No 6	RVFSR Annex IX. Annex I states that Reg 6 compulsory.	Same requirement				No change	1. Regulation 6 compulsory already
24	Rear registration plate lamps	Directive 76/760/EEC							

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
24A	Illumination of rear-registration plates of power-driven vehicles and their trailers	Regulation (EC) No 661/2009 UNECE Regulation No 4	RVFSR Annex IX	Similar requirements	None foreseen		0	No change - adoption of R48 effectively adopts R4	1. If Reg 48 adopted, requirement the same.
25	Headlamps (including bulbs)	Directive 76/761/EEC Regulation (EC) No 661/2009 UNECE Regulation No 31	RVFSR Annex IX						
25A	Power-driven vehicle's sealed-beam headlamps (SB) emitting an European asymmetrical passing beam or a driving beam or both	Regulation (EC) No 661/2009 UNECE Regulation No 31	RVFSR Annex IX	Reg 31 not compulsory for L7e, possibly because SB headlamps not fitted to these vehicles	Some risk if sealed beam unit fitted	1	1	Make R31 mandatory if sealed beam units fitted	1. If sealed beam units fitted should be type approved 2. Unsure how likely it is that sealed beam units will be used on L7e vehicles
25B	Filament lamps for use in approved lamp units of power-driven vehicles and their	Regulation (EC) No 661/2009 UNECE Regulation No 37	RVFSR Annex IX. Annex 1 states Reg 37 compulsory	Same requirement	None			No change	

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Item	Subject	Regulatory Act	Regulation (EU) No 168/2013						
	trailers								
25C	Motor vehicle headlamps equipped with gas-discharge light sources	Regulation (EC) No 661/2009 UNECE Regulation No 98	RVFSR Annex IX. Annex 1 states Reg 98 is compulsory.	Same requirement	None			No change	
25D	Gas-discharge light sources for use in approved gas-discharge lamp units of power-driven vehicles	Regulation (EC) No 661/2009 UNECE Regulation No 99	RVFSR Annex IX. Annex 1 states Reg 99 compulsory.	Same requirement	None			No change	
25E	Motor vehicle headlamps emitting an asymmetrical passing beam or a driving beam or both and equipped with filament lamps and/or LED modules	Regulation (EC) No 661/2009 UNECE Regulation No 112	RVFSR Annex IX. Annex I states Reg 112 compulsory.	Same requirement	None			No change	
25F	Adaptive front-	Regulation (EC) No 661/2009	RVFSR Annex	Reg 123 not compulsory for L7e, possibly because adaptive front lighting	Some risk if adaptive	1	1	Make R123 mandatory, if adaptive front lighting	1. If adaptive front lighting systems fitted should be type approved. However, probably unlikely that

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
	lighting systems (AFS) for motor vehicles	UNECE Regulation No 123	IX	systems not fitted to these vehicles	front lighting system fitted			systems fitted	they will be fitted.
26	Front fog lamps	Directive 76/762/EEC							
26A	Power-driven vehicle front fog lamps	Regulation (EC) No 661/2009 UNECE Regulation No 19	RVFSR Annex IX. Annex 1 states Reg 19 compulsory.	Same requirement				No change	
27	Towing hooks	Directive 77/389/EEC							
27A	Towing device	Regulation (EC) No 661/2009 (R55) Regulation (EU) No 1005/2010	1. Towing (coupling) device: RVCR Annex V states that can be approved as separate technical unit under R55 2. Towing device for vehicle recovery : None	1. Coupling device: Similar requirements so not a major safety issue 2. Towing device (for vehicle recovery): At least one fitted at front of vehicle with strength requirements	Difficult to recover vehicle in event of breakdown, etc.	0	0	Make Reg EU 1005/2010 mandatory	1. For break-down recovery useful to be able to tow vehicle. 2. CBA probably OK, 0:0, i.e. virtually no cost or benefit.
28	Rear fog lamps	Directive 77/538/EEC							
28A	Rear fog lamps for power-driven vehicles and their trailers	Regulation (EC) No 661/2009 UNECE Regulation No 38	RVFSR Annex IX. Annex 1 states Reg 38 compulsory.	Same requirement	None			No change	
29	Reversing	Directive 77/539/EEC							

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
	lamps								
29A	Reversing lights for power-driven vehicles and their trailers	Regulation (EC) No 661/2009 UNECE Regulation No 23	RVFSR Annex IX. Mention of Reg 23 but not as compulsory.	Similar requirement if fitted. Fitted if R48 mandated.	None foreseen	0	1	No change - if R48 mandated	1. If Reg 48 mandated, requirement similar.
30	Parking lamps	Directive 77/540/EEC							
30A	Parking lamps for power-driven vehicles	Regulation (EC) No 661/2009 UNECE Regulation No 77	RVFSR Annex IX. No requirements	1. None 2. Optional for M1 vehicles. 3. Generally use front and rear position lamps which are covered by Reg 7 which is compulsory already.	None foreseen	0	1	No change	
31	Seat-belts and restraint systems	Directive 77/541/EEC							
31A	Safety-belts, restraint systems, child restraint systems and Isofix child restraint systems	Regulation (EC) No 661/2009 UNECE Regulation No 16	RVFSR Annex 1 R16 compulsory	1. Seatbelt reminder 2. Installation of child restraints and ISOFIX systems, however, if child restraints allowed to be fitted full M1 requirements must be met	Additional risk due to seatbelt reminder and child restraint sytems not mandatory	For seatbelt reminder, some additional cost 2	3	1. Make relevant prescriptions related to M1 for seatbelt reminder (SBR) mandatory. 2. If manufacturer prescribes that vehicle can transport children, make relevant prescriptions related to M1 for CRS and ISOFIX mandatory.	1. No reason to suspect benefits of SBR for L7e-A not similar to M1 2. CBA OK, 2:3 good and fulfilled already by some L7e vehicles although some manufacturers would favour not made mandatory. 3. If children to be transported, clear that relevant prescriptions for CRS and ISOFIX for M1 should be met.
32	Forward vision	Directive 77/649/EEC							
32A	Forward field of vision	Regulation (EC) No 661/2009 UNECE Regulation No 125	Regulation (EU) No 168/2013: Annex II, B, 6 & Article 22 and	1. Transparent area of windscreen contains required datum points 2. No more than two A-pillars, for which angle of obstruction is acceptable 3. No obstructions to field of vision	Additional risk due to possible field of view limitations	Should be met already 0	1	Make R125 mandatory	1. With enclosed cockpit field of view requirements needed 2. Requirements should be met already so CBA, 0:1, OK. 3. Possible work required on issue of how to address very thin A pillars in field of view.

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
			RVFSR Annex VII. Note: No field of view requirements.						
33	Identification of controls, telltales and indicators	Directive 78/316/EEC							
33A	Location and identification of hand controls, tell-tales and indicators	Regulation (EC) No 661/2009 UNECE Regulation No 121	RVFSR Annex VIII. Note: Refers to Reg 121. '….alternatively, the relevant requiremnts of Reg 121 as prescribed for M1.'	Similar requirements	None foreseen			No change	
34	Defrost/demist	Directive 78/317/EEC							
34A	Windscreen defrosting and demisting systems	Regulation (EC) No 661/2009 Regulation (EU) No 672/2010	RVFSR Annex VII. Very basic requirements which do not specify how good system should be, only provide 'adequate visibility'. However, for L cat with max power > 15 kW, EU Reg 672/2010 for M1 compulsory	Specific requirements (tests) for demisting and deforsting time and efficiency	Additional risk due to poor visibility in cold weather conditions	Some cost 1	2	Mandate EC No 672/20210	1. Required to ensure adequate visibility 2. Most requirements should be already met so CBA should be OK, 1:2.

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
35	Wash/wipe	Directive 78/318/EEC							
35A	Windscreen wiper and washer systems	Regulation (EC) No 661/2009 Regulation (EU) No 1008/2010	RVFSR Annex VII	Similar requirements but slightly less, e.g. coverage of vision area A 90% cf 98% for M1	Possible additional risk due to poorer visibility in wet conditions	Some cost 1	1	Make EU Reg 1008/2010 mandatory	1. Required to esnure similar visibility requirements to M1. 2. CBA should be OK, 1:1, because requirements not much greater than current ones.
36	Heating systems	Directive 2001/56/EC							
36A	Heating systems	Regulation (EC) No 661/2009 UNECE Regulation No 122		1. Passenger compartment heater shall be fitted. 2. Basic requirements related to operational requirements, including safety, of heater	1. Likely that heater will not be fitted (not really a safety issue). 2. Operational safety issues with heater if fitted	Should meet Part II already if heater fitted 0	1	Make part II of R122 mandatory if heater fitted	1. Required to ensure operational safety of heaters if fitted. 2. CBA should be good, 0:1, because current heaters should meet requirements if fitted 3. Does not cover electrical seat heaters, so additional requirements may be needed for operational safety of these
37	Wheel guards	Directive 78/549/EEC							
37A	Wheel guards	Regulation (EC) No 661/2009 Regulation (EU) No 1009/2010	RVCR Annex VIII. No requirements could be found.	1. Must be provided with wheel guards 2. Sufficient to cover wheel/tyre combination 3. May consist of several parts but provide no gaps 4. Must allow room for snow chains on at least one set of driving wheels	Additional risk of spray and for VRU if wheel guards not fitted	Probably already met where required. If not small additional cost 1	1	Make EU Reg 1009/2010 mandatory	1. Required to reduce risk from spray and to VRU. 2. CBA should be OK, 1:1, because should meet already where required
38	Head restraints	Directive 78/932/EEC							
38A	Head restraints (headrests), whether	Regulation (EC) No 661/2009 UNECE Regulation No 25	Seating RVFSR Annex XIII, Interior fittings XVII.	Requirements for head restraints 1. Shall not cause additional danger to occupants 2. Parts in impact zone energy	Additional risk of injury in front and	Probably little effort cost if not met already 1	2	Make R25 mandatory	1. Required to reduce risk from head restraints which need to be fitted for protection against whiplash injury. 2. CBA should be good, 1:2, because should meet

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	or not incorporated in vehicle seats		No requirements could be found.	dissipating 3. Dimensional requirements.	rear impacts if head restraints not compliant				already
40	Engine Power	Directive 80/1269/EEC	Regulation (EU) No 168/2013: Annex II, A, 2 & Annex II, B, 17 & article 22/23/24 and RVFSR Annex XVIII (and UN R85 for electric motors only) Future UN GTR unlikely to be different						
44	Masses and dimensions (cars)	Directive 92/21/EEC							
44A	Masses and dimensions	Regulation (EC) No 661/2009 Regulation (EU) No 1230/2012	RVCR Annex XI Masses and dimensions	No relevant additional requirements were found	None foreseen			No change	
45	Safety glazing	Directive 92/22/EEC							
45A	Safety	Regulation (EC) No	RVFSR Annex	Same requirements	None			No change	

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
	glazing materials and their installation on vehicles	661/2009 UNECE Regulation No 43	VII. All safety glazing shall be type approved to Reg 43.						
46	Tyres	Directive 92/23/EEC							
46A	Installation of tyres	Regulation (EC) No 661/2009 Regulation (EU) No 458/2011	RVFSR Annex XV. References Reg 75 (motorcycle tyres - mainly load/speed test) unless conditions of use not compatible, in which case references EC 661/2009 or UNECE 106 (Agricultural tyres)	Same requirements if car tyres fitted. Hardy et al. assumed they probably would be because cheaper, but not necessarily the case.	Some possible risk if motorcycle tyres fitted because only load/speed test, no wet grip or noise tests or rolling resistance. However, this is unlikely unless appropriate for novel design.			No change	1. Motorcycle or car tyres can be fitted under current requirements according to needs of design. 2. Note that for motorcycle tyres no wet grip, rolling resistance or noise tests.
46B	Pneumatic tyres for motor vehicles and their trailers (Class C1)	Regulation (EC) No 661/2009 UNECE Regulation No 30	RVFSR Annex XV. References Reg 75 (motorcycle tyres - mainly load/speed test) unless conditions of use not compatible, in which case references EC 661/2009 or	Similar requirements, i.e. load /speed tests.	None foreseen			No change	

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
			UNECE 106 (Agricultural tyres)						
46D	Tyre rolling sound emissions, adhesion on wet surfaces and rolling resistance (Classes C1, C2 and C3)	Regulation (EC) No 661/2009 UNECE Regulation No 117	RVFSR Annex XV. References Reg 75 (motorcycle tyres - mainly load/speed test) unless conditions of use not compatible, in which case references EC 661/2009 or UNECE 106 (Agricultural tyres)	Same requirements if car tyres fitted. Hardy et al. assumed they probably would be because cheaper, but not necessarily the case.	Some possible risk if motorcycle tyres fitted because only load/speed test, no wet grip or noise tests. However, this is unlikley unless appropriate for novel design.			No change	
46E	Temporary-use spare unit, run-flat tyres/system and tyre pressure monitoring system	Regulation (EC) No 661/2009 UNECE Regulation No 64	RVFSR Annex XV. References Reg 75 (motorcycle tyres - mainly load/speed test) unless conditions of use not compatible, in which case references EC 661/2009 or UNECE 106 (Agricultural tyres)	Requirement for temporary spare wheel / run-flat and tyre pressure monitoring system.	Additional risk because of no tyre pressure monitoring	Some effort / cost 1	0/1	TBD: Possibly make TPMS system fitment and spare /run-flat provision and R64 mandatory	1. Further work required to understand importance of TPMS and whether or not run-flat or spare tyre needed for car-like L7e-A. 2. Comment from manufacturer that these vehicles will be used mainly in urban areas so less need for run-flat or spare tyre.
50	Couplings	Directive 94/20/EC							

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Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
50A	Mechanical coupling components of combinations of vehicles	Regulation (EC) No 661/2009 UNECE Regulation No 55	RVCR Annex V. Annex V states that coupling devices may be approved as separate technical units under this regulation or under Reg 55	Similar requirements	None foreseen		1	No change	
53	Frontal impact	Directive 96/79/EC					0		
53A	Protection of occupants in the event of a frontal collision	Regulation (EC) No 661/2009 UNECE Regulation No 94	None	40% overlap test into barrier at 56 km/h. Dummy criteria for front outboard seats. Also requirements for steering column movement, door opening, dummy extraction and fuel leakage.	Substantial increase in risk of injury for vehicle occupants if involved in a frontal impact – It should be noted that this test implies safety if struck by a vehicle of equal mass, which is a best case scenario for light vehicles	Difficult to meet, substantial cost penalties in some or many cases. Some vehicles, at least, are close to M1 requirements; in these cases costs will be lower but still significant. Also weight penalties. 3	3	TBD: Make R94 mandatory but with changes for issues with narrow vehicles, e.g. possibly change overlap from 40% to 100% for narrow vehicles.	1. Protection in frontal impacts of high priority from a benefit perspective, but issues with testing of narrow vehicles.
54	Side impact	Directive 96/27/EC							
54A	Protection of	Regulation (EC) No 661/2009	None	Barrier impact to side of vehicle at 50 km/h. Dummy criteria for front seat.	Substantial increase in	Difficult to meet, substantial cost	3	TBD: Make R95 mandatory	1. Protection in side impacts of high priority from a benefit perspective.

Framework Directive 2007/46/EC: Annex IV applicable for category M1			Regulatory Act L cat post 2016	Main additional requirements for cars	Risk assessment for do nothing scenario	Ease of meeting additional requirements, i.e. cost 0 Little/none 1-low 3 -high	Priority Benefit based 1 Low 3 High"	Draft Initial Proposal (Subject to impact assessment)	Main reasons
Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
	occupants in the event of lateral collision	UNECE Regulation No 95		Also requirements for door opening, production of no sharp edges and fuel leakage	risk of injury for vehicle occupants if struck in a lateral impact configuration	penalties in some or many cases. Some vehicles at least are close to M1 requirements; in these cases costs lower but still significant. Also weight penalties. 3			2. CBA analysis likely to be OK, 3:3, on the basis of current knowledge which shows that some current vehicles can meet or are close to meeting this standard already. However, further work is required to confirm this.
58	Pedestrian protection	Regulation (EC) No 78/2009	None	A series of pedestrian impactor tests to defined parts of car front-end, namely lower or upper legform to bumper test, upper legform to bonnet leading edge, child /adult headform to bonnet and adult headform to windscreen. Also brake assist systems BAS assessed. Performance limits	Substantial increase in risk of injury for vulnerable road users (VRU) if struck	Examination of some quadricycles indicates that should be possible to meet but with significant effort (Hardy et al. 2009) and hence cost. 3	3	TBD: Some current designs make it non-sensical to adopt the current test procedures, in particular for head impact.	1. Pedestrian protection is a high priority in terms of benefit for these vehicles, because they will be used mainly in urban environments. Therefore regulation is required to ensure that these vehicles meet minimum requirements for pedestrian protection equivalent to those for M1. Unfortunately, direct application of Reg EC 78/2009 is not possible because of the front-end designs of some L7e-A category vehicles.
59	Recyclability	Directive 2005/64/EC	None					Mandate Directive 2005/64/EC for all L cat vehicles	1. No reason why L7Ae category vehicles should not be included
61	Air-conditioning systems	Directive 2006/40/EC	None					No change	1. Not likely to be fitted to thisL7e-A category of vehicle
62	Hydrogen system	Regulation (EC) No 79/2009	None	Safety of hydrogen fuel components and systems	Substantial increase in risk for hydrogen fuel components and systems	Cost significant, but should be met already if hydrogen components / systems used 1	2	Mandate Regulation EC 79/2009, if hydrogen used.	1. Designs are likely to meet requirement already. 2. CBA good, 1:2, assuming systems deigned to meet already.
63	General safety	Regulation (EC) No 661/2009	Regulation (EU) No 168/2013						
64	Gear shift indicators	Regulation (EC) No 661/2009 [1229/12-70] Commission Regulation	None	Gear shift indicator for economical driving	Vehicle may not be driven as economical	Some small cost 0/1	0/1	Adopt EU Reg 65/2012 for L7e-A	1. Idea of these vehicles is to be fuel efficient, so gear shift indicator should be fitted to encourage this where appropriate 2. CBA may be OK, 0/1: 0/1 because both costs

Framework Directive 2007/46/EC: Annex IV applicable for category M1			Regulatory Act L cat post 2016	Main additional requirements for cars	Risk assessment for do nothing scenario	Ease of meeting additional requirements, i.e. cost 0 Little/none 1-low 3 -high	Priority Benefit based 1 Low 3 High"	Draft Initial Proposal (Subject to impact assessment)	Main reasons
Item	**Subject**	**Regulatory Act**	**Regulation (EU) No 168/2013**						
		(EU) No 65/2012			ly as possible				and benefits low.
67	Specific components for liquefied petroleum gases (LPG) and their installation on motor vehicles	Regulation (EC) No 661/2009 UNECE Regulation No 67	RVCR Annex IX (fuel storage). Reg 67 for M1 compulsory for vehicles using LPG	Same requirements	None			No change	
68	Vehicle alarm systems (VAS)	Regulation (EC) No 661/2009 UNECE Regulation No 97	None could be found for vehicle alarm system	Fitment of vehicle alarm system with specified requirements	Some additional risk of theft			No change	1. Not a major safety issue. 2. Could be consumer driven, for example, VAS fitted by choice by manufacturer to improve insurance rating.
69	Electric safety	Regulation (EC) No 661/2009 UNECE Regulation No 100	Regulation (EU) No 168/2013: Annex II, B, 3 & Article 22 and RVFSR Annex IV and UN R100 and ISO 13063	Similar requirements to Reg 100.	None foreseen			No change	
70	Specific components for CNG and their installation on motor vehicles	Regulation (EC) No 661/2009 UNECE Regulation No 110	RVCR Annex IX (fuel storage). Reg 110 for M1 compulsory for vehicles using CNG	Same requirements	None			No change	

9 Annex 2: Minutes of Stakeholder meeting, Brussels 7th February

Draft minutes of stakeholder meeting for 'An initial assessment of additional functional safety and vehicle construction requirements for L7e-A heavy on-road quads'

Date/time: 7th February 2014, 10:00 to 16:30

Location: Meeting Room 12/A
45 Avenue d'Audeghem
B-1049 Brussels
Belgium

1. Welcome, introduction and attendance

- MS/EC welcomed the participants
- Signed attendance list in Annex 1

	Christian name	Family name	Organisation
1	Mervyn	Edwards	TRL
2	Luc	Vinckx	GM
3	Matthias	Seidl	TRL
4	Alain	Jung	EQUAL
5	Erwin	Kirschner	ACEA
6	Jacques	Faure	Renault
7	Berber	Süleyman	VDE
8	Ian	Ashdown	Suzuki / JAMA
9	Ahmet Hamdi	TAKAN	Turkisk ministry
10	Timo	Kärkkäinen	Finnish Transport Safety Agency
11	Marcus	Wisch	BASt
12	Toshiyasu	Miyachi	JAMA
13	Serge	Verdee	JAMA
14	Thomas	Vercammen	ACEM
15	Erwin	Segers	ACEM
16	Herry	Kleyn van Willigen	ACEM
17	Anders	Gunneriusson	Swedish Transport Agency
18	Maciej	Szymanski	European Commission

2. Agree Agenda

- Agenda agreed

3. Initial proposal for possible regulatory change

- ME presented TRL's initial proposal[3]

4. Summary of stakeholder feedback received

- ME summarised stakeholder feedback received prior to meeting (see presentation)

5. Further feedback and discussion

5.1. General aim of study

- The study is based on the assumption that there is general agreement, that car-like L7e-A vehicles should provide the customers with car-like safety features. ME and MS/EC asked whether there were objections against this assumption. No objections were raised.

5.2. Accidentology

- ME asked for potential sources of further relevant accident data. TRL identified only limited data on L7e vehicles (not broken down into subcategories).
- Consensus amongst stakeholders that general L7e accident data are only of limited relevance, because
  - Generally does not contain L7e-A type vehicles, i.e. with v_{max}>90 km/h,
  - Data sample contained mix of very different vehicles, and
  - expected use of L7e-A, -B and -C vehicles varied largely.
- ME agreed, however, also emphasised that no other data were available.
- Japanese accident data: Accident data of K-cars might be relevant under the aspect of lighter vehicles versus heavier vehicles. However, these vehicles were much more akin to M_1 and more powerful than L7e-A.
- A recent Swedish study was mentioned that identified a strong increase in fatalities on Swedish roads since quads used by commuters (60% of fatalities for these quads occur during on-road use). Stakeholders warned to not mix information on off-road quads, microcars and L7e-A vehicles. **Action AG to make Swedish study available via CIRCA.**

5.3. Expected use of L7e-A vehicles

- LV reported that GM prototype RAK-e was developed for short distance commutes in Europe. Main purpose should be urban mobility and energy conservation.
- Input from vehicle manufacturers suggested that the safety equipment that they expect to fit would not fall much behind M_1 requirements, e.g. try to meet UN R94, UN R95 and pedestrian protection; not necessarily seat belt reminders.

[3] Mervyn Edwards, *Assessment of additional functional safety and vehicle construction requirements for L7e-A heavy on-road quads: Initial proposal & stakeholder feedback*, 07/02/2014

5.4. Exact scope of study

- ME asked whether L7e-A1 vehicles with enclosed driving and passenger compartment accessible by maximum three sides should be included alongside L7e-A2 with enclosed compartment.
- Stakeholders expressed no principal concerns, however, stressed that L7e-A1 vehicles are designed differently (straddle seats, sitting on top of vehicle, "body active driving"), which would have a strong influence on some of the discussed safety features. It should be noted that it is not known if an L7e-A1 with enclosed compartment is ever likely to be made.
- MS/EC decided to include L7e-A1 vehicles with enclosed compartment in for the time being, with the option to exclude them for future work in conclusion of this phase.

Author's note:

Since meeting EC/MS have confirmed that scope of study is all L7e-A 'heavy on-road quads' vehicles as defined by Article 74. Therefore all vehicles within this category must be considered and can only be excluded if valid reasons are given. For the same reasons vehicles outside this category are outside the scope of the study and should not be considered.

- Stakeholders noted that also vehicles with v_{max}<90 km/h (i.e. other sub-categories than L7e-A) could be involved in high speed crashes and therefore needed decent crash protection. JF replied by saying that Renault expects the Twizy not to be used much at high speeds on rural roads, because the 80 km/h maximum speed would make it uncomfortable to mix with rural traffic. MS/EC emphasised that the scope of this study was limited to L7e-A vehicles.

5.5. Other general questions

- Stakeholders pointed out that some relevant vehicle prototypes were not considered in the TRL report. **Action ME to consider the vehicle (prototypes) KTM X-Bow, Audi Urban Concept, VW Nils, TU Muenchen Visio.M, IMA Colibri and Loremo for the study.**
- TV emphasized that the scope of this study was limited to L7e-A sub-category vehicles only. **Action ME to adapt references in TRL report to L6e or whole L7e category as appropriate for the scope.**

5.6. Proposed safety items in detail

Note: When minuted below that concluded that initial proposal will be taken forward / supported, this is still subject to a cost benefit analysis to be performed in next phase of project.

5.6.1. Braking

- TRL's initial proposal: To be determined (TBD). Taking over UN R13-H would entail many additional requirements, most notably requirements for brake assist and ESC (including ABS).
- Stakeholder input:
  - Might increase cost and weight (electronic network and hydraulic pump needed for ESC).
  - ABS/ESC systems would need to be developed specifically for L-cat vehicles. ABS already available on motorcycles, but motorcycle braking systems are fundamentally different (2 actuators, "bending vehicle").
  - ABS and ESC seem sensible and possible, but probably not to meet all of the latest M_1 standards.

- Conclusion TRL: Require some form of ESC and ABS, but not full UN R13-H. Investigate whether provisions allow to use L-cat parts.

5.6.2. Frontal collision

- TRL's initial proposal: Mandate UN R94 with changes for narrow vehicles, e.g. 100% overlap instead of 40%.
- Stakeholder input:
  - 100% overlap would lead to higher deceleration and therefore a more stringent test regarding restraint systems and dummy numbers. 40% overlap would be more challenging for the compartment strength.
  - Cockpit designs will most likely not be two rail systems, but rather of monocoque type with stiff structure; engine will be located in the rear.
  - Existing deformable barrier would not be expected to bottom out in 100% overlap test.
- Conclusion TRL: Mandate UN R94 with 100% overlap with existing barrier because high decelerations can be expected in real-world accidents with heavier vehicles. A certain amount of additional work including testing would be necessary in phase 2 of the study to back up this suggestion.

5.6.3. Lateral collision

- TRL's initial proposal: Mandate UN R95. The barrier weight represents the impacting car, so the weight difference should not pose a problem. The existing barrier could bridge front and rear axle in short vehicles (which is not the case with M1 vehicles, for which the barrier was designed) making the test easier to pass. In real-world collisions (different angles, different impact location), the axles might not be able to fulfil this protecting function.
- Stakeholder input:
  - A certain side impact protection is needed and should not be negotiable.
  - Double seat belts might be required to help prevent ejection from the vehicle.
  - Cost to pass UN R95 will be dependent on the design of the vehicle.
  - Renault Twizy has been side impact tested; test video may be available on YouTube; may be tested by Euro NCAP in summer 2014; design of Renault Twizy is generally good for the side impact test because stiff structures in front and rear axle offer protection; the passenger in the Renault Twizy sits protected between rear wheels (does not apply to driver).
  - UN R95 might not be suitable for all future vehicle designs, for example due to different seating positions. ME asked for other potential minimum side impact requirements. No other requirements were brought forward by stakeholders.
  - MS/EC indicated that funding for the development of a new test procedure was not available from EC.
  - Virtual testing was suggested as alternative. After discussion, it was abandoned because too many issues such as model validation to be overcome at present.
- Conclusion TRL: No argument was brought forward that would justify not to require a certain level of side impact protection in L7e-A vehicles. As there are no suitable alternatives to UN R95 and no funding to develop a new test available, UN R95 should be mandated with the obligation to review this requirement after a period of time based on then existing accident data. The technical shortcomings of UN R95 are noted. Some further work may be needed in phase 2 of this study to assess this proposal more fully.

5.6.4. Pedestrian protection

- TRL's initial proposal: TBD. Potential use of L7e-A in urban environment suggests high priority. Taking over Regulation (EC) No 78/2009 has certain problems: For some vehicle designs only a very narrow part of the front end would be tested because the outer parts are only covers; no limit values are applied to head impact on windscreen, which might be the predominant impact location on some vehicle designs with short bonnets.
- Stakeholder input:
  - A vehicle manufacturer suggested that the current designs were not optimised for pedestrian protection because no legal requirements were set out.
  - The accident situation described in the Swedish study mentioned above indicates 90% of accidents being single vehicle accidents, in particular overturning. The details of pedestrian accidents in Sweden were unknown during the discussion.
- Conclusion TRL: Regulation (EC) No 78/2009 does not appear suitable for some potential L7e-A vehicle front end designs and no ideas were brought forward for adaptations. Pedestrian protection appears to be necessary, so it might be justified to develop new test specifications for future L7e-A vehicle front end designs.

5.6.5. Steering mechanism in frontal impact

- TRL's initial proposal: UN R12 is considered high priority for L7e-A2, if UN R94 is not mandated (otherwise already covered by UN R94). Not possible to apply immediately to L7e-A1 (handlebar to steer) or vehicles with alternative steering concepts, e.g. joysticks or steering mechanisms at the side of seats.
- Stakeholder input: No relevant stakeholder input to resolve the questions regarding alternative steering systems.
- Conclusion TRL: Mandate UN R12 for L7e-A2 (if UN R94 is not applied). Open issue: how to apply provisions to L7e-A1 if decided within scope?

5.6.6. Safety belt anchorages and ISOFIX anchorages

- TRL's initial proposal: Mandate the relevant parts of UN R14 (as defined in RVFSR, Annex XII) with regard to anchorages for safety belts for all L7e-A. Mandate ISOFIX anchorage related parts of UN R14 if manufacturer states children allowed to be transported in vehicle. Due to light weight, L7e-A vehicles are likely to experience high decelerations with high loads on restraint anchorages in accidents.
- Stakeholder input:
  - Renault Twizy meets the L-cat regulations for safety belt anchorages, but may not meet M1 levels, i.e. unknown because not tested to this level.
  - ISOFIX design can be problematic in narrow vehicles. UN GRSP is discussing changes to address these issues
  - No objections to proposal
- Conclusion TRL: Apply TRL's initial proposal taking into account possible changes to R14 mentioned above. **Action ME to discuss details of ISOFIX requirements with Peter Broertjes/EC.**

5.6.7. Safety belts and ISOFIX restraint system

- TRL's initial proposal: Mandate UN R16 with regard to Seat Belt Reminders (SBR). If vehicle can transport children (according to manufacturer), mandate UN R16 with regard to child restraint systems and ISOFIX.
- Stakeholder input:
  - Concerns were raised about a potentially high cost to benefit ratio of SBRs. In reply, a TRL study[4] was cited that identified SBRs as being cost beneficial for M_1 passenger seats and other M- and N-cat vehicles. An exemption of SBRs might be sensible for 4 or 5 point belts, because their design makes it very uncomfortable to sit on them when not worn.
  - ISOFIX design can be problematic in narrow vehicles. UN GRSP is discussing changes to address these issues
  - It is conceivable that L7e-A vehicles will be used by commuters to drop of children at school.
- Conclusion TRL: Mandate UN R16 with regard to SBRs; possibly define exemption for 4 and 5 point belts. If vehicle can transport children (according to manufacturer), mandate UN R16 with regard to child restraint systems and ISOFIX. **Action ME to discuss details of ISOFIX requirements with Peter Broertjes/EC.**

5.6.8. Steering equipment

- TRL's initial proposal: Mandate relevant parts of UN R79 if (electric) power steering is fitted.
- Stakeholder input:
  - L6e and L7e vehicles are light weight and will might often not be equipped with power steering at all.
  - Proposal was supported because of potential liability issues if fitted power steering fails.
- Conclusion TRL: Apply TRL's initial proposal.

5.6.9. Door latches and hinges

- TRL's initial proposal: TBD. Further work required to decide how to take novel door designs into account.
- Stakeholder input:
  - In cars, conventional doors fulfil the functions to retain occupants inside the vehicle while driving and in case of a crash (the risk to get ejected in rollover accidents is accepted for convertibles) and to provide an escape route after an accident.
  - Mandating UN R11 would impose high testing costs which might be unnecessary for certain door designs, for example where fixed side guards retain occupants inside the vehicle.
  - UN R94 requires to be able to escape after an accident, which in conventional cars in effect means to be able to open at least one door by applying a certain force. UN R11 does not contain provisions on escaping.
  - Requirements for escaping should be reviewed and applied to L7e-A. Requirements for racing cars were mentioned as potential source.

[4] M McCarthy and M Seidl, *Benefit assessment for fitment of Seat Belt Reminder (SBR) systems to M1 passenger seat positions and to other vehicle types*, TRL Limited, Wokingham, 2014

    - LV offered to provide draft legislative text. **Action LV to provide draft text on requirements for novel door/opening system designs.**
- Conclusion TRL: Mandate UN R11 for conventional and sliding doors. Create new requirements for novel door/opening system designs.

5.6.10. Interior fittings

- TRL's initial proposal: Mandate UN R21. This is regarded as foundation for UN R94 and UN R95 and is already fulfilled by some L7e vehicles. Uncertain about additional costs.
- Stakeholder input:
    - UN R21 does probably not incur high costs; considered mainly a question of design.
- Conclusion TRL: Apply TRL's initial proposal.

5.6.11. Seat strength

- TRL's initial proposal: Mandate UN R17 apart from luggage displacement prescriptions (considered unnecessary due to insufficient space in vehicles).
- Stakeholder input: No objections to proposal.
- Conclusion TRL: Apply TRL's initial proposal.

5.6.12. Lighting installation

- TRL's initial proposal: Mandate UN R48. This would require the fitment of reversing lamps, hazard warning signals and daytime running lights. The quality of components is also regulated. Explicitly allowing L-cat components for lights, bulbs, etc. could reduce costs.
- Stakeholder input:
    - It was suggested to amend RVFSR accordingly for all L6e and L7e vehicles. MS/EC and stakeholders emphasized that this was out of scope of the current study.
    - UN R48 will require automatic switch from daytime running lights to headlights in a few years.
    - No objections to proposal.
- Conclusion TRL: Apply TRL's initial proposal. **Action ME to investigate future requirements for automatic light switch.**

5.6.13. Sealed beam headlamps

- TRL's initial proposal: Mandate UN R31 if sealed-beam headlamps are fitted.
- Stakeholder input: No objections to proposal.
- Conclusion TRL: Apply TRL's initial proposal. **Action ME to gather input from Peter Broertjes/EC on requirements regarding sealed-beam headlamps.**

5.6.14. Adaptive front lighting systems

- TRL's initial proposal: Mandate UN R123 if adaptive front lighting systems are fitted.
- Stakeholder input: No objections to proposal.
- Conclusion TRL: Apply TRL's initial proposal.

5.6.15. Towing device

- TRL's initial proposal: Mandate Regulation (EU) 1005/2010 (this concerns towing devices for vehicle recovery in case of breakdown, not devices for towing trailers).
- Stakeholder input:
  - Differing opinions were brought forward: Some stakeholders supported the point that the decision should be left to manufacturers because there was little quantifiable benefit. Other stakeholders raised the point that towing devices were safety relevant in order to be able to escape unsafe situations (e.g. breakdown on major road) by help of other motorists.
  - MS/EC suggested to apply only strength requirements, if a towing device is fitted at the discretion of the manufacturer.
- Conclusion TRL: Various opinions. ME decided to keep TRL's initial proposal for the moment.

5.6.16. Forward field of vision

- TRL's initial proposal: Mandate UN R125.
- Stakeholder input:
  - Exemptions could be considered for novel designs with thin A-pillars (ca. 2 cm). These might not pose a big obstruction and could therefore be ignored when measuring the field of vision in narrow vehicles.
  - No objections to proposal.
- Conclusion TRL: Apply TRL's initial proposal. **Action ME to investigate potential exemptions for thin A-pillars.**

5.6.17. Windscreen defrosting and demisting

- TRL's initial proposal: Mandate Regulation (EU) No 672/2010.
- Stakeholder input:
  - These requirements were requested by the technical authority for Renault Twizy. The devices proved to be not as energy consuming as Renault initially thought.
  - No objections to proposal.
- Conclusion TRL: Apply TRL's initial proposal

5.6.18. Windscreen wiper and washer systems

- TRL's initial proposal: Mandate Regulation (EU) 1008/2010.
- Stakeholder input: No objections to proposal.
- Conclusion TRL: Apply TRL's initial proposal.

5.6.19. Heating systems

- TRL's initial proposal: Mandate UN R122, Part II (safety) if a heating system is fitted .
- Stakeholder input: No objections to proposal.
- Conclusion TRL: Apply TRL's initial proposal.

5.6.20. Wheel guards

- TRL's initial proposal: Mandate Regulation (EU) 1009/2010 to reduce spray at higher speeds and protect vulnerable road users.

- Stakeholder input: No objections to proposal.
- Conclusion TRL: Apply TRL's initial proposal.

5.6.21. Head restraints

- TRL's initial proposal: Mandate UN R25.
- Stakeholder input: No objections to proposal.
- Conclusion TRL: Apply TRL's initial proposal.

5.6.22. Spare wheels, run flat tyres, tyre pressure monitoring systems (TPMS)

- TRL's initial proposal: TBD. Possibly mandate UN R64.
- Stakeholder input:
  - MS/EC: TPMS for cars were introduced as a measure to reduce CO_2 emissions. The benefit for L7e vehicles would be smaller because of lower mass. Therefore, TPMS should not be required.
  - Vehicle manufacturers suggested they would oppose requirements for spare wheels, run flat tyres or tyre emergency repair kits, because these are not required for three-wheeled vehicles and L7e-A vehicles were intended for short distance travel only.
- Conclusion TRL: Do not set out requirements.

5.6.23. Recyclability

- TRL's initial proposal: Mandate Directive 2005/64/EC for all L-cat vehicles.
- Stakeholder input:
  - Out of scope of the project (not safety related, only dealing with L7e-A).
  - MS/EC: Agreed, out of scope.
- Conclusion TRL: Do not set out requirements.

5.6.24. Hydrogen system

- TRL's initial proposal: Mandate Regulation (EC) 79/2009 for all L-cat vehicles if hydrogen is used.
- Stakeholder input:
  - Should not be applied to all L-cat vehicles (out of scope of the project).
  - This was potentially covered in the "new technology article" and, therefore, at the discretion of the technical authority.
- Conclusion TRL: If provisions are to be applied, only to L7e-A (scope). **Action ME to review provisions in "new technology article".**

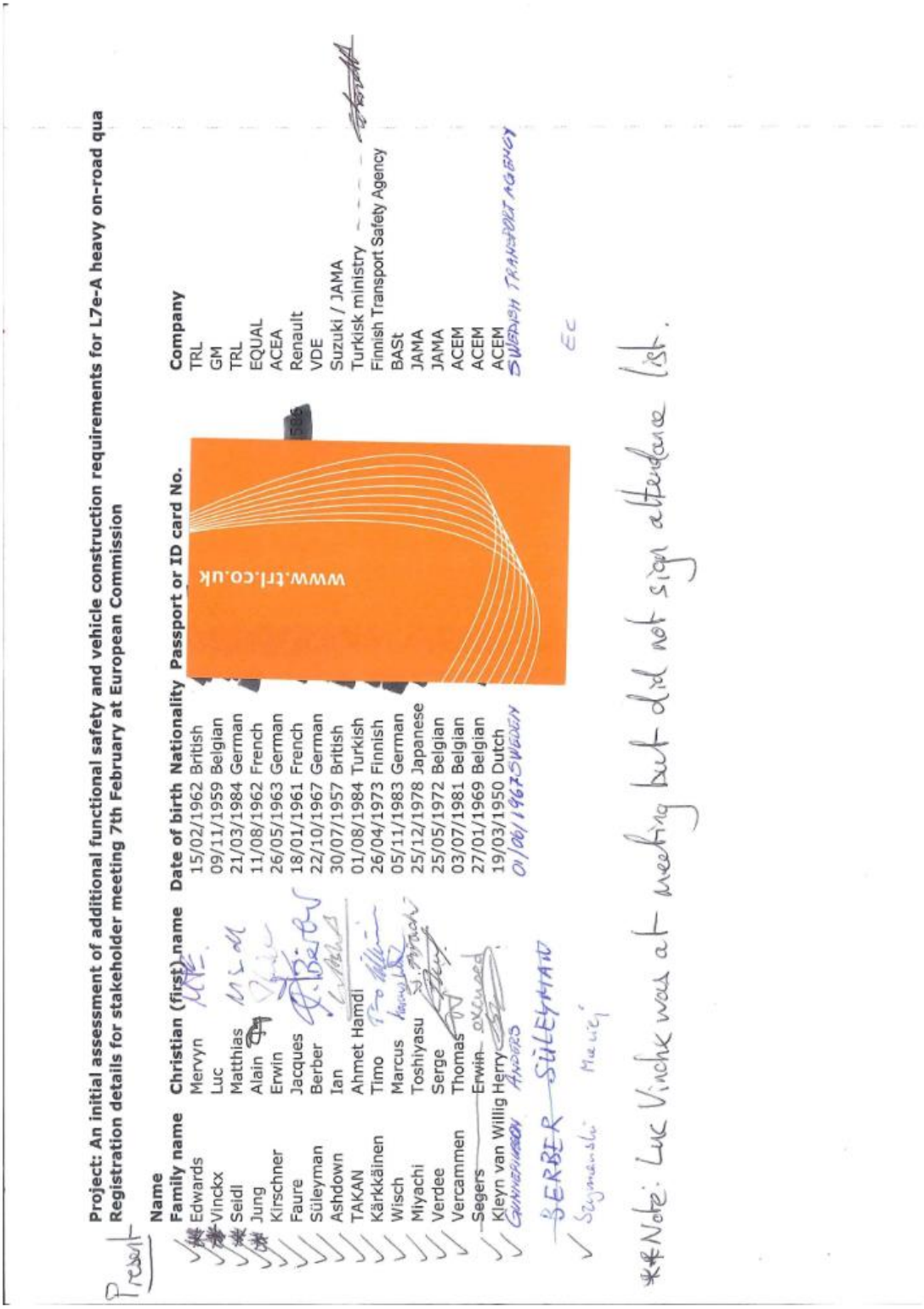
5.6.25. Gear shift indicators

- TRL's initial proposal: Adopt Regulation (EU) 65/2012 for L7e-A.
- Stakeholder input:
  - Most vehicles expected to be electric, some might have continuous variable transmission (CVT).
  - MS/EC: Not safety related, therefore out of scope.
- Conclusion TRL: Do not set out requirements.

6. AOB

- TV stressed that the motorcycle industry needed stability in L-cat regulations now.
- MW raised the question whether active safety systems might replace some of the discussed measures (for example Automatic Emergency Breaking Systems instead of pedestrian impact requirements). MW emphasised that this does not imply a personal preference of his for active safety measures.
- MS/EC thanked the participants of the meeting for their contributions and asked for further input in the future, in particular on fleet size, expected use and accident data.

Annex 1: Attendance list



Present

Project: An initial assessment of additional functional safety and vehicle construction requirements for L7e-A heavy on-road qua
Registration details for stakeholder meeting 7th February at European Commission

Name						
Family name	**Christian (first) name**	**Date of birth**	**Nationality**	**Passport or ID card No.**	**Company**
Edwards	Mervyn	15/02/1962	British		TRL
Vinckx	Luc	09/11/1959	Belgian		GM
Seidl	Matthias	21/03/1984	German		TRL
Jung	Alain	11/08/1962	French		EQUAL
Kirschner	Erwin	26/05/1963	German		ACEA
Faure	Jacques	18/01/1961	French		Renault
Süleyman	Berber	22/10/1967	German		VDE
Ashdown	Ian	30/07/1957	British		Suzuki / JAMA
TAKAN	Ahmet Hamdi	01/08/1984	Turkish		Turkisk ministry
Kärkkäinen	Timo	26/04/1973	Finnish		Finnish Transport Safety Agency
Wisch	Marcus	05/11/1983	German		BASt
Miyachi	Toshiyasu	25/12/1978	Japanese		JAMA
Verdee	Serge	25/05/1972	Belgian		JAMA
Vercammen	Thomas	03/07/1981	Belgian		ACEM
Segers	Erwin	27/01/1969	Belgian		ACEM
Kleyn van Willig	Herry	19/03/1950	Dutch	01/06/1967 SWEDEN	ACEM

BERBER SÜLEYMAN

**Note: Luc Vinckx was at meeting but did not sign attendance list.

Annex 2: List of actions

1. Action AG to make Swedish study available via CIRCA.
2. Action ME to consider the vehicle (prototypes) KTM X-Bow, Audi Urban Concept, VW Nils, TU Muenchen Visio.M, IMA Colibri and Loremo for the study.
3. Action ME to adapt references in TRL report to L6e or whole L7e category as appropriate for the scope.
4. Action ME to discuss details of ISOFIX requirements with Peter Broertjes/EC.
5. Action LV to provide draft text on requirements for novel door/opening system designs.
6. Action ME to investigate future requirements for automatic light switch.
7. Action ME to gather input from Peter Broertjes/EC on requirements regarding sealed-beam headlamps.
8. Action ME to investigate potential exemptions for thin A-pillars.
9. Action ME to review provisions in “new technology article”.