Informal document **GRSG-118-36**
(118th GRSG, 15-17 July2020,
Agenda item 5)

THE FUTURE OF TRANSPORT

Moving Off Information Signal (MOIS) Regulation

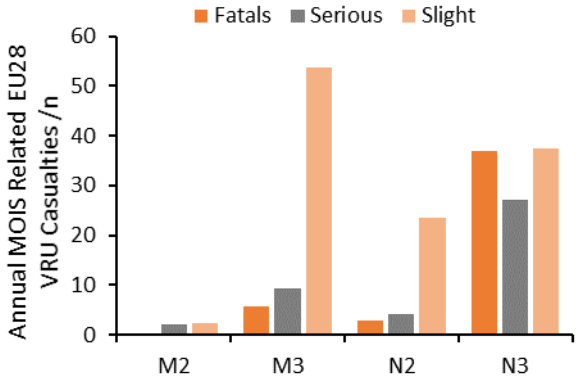
Overview of Regulation Proposed by VRU-Proxi IWG GRSG-118

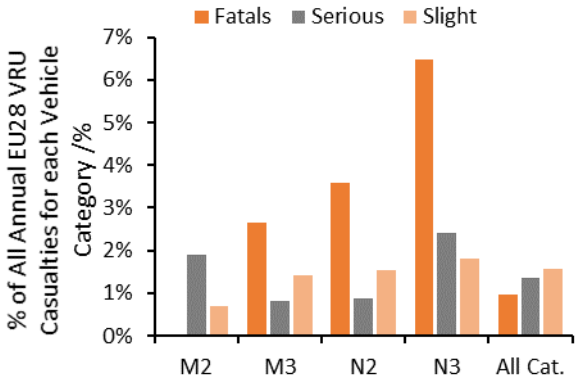
16th July 2020

Collision Scenarios to be Addressed

Characteristics of Moving Off from Rest Collisions

- A substantial number of VRUs are involved in collisions with heavy vehicles moving off from rest (~£98M /year)
- More severe consequences for heavier (M2/M3/N2/N3) vehicles, compared to light vehicles
- Key VRUs involved include pedestrians and cyclists
- Key collision scenarios characteristics include:
  - **Crossing VRU:** VRU (ped/cyclist) crossing in front of stationary heavy vehicle which subsequently moves off from rest
  - **Longitudinal cyclist:** Cyclist located in carriageway in front of stationary heavy vehicle with heavy vehicle either moving off before or at same time as (but faster than) cyclist
  - **Blind spots:** VRUs "located in vehicle blind spot" at critical point in time in 30% of MOIS related collisions
  - **Driver looked but didn't see:** Driver "failed to look properly" at critical point in time in 49% of MOIS related collisions





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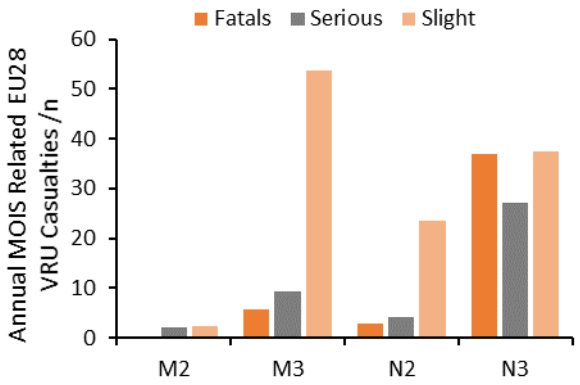

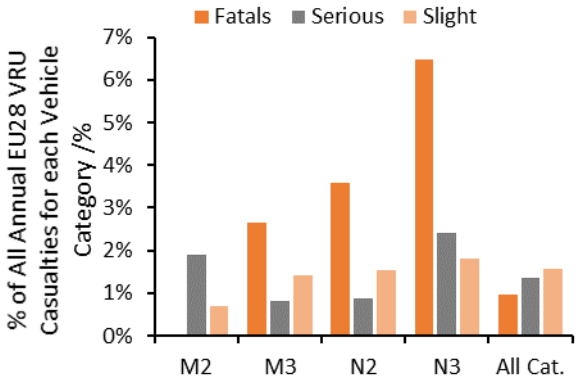

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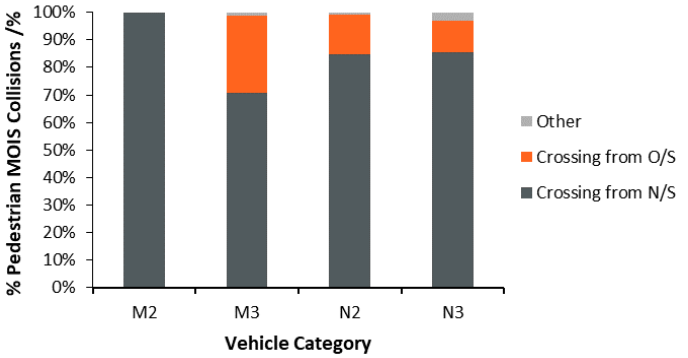
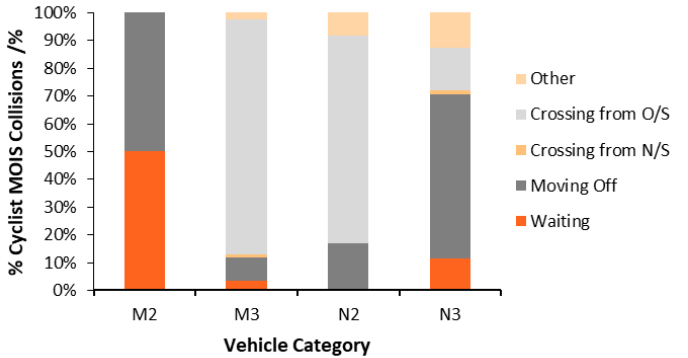
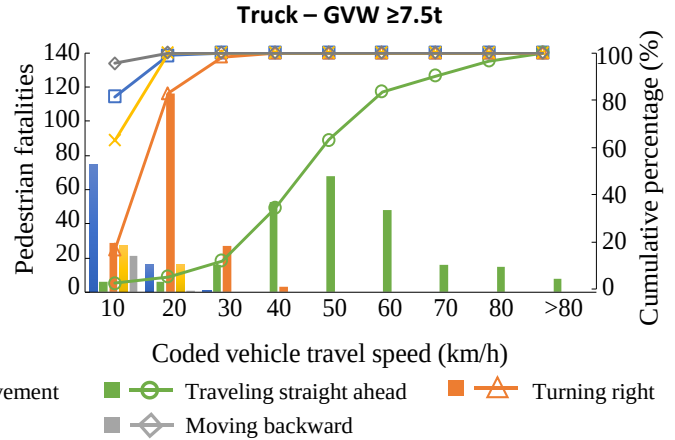




Key MOIS Regulation Requirements

The regulatory solution for the safety problem

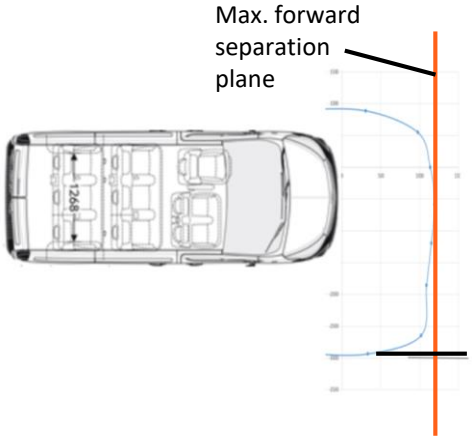
- Regulation drafted based on VRU-Proxi IWG consensus
- Scope of regulation:
  - Vehicle categories: M2, M3, N2, N3
  - VRUs: Adult/child pedestrians, adult/child cyclists
- System functionality:
  - Detection of presence of VRUs in close proximity to vehicle front
  - Provision of signal to alert driver of VRU presence
    - Information signal (medium-urgency, low-intrusion)
    - Collision warning signal (high-urgency, high-intrusion)
- Applicable vehicle manoeuvres:
  - Stationary while preparing to move off from rest
  - Moving off from rest in a straight line
  - Moving ahead slowly in a straight line
  - Operational at vehicle speeds of ≤10 km/h

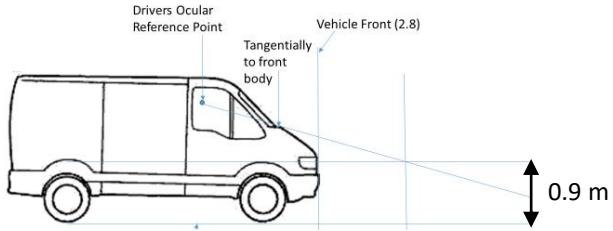


Key MOIS Regulation Requirements

The regulatory solution for the safety problem

- VRU manoeuvres:
  - Pedestrians:
    - Crossing perpendicular from nearside and offside, vehicle stationary
  - Cyclists:
    - Crossing perpendicular from nearside and offside, vehicle stationary
    - In carriageway, while stationary
    - In carriageway, while moving off in same direction as vehicle
  - Speeds:
    - Pedestrian/cyclist crossing: 3-5 km/h
    - Cyclist in carriageway: 0-10 km/h
- Vehicle blind spot:
  - Detection of VRU required within forward blind spot of vehicle
  - Maximum forward extent of blind spot used to determine detection zone size

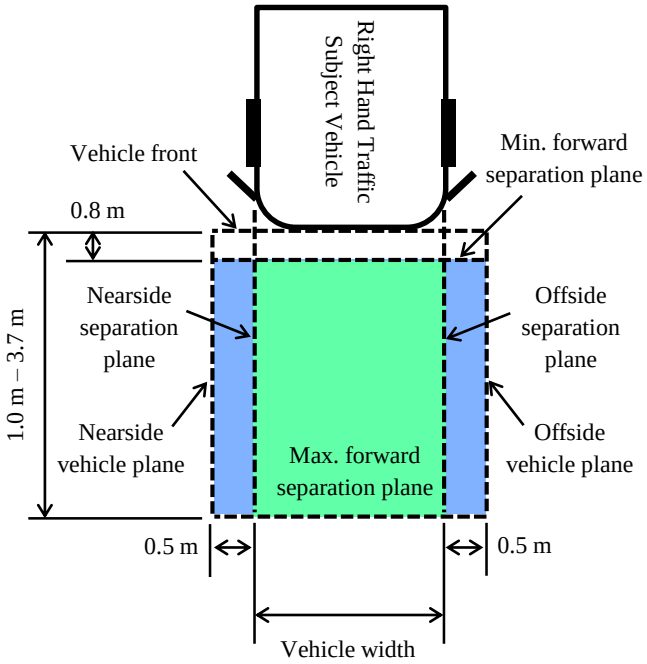




Key MOIS Regulation Requirements

The regulatory solution for the safety problem

- Detection zone:
  - Trade off between true positives (detection of VRUs at risk) and false positives (detection of VRUs not at risk)
    - Larger detection zones increase the likelihood of false positives
    - More false positives => lower driver acceptance => less safe system
    - Requirement to document efforts for reducing false positives
  - Maximum forward separation plane
    - Based on most forward point of the blind spot boundary
    - Maximum of 3.7 m, minimum of 1.0 m, from vehicle front
  - Minimum forward separation plane
    - Distance of 0.8 m from vehicle front
  - Nearside/offside separation planes
    - Dependent on vehicle manoeuvre
    - *Potential moving off manoeuvre*: 0.5 m outboard from vehicle width
    - *Low speed manoeuvre*: in line with vehicle width (vehicle trajectory)



Key MOIS Regulation Requirements

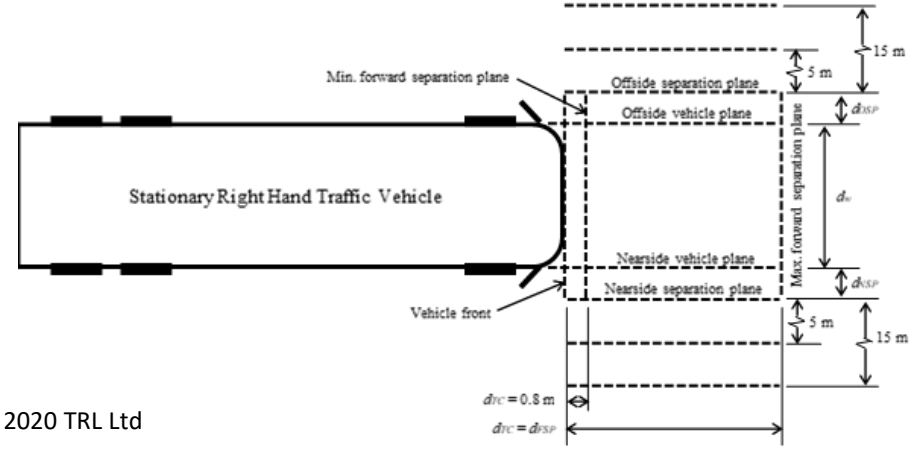
The regulatory solution for the safety problem

- MOIS deactivation:
  - Automatic deactivation: if malfunction, contamination or low ambient light (≤15 lux)
  - Manual deactivation: through a sequence of intentional actions
- Human-Machine Interface (HMI):
  - Information signal
    - Medium-urgency, low-intrusion signal
    - Advance alert for presence of VRUs in close-proximity to front
    - Optical signal only
  - Collision warning signal
    - High-urgency, high-intrusion signal
    - Manufacturer defined strategy to alert driver of imminent collision
    - At least two signal modes provided from optical, acoustic and haptic (optical signal shall be different from information signal)
  - Failure warning signal
    - Signal to alert driver of automatic deactivation
    - Optical signal only – shall be different from information signal

Test Specifications

Type Approval testing

- Static Crossing Tests:
  - Subject vehicle stationary, gear engaged, test planes marked out
  - Pedestrian/cyclist test targets (based on ISO 19206) move at range of test speeds perpendicular to vehicle at range of distances from front of vehicle within detection zone
  - Information signal shall be provided before test target reference point passes nearside/offside separation planes and until at least test target reference point passes the opposite separation plane
  - Performed for two tests from Table 1 Appendix 1 and one additional test not in Table

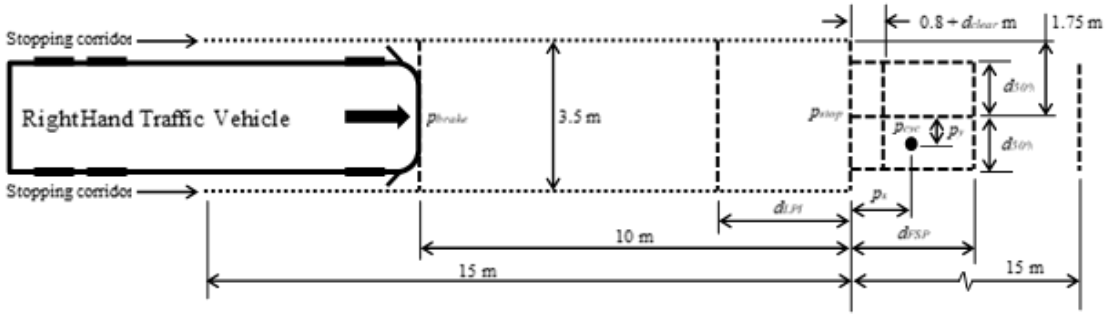


Test Case	Soft Target (T)	Test Case Distance (d_{TC}) /m	Crossing Direction (c)	Soft Target Speed (v) /km/h	Distance to Last Point of Information (d_{LPI}) /m
1	Child Pedestrian	0.8	Nearside	3	d_{NSP}
2	Adult Pedestrian	d_{FSP}	Nearside	3	d_{NSP}
3	Adult Cyclist	0.8	Offside	3	d_{OSP}
4	Adult Cyclist	d_{FSP}	Nearside	5	d_{NSP}
5	Adult Pedestrian	0.8	Offside	5	d_{OSP}
6	Child Pedestrian	d_{FSP}	Offside	5	d_{OSP}

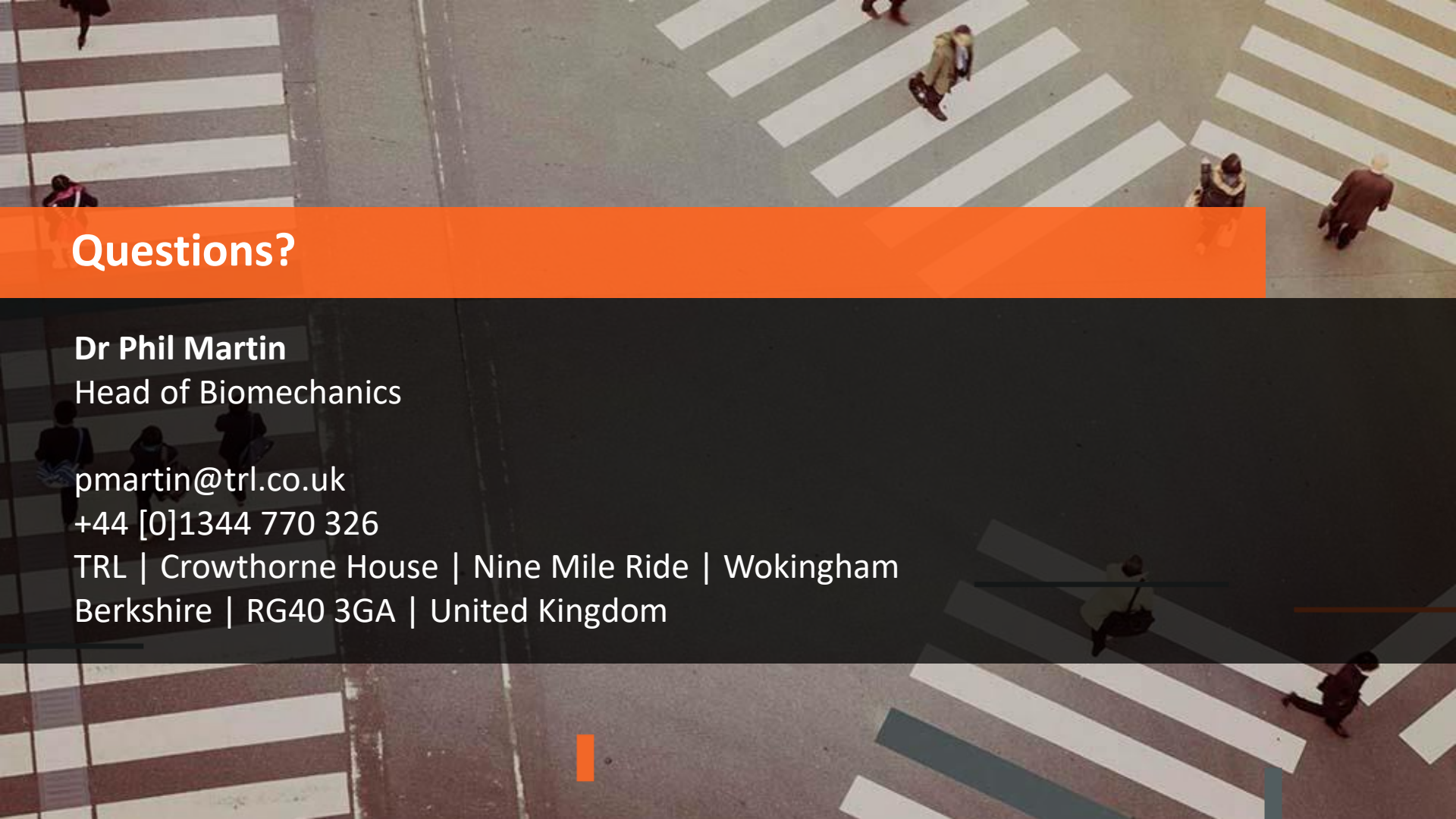
Test Specifications

Type Approval testing

- Longitudinal Tests:
  - Subject vehicle travelling at 10 km/h and braking to a stop, before area where test planes marked out
  - Cyclist test targets stationary at a range of positions in front of vehicle within detection zone
  - Cyclist moves off from rest either with or without subject vehicle also moving off from rest
  - Information signal shall be provided before subject vehicle reaches a distance from the test target reference point equivalent to the maximum forward separation distance and shall be maintained for at least as long as the cyclist is located within the detection zone
  - Performed for two tests from Table 2 Appendix 1 and one additional test not in Table



Test Case	Test Target (T)	Distance to Forward Cyclist Start Point (p_x) /m	Distance to Lateral Cyclist Start Point (p_y) /m	Distance to Last Point of Information (d_{LPI}) /m
1	Adult Cyclist	$0.8 + d_{clear}$	$+d_{50\%}$	$d_{FSP} - 0.8 - d_{clear}$
2	Adult Cyclist	$0.8 + d_{clear}$	0.0	$d_{FSP} - 0.8 - d_{clear}$
3	Adult Cyclist	$0.8 + d_{clear}$	$-d_{50\%}$	$d_{FSP} - 0.8 - d_{clear}$
4	Adult Cyclist	$d_{FSP} - 0.1$	$+d_{50\%}$	0.1
5	Adult Cyclist	$d_{FSP} - 0.1$	0.0	0.1
6	Adult Cyclist	$d_{FSP} - 0.1$	$-d_{50\%}$	0.1



Questions?

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