



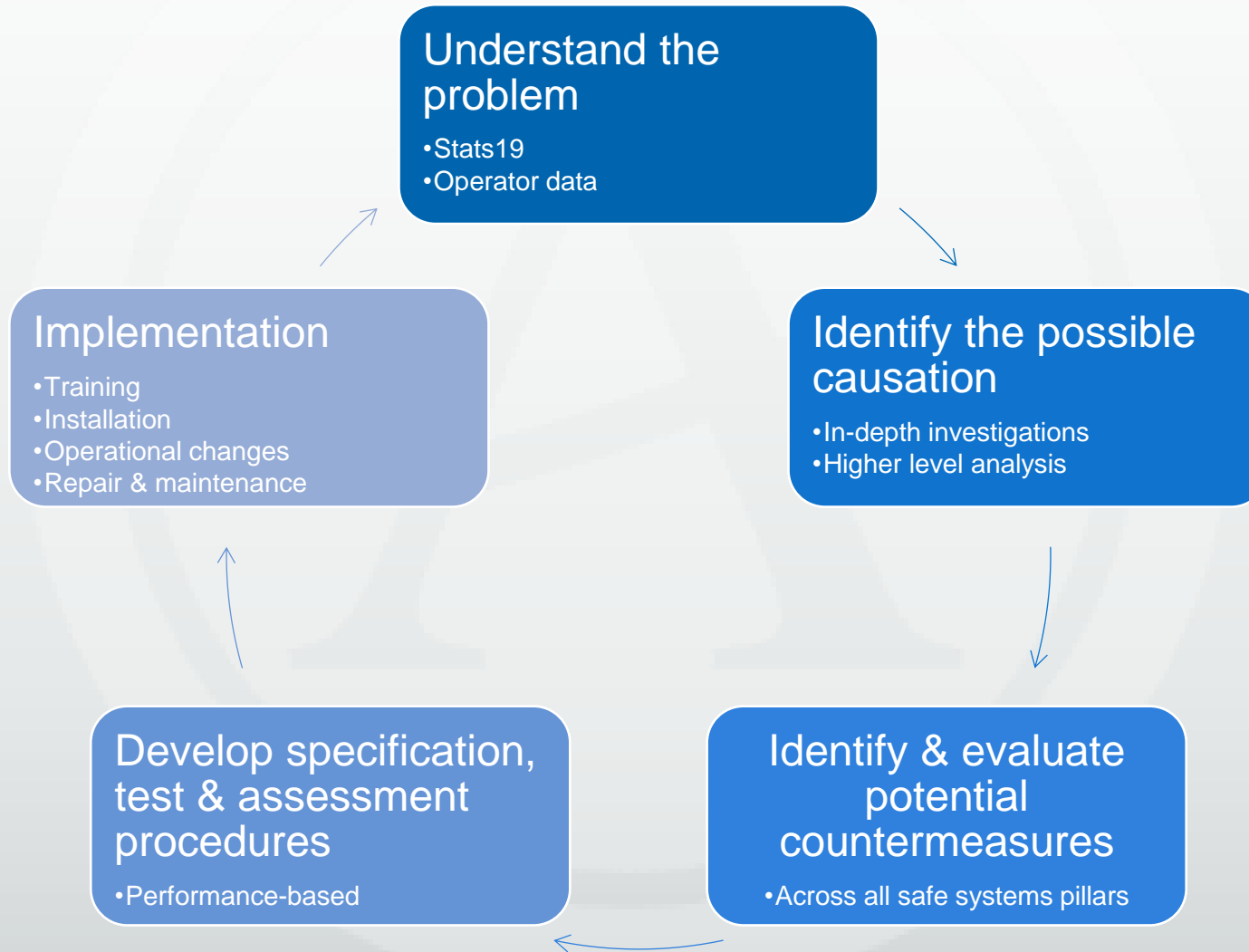
Bus Safety – Implementing Technology to Reduce Casualties



Agenda

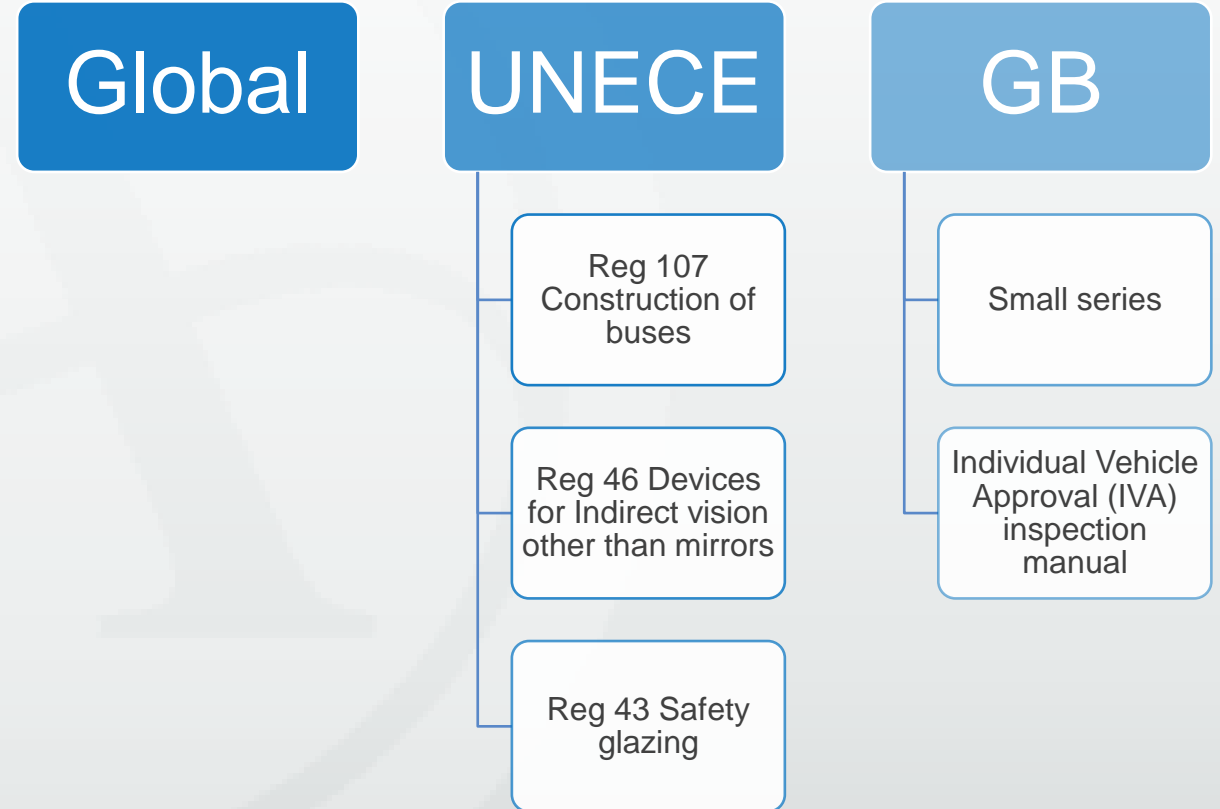
- Introduction
- Mandatory Regulation
- Voluntary standards
- Consumer testing
- Procurement tools
- Summary

Building an evidence base



Regulations: Mandatory

- Mandatory requirement
 - First date for new types, second date (usually 2-3 years later) for all new vehicles
 - GB, UNECE, Global
 - Type approval / certification of new vehicles



And many others, non-exhaustive list...

International Standards: Voluntary

- Provide uniformity of approach
- ISO 16121 on bus driver cab design
 - Followed by many manufacturers
- Voluntary, so no independent conformity/certification; only self-checks by manufacturers and evidence packs if required

Consumer Testing: Voluntary

- Euro NCAP for example tests car, vans and now trucks
 - Star rating scheme; rewards best practice
 - Publication of safety ratings can influence sales
 - Puts pressure on manufacturers to perform well
 - Drives improved performance over time
- Test houses perform testing of vehicles sponsored by Euro NCAP members and manufacturers
- No independent bus safety testing schemes as yet...



Procurement: Fleet influence

- Voluntary for transport authority / fleet operators
- Mandatory for bus manufacturers and their supply chain in order to win contracts
- Faster paced
- At risk – regulations that follow might differ
- Bus vehicle specifications
 - Range of complexity and topics
 - Conformity assessments:
 - New vehicles:
 - Testing by independent test houses
 - Evidence pack supplied by manufacturers
 - In-service
 - Audit checks

Transport for London's Bus Safety Standard

- Vision Zero targets:
 - 2030: No one killed in or by a London bus
 - 2041: Zero fatalities or serious injuries on London's roads



Baseline

- Definition of the problem, including collision analysis
- Definition of the outcomes
- Benchmarking



Identification of countermeasures

- Development of a long list of measures
- Prioritisation
- Business Case development



Development

- Concept development and trials
- Analysis and evaluation of measures
- In-depth research for each countermeasure



Implementation

- Development of the Roadmap
- Specification and assessment procedures for each measure
- launch

Stakeholder engagement

BSS: Categories

Driver Assist

- Helping the driver to avoid or mitigate the severity of incidents
 - Automated Emergency Braking (AEB)
 - Intelligent Speed Assistance (ISA)
 - Improved vision
 - Runaway bus prevention
 - Pedal Application Error (PAE)

Partner Assist

- Helping other road users to avoid collisions
 - Acoustic Vehicle Alerting System (AVAS)

Bus Safety Standard

Occupant Protection

- Reducing injury severity for bus passengers and drivers
 - Occupant friendly interiors
 - Slip resistant flooring

Partner Protection

- Reducing injury severity for other road users
 - Vulnerable Road User frontal crashworthiness

BSS Roadmap

		2018	2019	2020	2021	2022	2023	2024	2025	2026	onwards	
Driver Assist	Intelligent Speed Assistance (ISA)	Standalone mandatory	Required									
	Advanced Emergency Braking (AEB)	Car, Pedestrian & Cyclist partners		Preferred				Required				
	Runaway Bus Prevention	Interlock system		Preferred	Required							
	Pedal Application Error – Foot placement	Brake toggling		Preferred	Required							
		Pedal standardisation			Preferred	Required						
	Pedal Application Error – Recovery	Pedal indicator lights		Required								
		Pedal acoustic feedback		Preferred	Required							
	Pedal Application Error – Intervention	AEB logic			Preferred				Required			
		Vision – Direct & indirect vision standard	Direct vision		Preferred	Required						
	Enhanced indirect vision				Preferred				Required			
	Class II CMS				Preferred	Required						
	Blind spot Mirrors			Required								
	Blind spot CMS				Preferred	Required						
	Vision – Internal obscuration	Reversing CMS		Required								
		Front & Nearside			Preferred				Required			
Driver assault screens			Required									
Partner Assist	Acoustic Conspicuity	Acoustic Vehicle Alerting System	Required									
Partner Protection	VRU Frontal Crashworthiness – Bus front end design	Minimum geometry		Preferred	Required							
		Optimised geometry				Preferred		Required				
	VRU Frontal Crashworthiness – VRU impact protection	Energy absorption				Preferred		Required				
		Wiper protection		Preferred	Required							
VRU Frontal Crashworthiness – Mirror strike protection	Class II CMS			Preferred	Required							
Occupant Protection	Occupant Friendly Interiors – Visual inspection & design	Level 1 requirements		Preferred	Required							
		Level 2 requirements			Preferred			Required				
	Occupant Friendly Interiors – Slip protection	Surface friction requirements		Required								

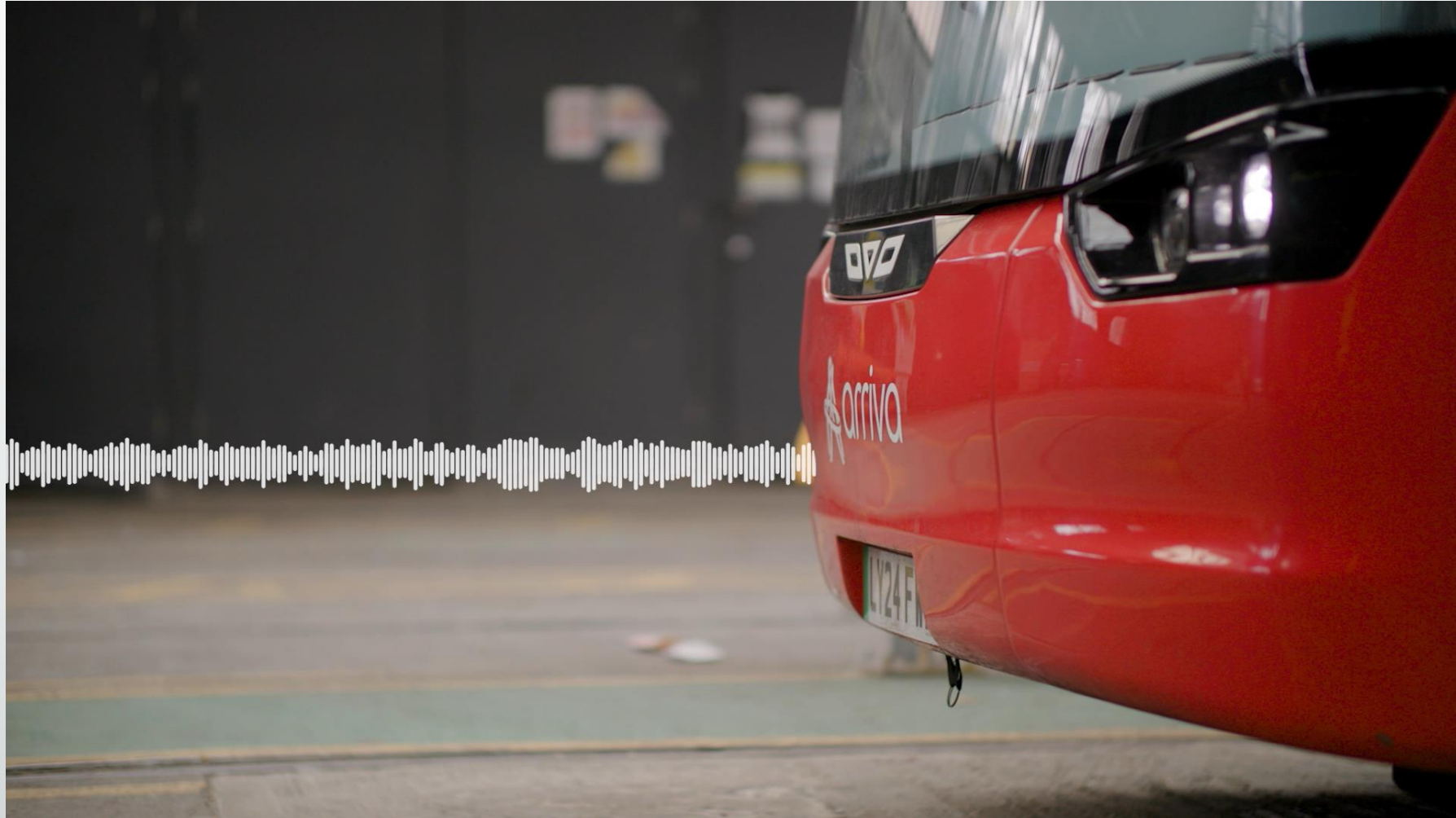
Camera Monitor System

- Blind spot mirrors
- Camera monitor system:
 - Improving close proximity indirect vision
 - Prevent head strikes by side mirrors
- And the future? Integration of Blind Spot Information System (BSIS)



Acoustic Vehicle Alerting System (AVAS)

- Based on Regulation 138; implemented sooner



VRU Crashworthiness: Front end geometry

Changing the shape of the bus front end to better deflect Vulnerable Road Users (VRUs) and prevent runovers



Old

New

- Works better with technology:
 - Intelligent Speed Assistance (ISA) - prevent speeding
 - Advanced Emergency Braking (AEB) - emergency braking if driver unresponsive



The speed of this bus is restricted to the local limit



Conclusion

Summary

- Regulation – strongest influence on fleet – slowest moving
- [ISO] Standards – help to provide international consistency – no enforcement
- Procurement standards – innovative, fast, set requirements above regulation – effort to develop and implement

Questions?

- Keep challenging the manufacturers to improve designs, use technology, and integrate systems to improve uptake
 - Need right influence (regs/procurement)
- What aspects of procurement standards can be used to influence regulatory and international standards development?
- How can procurement standards be rolled out more widely nationally?
 - Greater evidence base, greater economies of scale
- Renewing fleet for Zero Emissions; improve safety too?