

Future Trends in Truck and Trailer Technology

**Institute of Road Transport
Engineers Conference – Rotorua
13 - 15 July 2004**

Doug Latto

Background

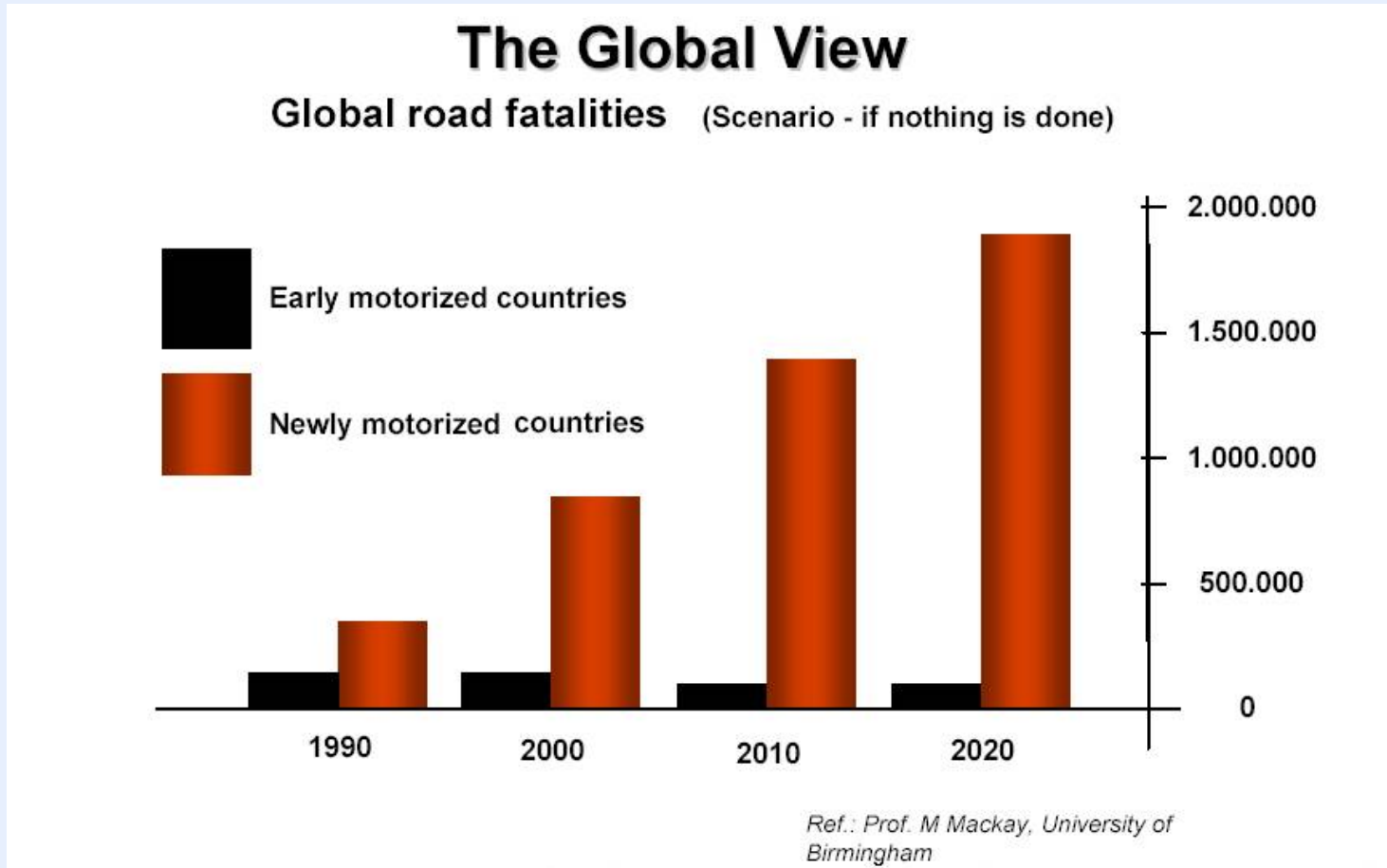
- It is estimated that by 2020 more than 2 million people worldwide will die each year in traffic related fatalities
- Driver error is a major factor in 70% – 90% of all traffic crashes
- The social cost of road transport crashes in NZ is estimated to be \$775 per person per year
- Heavy vehicle travel has been increasing on average by 4.5% over the last 7 years – increasing congestion and emissions

Background

- Because of the drive to reduce the number of fatal and injury accidents in the US and EU, major multi-year intelligent vehicle programs are being conducted. The aim of these programs is to develop new technologies that will reduce the accident rate and the consequences of an accident when it occurs.
- The development of electronic systems to assist the driver and monitor the vehicle is a rapidly growing area, with significant developments having occurred in the last 3 years

Future Trends in Truck and Trailer Technology

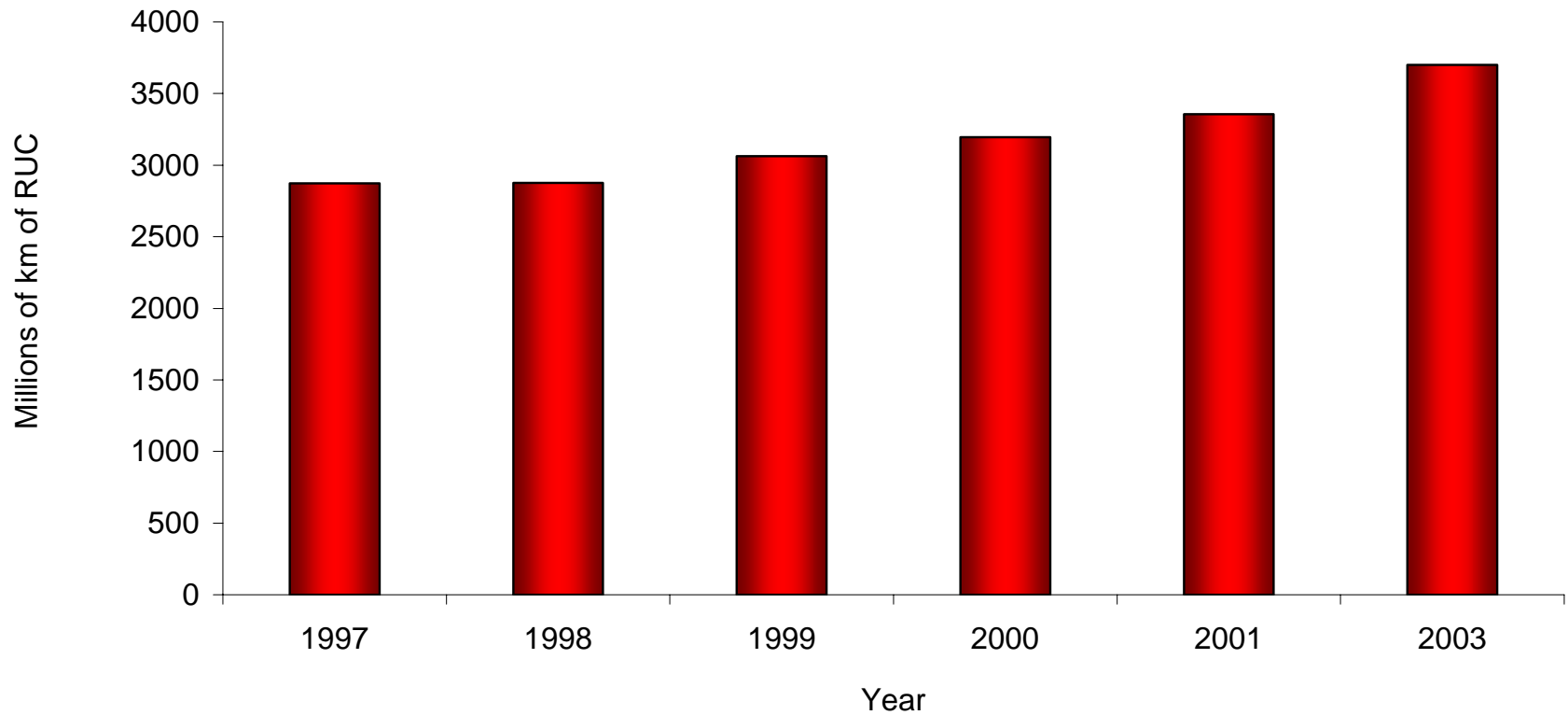
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Background

Total RUC Purchased in Kilometres for Heavy Vehicles



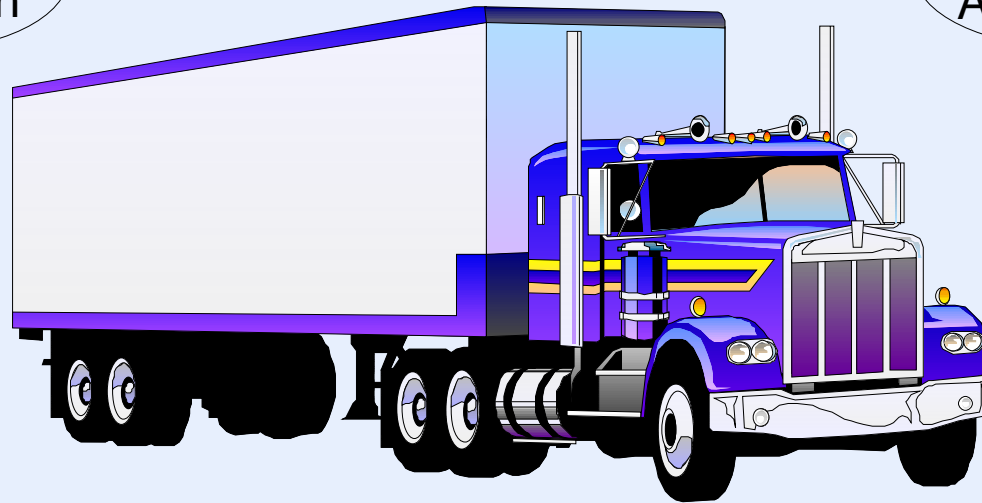
Vehicle
Monitoring

Crash
Mitigation

Crash
Avoidance

Brakes

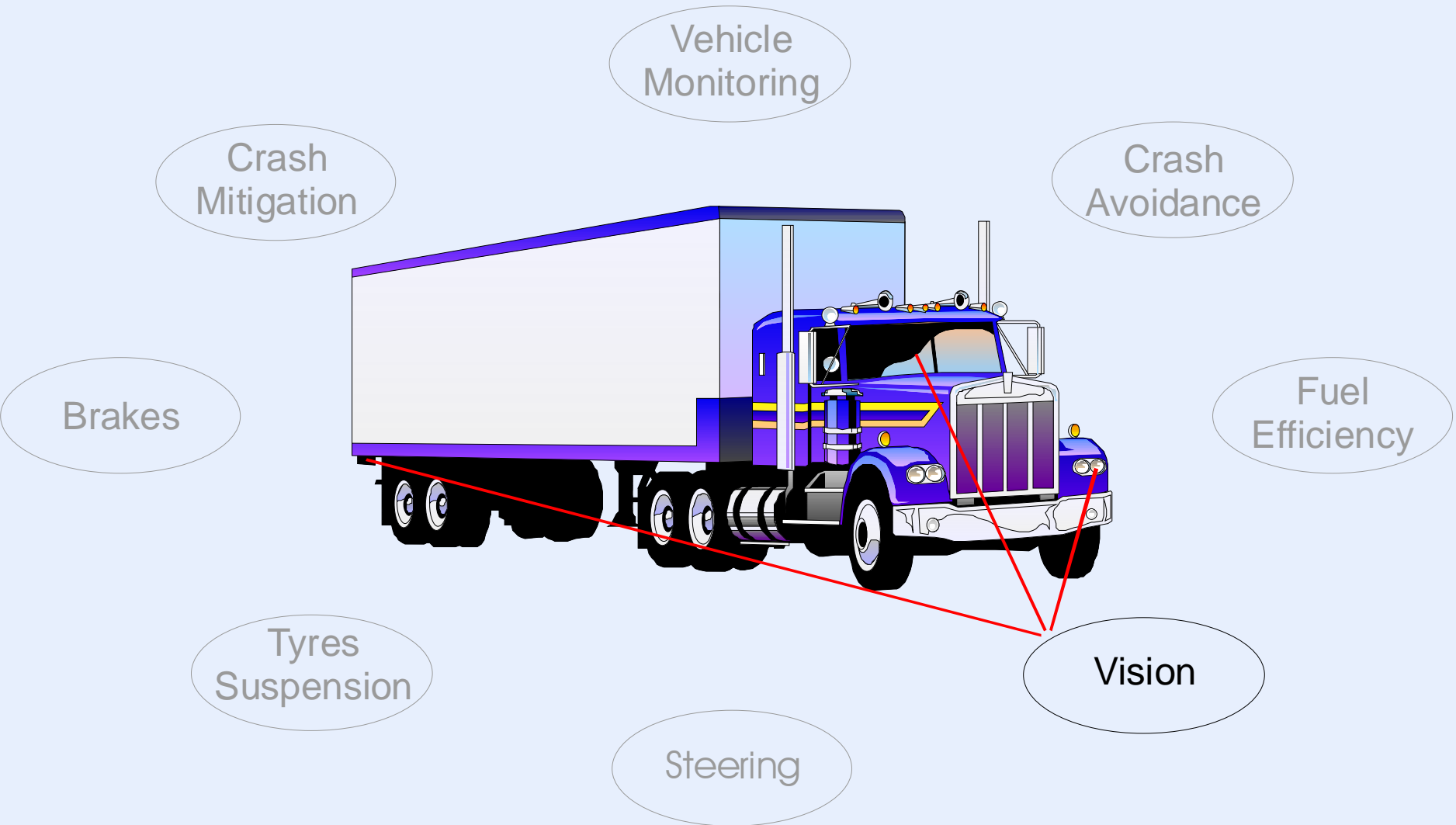
Fuel
Efficiency

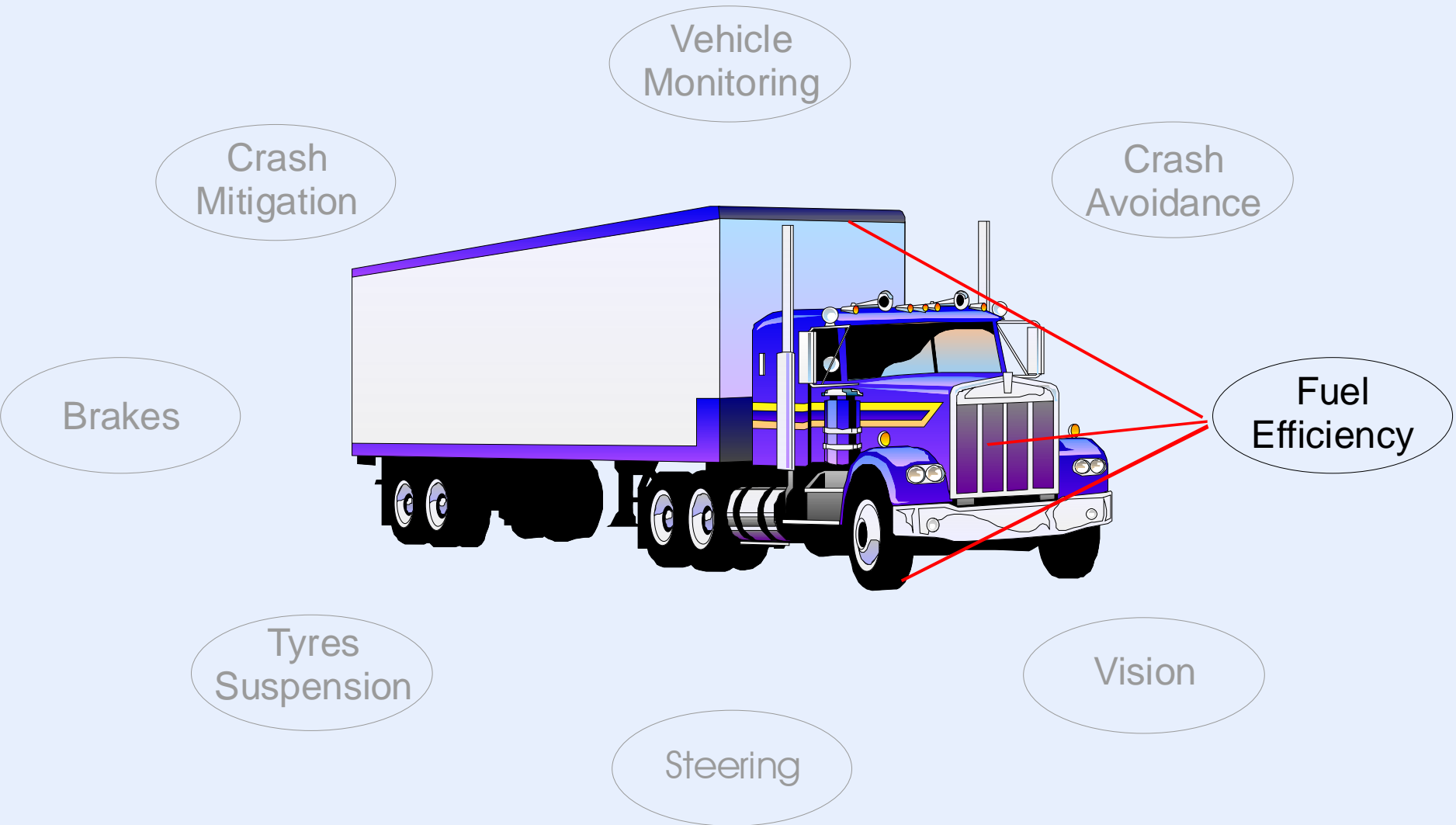


Tyres
Suspension

Vision

Steering





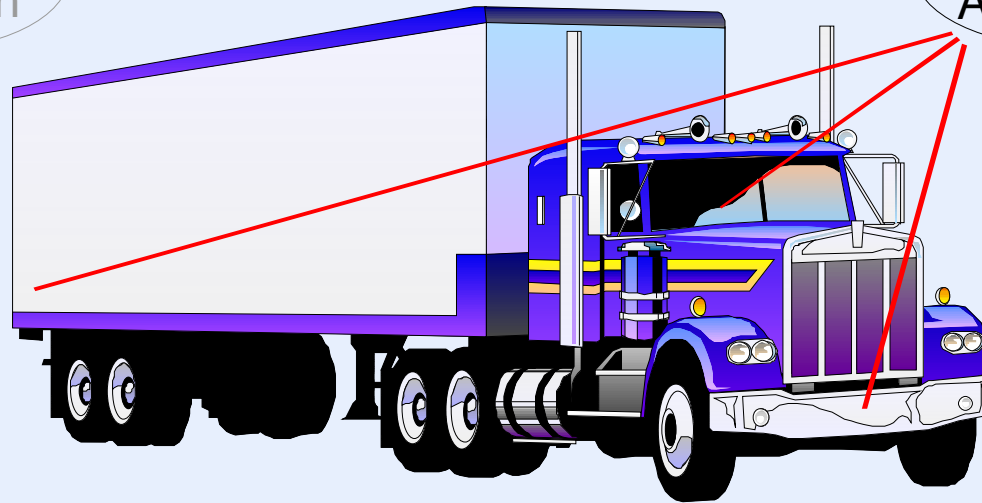
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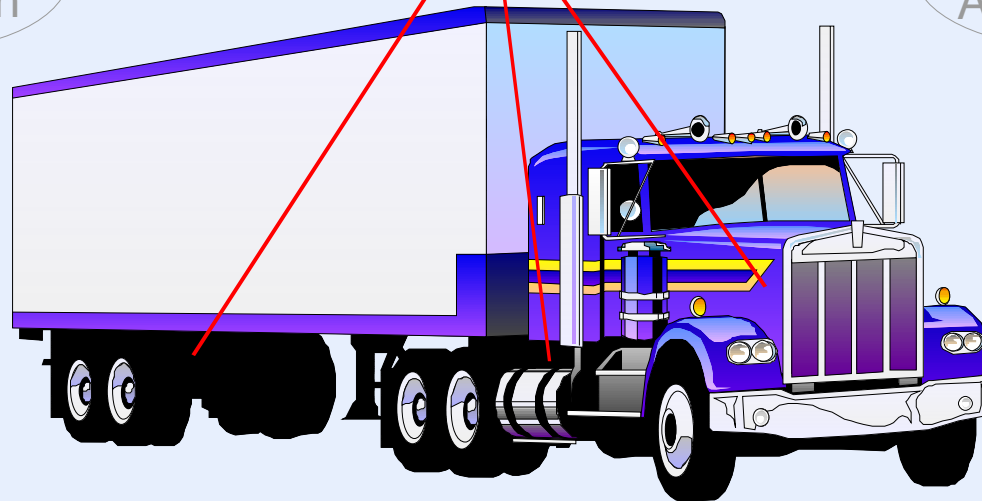
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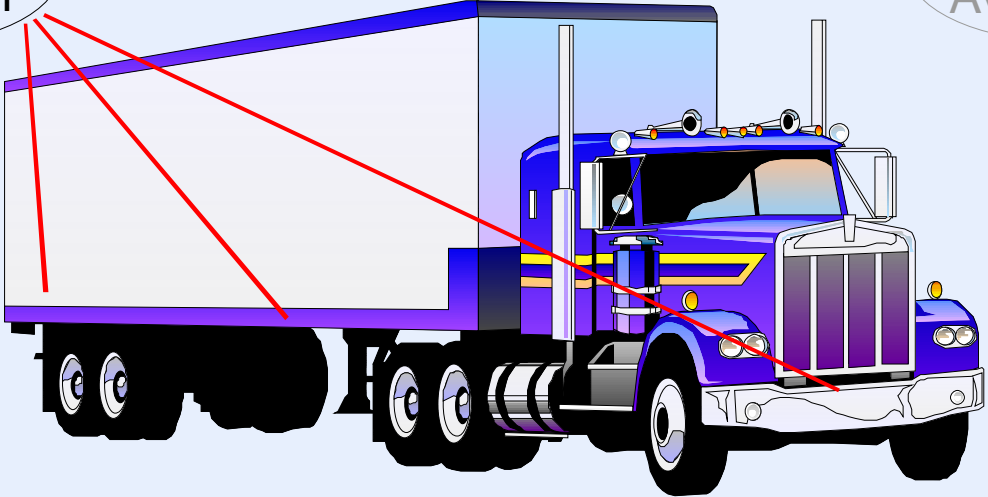
Vehicle Monitoring

Crash Mitigation

Crash Avoidance

Brakes

Fuel Efficiency



Tyres Suspension

Vision

Steering

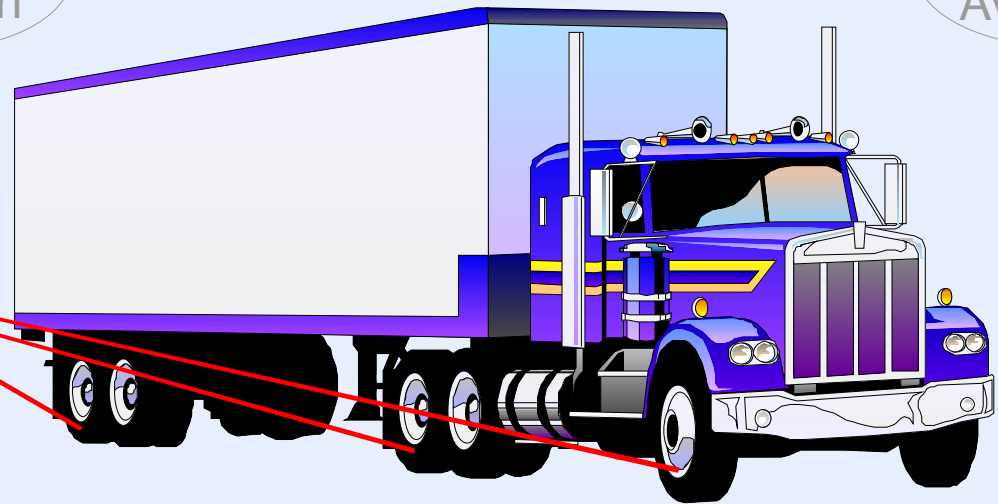
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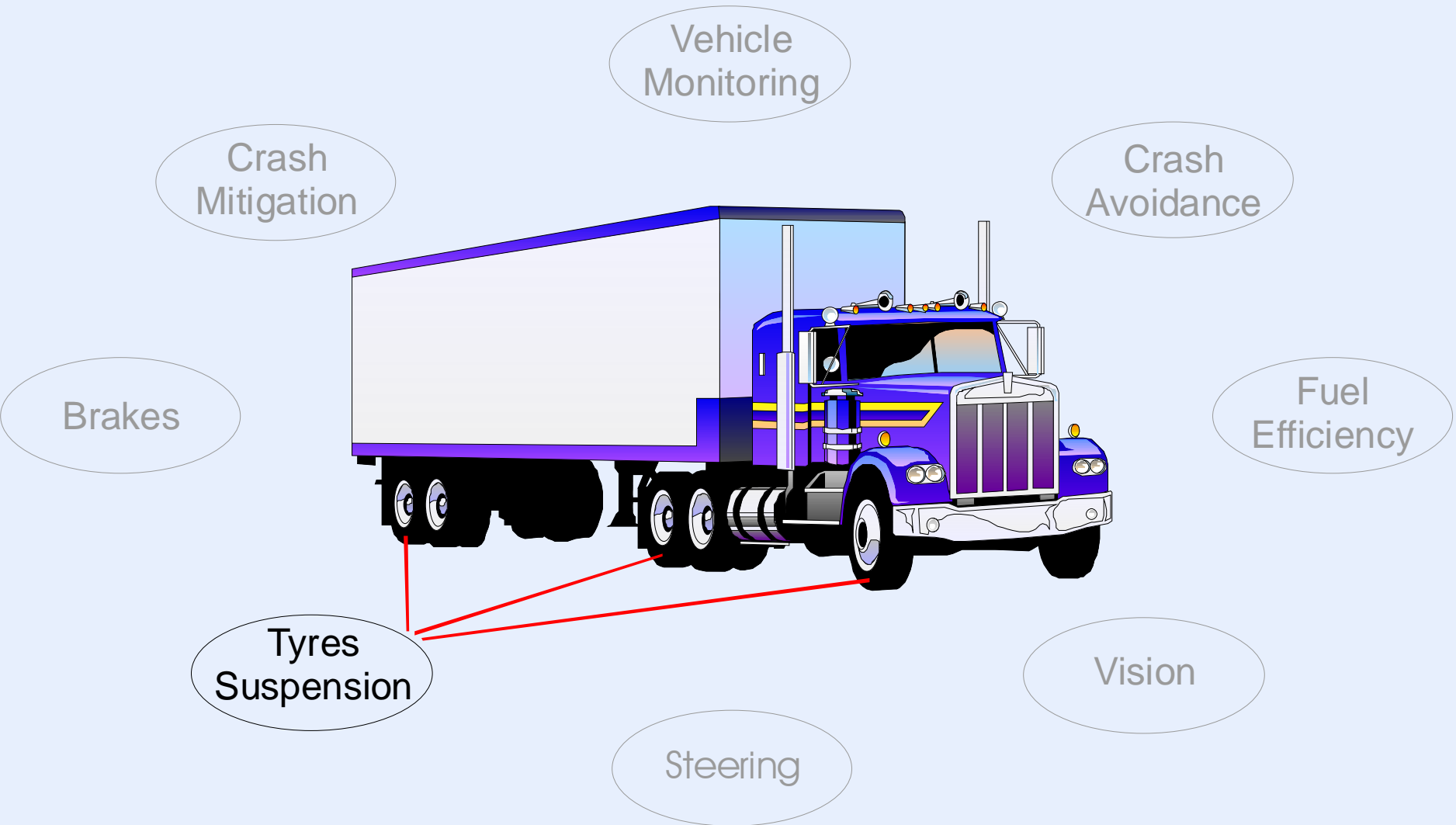
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Efficiency

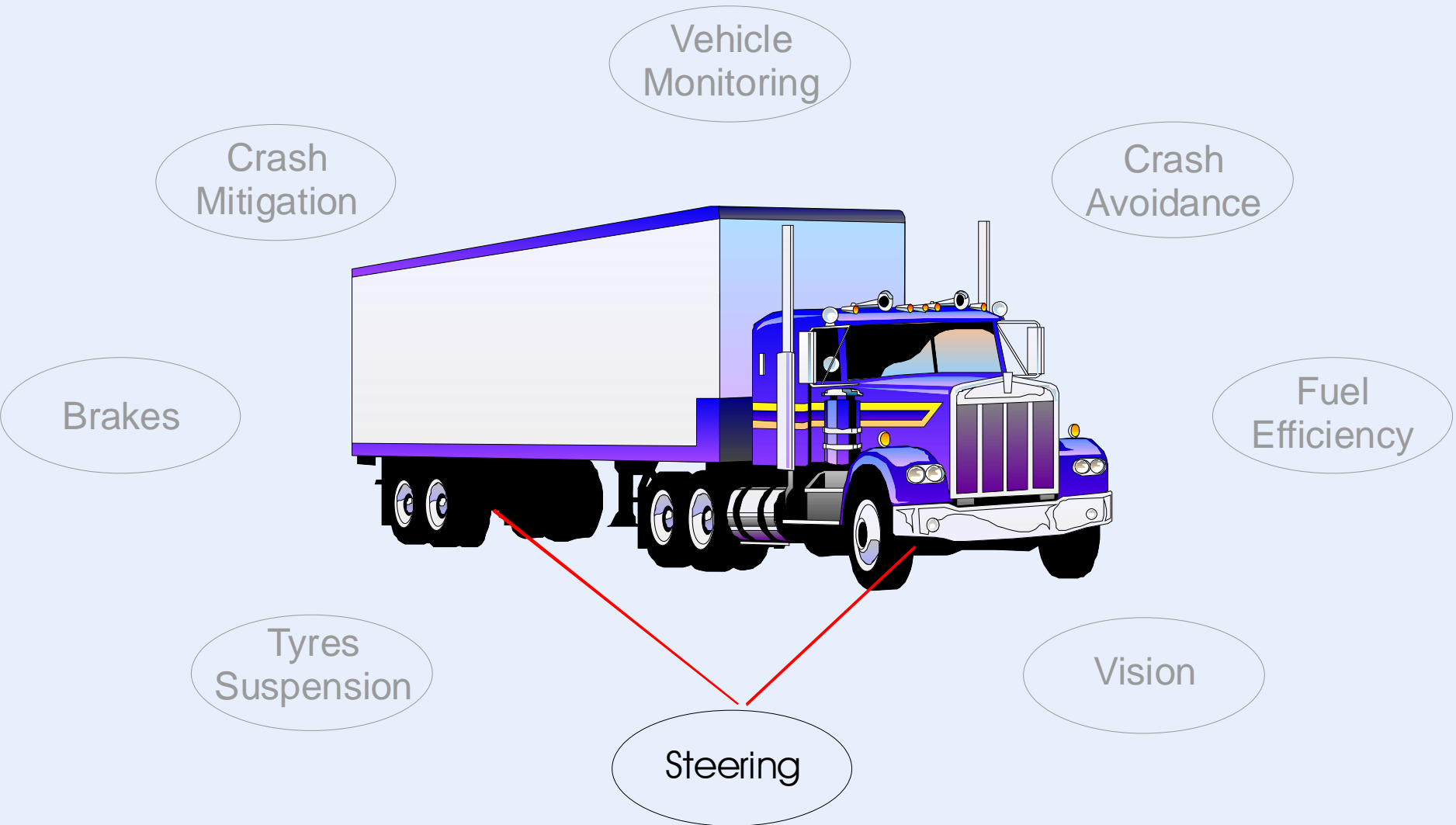


Tyres
Suspension

Vision

Steering





Caveat

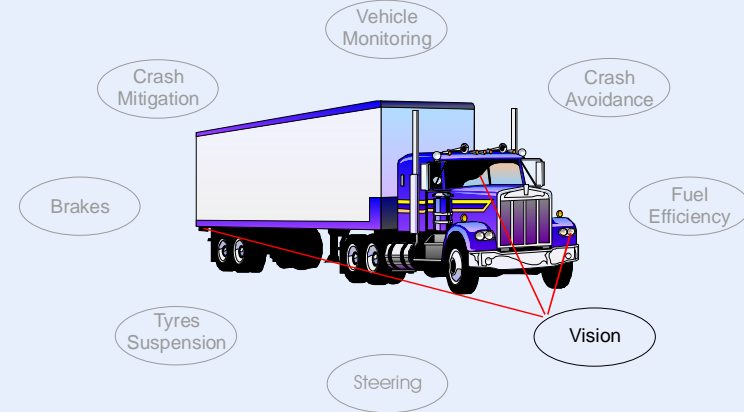
- **Pace of technology change is fast**
A technology that may be promising today could be superseded before it even gets to market
- **Putting a timeline to new technologies will not be a precise art – more an informed guesstimation**
- **Not an exhaustive list of all new technologies**
- **Most of the material has come from a project for AustRoads.**

Full report can be found at www.austroads.com.au
Titled 'Future trends in vehicle design'

Future Trends in Truck and Trailer Technology

Vision

- Night vision assistance
- Adaptive headlighting

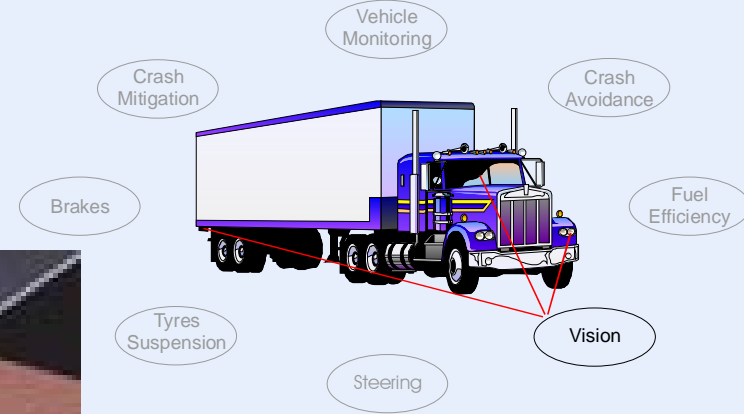


55% of all fatal crashes take place at night, while night time travel only represents 28% of all travel

- Xenon lighting

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Vision



Low beam 90m
High beam 150m
Night vision 450m

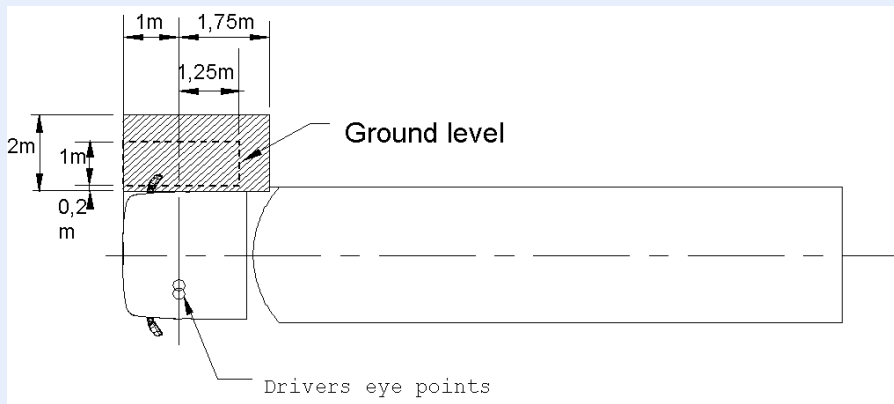
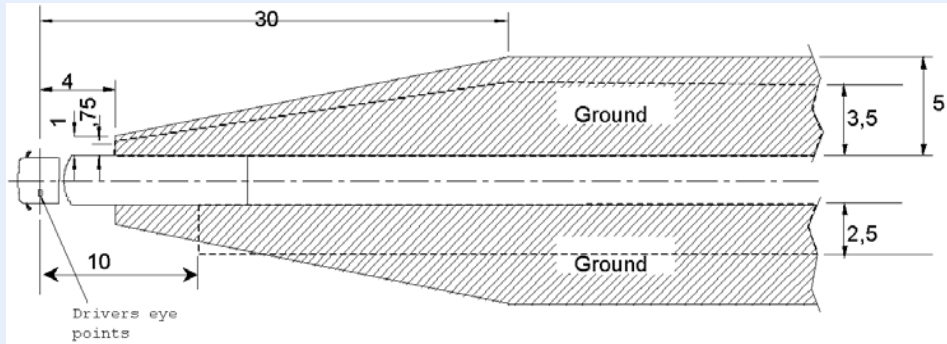
Avoid:

- Animals
- Highway construction
- Pedestrians
- Stalled Cars
- Poorly Lit Vehicles

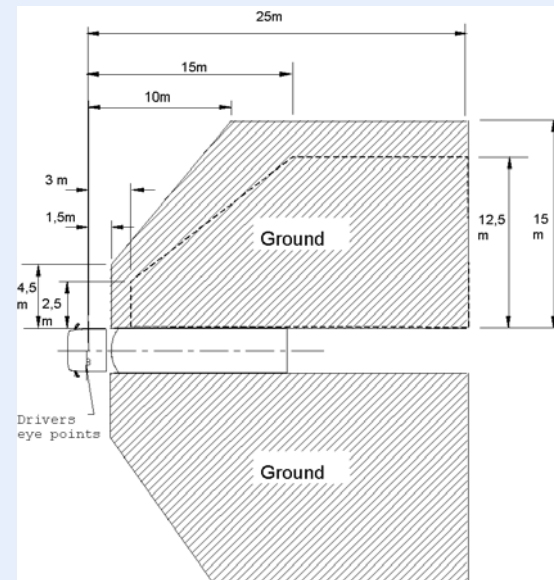
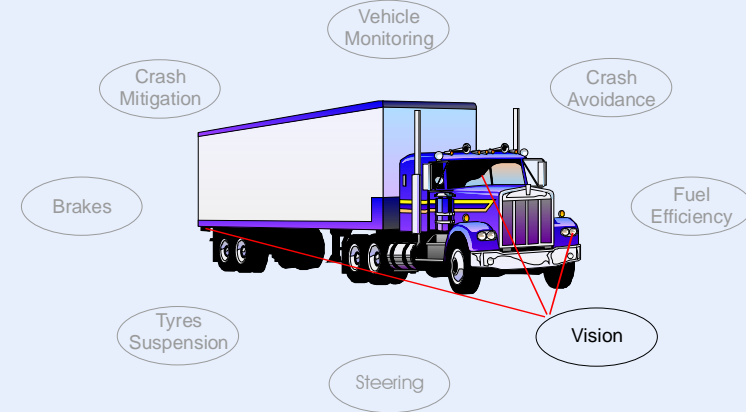
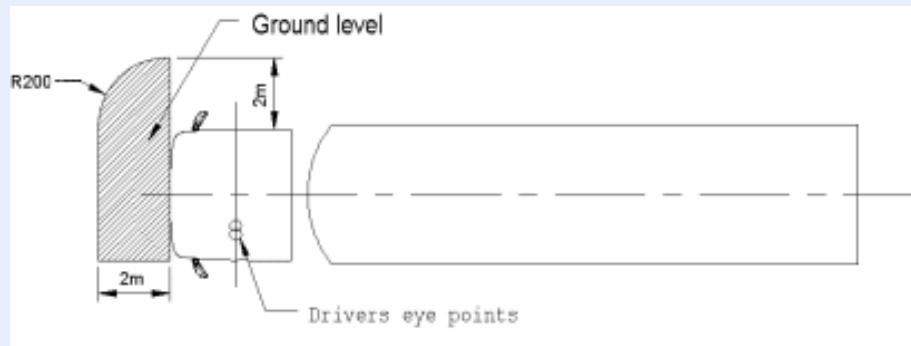


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Vision

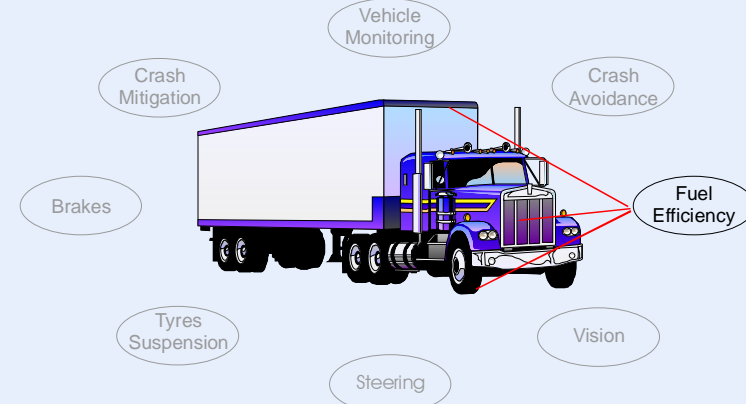


New European Union field of view requirements - 2005



Future Trends in Truck and Trailer Technology

Fuel Efficiency



- **Parasitic drag reduction**

Electrically driven air compressors, power steering pumps, water pumps, oil pumps and air conditioning pumps

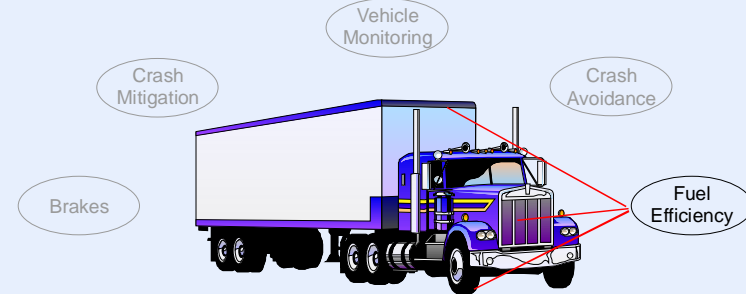
Difference in fuel consumption between good and poor drivers is up to 35%

- **Aerodynamic drag reduction**

Aims of 21st Century Truck Program – to double the fuel efficiency of heavy duty trucks by 2010

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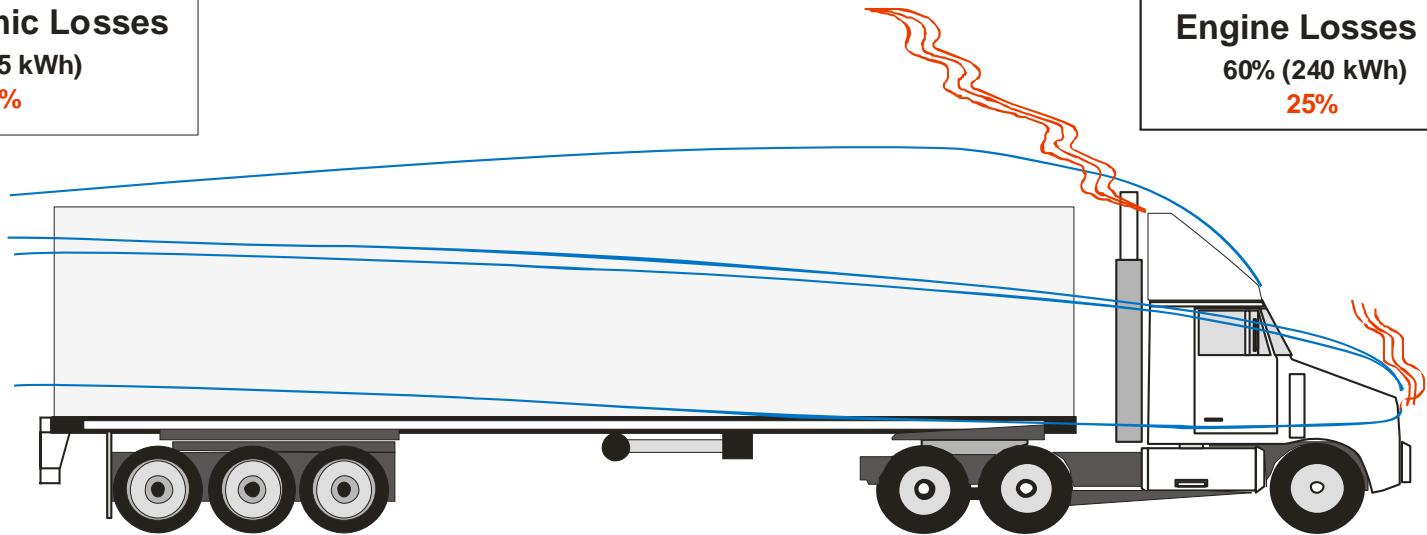
Fuel Efficiency



Total Energy Used per Hour
(105 km/h, fully loaded, level road for one hour)
Base = 400 kWh (544 hph) Mass 36.3 tonnes

Aerodynamic Losses
21% (85 kWh)
20%

Engine Losses
60% (240 kWh)
25%



TERNZ Ltd

Rolling Resistance
13% (51 kWh)
40%

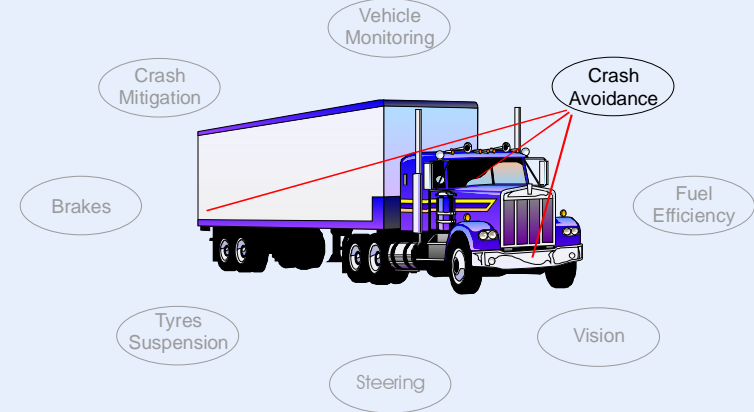
Drivetrain
2% (9 kWh)
30%

Auxiliary Loads
4% (15 kWh)
40%

**Difference in fuel consumption
between good and poor drivers is up
to 35%**

Future Trends in Truck and Trailer Technology

Crash Avoidance



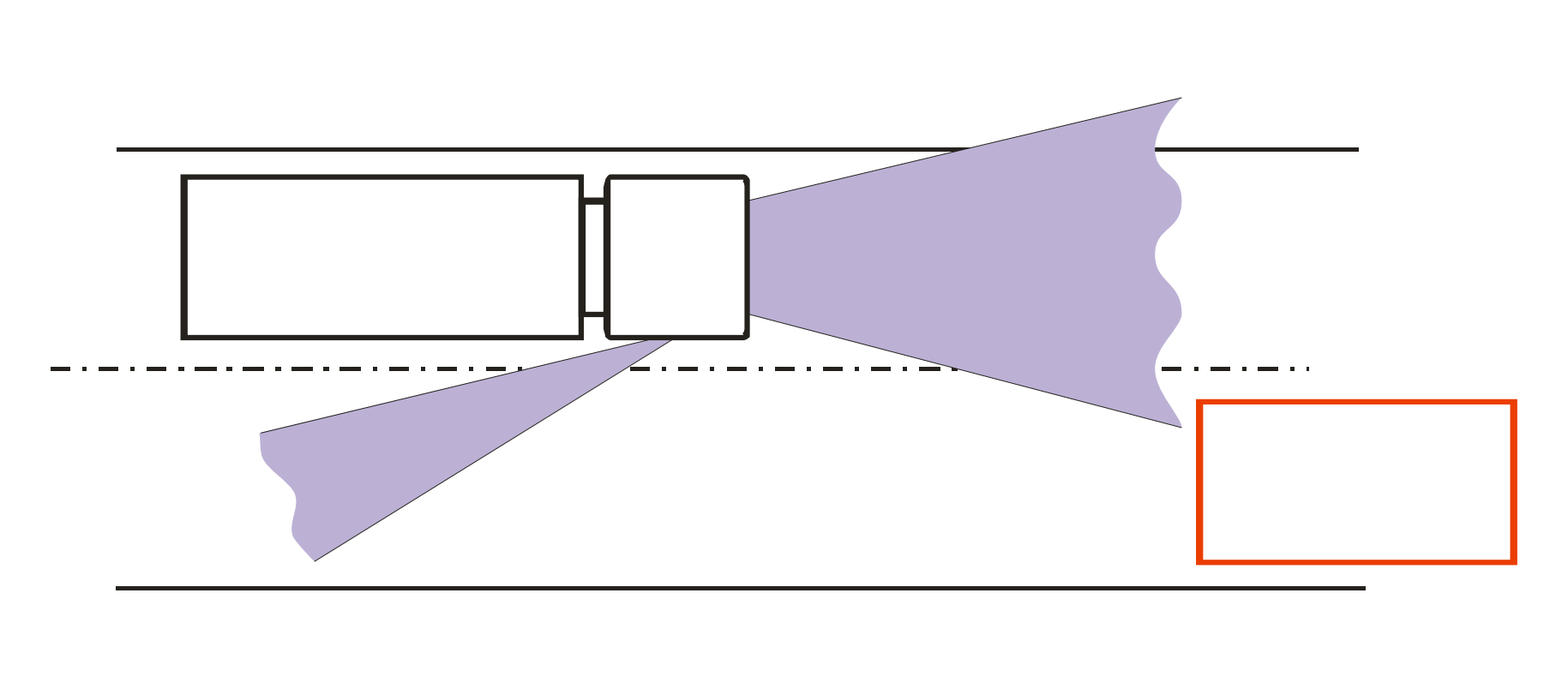
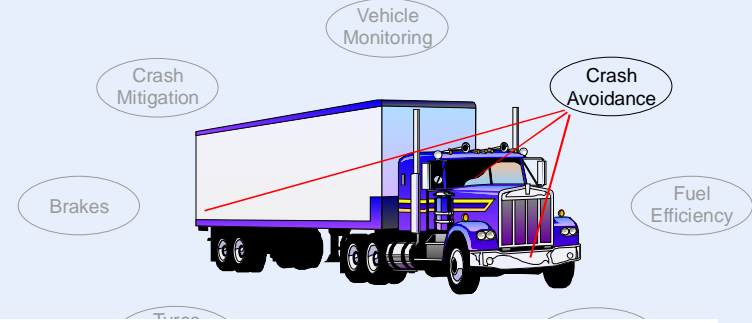
- Adaptive cruise control
- Collision warning systems

Rear end collisions account for 1 in 4 of all crashes in the US

- Road/Lane departure warning
- Rollover prevention
- Drowsy driver detection
- Friction detection
- Traction control systems
- Vehicle dynamics controllers

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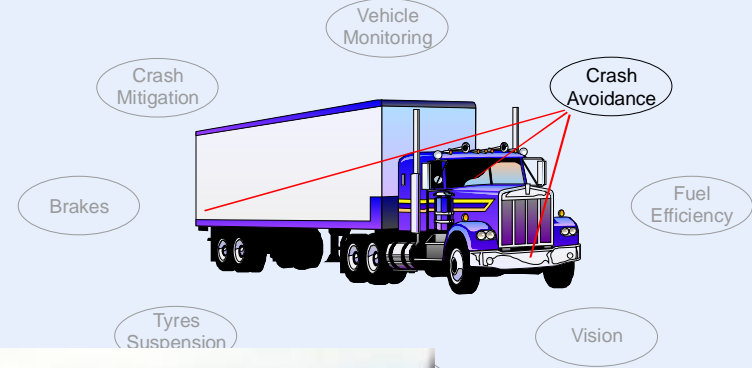
Crash Avoidance



CWS - Some fleets in the US have reported up to 50% reduction in crashes

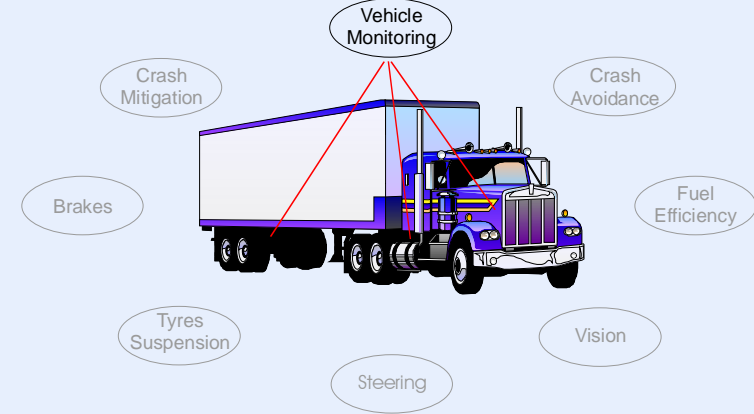
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Crash Avoidance



Future Trends in Truck and Trailer Technology

Vehicle Monitoring



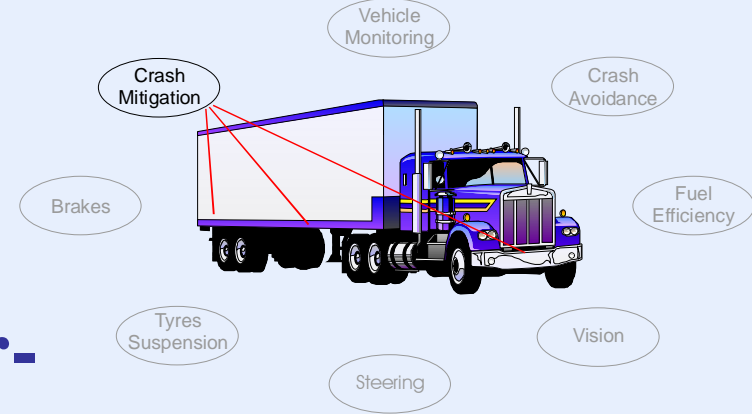
- Engine management and data recording

Repairs and maintenance costs can vary by as much as 50% between good and poor drivers

- Fault diagnostics
- Vehicle platooning
- Autonomous driving

Future Trends in Truck and Trailer Technology

Crash Mitigation



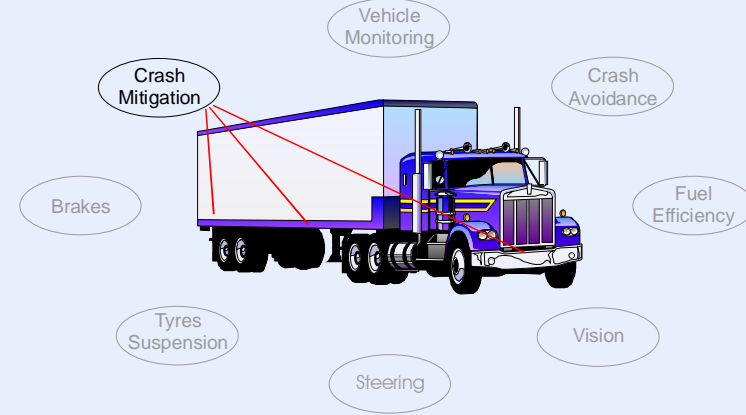
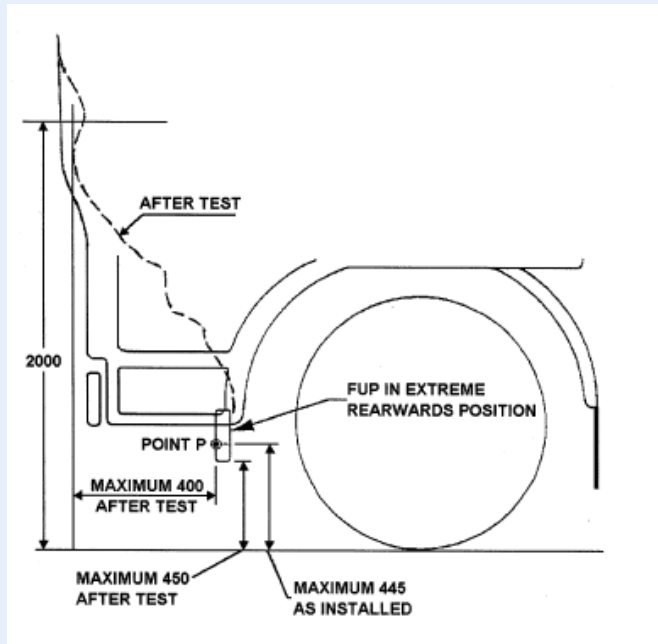
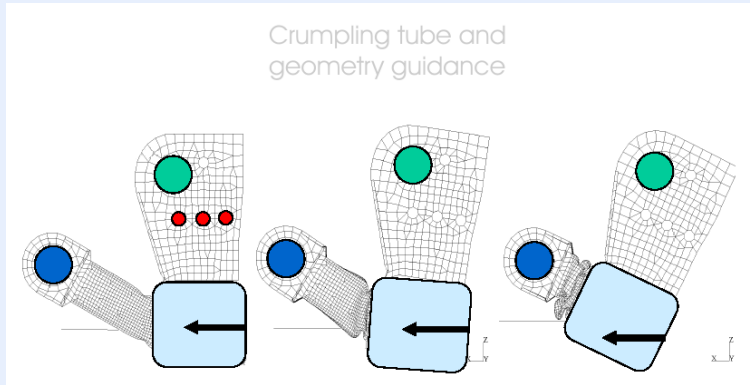
- Front rear and side under-run protection (energy absorbing)

Car occupants are the largest group of trafficants injured in truck accidents

- Pre-crash sensors
- Pretensioner safety belts
- Smart airbags
- Vehicle aggressivity reduction
- Emergency call

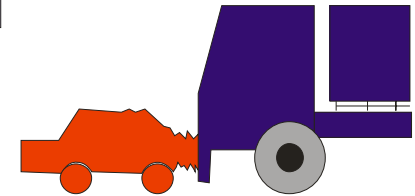
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Crash Mitigation

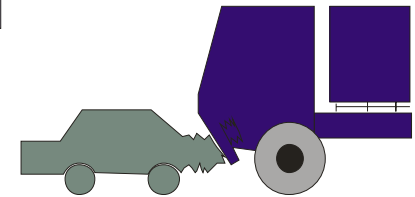


Protection of other road users - Front Under-run Protection System

Without FUPS:



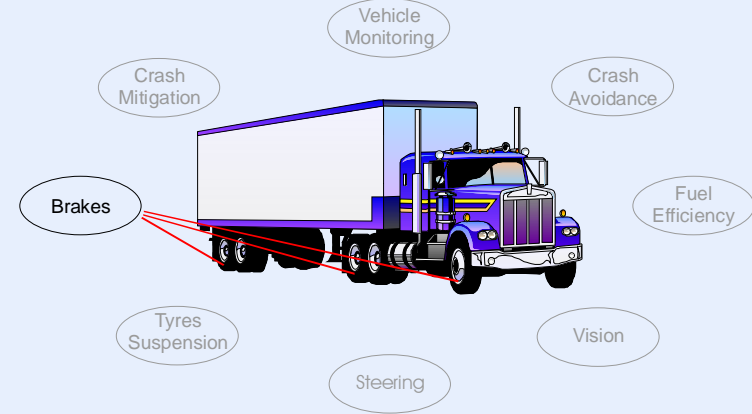
With FUPS:



Car occupants largest group of trafficants injured in truck accidents

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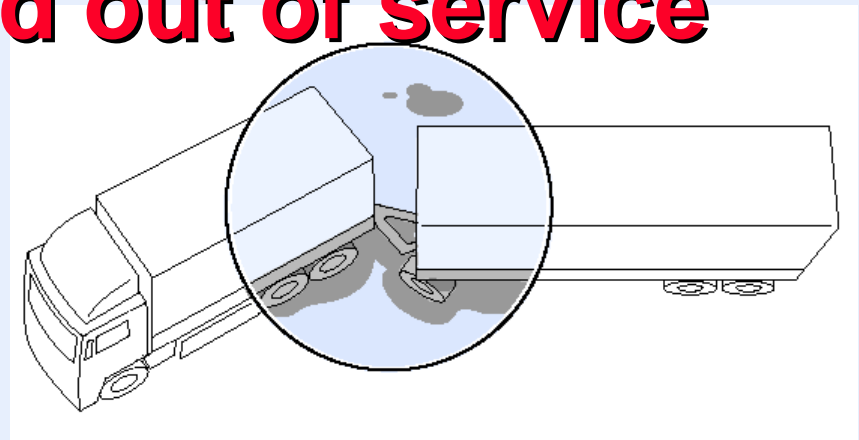
Brakes



- Electronically controlled braking systems

Out-of-adjustment brakes are the primary equipment related cause for HV's being placed out of service

- Braking compatibility systems
- Engine drag torque control (stability on low friction surfaces)
- Drag reduction

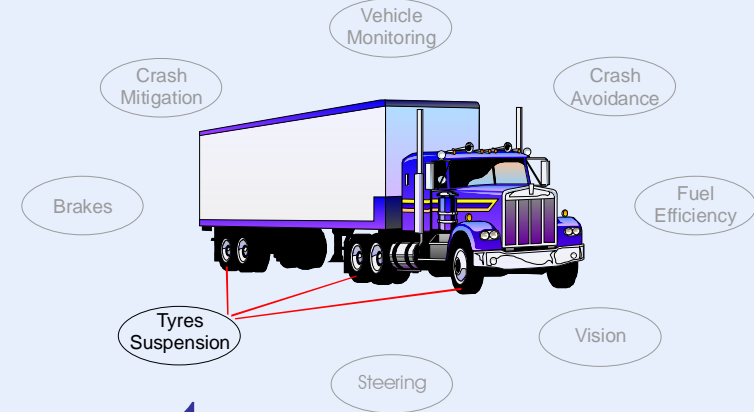


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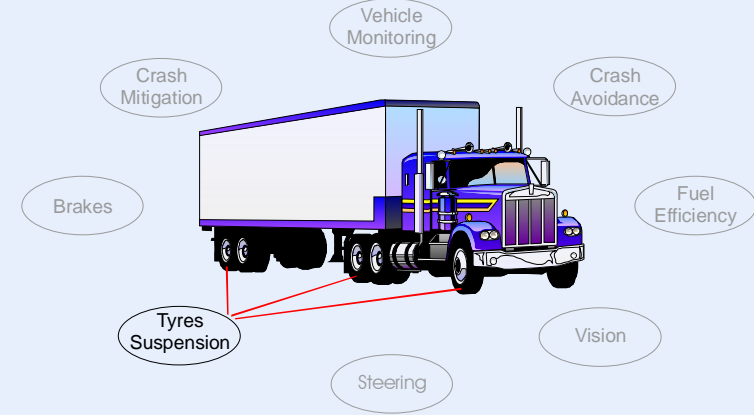
Tyres and Suspension

- Intelligent suspensions to provide roll stability enhancement
 - Tyre pressure monitoring systems
 - New tyre developments
- Tyre failure is the most common reason for a roadside repair – 80% of tyre problems are due to under-inflation**



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Tyres and Suspension

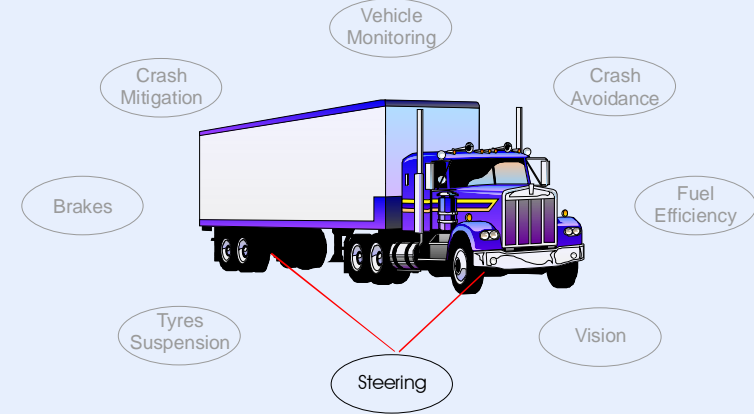


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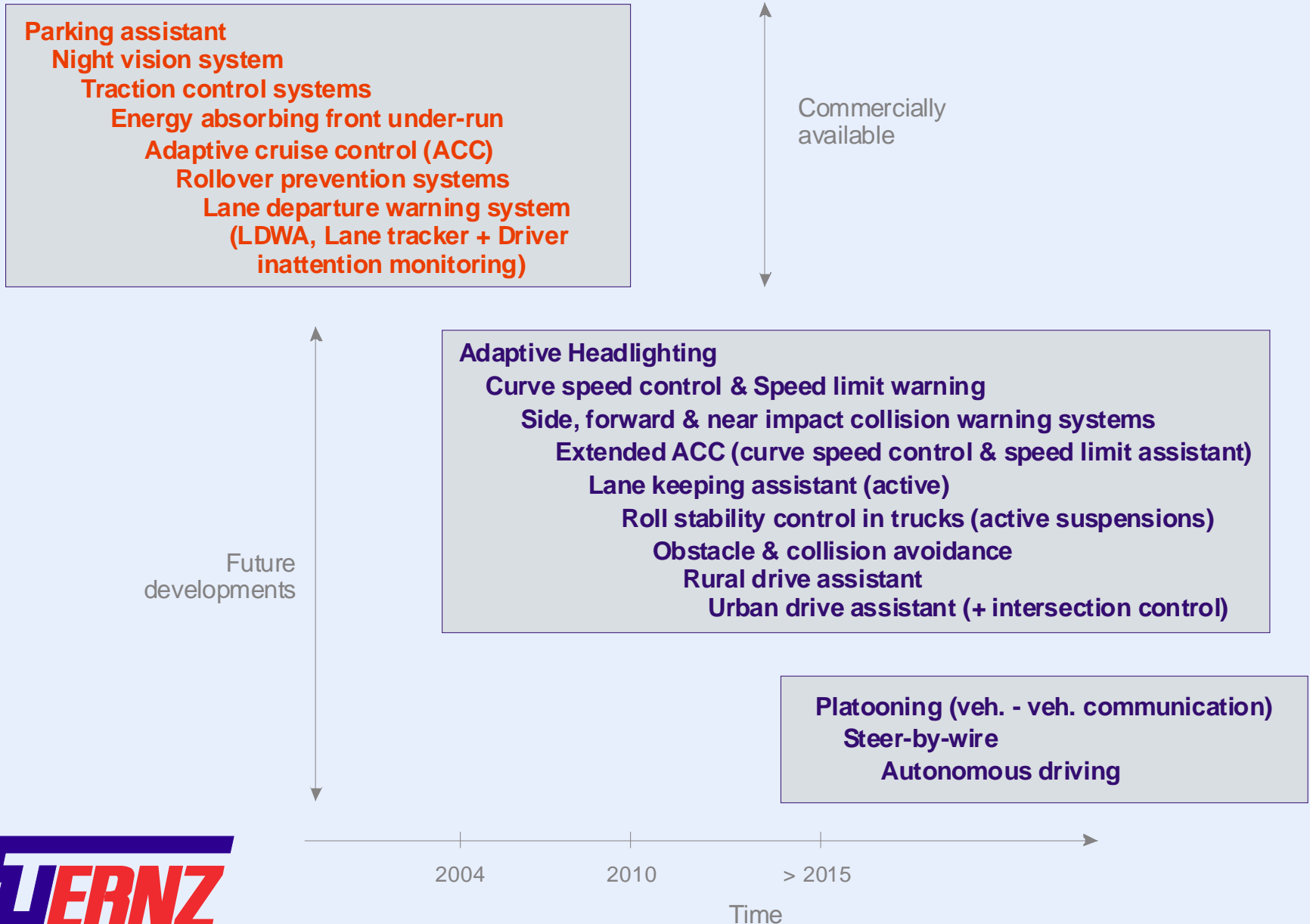
Future Trends in Truck and Trailer Technology

Steering

- Active power steering
- Electro-hydraulic power steering
- Steer-by-wire
- Vehicle platooning
- Autonomous driving



Summary



Summary

New technologies have the potential to not only improve vehicle safety but also improve the efficiency of vehicle inspections and enforcement procedures. The flow on from this will be a more efficient transport system

Maintaining the edge in this area is about being aware of what technologies are becoming available and how they may impact on your business.