

‘Too close for comfort’

Did you mean CAS or CAS?

An Update

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Today...

Background Statistics - update

Observations - proximity trials and installations

Disclaimer

Presentation based on observations at mine visits.
Images are for illustration purposes only.

Figure 1.1: Fatalities in Queensland mines, 1900–2013

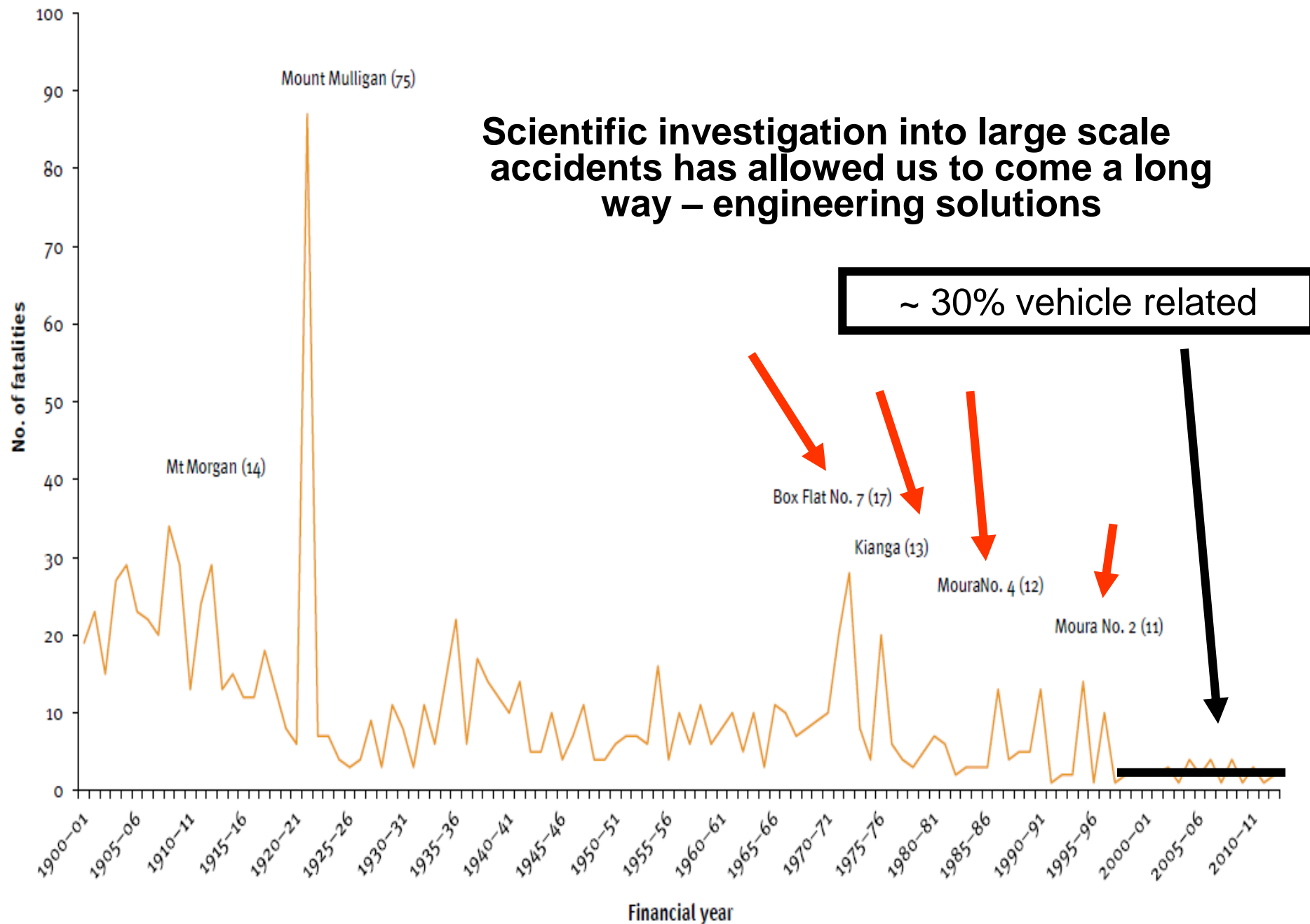


Figure 1 - Qld Fatalities - 2000 to current

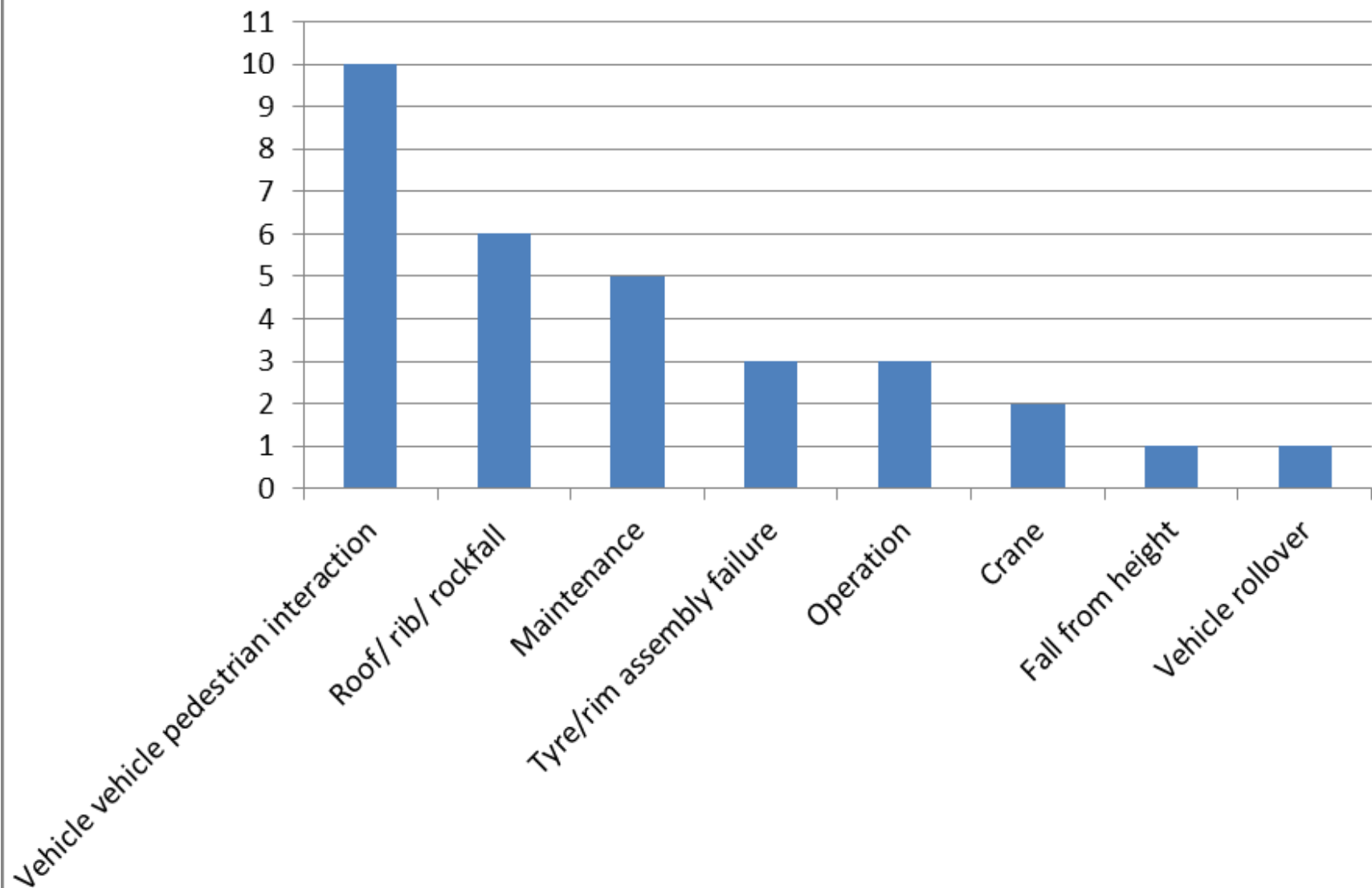
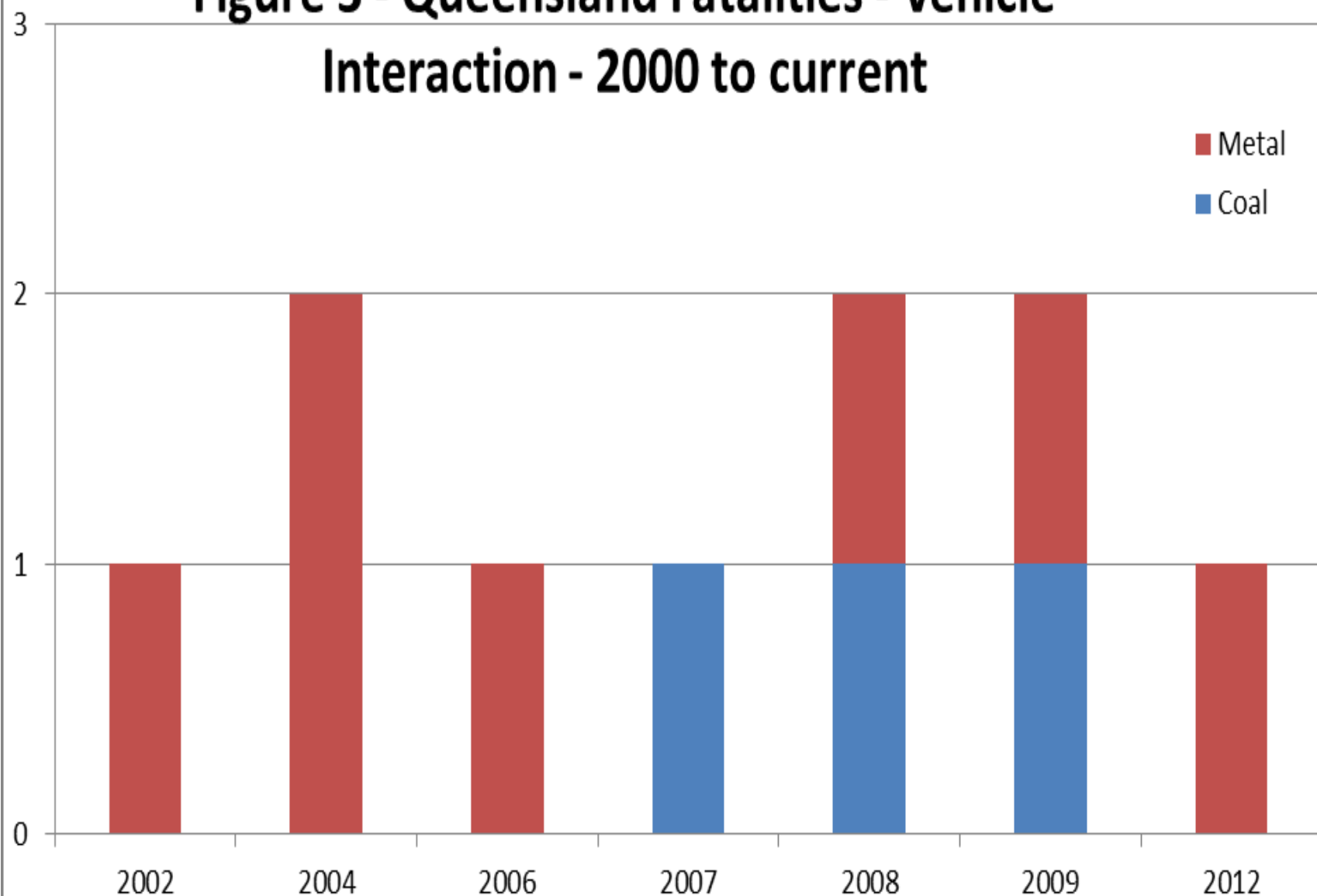


Figure 3 - Queensland Fatalities - Vehicle Interaction - 2000 to current



Recent vehicle related accidents

Qld Mt Moss 2012 – supervisor on foot crushed by FEL

NSW October 2013 – LV crushed by dozer (non-fatal image below)

NSW November 2013 – LV crushed by truck





‘There are only so many ways to kill people, and we know them all’

Fit for purpose equipment - Selection of the equipment

'an informal term used to describe equipment capable of meeting its objectives or requirements'

Being FFP requires reliability plus other

Review all relevant scenarios

Verify that equipment can mitigate

Explicit uncertainties

Polar diagrams envelopes

Physics - understand

equipment capable of meeting

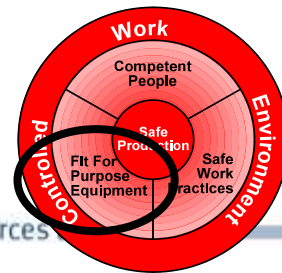
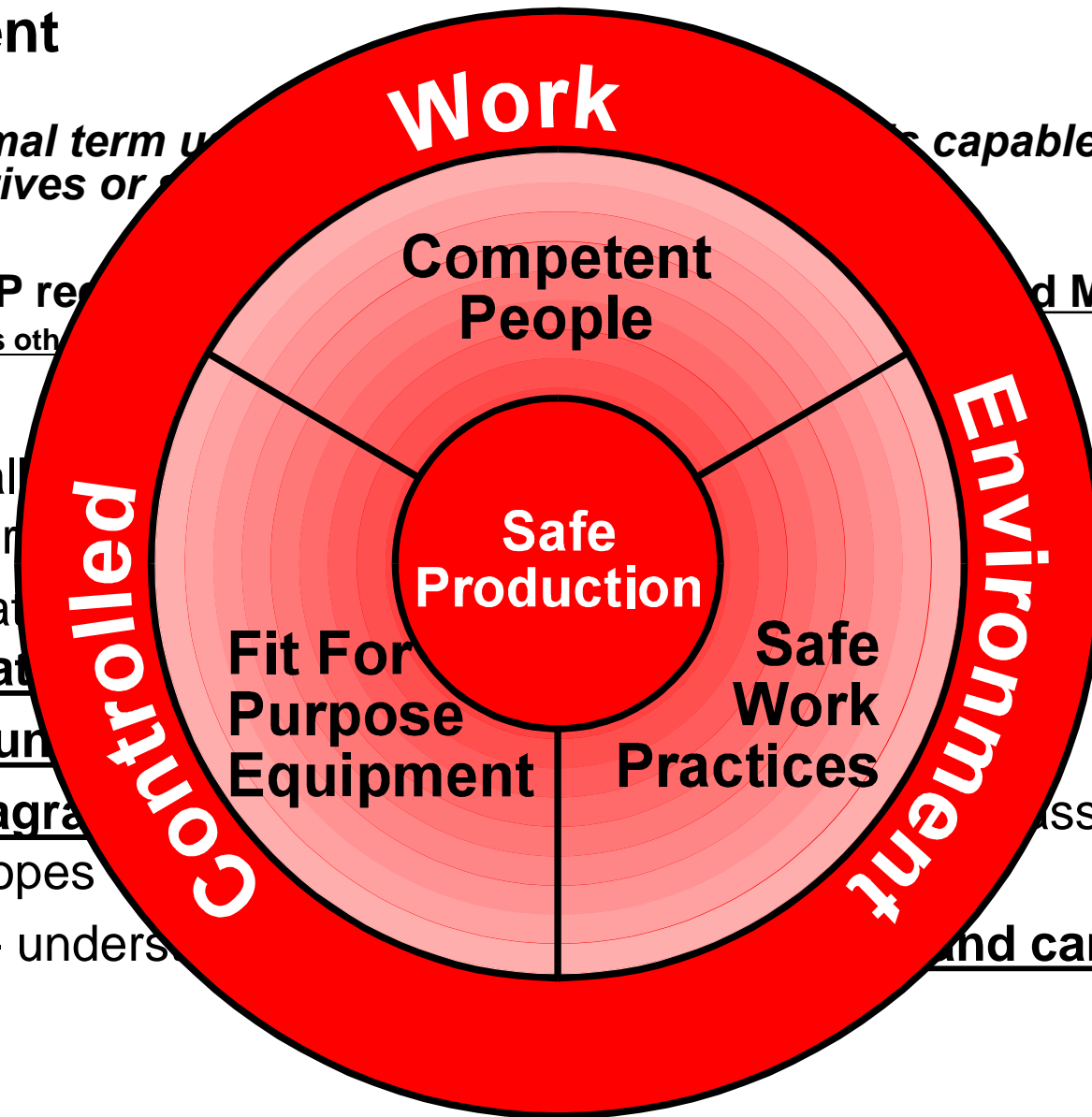
and Maintain-

collision

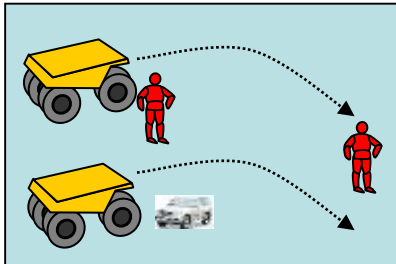
le to

assumed

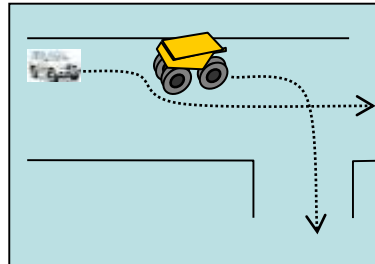
and cannot do



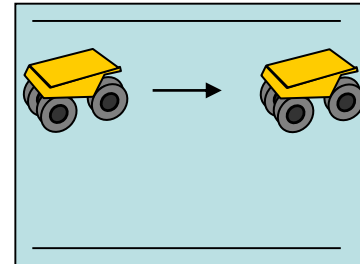
Some typical OC scenarios....



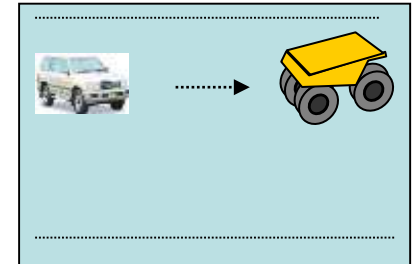
V2V V2P slow speed e.g. Parkup areas



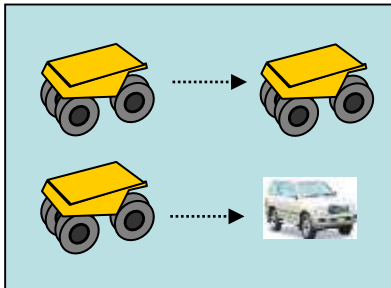
V2V – overtaking collision



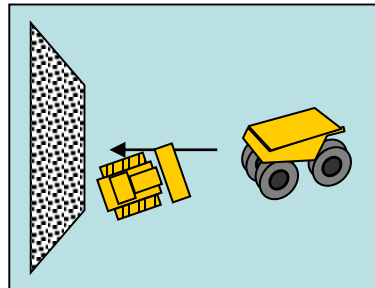
V2V – high speed rear end collision



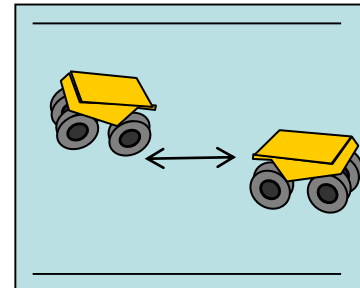
V2V - rear end collision



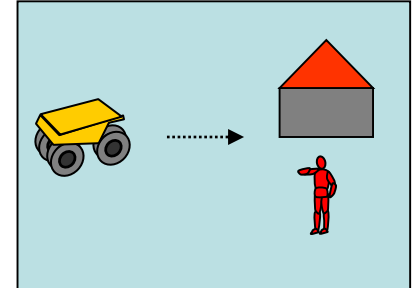
V2V – slow speed rear end collision



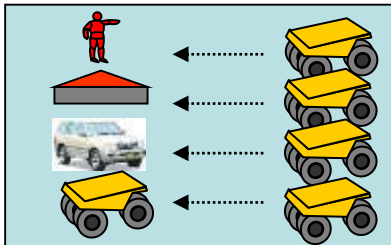
V2V collision or reversing over dump



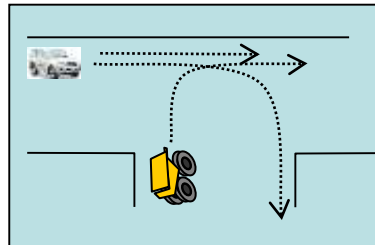
V2V – head on collision



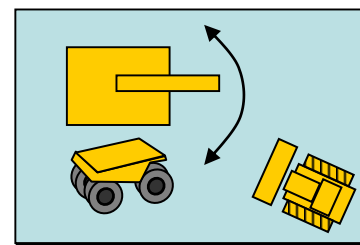
V2I or V2P forward collision



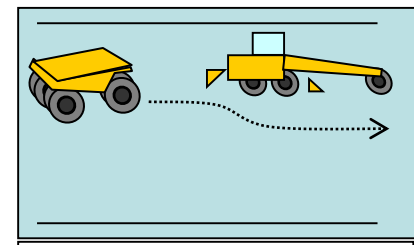
V2V V2P V2I reversing collisions



V2V collision - intersection

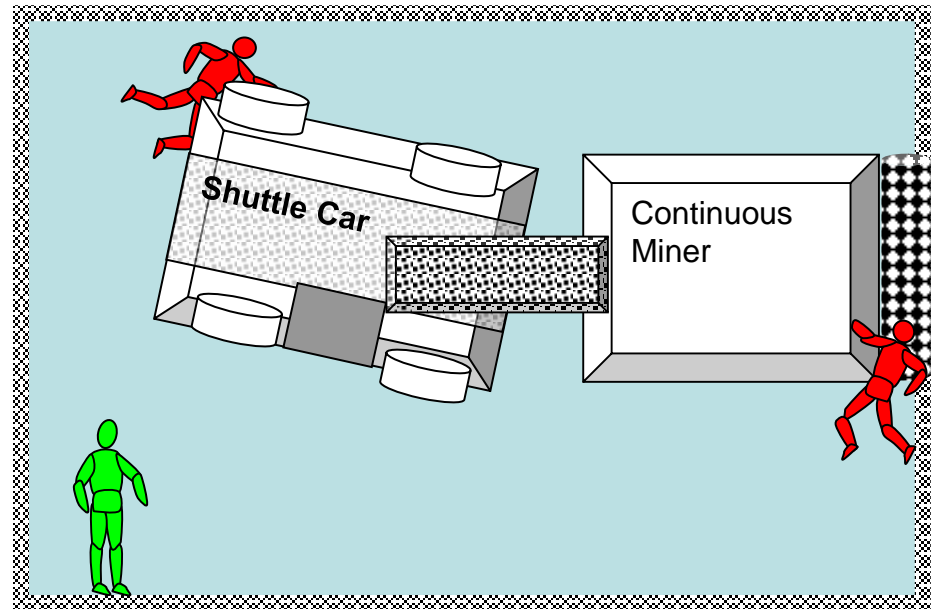
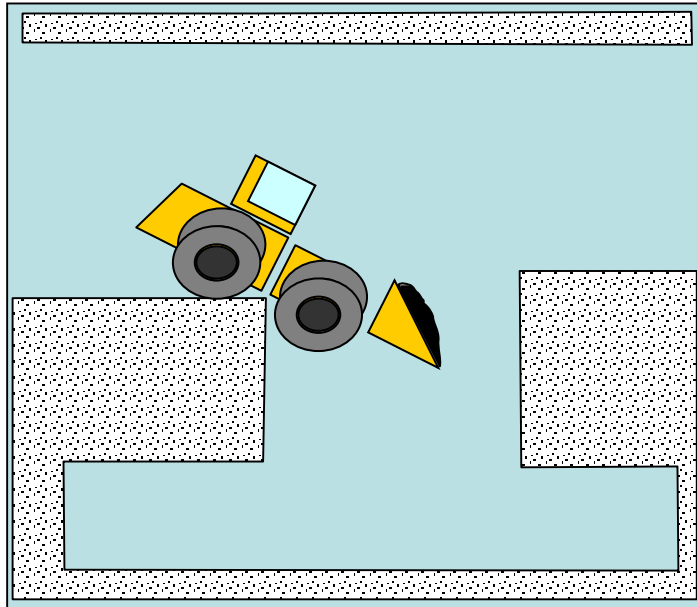


V2V collision – mining face



V2V collision – fast –slow moving vehicles

Typical Underground Scenarios, there are many more.....



No Go-Zones !



Fit for purpose equipment - Selection of the equipment

Manufacturers to

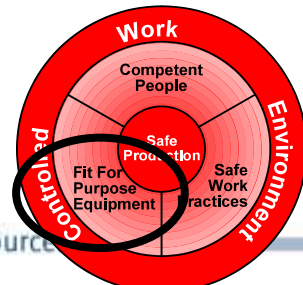
declare if their systems are 'collision awareness' or 'avoidance' systems

provide sound, logical and unambiguous evidence for their judgement

Change management – disabling of system functions – residual risk ↑?

Maintainability – easy and safe access to all external hardware must be achievable – e.g. cleaning

Placement of screens – glare/veiling, periphery of vision





Blindspots

Design?
Acceptance?



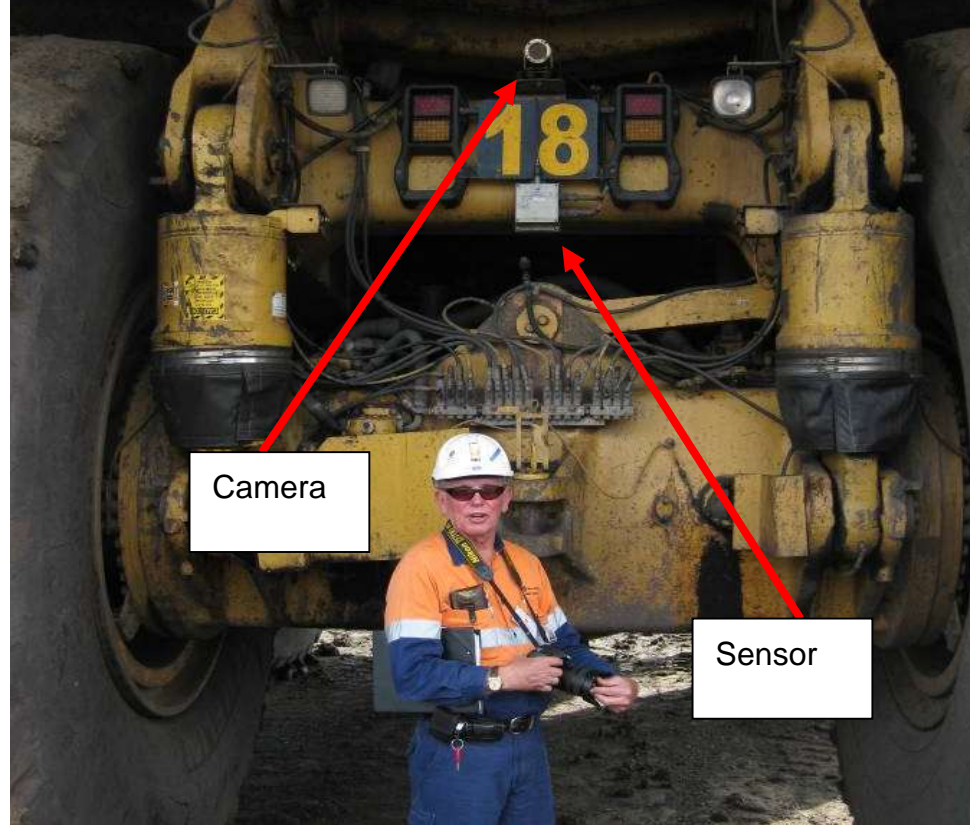
Small
screens
displ'g
large
areas



Contrast –
brightness
outside vs
dark cabin
interior

Adjustment
of eyes?

Dirt on camera



Camera

Sensor



Kneel to clean

Mounting of hardware



Kneel to clean



Electrical cabinet in line of sight

Area of mirror <1% of total viewing area



Design

The image features a large, bold, yellow 3D word 'Design' that dominates the upper half of the frame. It is set against a background of a yellow and black forklift, likely a Toyota model as indicated by the partial logo. A red stick figure stands in the lower right foreground, looking towards the forklift. A green triangle is positioned between the stick figure and the forklift, pointing towards the rearview mirror area. The scene is outdoors on a clear day with trees in the background.

Visibility = Opportunity to identify a hazard & react in time

Fundamental Questions...

What is the nominated separation distance at your mine site?

What is the assumed stopping distance of your worst performing vehicle (braking performance)? Downhill /uphill/going round corners????

(Human Perception Time, Human Reaction Time, Vehicle Reaction Time, Vehicle Braking Capability)

Is Separation distance >> stopping distance ????

What assumptions do you make?

‘A thing that is accepted as true or as certain to happen, without proof’

Have you checked your assumptions (are they true & valid) ?

Are your controls effective? Have you checked?

FFP equipment - Selection

Can PD system cater for your separation distances? (Can it detect a vehicle that is say 50 m out?)

Combination of screens and method of alarming – intuitive
exception based alarming based on criticality

