



**Old Ideas + New Technology
= Crash Savings**

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Vehicle Design and Research P/L

Introduction

There are two veteran road safety countermeasures that seem to have been overlooked in recent hi-tech efforts to make vehicles safer

- Not going too fast
- Being seen

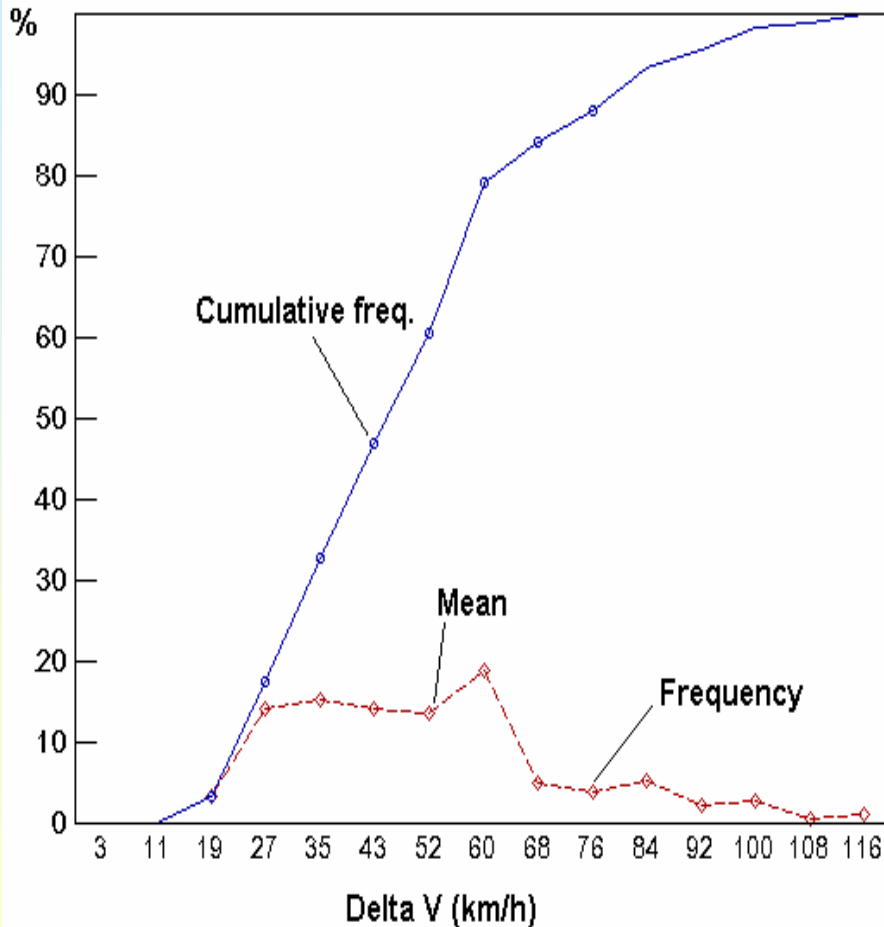
I will be talking about recent developments that could lead to remarkable road safety benefits through these countermeasures

Speed Control Issues

- Impact speed and crash severity
- Crashworthiness of cars
- Travel speed and crash risk
- Compliance with speed limits
- Top speed limiting
- Involvement of speed in crashes

Impact Speed & Fatalities

Figure 2 - Distribution of Delta V for fatalities to belted drivers



- Half of all fatalities to seat-belted drivers in car to car frontal crashes occur at impact speeds of 55km/h or less (US data - early 1990s - but average age of Australian fleet is 11 years).
- Airbags increase this, but only by a few km/h.

64km/h - a Severe Crash

NCAP crash tests have shown that a head-on crash at 64km/h is a very severe crash.

This video shows recent vehicles - the "average" 11 year old Australian vehicle could be expected be worse than this.

QuickTime™ and a
H.263 decompressor
are needed to see this picture.

29km/h intrusive side impact

Sideways impacts into poles or trees, or being T-boned by a large vehicle can be deadly at quite low speeds.

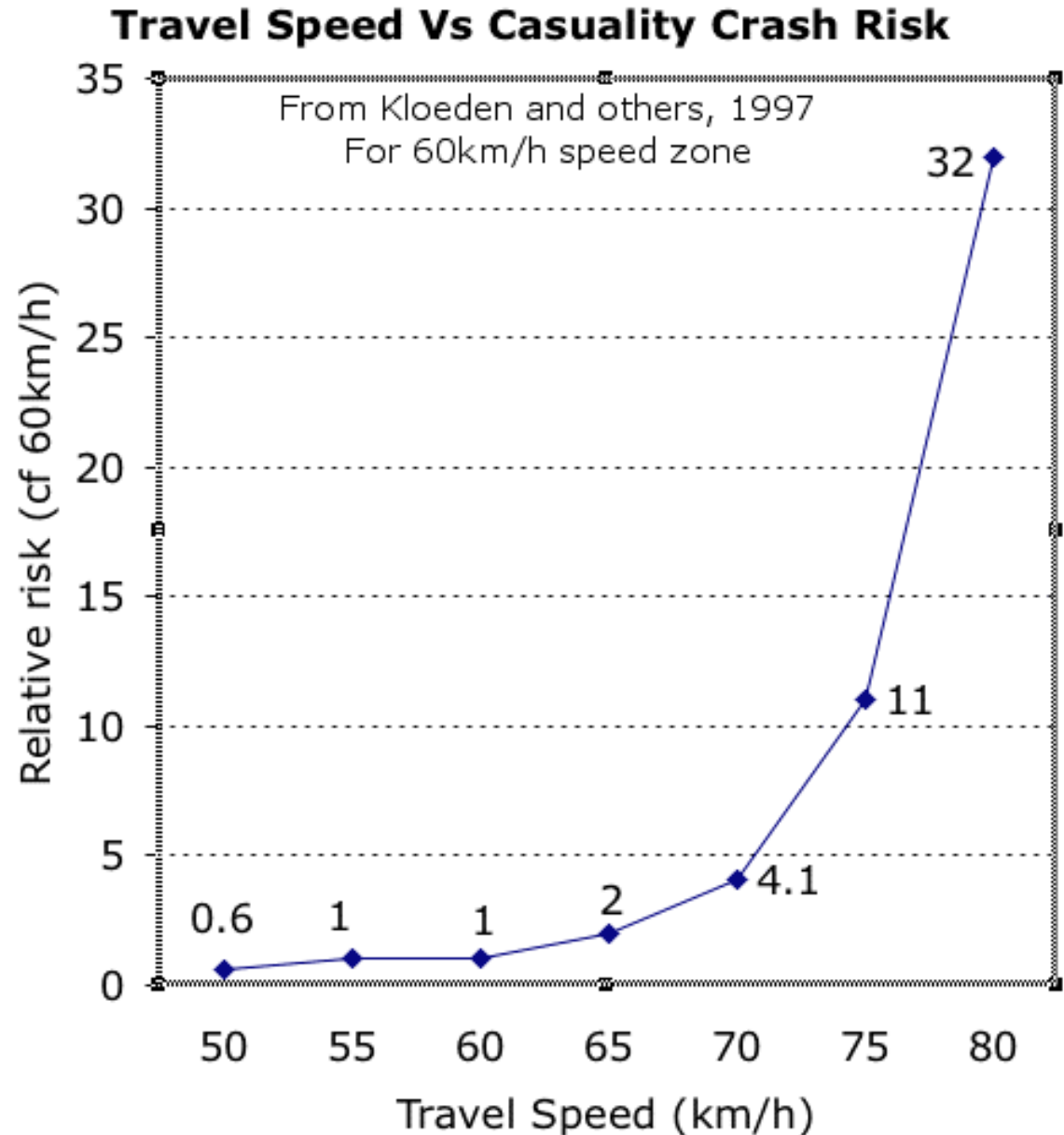
This crash test is only survivable because of a head-protecting side airbag.



A variety of studies show that the risk of a fatal or casualty crash is highly sensitive to speed.

This curve is for vehicles in a 60 zone.

Similar curves have been derived for pedestrian fatalities but in this case the curve starts to climb at about 30km/h.



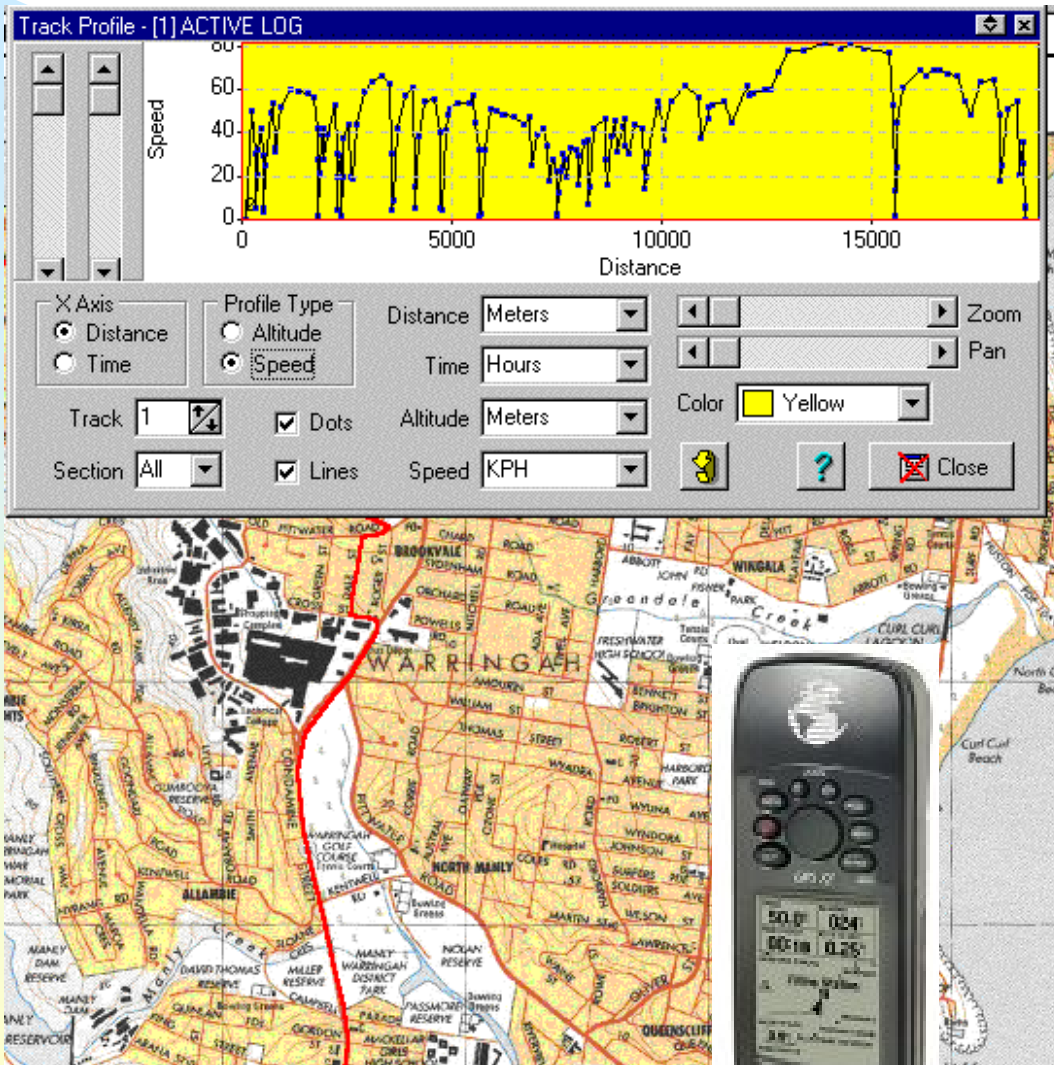
Compliance with Speed Limits “Intelligent Speed Adaptation” (ISA)



- These days cars are smoother and quieter - it is easy for speed to creep up
- Likely that unintentional/reluctant speeding makes up a large proportion of the speeding problem (queue jumpers)
- Drivers could do with some technical assistance in keeping to the speed limit - one purpose of ISA
- Highly successful trials of automatic speed limiters/alarms have been underway for 6 years - including the TAC Safe-Car project in Melbourne (uses throttle pedal feedback).



GPS and Speed Control



- Even a \$300 handheld GPS can be used to monitor speeds
- ISA is now easy to do with GPS equipment in cars
- Speed zone data is not yet in digital maps - must also cope with school zones.



Top Speed Limiters

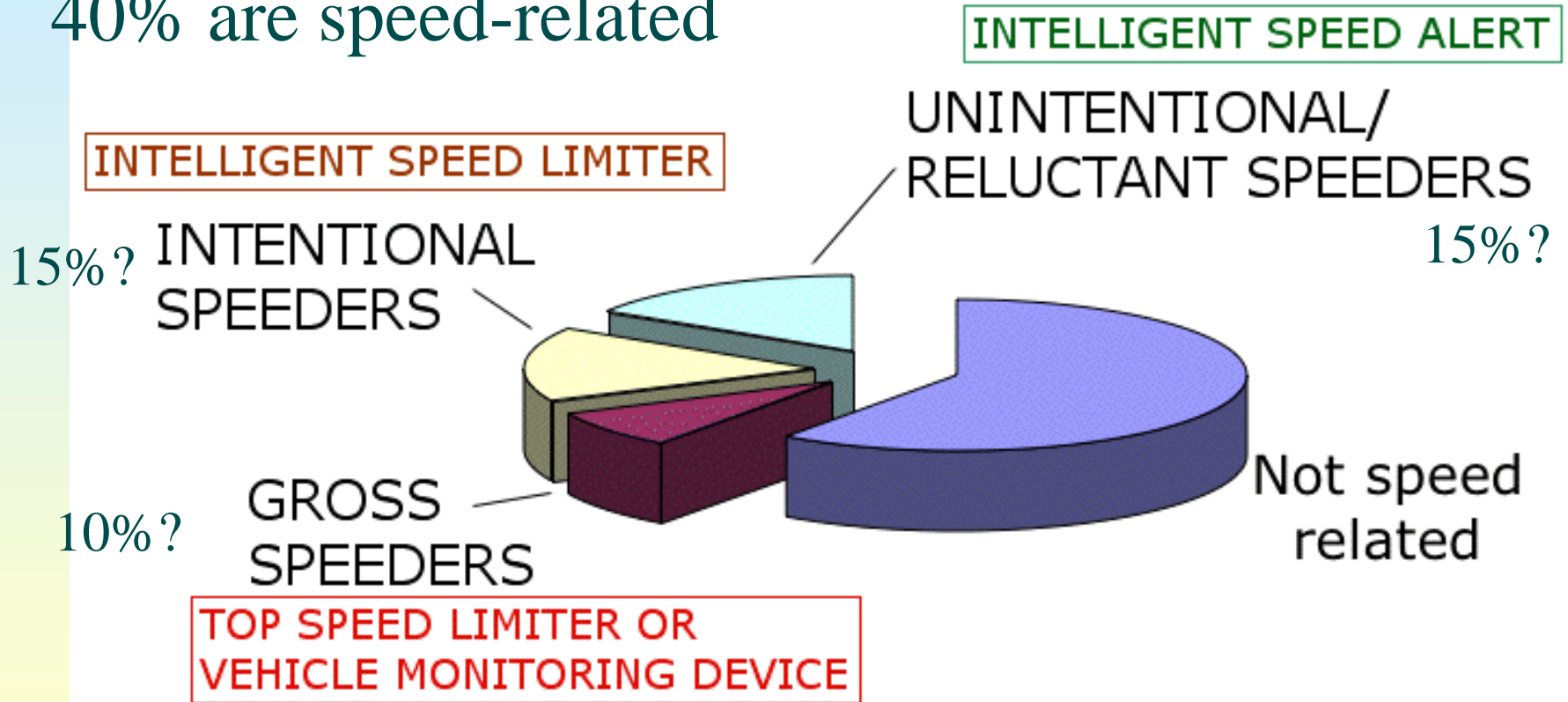


- Engine power drops off above a preset speed
- Many engine management chips already have a top speed setting (but typically well in excess of 200km/h)
- *Very* low cost to set at a realistic value (120km/h would be appropriate).
- Consumer should be able to choose this when ordering a new vehicle (can Government fleets take the lead here?)
- Strong deterrent to theft, car-jacking and joy-riding.

Speed-related Crashes

Fatal Crashes

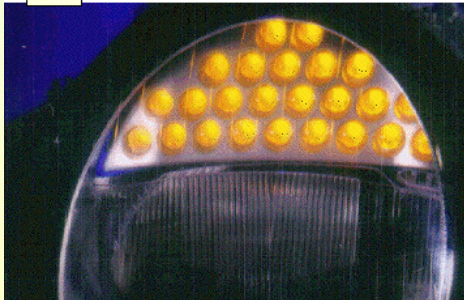
40% are speed-related



Estimated effectiveness of 80% (Regan 2003) gives 30% saving

Being Seen

- 50% of *daytime* road accidents involve one road user failing to see another road user.
- Well designed daytime running lights (DRLs) can greatly improve the chances of being seen by other road users.
- Turn signals and brake lights are important for signalling intentions to other motorists but most lighting systems that are designed for both day and night use perform poorly on bright days.
- LED technology is revolutionising lamp design but, at this stage, light output tends to be at the minimum levels permitted by regulation.

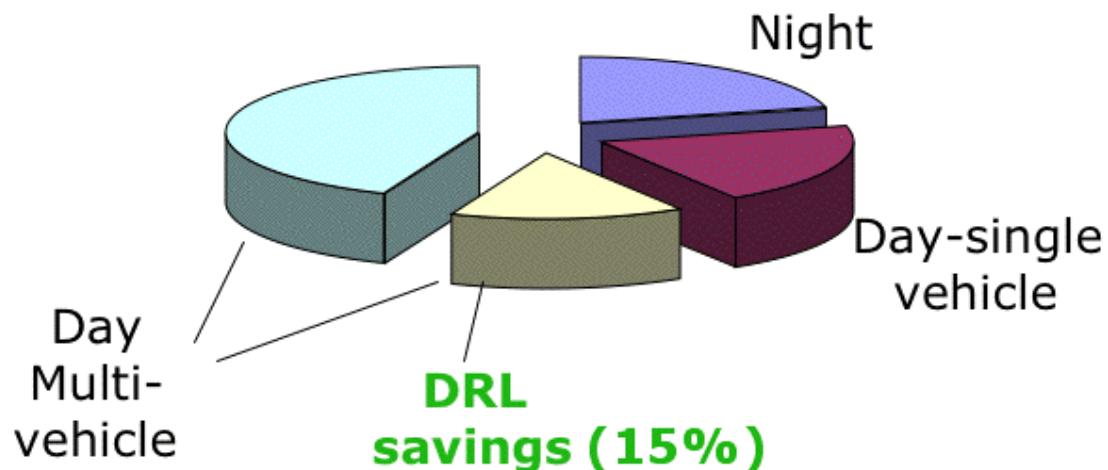


DRL History

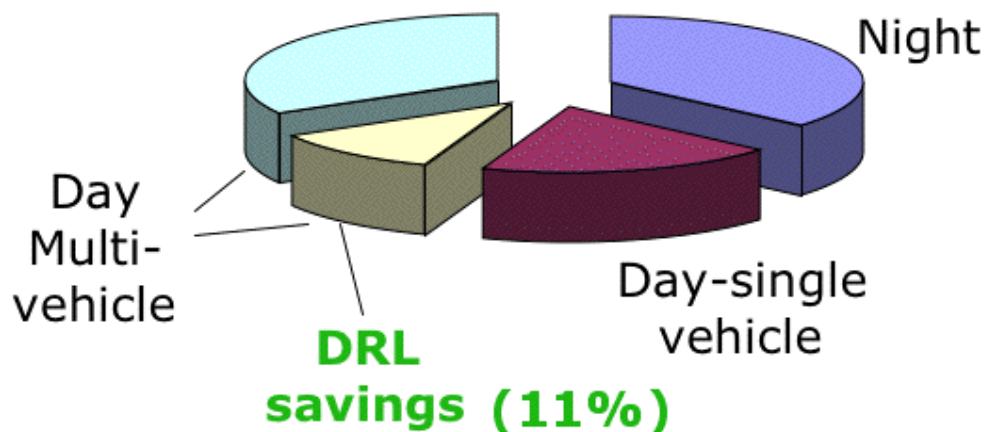
- A major shortcoming of DRL effectiveness studies is that they all involved use of headlights as DRLs. As I will show, *headlights make lousy DRLs* (marginally effectiveness may be the reason for the "latitude effect").
- In 1991 an international committee (CIE) recommended white dedicated DRLs with a maximum luminous intensity of 1200 candela. They also criticised headlight DRLs.
- ECE Regulation 87 (and ADR 76) currently sets a maximum of 800cd - this is under review in Europe.

Potential Savings in Australia - DRLs

Non-Fatal Crashes



Fatal Crashes

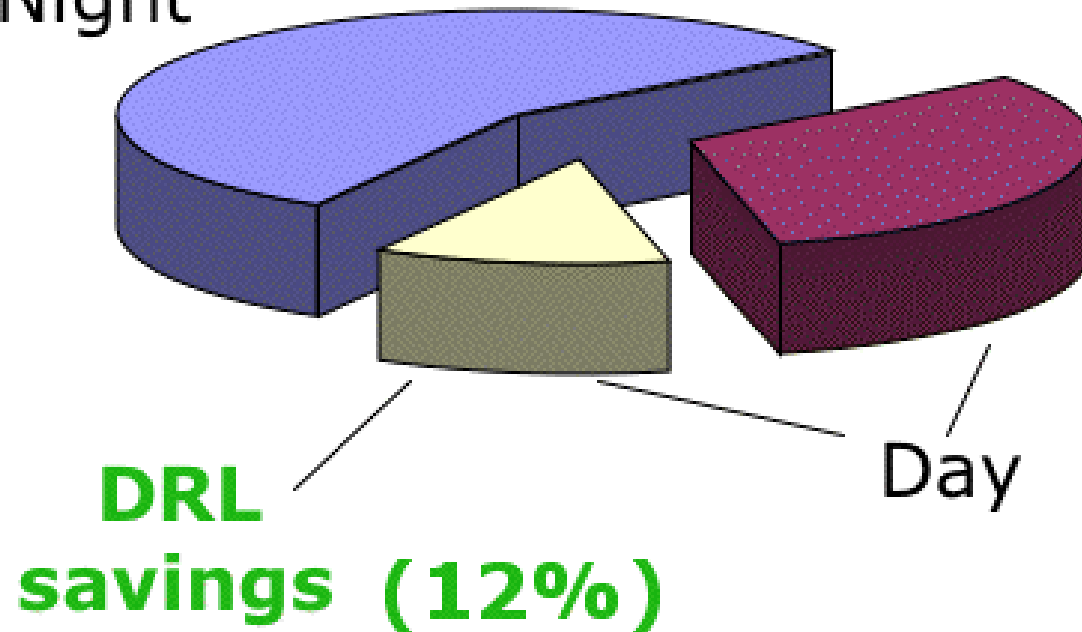


- 25% of multi-vehicle daytime fatal accidents
- 20% of multi-vehicle daytime injury accidents (SWOV 1997)

Potential Savings in Australia - DRLs

Pedestrian Fatalities

Night



DRL

savings (12%)

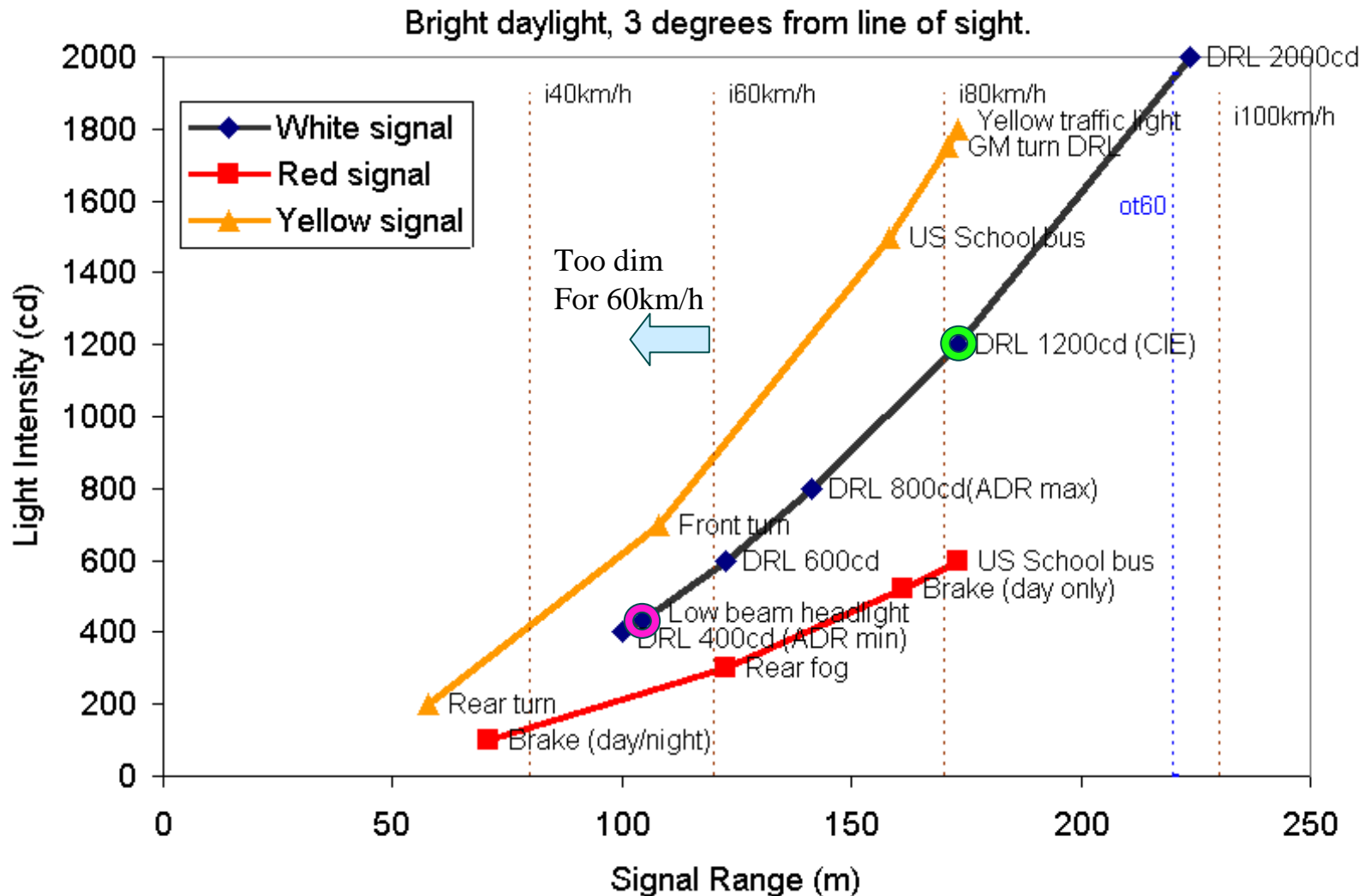
Day

Road Design Sight Distances



Design Speed	Intersection Sight Distance	Overtaking Sight Distance
40km/h	80m	160m
60km/h	120m	220m
80km/h	170m	340m
100km/h	230m	480m

Signal Range of Vehicle Lights



Concerns about DRLs

There are many myths and misunderstandings

- Increased fuel consumption is not an issue with energy-efficient dedicated DRLs
- Concern about “masking” of vulnerable road users has been shown to be unfounded - in any case they benefit most from being able to see approaching vehicles.
- Glare could be a problem at dawn and dusk - this is easily overcome by automatic headlights with an ambient light sensor (now standard on all Commodores)
- Premature failure of headlights - not an issue with dedicated DRLs

Motorcycle DRLs

QuickTime™ and a
H.263 decompressor
are needed to see this picture.

- Daytime use of headlights has had mixed success - at best , they can be expected to perform marginally on bright days.
- Most M/C turn signals are barely adequate on bright days
- Proposed that M/C front turn signals be much brighter and operate as DRLs (but research funds are lacking)

Recommendations - Being seen



- Introduce consumer tests of vehicle lights (turn signals and brake lights) to encourage better performing designs.
- Change regulations to allow white 1200cd DRLs, *provided* the vehicle has a light sensor that automatically switches to headlights at dusk
- Encourage aftermarket dedicated DRLs
- Encourage factory-fitted DRLs (fleets should *insist* on DRLs instead of fog lights that are commonly fitted and are of little use in Australia)
- Propose yellow DRLs for motorcycles (combined with much brighter turn signals)

Recommendations - Speed



- Make motorists aware that even relatively low speed impacts can be fatal - the speeding problem is not just confined to high speeds and reckless drivers
- Encourage intelligent speed limiters for new vehicles - particularly those with navigation systems
- Insist on top-speed limiting for fleet vehicle purchases
- Provide consumers with information about vehicles available with speed control devices

Links at www4.tpg.com.au/users/mpaine/roadsafe.html