



# Motorcycling safety

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## Australian National Road Safety Strategy 2011-2020 commentary on motorcycling safety:

- Motorcycle (and scooter) usage rose by a very high 82% between 2000 and 2010, corresponding with a 17% increase in motorcyclist fatalities
- Single vehicle crashes account for 42% of motorcyclist fatalities
- Reducing the number of serious casualty motorcycle crashes is seen as a key future challenge
- Important that a systems approach across all pillars be adopted
- Addressing safety issues along popular motorcycling routes and introducing motorcycle black spot/black length programs are seen as important actions

# What do we know?

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## Motorcycle safety

- One of the most challenging areas of road safety
- 5x fatality rate of 4 wheeled vehicles (per registered vehicle)
- Commuting aspect – 64% FSI - intersections
- Recreational aspect - curves
- There is very little known about the relationship between travelling speed and crash injury severity
- In a crash, there almost always exists a mass inequality in favour of the other vehicle
- There are strong (mis)-perceptions about flexible crash barriers
- Motorcycle friendly crash barriers are evolving

# Urban motorcycle crash

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# What does this mean?

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## **Specifically targeted safe system treatments are limited**

- Limited options to dramatically reduce fatal and serious injuries
  - Innovation across the SS pillars will be key
- Current primary Safe System treatments do not cater specifically for motorcycles
  - e.g. roundabouts and flexible barriers
- Primary treatment is limited to segregation of motorcycles from other vehicles
  - Supporting treatments that improve overall road safety benefit motorcyclists – e.g. sealed shoulders, eliminating right turns
- Will require more contribution from the other pillars than is the case for vehicle occupants
  - Vehicle based solutions offer much promise – e.g. ABS braking technology
  - Differing licensing regimes and competency based development may offer effective alternatives

# Safe System approach

Specifically targeted safe system treatments are limited

Hierarchy	Treatment	Influence (E = exposure L = likelihood S = severity)
Safe System options (‘primary’ or ‘transformational’ treatments)	<ul style="list-style-type: none"><li>• Separate motorcycle lane (e.g. on freeways).</li></ul>	E
Supporting treatments (compatible with future implementation of Safe System options)	<ul style="list-style-type: none"><li>• Shared motorcycle/bus/taxi lane (e.g. on freeways).</li></ul>	L
Supporting treatments (does not affect future implementation of Safe System options)	<ul style="list-style-type: none"><li>• Consistent design along the route (i.e. no out-of-context curves)</li><li>• Consistent delineation for route</li><li>• Skid resistance improvement</li><li>• Motorcycle-friendly barrier systems.</li></ul>	L L L S
Other considerations	<ul style="list-style-type: none"><li>• Speed enforcement</li><li>• Enforcement of other regulations.</li></ul>	L, S L



Photo: [www.thestar.com.my](http://www.thestar.com.my)

# Barriers

## Motorcycle barrier protection

- Half of all barrier collisions occur with motorcyclist in sliding posture (i.e. separated from motorcycle)
- Severe injuries can occur at 30 km/h + impacts with barrier post (*Bambach and Grzebieta 2015*)
- Barriers that are more motorcycle friendly are evolving



*Flexible (left) and steel rail (right) motorcycle barrier protection (sourced from Dua and Sapkota 2012)*



# Barriers

## Motorcycle barrier protection

*Motorcycle crash into flexible motorcycle barrier protection.  
The rider received no treated injuries.*



*Rub marks on flexible mesh  
were reportedly from the rider's  
helmet*



*(Dua and Sapkota 2012)*

# Wire rope safety barriers

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## Skepticism regarding the safety of WRSBs

- A perception that WRSBs are especially dangerous for motorcyclists – the “cheese cutter effect”
- Barriers in general are substantially more dangerous to motorcyclists than motor vehicle occupants
- In Australia, impacts with WRSBs are associated with 7.8% of motorcyclist fatalities (Jama et al 2011)
- Comparatively, w-beams are associated with 72.7% and concrete barriers with 10.4% (Jama et al 2011)
- Use W-beam with rub rail on high risk hills curves
- Will require monitoring if barrier exposure increases significantly

# Wire rope safety barriers

## Skepticism about the safety of WRSBs

- Swedish study found that 2+1 roads with WRSBs reduced the risk of death and serious injury to motorcyclists by 65-70% (40-50% after sensitivity analysis)
- No evidence was found that WRSBs increase the risk of death and serious injury to motorcyclists (Carlsson 2009)



Wikipedia (2007) [https://en.wikipedia.org/wiki/2%2B1\\_road](https://en.wikipedia.org/wiki/2%2B1_road)

# Motorcycle FSI with barriers NZ/Aust

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- Last 10 Years:
- 4600 FSI
- 3.1% with barriers
- 0.05% all road users
- 2001-2013 (UNSW):
- 20F with barriers
- 3F flexible / 13F with W-beam
- 28F 114SI mc vs barrier
- 119F 716SI mc vs roadside object
- 129F 342SI mc vs opposing vehicles

# Motorcycle blackspot & safety programs

- Victoria: \$32 million blackspot funding from motorcycle registration levy
- South Australia: \$470,000 spent on w-beam motorcycle barrier protection
- New South Wales: blackspot and route safety review programs
- New Zealand: programs in North and South



# Motorcycle blackspot & safety programs

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- Range of treatments implemented:
  - Intersection specific to corridor treatments
  - Speed management, speed limit reductions
  - Flexible and steel w-beam motorcycle barrier protection
  - Flexible signposts
  - VMS signage
  - Improvements to road surface (skid resistance, maintenance)
  - Traffic flow management (banning or delineating right turns, advanced warning signs)
  - Frangible guideposts at consistent intervals
  - Advisory speed signs
  - Consistent line marking
  - Perceptual countermeasures (visual cues to slow people down)

# Victorian motorcycle blackspot program

## Evaluation of program by Cairney et al (2015)

- Overall, 27% reduction in casualty crashes, 31% reduction in FSI crashes
- Barrier protection treatments resulted in a 74% reduction in FSI crashes
- BCR between 7.1 and 8.5 when accounting for the economic cost of FSI crashes



All photos sourced from Kenn Beer

# Safety technology applied to motorcycles

## Vehicle based innovations

- New vehicle technologies
  - ABS and traction control
  - Stability control
  - Airbags
- New protective clothing technologies
  - Advanced materials
  - Integrated jacket airbags
- Protective clothing reduces injury risk and severity (de Rome et al. 2012)
  - Use of body armour increases benefit
  - Material failure effects a proportion of crashes



Sourced from Honda <http://world.honda.com/motorcycle-picturebook/Airbag/detail/>

# Guidance

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- Proactive management will require changes in practice of road design, asset management and maintenance
- Use of Road Assessment Programs recommended to identify motorcycle crash risk locations
  - E.g. AusRAP, KiwiRAP, ANRAM
- Treatments aimed at targeting key crash types
  - Run off road and head on feature highly on curves
  - Right turn and right angle are prominent at intersections



Infrastructure Improvements to  
Reduce Motorcycle Casualties

**Thank you**

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