The context

- Light Vehicle (LV) incidents feature high in ICMM member company safety statistics
- Industry adding safety features to LVs with modest inherent safety
- Conducted physical crash tests at independent expert laboratory on four vehicles – three with ROPS, one without
- Results were a little surprising
- New BHP Billiton LV standard requires 5 Star NCAP LVs and prohibits fitting aftermarket equipment such as ROPS and bullbars.

Light Vehicles (LV)
Safety built in, not bolted on

David Jenkins
Vice President Safety & Security, Group HSEC
15 November 2012

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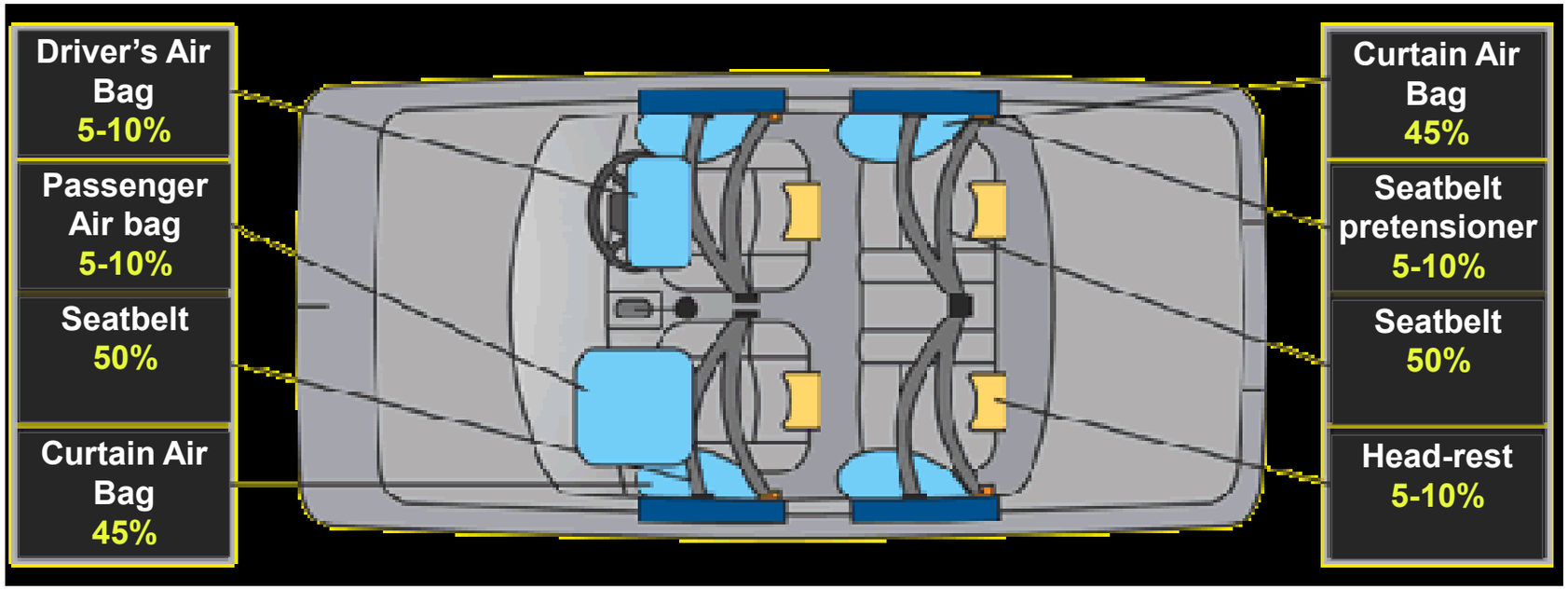
Vehicle safety features and their impact

Safety features and their capacity for reducing injury (1)



US research(2) shows Electronic Stability Control (ESC) reduces the risk of:

- Single vehicle fatal crashes by 49%
- Single 4WD fatal crashes by 53%
- 4WD rollover crashes resulting in fatality by 75%

(1) Folksam Research, 2005, Sweden

(2) Farmer, C.M. (2010) Effects of Electronic Stability Control on Fatal Crash Risk. Insurance Institute for Highway Safety, USA

New Car Assessment Programme (NCAP)

Multiple NCAPs around world:

- Australia ANCAP
- China CNCAP
- Japan JNCAP
- Korea KNCAP
- USA NHTSA / IIHS
- Latin America Latin NCAP
- Europe Euro NCAP
- SE Asia SEA NCAP
- Rest of World Global NCAP

Vehicles undergo physical crash testing

- Awarded star rating from 1 (worst) to 5 (best)
- Each extra star = 10% reduction in fatal injury
- Real world road crash data supports the rating system
- Regular safety improvements required to maintain 5 star safety rating

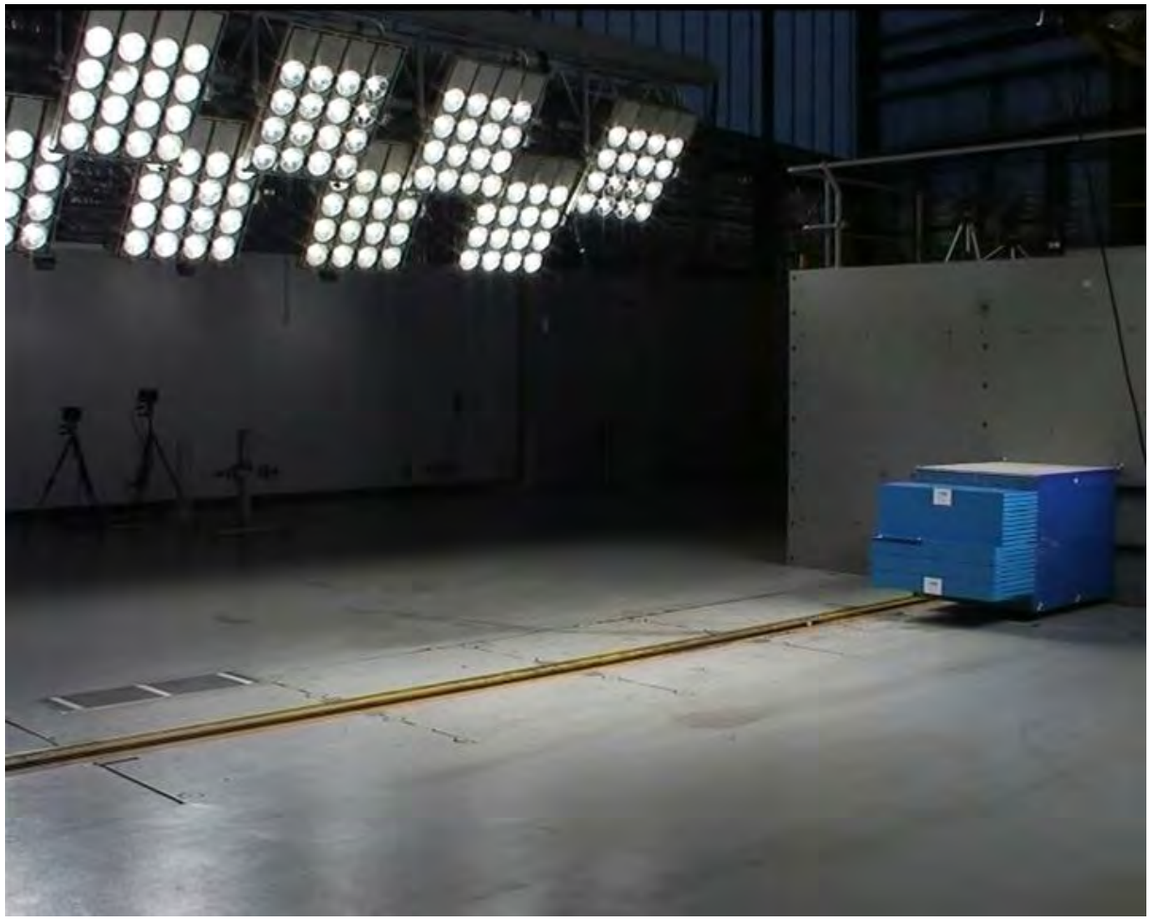
Past

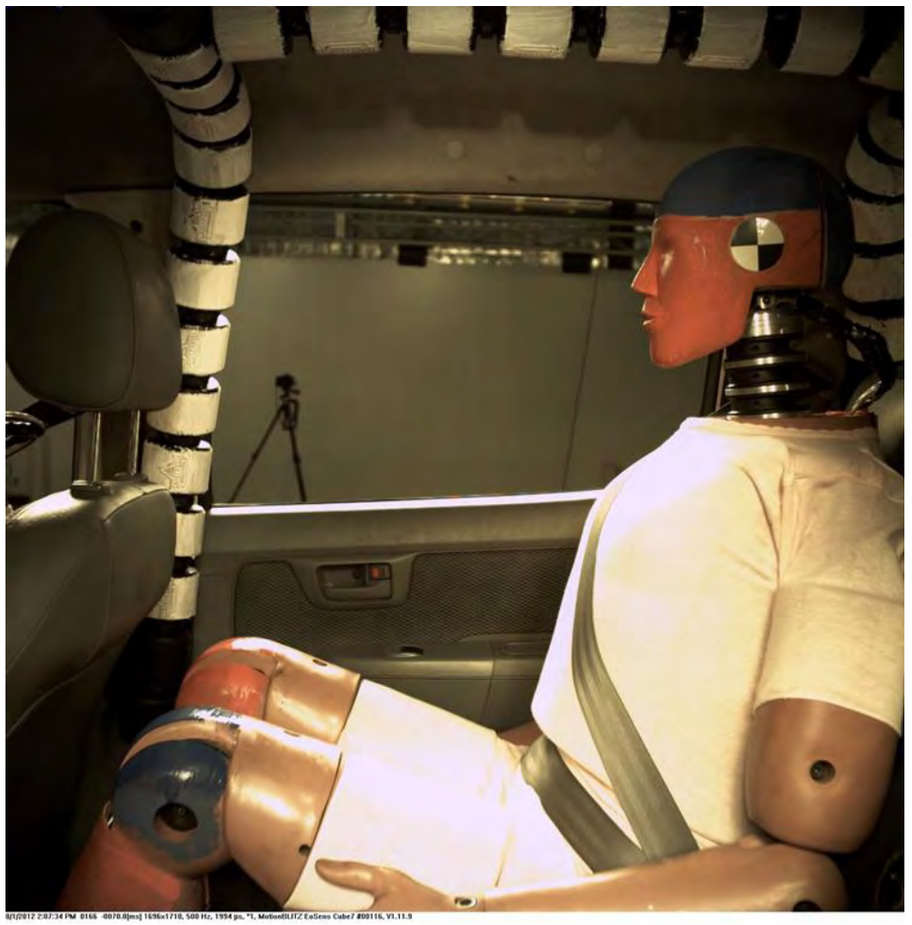
- High number of LV incidents
- Vehicle rollover fatalities – but none in recent years
- >90% BHP Billiton LVs no Electronic Stability Control (ESC), dual frontal or side air bags and some models no ABS
- ~30% Australian LVs were 3 star ANCAP
- 5 Star ANCAP cab chassis LVs only available since 2011
- Lower manufacturer safety specifications in different countries
- Industry approach was to retrofit rollover protection (ROPS)
- Safety “mission creep”
- Cost of complex compliance

Recent research

- Commissioned Crashlab NSW to undertake crash tests on four end-of-lease Toyota Hilux dual cabs
- Aim was to assess if internal ROPS contributed to injury outcomes to vehicle occupants in various crash scenarios:
  - Three vehicles fitted with ROPS, one without
  - All vehicles fitted with steel bull bar
- Tests:
  - 64kmph frontal offset
  - 50kmph side impact
  - 75kmph corkscrew rollover
    - One vehicle with ROPS
    - One vehicle without ROPS

Crashlab video – Frontal offset test (64kmph)



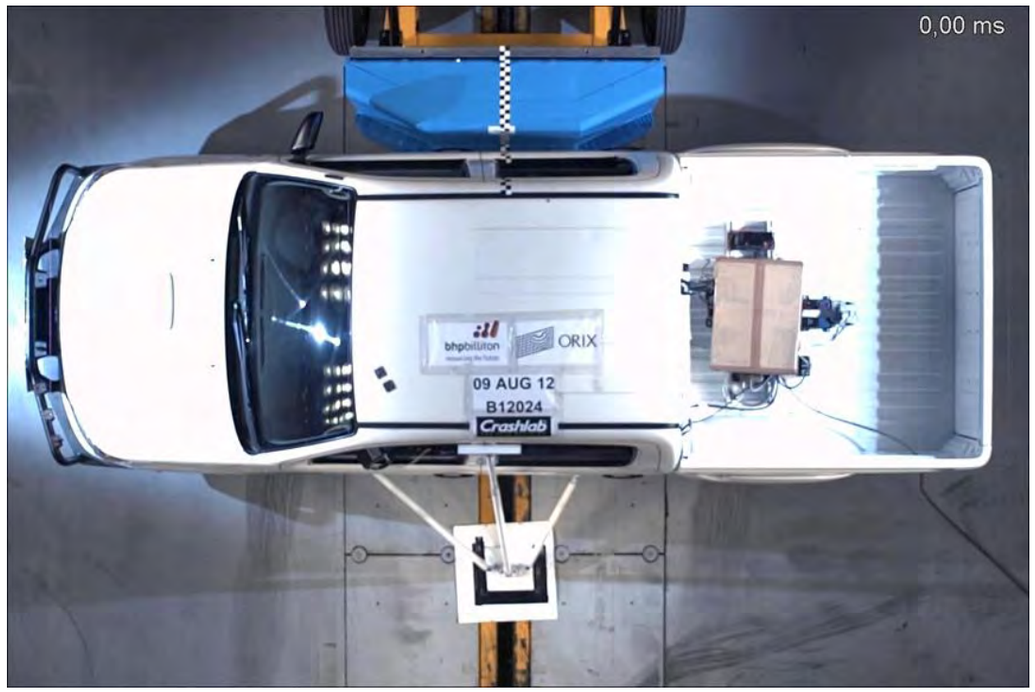


With and without bullbar

With bullbar
(Footwell intrusion / pedal displacement)

Without bullbar
(No footwell intrusion / negligible pedal displacement)

Crashlab video – Side impact test (50kmph)



Crashlab video – Rollover with and without ROPS (75kmph)

With ROPS - 180^0 rollover

Without ROPS - 90^0 rollover

Crashlab video – Rollover +35kgs added to roofline (75kmph)

LV without ROPS after 1st test

2nd test - 180⁰ rollover

Crashlab video – Rollover with and without ROPS (75kmph)

With ROPS

Without ROPS

With and without ROPS

With ROPS

Without ROPS

Crashlab results

- The bull bar caused footwell intrusion and displacement of pedals not present in 2006 ANCAP test of same model without bullbar
- The internal ROPS demonstrated no real reduction to potential serious head and spinal injuries to front seat occupants in the crash configurations
- ROPS designed to accommodate deployment of side curtain air bags would potentially represent a significant increase in the risk of serious head or brain injuries to rear seat occupants in a frontal crash
- The ROPS structure appeared to increase propensity for vehicle rollover by increasing the centre of gravity height;

Crash tests versus ‘real world’ incident

Testing
(75kmph ‘corkscrew rollover)

Real world
(90-100kmph sideways trip rollover)

New Light Vehicle Requirements

- Require all new BHP Billiton owned or leased light vehicles (excluding light vehicles dedicated and modified for underground use) to have a 5 Star New Car Assessment Programme (NCAP) safety rating.
- Prohibit installation of *aftermarket* equipment to 5 Star NCAP vehicles (other than special purpose light vehicles such as hi-rails and ambulances) except where necessary to meet the requirements of *Appendix 2* for visibility and communications equipment:
  - Reflective stripes / Vehicle number / Flashing light assembly on roof / Buggy flag;
  - Two-way radio;
  - Appropriate tray;
  - Must not must not affect stability or reduce 5 Star NCAP safety rating.
- Transition all light vehicles to a 5 Star NCAP safety rating by 1/1/ 2016
- Aftermarket defined as: *Equipment supplied by other than the vehicle manufacturer. Does not include manufacturer-supplied accessories and manufacturer options fitted at the dealership*.

Reaction from vehicle manufacturers?

Australian Toyota Hilux - currently 4 Star ANCAP.

In early 2012, Toyota Motor Corporation Australia (TMCA) was able to negotiate an improved Australia Hilux safety specification to provide a 5 Star ANCAP safety rating from late 2013.

The Land Cruiser 200 series will also achieve a 5 Star ANCAP rating in Q1 2013.

Quote from TMCA :

“The key drivers for TMCA to make these changes to the current Hilux were as a result of BHP Billiton's decision to introduce a 5 star vehicle policy.

This introduction would also have a large impact on contractors and the support businesses to the mining industry as a whole.

Toyota Australia is committed to vehicle safety and the decision to make this safety improvement early shows this support.”

Future

BHP Billiton owns / leases ~10,000 LVs globally.

In Australia alone, BHP Billiton LV standards influence 45-50,000 LVs

In dialogue with key vehicle manufacturers on topics such as:

- NCAP standards to apply across global production platforms;
- What safety technologies are in production or under development;
- Can we get this technology installed in LVs (currently aimed at sedans).

Current safety technologies of interest are:

- Intelligent ignition keys;
- Factory-fitted IVMS with internal & external video loop;
- Fatigue detection technology.

- Purchasing the safest vehicles available
- Not spending our time and money altering vehicle designs
- Allowing our people to focus on our core business
- Helping our contractors to comply with LV standards quickly and simply
- Leave vehicle safety to the experts - vehicle manufacturers

Better safety, less complexity, lower cost

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Takeaway points

- Fitting aftermarket safety equipment may have adverse consequences
- Leave vehicle safety to the experts - vehicle manufacturers
- It is possible to significantly influence vehicle manufacturers
- The starting point should be providing the safest LV (5 Star NCAP)
- By referencing NCAP we are tied to a continually improving standard developed by experts in conjunction with LV manufacturers
- Simplicity has provided improved safety, less complexity, lower costs and greater flexibility to our operations and contractors