

# **Position paper regarding parking and manoeuvring accidents**



RCAR P-Safe Working Group

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## Introduction

During the last decade parking and manoeuvring accidents appear to be increasingly relevant in third party damage liability and first party or motor own damage claims; a trend evident in many RCAR member states.

In addition vehicle manufacturers offer a variety of parking and manoeuvring driver assistance systems. For example Park Distance Warning (PDW), as fitted to numerous vehicles, provides a proximity-based acoustic warning and may also offer a visual display, whilst in-vehicle screens can display rear view and surround view camera images, the latter of which can be combined to give an effective overhead representation. In claims studies the effectiveness of PDW varies, for some vehicles it demonstrates a significant reduction in crash rates and associated claims costs, however for others there is no apparent benefit. See Allianz Centre for Technology (AZT), Folksam Insurance and Highway Loss Data Institute (HLDI) results.

Automated parking systems can identify appropriate parallel and bay parking spaces and provide the necessary steering to manoeuvre the vehicle into the space, and in some cases even control the speed and driving direction on behalf of the driver too. Similar to Autonomous Emergency Braking (AEB) which has proved to be effective at reducing the incidence of front-to-rear crashes in numerous studies, a recent development available on some vehicles is reversing auto-braking. This technology detects potential crashes in the path behind a reversing vehicle and automatically applies the brakes to slow or stop the vehicle thus mitigating or preventing the crash, and potentially avoiding any associated insurance claim altogether.

In order to gain an insight into the magnitude of the problem various international members of the RCAR P-Safe Working Group performed an analysis of their insurance data to identify relevant parking and manoeuvring claims. As a prerequisite to provide the necessary real world information for the definition of a possible future test standard for driver assistance systems that effectively address parking and manoeuvring crashes, these claims became the subject of an in-depth analysis to identify the following aspects:

- The relevance of parking and manoeuvring crashes in third party damage liability and first party own damage claims (e.g. claim frequency, average costs etc.)
- Common causation factors and attributes such as how, where and when parking and manoeuvring crashes occur (e.g. location, manoeuvre, direction of travel, impact partner, damage sustained, lighting conditions etc.)
- What types of driver assistance systems might be effective at avoiding or mitigating parking and manoeuvring crashes

## Glossary

Across the RCAR member states there is some variation in insurance products, their composition and the technical terms used to describe them. Relevant terms are grouped and explained below.

**Parking and manoeuvring crash:** A collision occurring with another vehicle or object etc. when the subject vehicle is undergoing parking and manoeuvring driving, independent of the direction of travel. Generally these crashes occur at low driving speeds in more confined spaces at the beginning or end of a journey.

**Reversing crash:** A collision occurring with another vehicle or object etc. specifically when the subject vehicle is driving backwards.

**1<sup>st</sup> party:** The insured covered by an insurer.

**3<sup>rd</sup> party:** Someone else outside of the agreement between the 1<sup>st</sup> party and the insurer.

**1<sup>st</sup> Party or Motor own Damage (MoD) insurance:** A type of insurance under which an insured (the 1<sup>st</sup> party) is compensated by their insurer in the event of an accident, injury or loss whether caused by themselves or someone else (the 3<sup>rd</sup> party).

**3<sup>rd</sup> Party or Third Party Liability (TPL) insurance:** A type of insurance under which an insured (the 1<sup>st</sup> party) is protected by an insurer against the claims of someone else (the 3<sup>rd</sup> party).

**1<sup>st</sup> Party or Motor own Damage (MoD) claim:** A claim made against 1<sup>st</sup> party or MoD insurance by the 1<sup>st</sup> party as a result of negligence by the 1<sup>st</sup> party e.g. the 1<sup>st</sup> party reversed their vehicle into a 3<sup>rd</sup> party vehicle causing damage to both vehicles.

**3<sup>rd</sup> Party or Third Party Liability (TPL) claim:** A claim made by a 3<sup>rd</sup> party against the 3<sup>rd</sup> party or TPL insurance of the 1<sup>st</sup> party as a result of negligence by the 1<sup>st</sup> party e.g. the 1<sup>st</sup> party reversed their vehicle into a 3<sup>rd</sup> party vehicle causing damage to the 3<sup>rd</sup> party vehicle.

**First Notification of Loss (FNOL):** The process through which an insured (the 1<sup>st</sup> party) reports a collision to their insurer.

**Parallel or inline parking:** The process of parking a vehicle parallel to the general direction of travel along a road.

**Perpendicular or bay parking:** The process of parking a vehicle perpendicularly or thereabouts to the general direction of travel along the road.

**Research Council for Automobile Repair (RCAR):** A global association of insurance research centres that is dedicated to improving vehicle safety, damageability, repairability and security.

**P-Safe Working Group:** A subset of RCAR members dedicated to researching Advanced Driver Assistance Systems (ADAS) to help prevent and mitigate the effect of crashes.

**Ego vehicle:** The 1<sup>st</sup> party or subject vehicle.

## Main results of the studies

A summary of the parking and manoeuvring crashes studied by RCAR members in Australia, Germany, Korea, Japan, Sweden, United Kingdom and the United States of America is provided in alphabetical order by member state.

### IAG Insurance Australia Group, Australia

#### Data:

1,074,857 collision claims occurring in Australia from 2010 to 2014 reported to IAG, analysis by text analytics to automatically extract parking related claims from the accident details report using keywords such as 'parking' and 'reversing' etc. (all \$ figures in AUD)

#### Main results:

- 22% of all reported claims during 2010 to 2014 are reversing collisions; the average costs of reverse collisions raised from \$1,728 in 2010 to \$2,333 in 2014
- The proportion of parking and manoeuvring claims increased from 17% in 2010 to 20% in 2014
- The average costs of parking collisions increased from \$2,492 in 2010 to \$2,883 in 2014, an increase of 15.7%
- The total estimated parking collision cost for the Australian Insurance Industry was approximately \$460m in 2014 (extrapolated based on IAG market share).
- Parking and manoeuvring claims are mainly 'damage while parked' (58%), followed by 'hit other car' (27%), 'hit by other car' (8%) and 'hit object' (7%)
- The average cost of parking and manoeuvring claims is highest for the claim type 'hit other car' (\$4,025) followed by 'hit by other car' (\$2,646), 'hit object' (\$2,539) and 'damage while parked' (\$2,206)

### Allianz Centre for Technology (AZT), Germany

#### Data:

1,000 Third Party Liability (TPL) claims with material damage only and 983 Motor own Damage (MoD) collision claims. All claims were reported to Allianz and occurred in Germany in 2011.

#### Main Results:

- 44% of all TPL claims and 39% of all MoD collisions are parking and manoeuvring claims, which account for approximately 30% of total claim costs
- The average claim costs for parking and manoeuvring claims are for TPL €1,698 and for MoD €2,130
- 32% of all TPL claims and 26% of all MoD collisions are crashes due to reversing
- Typically the insured car is moving backward: TPL in 83% and MoD in 73% of the parking and manoeuvring crashes

- The comparison of TPL and MoD data in 2011 to 2004/2007 shows a significant increase of parking and manoeuvring crashes relating number and costs (relative increase of more than 20%)
- In TPL and MoD, parking and manoeuvring crashes happen mainly in parking areas, car parks, private property ground and urban roads
- In TPL and MoD, parking and manoeuvring crashes occur mainly whilst moving out of a parking space and manoeuvring (>80%) rather than whilst entering a parking space
- In summary, most frequent collision objects are stationary vehicles, poles/trees and walls
- In TPL and MoD, frequently damaged areas (insured vehicle) are the vehicle rear, the passenger side and all four corners
- In TPL and MoD, there is a similar rate of parking and manoeuvring crashes occurring with vehicles equipped with a Park Distance Warning (PDW) system as those not equipped, indicating that the PDW systems in today's cars show limited effectiveness at preventing common crashes types

## German Insurers Accident Research (UDV), Germany

### Data:

345 Third Party Liability (TPL) claims with material damage and 219 Motor own Damage (MoD) claims with collisions only in Germany in 2004 to 2006 and 2012.

### Main Results:

- 39% of TPL claims and 47% of MoD collisions are parking and manoeuvring accidents, which account for approximately 30% of claims costs in TPL and 35% in MoD
- The average claim costs for parking and manoeuvring claims are for TPL €1,632 and for MoD €1,607
- In TPL and MoD, parking and manoeuvring accidents happen mainly in parking areas, parking lots/underground garages, private garages and entrances/exits
- Typically the insured car is moving backward: TPL in 79% and MoD in 60 % of the cases
- In TPL and MoD, crashes occur mainly whilst moving out of a parking space and manoeuvring (approximately 70%) rather than whilst entering a parking space
- In summary, for TPL the most frequent collision objects are stationary cars and for MoD large or medium-sized objects as well as stationary vehicles
- In TPL and MoD, frequently damaged areas (insured vehicle) are the vehicle rear, the passenger side and the driver side
- In TPL, nearly all collisions occur with another 3<sup>rd</sup> party vehicle, independent of the damaged area
- In MoD, damage to the rear and to the front mostly results from collision with a 3<sup>rd</sup> party vehicle, whilst for the vehicle sides large or medium-sized objects are more frequent
- In-depth analysis of newly defined accident types show more details regarding the pre-crash phase

## Korea Insurance Development Institute/Korea Automobile insurance Repair research & Training center (KIDI/KART), South Korea

### Data:

8,610,616 claims (property damage & collision) occurring in Korea from 2012 to 2014;  
analysis by text analytics to automatically extract parking related claims from the accident  
details report using keywords such as 'parking' and 'reversing' etc.

### Main results

- 27.8% of 1<sup>st</sup> party (collision coverage) and 31.5% of 3<sup>rd</sup> party (property damage) are parking and manoeuvring cases, which account for approximately 30.2% of all claims
- 10.5% of parking & manoeuvring claims were cancelled at the insured's request, mainly because the driver would suffer an increased renewal premium in the future after claiming
- 78% of parking and manoeuvring crashes occur whilst reversing
- Typical crash locations are car parks, alleyways and the side of the road
- Parking accidents occur more frequent in the daytime, peaking between 1200 and 1600
- In almost 82% of cases the collision occurs with a 3<sup>rd</sup> party vehicle and in a further 11% of cases with a structure (wall, pole, post etc.)

## Jiken Center, Japan

### Data:

Analysis of Institute for Traffic Accident Research and Data Analysis (Japan) (ITARDA) data from 2011. Analysis of insurance payment data (TPL and MoD) of 2011.

### Main results:

- Regarding ITARDA data 12% of the police reported accidents are 'other accidents'. The major parts of this accident type are accidents during 'parking and reversing with low speed'. Remark: The real number of 'parking and manoeuvring accidents' in Japan is very likely to be higher as ITARDA data contains only police reported accidents
- Relating insurance payment data the repair costs of 'other accidents' are in approximately 56% of the cases below 150,000 yen
- In approximately 50% of the claims with repair costs below 150,000 yen the damaged parts were parts at the rear of the vehicle (e.g. rear bumper, rear fender). This is a strong indicator for the high relevance of reversing accidents (>50%)
- Claims resulting from crashes occurring in parking lots represent 30% of all claims

## Folksam Insurance, Sweden

### Data:

Analysis of 572 accidents with Toyota/Lexus models reported to Folksam Insurance in Sweden in 2012. In addition, comparison of accidents with/without rear-end ultrasonic sensors: 84 cars with, 488 without.

### Main results:

- 25% of all crashes happened during reversing. The repair cost share of accidents during backing is approximately 21% of total repair cost
- On the basis of a comparison of crashes with/without ultrasonic sensors a crash avoidance effect of approximately 28% was calculated (statistical method: induced exposure)

## Thattham Research, United Kingdom

### Data:

12,565 First Notification of Loss (FNOL) cases from collisions occurring in the UK in 2010. The data includes 1st and 3rd party claims, of which 7,687 (61%) of these claims are 1st party and single vehicle at fault cases.

### Main Results:

- 24% of 1st party and single vehicle at fault cases (1,836 of 7,687) are parking and maneuvering cases, which account for approximately 23% of claims costs
- In 70% of the parking and maneuvering cases the vehicle at fault was reversing
- In 75% of the parking and maneuvering cases another parked or stationary vehicle was hit, in 14% a pole-like object (e.g. post, pillar, tree) and in 8% a barrier or wall was hit
- 1st party damage (ego-vehicle) is predominantly to the rear corners of the vehicle and there is also some front corner and distributed side damage, whilst damage confined to just the rear centre is rare
- 3rd party damage (struck vehicle) is predominantly to the vehicle corners and sides,, whilst damage confined to the front and rear centres is again rare

## Insurance Institute for Highway Safety, United States of America

### Data:

A retrospective analysis of data accumulated through a survey of 509 vehicles brought to drive-in insurance claims centers in the Washington D.C. metropolitan area in 2001 to 2002. The study examined the types and amounts of vehicle damage sustained in relatively minor front and rear crashes.

**Main Results:**

- The 509 case vehicles included 342 cars (67 percent), 116 SUVs (23 percent), and 51 minivans (10 percent)
- 14% of claims were for crashes that occurred in car parks, of which 58% involved reversing
- 15% (76 of 509) of claims involved reversing
- Of these 76 reversing claims...
  - 52% car collided with another car, 35% SUVs and pickups, 9% fixed object, 3% large truck/van, 1% other
  - Reversing action: 51% straight, 34% turning right, 15% turning left
  - Location: 54% car park, 20% driveway, 18% travel lane, 3% around intersection, 5% other
- 41 reversing car park crashes with a third party vehicle...
  - 3<sup>rd</sup> party vehicle action: 45% parked car, 24% moving in travel lane, 15% stopped in travel lane, 7% fixed object, 7% other backing vehicle, 3% other
- 15 reversing driveway crashes
  - 67% parked vehicle, 20% fixed object, 8% moving in travel lane, 7% other backing vehicle
- 33 reversing claimants with damage information
  - 85% rear damage, 15% front damage

**Highway Loss Data Institute (HLDI), United States of America****Data:**

HLDI examined the effectiveness of proximity sensors for parking assistance systems (effectively Park Distance Warning (PDW) in the previous studies) and rear view cameras on the basis of collision claims (1<sup>st</sup> party) and property damage liability claims (3<sup>rd</sup> party) from the years 2000-2011 in the US. Logistic regression modelling was used to compare the insurance claims experience for vehicles equipped with these systems to the same year/make/model counterparts without. Details of these analyses are available at <http://www.iihs.org/iihs/topics/t/crash-avoidance-technologies/hldi-research>

**Main Results:****Proximity sensors for parking assistance**

Two systems from Mercedes-Benz and one from Buick were examined.

- The only statistically significant results were a 5% reduction in collision claim (1<sup>st</sup> party) frequency and a 17% reduction in property damage liability claim (3<sup>rd</sup> party) frequency associated with the Buick system. Both frequency reductions were associated with reductions in overall loss costs, although only the property damage liability reduction was statistically significant.
- Mercedes-Benz Parktronic appears to have little effect on damage claim frequency and its Parking Guidance system is associated with a not statistically significant increase in damage claim frequency for both coverage types.



### **Rear view cameras**

Camera systems from Mazda and Mercedes-Benz were examined.

- The Mazda rear view camera was associated with statistically significant increases in collision claim frequency (3%), severity (\$125) and overall losses (\$18)
- The Mercedes-Benz camera seemed to have little effect on damage claim frequency, severity and overall losses

## Summary and future intentions

Although the various insurance claims data studies performed by the various RCAR centres were originally initiated to satisfy different intentions, it is clear that their findings indicate that parking and manoeuvring crashes are broadly similar in Australia, Germany, Korea, Japan, Sweden, United Kingdom and the United States of America:

- High relevance as a proportion of all claims (approximately 15% up to 40%)
- High relevance as a proportion of total claims costs (approximately 10% to 30%)
- High relevance for reversing among claims that result from parking and manoeuvring (approximately 60% to 80%)
- Collision objects are mainly 3<sup>rd</sup> party vehicles (approximately 55% to 80%), followed by poles and walls
- High relevance at parking areas, car parks, private property ground and urban roads

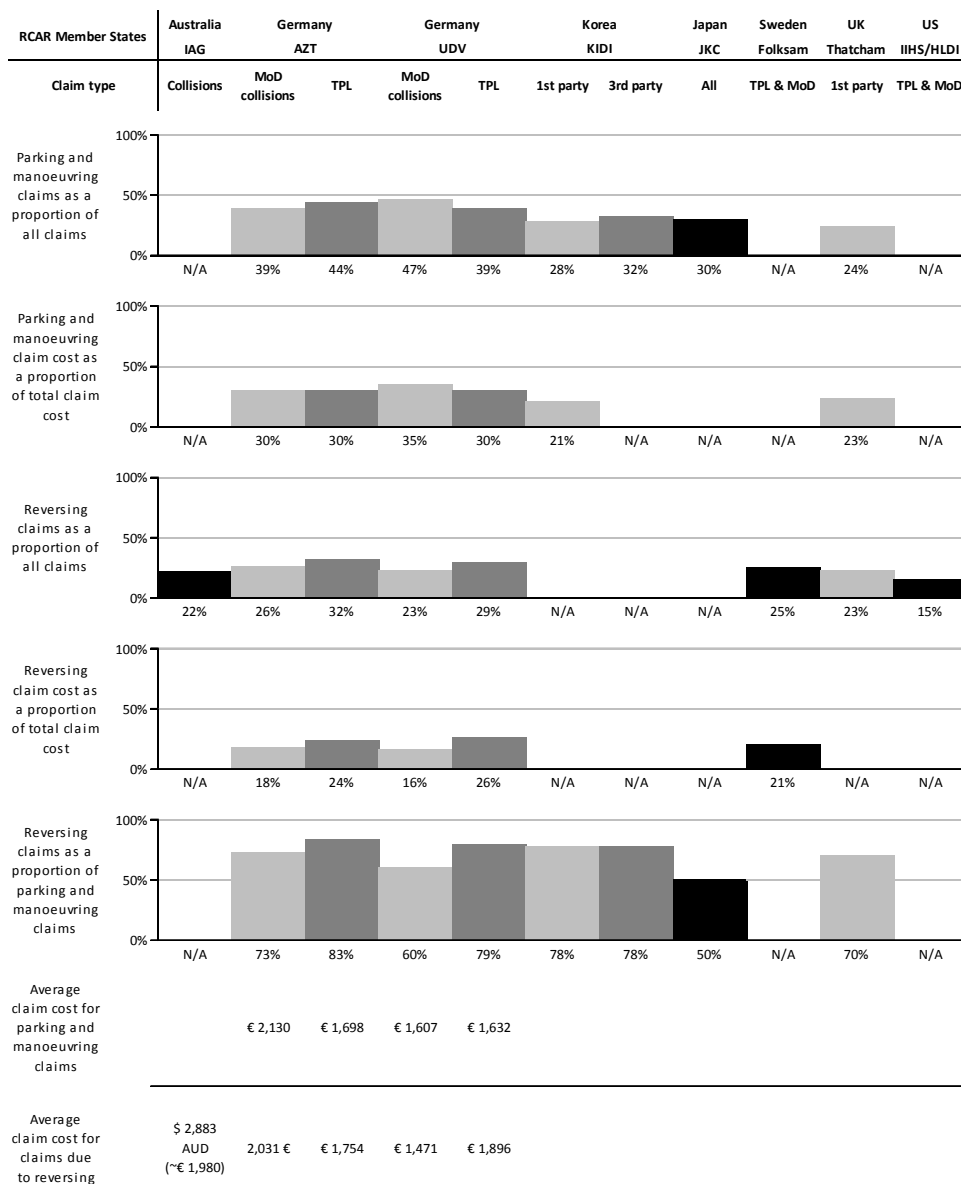


Table: Summary of main results relating parking and manoeuvring claims

Furthermore, detailed analysis of AZT and UDV claims shows that the main problem is not entering a parking space, but moving out of a parking space and manoeuvring (70% to 85%).

In addition, relating to AZT and IAG data, parking and manoeuvring crashes have become more relevant during the last years in terms of number of accidents and cost of accidents.

Finally, the effects of parking assistance systems (proximity sensors and rear view cameras) on insurance claims studied by AZT, Folksam and HLDI are mixed. Some are beneficial, whilst others have no effect or even appear to have be detrimental. Therefore further investigation and analysis is required to understand the design and function of these different systems to achieve the potential benefits they can provide.

Considering the findings of the various analyses, the RCAR P-Safe Working Group will focus future research efforts on developing test procedures for driver assistance systems addressing parking and manoeuvring crashes in the areas of:

1. Autonomous Emergency Braking (AEB) for reversing crashes – intention to have a RCAR test procedure prepared by the end of 2015
2. Automated parallel and bay parking systems for entering and leaving parking spaces – intention to have a RCAR test procedure prepared by the end of 2017
3. Observation of the effect of other parking and low speed manoeuvring driver assistance and collision avoidance systems e.g. rear and/or surround view cameras, rear cross traffic alert etc. If the systems show claims benefit then the P-Safe Working Group will revisit developing guidelines and/or test procedures to guide their design and implementation, field of view etc.