Evaluating the Impact of Autonomous Driving Technologies on Claims Frequency, Claims Severity and Claims Management

Presentation from Thatcham UK
AEB: Should It Be Mandatory...?

- Euro NCAP see a 38% overall reduction in real-world, rear-end crashes for vehicles fitted with low speed AEB compared to a sample of equivalent vehicles with no AEB.

- Thatcham Research – now a world leading reference in AEB and ADAS system functionality and effectiveness.
AEB Testing & Insurer Effect

**Low Speed**

- **Approaching speed (km/h)**: 0 km/h
- **XC60**: Auto brake
- **Golf**: Auto brake

**High Speed**

- **Approaching speed (km/h)**: 10-80 km/h
- **XC60**: Auto brake, Forward collision warning
- **Golf**: Auto brake, Forward collision warning

---

**Claims Data**

**THIRD PARTY INJURY CLAIM FREQUENCY**

- **Volvo XC60**: 4.5 claims per 1000 insured vehicle years
- **SUV Control**: 10.5 claims per 1000 insured vehicle years

- **Volvo XC60** compared to **SUV Control** shows a 21% reduction in claims.

**THIRD PARTY INJURY CLAIM FREQUENCY**

- **Golf 7**: 2.3 claims per 1000 insured vehicle years
- **Small Family Car Control**: 15.0 claims per 1000 insured vehicle years

- **Golf 7** compared to **Small Family Car Control** shows a 45% reduction in claims.

*All Crashes
Euro NCAP

Rating requires active safety

<table>
<thead>
<tr>
<th></th>
<th>Adult</th>
<th>Child</th>
<th>Pedestrian</th>
<th>Safety Assist</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>88%</td>
<td>83%</td>
<td>69%</td>
<td>79%</td>
<td>82%</td>
</tr>
<tr>
<td>Stars</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Renault Megane
1.5dCi 'Life', LHD

Nissan Qashqai
1.5dCi Acenta, LHD

Influencing standard fitment

All new cars on sale 2015

Cars launched in 2015

The Safety Assist score limits the overall rating
In the UK, 23% (725 out of 3,107 cases) of claims related to parking collisions. 71% of parking collisions (516 out of 725 cases) occurred during reversing.
Vehicle Evolution – Automated Steering

- LDW/LKA systems widespread in the market
- 20% of KSI relate to single vehicle crashes
- Sophisticated Lane Guidance Systems now available
- Run off road and across lane capabilities

**Insurance claims**

- **23%** Reversing & Parking
- **18%** Car to car rear
- **17%** Single vehicle
- **12%** Junction
- **4%** Head on
- **3%** Lane change
- **2%** VRU
- **2%** Other

**Insurance claims (%)**

- **22%**
- **18%**
- **17%**
- **12%**
- **4%**
- **3%**
- **2%**
Ten Year Prediction of Crash Severity

Speed Reduction in Rear-End Crashes

Accident Damage Distribution


Delta V = change of energy in a crash (not approach speed). Simple e.g. car travelling at 30km/h hits a stationary car; delta V is approx. 15km/h; complex calculation allows for many factors including vehicle stiffness, rebound etc.
Addressing Crash Types: What Next?

- But what about other crash types?
- ADAS systems will address other crashes too...
- What about Automated Driving – here by 2020?

AEB effect on Car-to-Car Rear

Damage claim distribution from Insurer member data

- Reversing & Parking
- Car to car rear
- Single vehicle
- Junction
- Head on
- Lane change
- VRU
- Other
ADAS Building Blocks

Thatcham Influence on Testing Procedures – *towards Automated Driving*

- **Automated Driving**
  - Automated Driving (Trained)
  - Automated Driving (Destination)
    - Automated Highway Driving
    - Automated City Driving
    - Automated Valet Parking
    - Autonomous Emergency Steering (AES)
    - V2X
    - AEB - City
    - AEB - Urban
    - Overtaking Assist
    - AEB – Pedestrian/Cyclist
    - Intersection Assist
    - ACC / Queue Assist
    - Lane Keeping
    - Lane Centering
    - Auto Parallel Parking
    - Navigation
    - Rear-Collision Mitigation
    - Anti-Lock Brakes
    - Stability Control
    - Electric Power Steering
    - Blind Spot Monitoring
    - Pedestrian Detection
    - Parking Aid
    - Traffic Sign Recognition
    - Lane Departure Warning
    - Forward Collision Warning
    - GPS
Why Automated Driving

Societal Advantages of Automated Driving

- Congestion
- Road Investment
- Productivity
- Emissions
- Mobility
- Safety
The Autonomous Car Timeline

International Categorisation of Autonomy – open to interpretation

0: LDW, ESC
1: ACC, LKA, BLIS, AEB
2: Queue Assist, Parking Assistance…
3: (2018 on) Highway Pilot?
4: (2021 on) Automated Driving
5: (2025) Robot Taxi

0: No Automation
1: Assisted
2: Partial Automation
3: Conditional Automation
4: High Automation
5: Full Automation

Driver monitors driving environment
System monitors driving environment

2016

2016

Driver attention

Eyes Off

Brain Off?
## Regulatory Procedures – Steering (R79) -Today

<table>
<thead>
<tr>
<th>Advanced Driver Assistance Steering System (ADASS)</th>
<th>Autonomous Steering</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corrective Steering (CSF)</strong></td>
<td><strong>Automatically Commanded Steering (ACSF)</strong></td>
</tr>
<tr>
<td>• Driver in primary control</td>
<td>• Driver in primary control</td>
</tr>
<tr>
<td>• Discontinuous control, for a limited duration</td>
<td>• Continuous control</td>
</tr>
<tr>
<td>• Changes to the steering angle</td>
<td>• Actuation of the steering system</td>
</tr>
<tr>
<td>• To maintain the desired path of the vehicle or to influence the vehicle’s dynamic behaviour.</td>
<td>• To assist the driver in following a particular path, in <strong>low speed</strong> manoeuvring or parking operations</td>
</tr>
<tr>
<td>• Signals initiated on-board the vehicle</td>
<td>• Signals initiated on-board the vehicle</td>
</tr>
<tr>
<td></td>
<td>• Control system that causes the vehicle to follow a defined path or to alter its path</td>
</tr>
<tr>
<td></td>
<td>• Signals initiated and transmitted from off-board the vehicle</td>
</tr>
</tbody>
</table>
Regulatory Procedures – R79 (the 2018 Challenge)

ACSF Category (replacing SAE 0-6)

A. Low speed maneuvering [Parkassist / Remote Controlled Parking]

B. Lane keeping

C. Lane change [Lane change commanded by the driver]

D. Lane change [System indicates possibility of a lane change, driver confirms]

E. Lane change [Lane changes are performed automatically by the system]
# Vehicle Timeline

<table>
<thead>
<tr>
<th>Regulation</th>
<th>L5</th>
<th>L4</th>
<th>L3</th>
<th>Tesla</th>
<th>Google</th>
<th>Mercedes S-Class</th>
<th>Hands free in lane driving up to 130km/h and &lt;1min + lane change assistant</th>
<th>Traffic Jam Pilot - Autonomous lane change</th>
<th>Mercedes S-Class – Hands free in lane driving &lt;2mins + Autonomous lane change</th>
<th>Auto Pilot &lt;40mph</th>
<th>Auto Pilot &gt;70mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vienna Convention ratification 23/4/16 to permit Automatically Commanded Steering Function (ACSF) increase from 10 up to 130km/h; with driver override/disable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN R79 – Automated steering greater than 10 km/h</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• R79 will enable “official” Automated Driving up to 81 mph – Spring 2018
• Only divided highways – motorways
• R79 proposed as a level 2 “driver support system” only
• Liability remains with the driver
• Driver will be monitored (somehow)
• Driver will be required to periodically “sign in” – maybe only every 15 mins
Risks

• Drivers will be unclear what an “auto pilot” is – do I do anything?
• Are they in-the-loop or not?
• If the driver only has to monitor system functionality why buy the system
• Drivers today use their capacity in the driving process – the easier the driving task the more they will become distracted – mobile phones? – and the longer to return into the loop
• Drivers will explore the capacity of the system – to the limit
• Systems will still only have 3-5 seconds of vision – not enough to get back into the loop and react
• Additional crash risks may emerge as drivers adapt
• HOWEVER – overall systems will be beneficial – crash rates reduce - *super AEB*
The Autonomous Car

Levels of Autonomy – When will it happen?

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>New Car Sales %:</th>
<th>Fleet %:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No Assisted Automation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Assisted Automation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Partial Automation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Conditional Automation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>High Automation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Full Automation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Autonomous Car

Insurance Model Risks for the Autonomous Car: Premium Value & Personal to Product Liability

Premium Value

Premium Distribution

Halving of insurance claims

80% reduction in claims reflecting benefits of autonomous vehicles

Product Insurance through ‘Bundled’ insurance

Premium breakdown:
Person: 70%, Car: 30%

Premium breakdown:
Person: 50%, Car: 50%

Premium breakdown:
Person: 30%, Car: 70%

Insurance Model for the Autonomous Car: Premium Value & Personal to Product Liability
Evaluating the Impact of Autonomous Driving Technologies on Claims Frequency, Claims Severity and Claims Management