Driver Assistance & Autonomous Driving
Challenges and Opportunities

Presented by Marc Seguer
ADAS, Chasis Development
SEAT, S.A.

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Driver Assistance & Autonomous Driving

Agenda

01 Introduction
SEAT / SEAT Technical Center

02 Present Driver Assistance Systems
Overview / ADAS in new SEAT ATECA

03 Autonomous Driving
Media / Car Manufacturers / Challenges / Risks / Opportunities

04 Conclusion
Established in 1975 (40th anniversary in 2015)
More than 900 engineers - The innovation driving force of the company
Number 1 industrial investor in R & D in Spain (300 million € /year on average)
SEAT Design Center – Unique in Spain
# Driver Assistance & Autonomous Driving

**SEAT Technical Center - Numbers and Facts**

<table>
<thead>
<tr>
<th>363 Projects</th>
<th>Developing process</th>
<th>Projects within VW group</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Car Model" /></td>
<td><img src="image" alt="Developing Process Diagram" /></td>
<td><img src="image" alt="VW Group" /></td>
</tr>
<tr>
<td>283 Registrations on 2015 (Patents, utility and design models)</td>
<td><strong>CONCEPT</strong></td>
<td>Engineering companies, Suppliers, Universities ...</td>
</tr>
<tr>
<td>120,000 Simulations</td>
<td><strong>DEVELOPMENT</strong></td>
<td></td>
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<tr>
<td>42 Prototypes</td>
<td><strong>PRE-SERIE / SERIE</strong></td>
<td></td>
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<tr>
<td>2.400,000 km</td>
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**Engineering companies, Suppliers, Universities ...**
Driver Assistance
SEAT ATECA

Digitalisation  Urbanisation  Shared economy  Sustainability

Ageing Society

The vehicle should be understood as a part of a bigger mobility system
Driver Assistance

New SEAT ATECA and new Leon
Driver Assistance
New Driver Assistance Systems in SEAT ATECA: Comfort and Safety

<table>
<thead>
<tr>
<th>Rear View Camera</th>
<th>Traffic Signal Recognition</th>
<th>High Beam Assist</th>
<th>Lane Assist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park Distance Control</td>
<td>Adaptative Cruise Control</td>
<td>Front Assist</td>
<td>Tiredness Recognition</td>
</tr>
<tr>
<td>Top view</td>
<td>Emergency Assist</td>
<td>Park Assist</td>
<td>Blind Spot Detection</td>
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<tr>
<td>Traffic Jam Assist</td>
<td>Rear Traffic Alert</td>
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<td></td>
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Front Assist including pedestrian detection

Blind Spot Detection

Top view

Emergency Assist

Park Assist

Rear Traffic Alert

Traffic Signal Recognition

High Beam Assist

Lane Assist

Adaptative Cruise Control

Traffic Jam Assist

Rear View Camera

Tiredness Recognition

Lane Assist

Rear Traffic Alert

Traffic Signal Recognition

Emergency Assist

Blind Spot Detection

Adaptative Cruise Control

Traffic Jam Assist

Rear View Camera

Tiredness Recognition
Driver Assistance

Owners’ willingness to repurchase is high

Advanced driver-assistance systems

- Average of 20 features for vision assistance, warnings and alerts, adjustments, and interventions
- Most-adopted features include blind-spot monitoring, advanced emergency braking, and precollision warning

Current adoption rate, % (minimum, maximum)

<table>
<thead>
<tr>
<th>Country</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>8</td>
<td>28</td>
</tr>
<tr>
<td>Germany</td>
<td>6</td>
<td>23</td>
</tr>
<tr>
<td>South Korea</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>United States</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Japan</td>
<td>3.1</td>
<td>8</td>
</tr>
</tbody>
</table>

Willingness to repurchase, %

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<th>Country</th>
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<tr>
<td>China</td>
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</tr>
</tbody>
</table>

¹Percentage of respondents who own advanced driver-assistance systems features who answered “definitely would buy again” or “probably would buy again.”

Source: McKinsey Connected Car Survey, 2015, of 5,500 recent car buyers
Driver Assistance & Autonomous Driving

In January 2014, the SAE classified the future of the automobile...

- **SAE Degree**
  - 0: No Automation
  - 1: Driver Assistance
  - 2: Partial Automation
  - 3: Conditional Automation
  - 4: High Automation
  - 5: Full Automation

**SAE Degree 0**
The driver must need to monitor the drive all the time

**SAE Degree 3**
The driver can hand over the driving task to the system (in certain situations)

*The driver is „out of the loop“*
Driver Assistance & Autonomous Driving
In January 2014, the SAE classified the future of the automobile...
Driver Assistance
Driver Assistance Systems in new SEAT ATECA: Safety and Comfort, Level 2

Front Assist including pedestrian detection

Traffic Jam Assist (Level 2: Partial Automation)
# Autonomous Driving

## Vision: Autonomous vehicles in the market

### The self-driving vehicle revolution

An illustration of potential growth

<table>
<thead>
<tr>
<th>Era 1: Fully autonomous vehicles (AVs) being developed for consumers</th>
<th>Era 2: Consumers begin to adopt AVs</th>
<th>Era 3: AVs become the primary means of transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. AVs are already a reality in industrial fleets</td>
<td>4. The after-sales service landscape is reshaped</td>
<td>7. AVs free up to 50 minutes a day for drivers</td>
</tr>
<tr>
<td>2. Car OEMs begin to assess strategic impact</td>
<td>5. Insurers shift from covering individuals to covering technical failures</td>
<td>8. Parking space is reduced by billions of square meters</td>
</tr>
<tr>
<td>3. New mobility models begin to emerge</td>
<td>6. Supply chain and logistics are redefined</td>
<td>9. Vehicle crashes fall by 90%, saving billions of dollars</td>
</tr>
<tr>
<td>10. AV technology accelerates development of robots for consumer use</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Autonomous Driving
Vision (Year 1954)
## Autonomous Driving

### Challenges

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal aspects</td>
<td>Vienna Convention 1964, ECE-Norms</td>
</tr>
<tr>
<td>Ethical dilemas</td>
<td>Lethal behaviour, politeness</td>
</tr>
<tr>
<td>Operator safety</td>
<td>HMI, Safety beyond manufacturer's instructions</td>
</tr>
<tr>
<td>Active safety</td>
<td>Emergency maneuver: brakes, avoid, stop</td>
</tr>
<tr>
<td>System Architecture</td>
<td>Redundancy, protection against failures</td>
</tr>
<tr>
<td>Verification</td>
<td>Simulation, Open Road Testdrives</td>
</tr>
</tbody>
</table>
Autonomous Driving

Challenges
Conclusions (*):

/ A transition time of 8 seconds seems to be enough in this simple scenario for all drivers to take over the driving task comfortably.
/ Drivers take over the driving task not as quick as possible.
/ They gain situation awareness before they react.
/ Gaining Situation Awareness is the most important time factor.

… Are 8s transition time valid for more complex scenarios which require a decision before acting?


(*) SA: Situation Awareness
Autonomous Driving

“Autonomous cars will not arrive in my lifetime.” (J. Lentz, autoguide.com, 09.2013)

“Google will have autonomous cars available for the general public within five years.” (S. Brin, cnet, 09.2012)

“First self-driving cars are expected to be on the roads in Gothenburg by 2017.” (volvocars.com, 12.2013)

“I am committing to be ready to introduce [...] Autonomous Drive by 2020.” (C. Ghosn, nissannews.com, 08.2013)

“Vehicles capable of taking you to a destination with no oversight from a human driver are a significant distance into the future.” (2013)

“Ab 2020 sollen [...] die technischen Voraussetzungen für einen Autobahn-Piloten gelegt sein.” (bmwgroup.com, 01.2014)

“Noch in dieser Dekade wird es einen Autobahn-Pilotengeben.” (R. Hortwich, auto.de, 09.2013)


Renault’s ultimate goal is a fully automated valet parking system in 2020. (The Morning Journal News, 10.02.2014)

Commercially-available Volvos could be parking themselves within the next 10 years. (www.gizmag.com, 04.07.2013)

Vollautomatisches Parken per Smartphone wird voraussichtlich ab 2015 erhältlich sein. (www.bosch.com, 15.04.2014)


Autonomous Driving

Challenges

1. Adaptation
   - SEAT facilitates urban driving by creating urban vehicles, developing smart assistance systems and providing flexible access.

2. Interaction
   - SEAT is connected with the urban infrastructure, providing integrated mobility access and new transportation services.

3. Cooperation
   - SEAT cars are part of multimodal networks and cooperate with the local traffic management to meet urban KPIs in real time.

Objective: achieve cooperative mobility through smart connectivity
Autonomous Driving

Carsharing

SEAT President Luca di Meo. Mobile World Congress (MWC), 2017
Driver Assistance & Autonomous Driving

Conclusions

/ SEAT ATECA: SAE Standardized Level 2 of automation is already a reality

/ First Semi-autonomous vehicles will be very soon in the market

/ Cars will be connected in a near future and a part of multimodal networks

/ … But costs, challenges and risks of autonomous driving are really huge

“You will face your greatest opposition when you are closest to your biggest miracle.”
Shannon L. Alder
Thank you!

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