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“Restraint Systems Must Become More Adaptive”

In the field of vehicle safety, active and passive functions are increasingly coming together to form integral safety systems. In an interview with ATZ, Stefanie Eßers from Takata explains why the rear seat is no longer the safest place in the car, how the Hands on Wheel sensing system makes autonomous driving possible and why airbags and seatbelts are experiencing a renaissance.

Dipl.-Psych. Stefanie Eßers (born in 1973) was appointed Director EMEA Core Engineering and Research at Takata AG in April 2015. She heads the Pre-development and Research departments in Berlin and studies restraint systems, together with sensors, user interfaces and algorithms for automated driving. After completing her degree in psychology at the RWTH Aachen University and the University of Potsdam, she began her career in 2002 at Daimler-

Chrysler in Berlin and Stuttgart as a research assistant. Four years later she moved to Takata as an HMI and Human Factors specialist. Here she introduced user-centred development to the company and built up the first worldwide HMI team at the Takata Corporation. In 2011, she was promoted to the role of Team Leader of the Future Drivers' Workspace. From 2012 to 2015, she was Head of the global HMI and Human Factors Research department.

ATZ _ Everyone believes that the rear seats are the safest place in the car and that children should sit in the back. Do the latest studies support this belief? And how can safety in the rear seats be improved?

ESSERS _ At Takata we are heavily involved in this area. As far as restraint systems are concerned, the majority of the attention over the last few decades has been focused on the situation in the front seats. This was due to the fact that someone is always sitting in the front, even if only the driver. However, if we put a person with the same build and of the same age and gender in the same car, they would probably be more seriously injured in the rear seats in the event of an accident than if they had sat in the front of the car. We can no longer really say that the back is always safer. This is partly because the existing restraint systems in the rear of the car are not as adaptive and as well-equipped as those in the front. For example, there is not such a device as a front airbag in the back. The only restraint system is the seatbelt. But the additions to Euro NCAP last year are putting more focus on the safety of the rear-seat passengers.

“We need to take the comfort of rear seats more seriously”

It's not only children who sit in the rear seats, but also adults. For example in China extra-long versions of certain models are popular with the big bosses who prefer to be in the back.

China NCAP now uses 5th percentile dummies in the back during frontal and side crash tests. Car manufacturers that offer comfortable seats in the back, in particular in premium models, are also testing with larger dummies as part of the due care provision.

When will there be a front airbag for rear-seat passengers?

It is very likely that the front-seat technology will soon begin to be incorporated into the rear of the car. I believe that in around four years' time serial models will be available with airbag concepts for occupants in the rear seat. A combination of an airbag and an adaptive seatbelt tensioner would be a possi-

ble means of adjusting the amount of force to match the severity of the accident.

Your latest research relates to the rear seats. How is protection being improved for passengers sitting in the back?

One of our findings is that rear-seat occupants are less likely to be sitting in a standard position than those in the front. Adult passengers in particular want to be involved in what's going on in the front seats. This means that their upper bodies are leaning forwards and sideways when the crash occurs. Our study has also shown that passengers in the back often do not have the seatbelt in the ideal position. They resolve the problem of an uncomfortable belt by trapping it under their arm. Both of these behaviours increase the severity of the accident, because the protection system can no longer work properly, in contrast to the one in the front of the car. These phenomena reinforce the fact that the rear seats are no longer necessarily the safest place in the car. We believe that this is a good reason for taking passengers' comfort more seriously.

How can you improve the quality and the market presence of your child seats in future?

In this case too, comfort is not a separate issue, but an important safety factor. Children have to be able to sit comfortably in their child seats, sometimes for five or six hours at a time, for example when the family is going on holiday. Otherwise they will start to dislike the seats and will not sit in them properly. The challenge is to achieve the right balance of safety, comfort and ease of use. The main criteria that consumer protection organisations apply in their tests are the availability of the seats in stores and the newness of the products. Our child seats have not featured in the tests for the last three years because they could only be ordered over the Internet. However, since the start of 2016 we have been working on increasing our market presence with a new sales system and new products. For example, our seats are already available at 80 retailers in Spain and in Germany the figure will soon be 25. We believe that our new products will be tested by the consumer protection organisations and given good ratings.

The Euro NCAP regulations are becoming increasingly strict and now include the positive influence of assistance systems such as emergency brake assist and lane departure warning. What does that mean for your day-to-day work?



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Stefanie Eßers (left), Head of R&D at Takata, here in conversation with Michael Reichenbach (right), Deputy Editor in Chief of ATZ, believes that we can no longer really say that the rear seats of a car are always safer

Our core business is developing and supplying passive safety systems. For this reason, we very much welcome this development. Our corporate mission is Vision Zero. The systems you mentioned will help us to move towards the goal of no fatalities on the roads. Until now we have especially been looking at crash tests at high speeds involving the absorption of considerable amounts of energy. As the relative speeds begin to fall, for example because of emergency brake assist, crash tests involving less serious impacts will become statistically more important. As a result, we will be supplying more flexible restraint systems in future that take these requirements into consideration more effectively.

What might these new products look like?

There is a significant need for restraint systems to become more adaptive. The new concepts include our re-compression airbag, which allows us to actively control how the energy is absorbed by the occupants via the airbag. At the start of the energy absorption process, we can guarantee rapid restraint. In the later stages, an opening in a second bag installed in parallel with the main bag enables pressure to be released from the

system. This optimises the recovery of energy and provides the ideal level of restraint for both light and heavy people.

The move towards more automated driving is well underway. How does your Hands on Wheel sensing system monitor the driver?

When we provide drivers with a combined assistance system involving a lane departure warning function and adaptive cruise control, such as the current traffic jam assist system, we need answers to the following questions: Is the driver playing an active role in the control loop? Can he or she take over responsibility for driving again at any time? This means that it is important to know whether the driver is holding the steering wheel. Our Hands on Wheel sensing function is a capacitive three-zone system which can be extended to include additional zones. As driving becomes partially automated in future, our function will be ideal for identifying the involvement of the driver in the control loop.

What happens with higher levels of automation and at higher speeds?

As the degree of automation increases, camera-based systems start to become important, because we need information

about the exact condition of the driver. In future, with higher levels of automation and at speeds above 60 km/h, we will definitely want to know about the driver's status via a camera and additional vital signs sensors. One scenario that we will not want to see is a driver climbing into a car in Berlin, programming the satnav to go to Munich, getting onto the motorway and around 100 km later having a circulatory collapse, while the car continues all the way to Munich. No one wants to find out about this only when the vehicle arrives at its destination. We need reliable systems for monitoring the condition of drivers.

“Exploited? Passive safety is currently undergoing a renaissance”

What about data protection? What will you do with drivers' personal data that you have collected via the steering wheel and the infrared camera?

This is a highly sensitive subject. In our case, we only process signals from the Hands on Wheel sensing system and the camera detection function. This means that we do not process any data which could identify the driver. The data from the Hands on Wheel sensing system consist of information about whether one hand or two hands are on the wheel and whether the driver is gripping it or simply resting the heels of his or her hands on it. We convert this information into a signal without storing it in the meantime and send the signal via the CAN bus to a central control unit. We are not responsible for managing this unit.

What happens to the data from the camera?

The situation with the camera data is just the same as that with the steering wheel data. The imager analyses the infrared image, but it only extracts the features. It needs to identify the pupil vector, the nose and the mouth in order to be able to calculate the position of the head. It is not possible to identify the face. The data are converted into a signal without being stored and are passed to a high-level control unit. Although as a supplier we are in the same boat as



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The Hands on Wheel sensing system is the ideal solution to the problem of transferring responsibility between automatic driving functions and the driver, according to Ebers from Takata

the vehicle manufacturer, we cannot tell the manufacturer how to process the data. From a development perspective, I expect the end customers to decide what happens to their data.

We have almost fully exploited the potential of passive safety systems, because airbags are now fitted as standard, at least in Europe, the USA and Japan. How will Takata reposition itself on the market?

The potential of passive safety systems has definitely not been fully exploited. They are currently undergoing a renaissance. We are seeing significant growth in the field of adaptive systems for use at low speeds. Current accident statistics show that increasing emphasis will be placed on specific load cases. This will lead to new systems which may need to be installed in new areas. The legislators and the consumer protection bodies will not move away from the current high-speed crash tests simply because we will “soon” have autonomous, accident-free driving. These load cases will remain important. In addition, autonomous driving will result in passive and active safety functions merging to form integral safety systems, which will lead to new business for us.

Stefanie Eßers, thank you very much for this interesting discussion.

You can read more of the interview – in German language – on the ATZ online portal at www.springerprofessional.de.

INTERVIEW: Michael Reichenbach

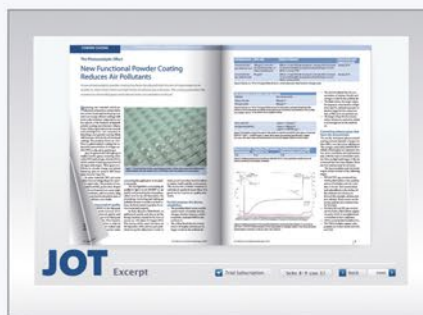
ATZ 07-08|2016 Volume 118

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