Innovative Active Headrest System

Development status

Phase 2

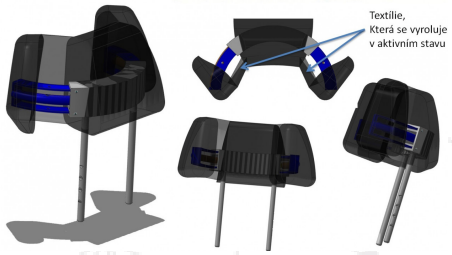
Feasibility study. There is a realistic design of the technology and the initial tests in the laboratory are leading to the specification of the technology requirements and its capabilities.

IP protection status

The invention is protected as an intellectual property - a patent, in the Czech Republic (CZ 305644 B6) and a European patent (WO 2015/180700 A1) in 6 European countries, which are the biggest car manufacturers.

Partnering strategy

Co-development, investment, licensing



Institution

CENTRUM DOPRAVNÍHO VÝZKUMU

Challenge

Although vehicle passengers, in comparison to other road users (e.g. pedestrians and cyclists), are relatively well protected, their injuries may occur in relatively low speeds. The most vulnerable body parts of car passengers include head and cervical spine. Based on the data from the In-depth analysis of road accidents, cervical spine injuries occur in a third of road accidents. The risk of a severe or even fatal injury at side impacts with a vehicle or a solid obstacle is high, therefore, it is necessary to ensure the vehicle passenger safety. However, the majority of currently used head rests are unable to protect head and cervical spine at inclined and side impacts or during vehicle rotations. Therefore, the research focused on developing a new type of an active head rest. Such head rest is be able to limit the movement of head sideways at an eccentric (deflected) impact.

Description

Our designed head rest will react similarly to an airbag at an eccentric or side impact. At a side impact the control unit sends an instruction to eject side arms of the head rest is able intercept the sudden movement of the passenger and reduce the extent of head and cervical spine movements up to a certain point. The development of the patented device already began in 2014. In order to optimize the designed head rest, the designed construction was further tested through numeric simulations. Computing modelling was using the assumption that the driver's head rest is correctly set and the driver is sitting in standard position. Subsequently, we used the numeric simulation to verify the functions while taking into account the variability of human population. Regarding the amount of simulations, a drivers age category was selected for a detailed analysis. This category was selected considering the road traffic accident rate statistics in the Czech Republic between 2007 and 2017. Driver's anthropometry was taken into account as well. The active head rest was tested in four impact configurations: side impact to a rigid pole, side impact to a pole – right side, inclined impact to a rigid pole, and inclined impact to a pole – right side. The head rest has been tested in more detailed and extensive numeric models, particularly at non-

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standard driver's head positions.

Commercial opportunity

The innovative headrest can be used by car seat manufacturers, headrest producers and car manufacturers. The headrest technology is new, innovative and the patent searches of the Transport Research Center and potential customers show that it is unique worldwide. The benefit of the headrest is especially in the safety of the vehicle crew. All simulations in a virtual environment have shown that the headrest can mitigate the consequences of an accident in various collision configurations. The restraint did not worsen the impact of the accident on the crew in any simulated case, in most cases there was a significant improvement. Technology should be implemented to enhance road safety.