

Analysis of the kinematics of the process of deformation of motorcar bodies during side impact crash tests carried out to the FMVSS 214 and conventional test procedures

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Abstract: The kinematics of the process of deformation of the motorcar body side in the culminating phase of a front-to-side vehicle collision has been examined as a possible basis for analysing and modelling the process of development of threats to car occupants during a road accident. The course of such accidents has a complex nature and their models are necessarily based on the approximation of strongly non-linear characteristics of impact processes, especially during the transition from the compression phase to the restitution phase of the deformation process. For such characteristics to be obtained, a lot of experimental tests have to be carried out. The modelling was based on results of specific FMVSS 214 crash tests carried out at NHTSA (USA) and conventional right-angle crash tests carried out at PIMOT (Poland). The kinematics of the contact phase and the vehicle deformation processes was modelled with taking into account experimental test results, inclusive of the characteristic curves representing the strongly non-linear processes that have a decisive effect on the vehicle body deformation. The analysis of the processes of deformation of the car body side, based on the experiment results, simultaneously revealed the range of penetration of body side parts into the car interior and showed the process of development of threats to car occupants. This danger was evaluated on the grounds of the velocity and energy of the impact against the occupant's body, resulting from the penetration of the deformed body side structure into the car interior.

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