# INTEGRITY ASSESSMENT OF AIRBAG HOUSINGS

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**Abstract:**

Occupant restraint systems are essential parts of today's vehicles to reduce the chance of occupant injuries during collisions. In order to evaluate the restraint performance, computer simulations, sled tests and vehicle barrier tests are conducted for several frontal collision types. Substantial prerequisite is the integrity of the passive safety module on component level. In this paper we focus on integrity of passenger airbag modules and the use of simulation methods in the development process.
Standard simulation approaches simplify the loads on the module during an airbag deployment to mean pressures and forces. These approximated loads are measured in specific tests and transferred into the simulation models. This approach is well applicable for one specific module. Basic modifications, for instance changes of inflator, airbag folding or airbag shape, require further test series, though. In order to reduce this additional hardware loops a full simulation of the module is proposed including details like the folded airbag and IP. Thus the loading conditions of the housing result directly from simulation which increases accuracy for the analysis of various setups and parameter changes. Recent development of software tools allows for a fast folding simulation of airbags, a pre-requisite for this approach. Completed by fluid structure interaction methods, e.g. CPM in LS-Dyna, a realistic gas flow and hence deployment of the airbag and loading of the housing can be achieved. First, the different loading situations for a passenger airbag module are summarized. Then modeling strategies are discussed within the development process. Benefits and limits of simplified models are presented. Then improvements by the use of detailed models are described. A systematic approach is presented to setup finite element models in a modular way that allow for fast variation of parameters in the development process. As one key point, the airbag folding is highlighted. Further, a modular modeling strategy is discussed with identification and correlation of the driving physical effects like the reaction force of the inflator. Finally the paper is closed with an outlook on the utilization of the proposed approach at TRW.