

# Migration of Crash Simulation Software at BMW

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*Abstract: Over the past three years, BMW has undertaken a significant project to first investigate, then proceed with migration from its present crash simulation software to ABAQUS. This project has been motivated by a growing recognition within BMW that, in order to advance its crash simulation methods, improved robustness in the software employed, along with a greater emphasis on physically-motivated simulation capabilities, are required. This paper documents the processes that have been undertaken for the migration project, from the very early stages, up through to the present point where ABAQUS is being used exclusively in a substantial pilot project to design the crashworthiness aspects of a new BMW automobile. The paper also documents some ABAQUS advantages already becoming evident for crash simulation, along with some particular ABAQUS simulation results demonstrating its advanced capabilities for modeling failure mechanisms.*

*Keywords: Crashworthiness, Failure, Fracture, Impact, Occupant Modeling, Safety.*

## 1. Introduction

BMW has used ABAQUS software for vehicle design analysis for several years, dating back to 1986, when material specialists started to use ABAQUS/Standard for thermo-mechanical analysis of the creep effects of particular engine components. Soon after this, engineers started to use ABAQUS for nonlinear static analysis of chassis components. In the 1990s numerous applications followed in the fields of chassis and engine analysis, such as the thermo-mechanical analysis of brake systems, including dynamic effects. Today, all nonlinear-static analysis work in the engine component, chassis, and body-and-white design are carried out in ABAQUS/Standard. In these applications ABAQUS has demonstrated particular fidelity in modeling material behavior and in capturing the important physical response of automotive components and systems, all the while providing robust solutions in a wide variety of applications. These factors are what motivated BMW to begin to investigate potentially using ABAQUS for crashworthiness simulation.