

Abstract

In February 2007, there was a severe frontal collision between two coaches with a velocity of more than 80 km/h. There were six fatally injured people. The Swedish Accident Investigation Board has done an in-depth investigation about the accident but it cannot answer all questions. It would be good with a complement to the in-depth investigation for example an accident reconstruction with finite element method. The finite element method is a numerical method often used in engineering problems. The geometry is divided into small elements, then the problem is solved for every element and finally the result from all elements is assembled.

The purpose of this project was to develop a model of a coach that could be used in reconstruction of the current accident. The model was built using the software Autodesk Inventor, LS PrePost and Hypermesh. The problem was solved with the finite element solver LS DYNA.

The accident was between two similar buses from Volvo, so just one coach model was created, and then two copies of this model were used to create impact simulation. The modeling process started with the building of the geometry. The geometry was affected by some limitations of the project. Firstly, just the front part of the bus was modeled up to the rear door. Secondly, the tires and the interaction between the ground and the coach were not modeled. Thirdly, no interior of the coach was modeled.

When the modeling of the geometry was finished it was meshed. Most of the parts were put together by merging nodes together. To connect the roof to the rest of the body, two different solutions were used; one with the constraint *CONSTRAINED_EXTRA_NODES_SET and the other with the contact definition *CONTACT_TIED_SURFACE_TO_SURFACE. When all the meshing and connections were done all the elements were assigned material properties and initial conditions. Two rigid bodies were also created, one for the rear part of the body and one for the engine.

The project resulted in a model of the current impact. The model consisted of more than 120,000 elements including both shell and beam elements. The results showed more damaged to the coaches compared to the real coaches. The results could be improved by making the model stiffer in several ways.

The purpose of the work was partly fulfilled, a model of a coach was constructed but the model has to be improved in order to be useful for accident reconstruction. If the model is improved and modeled more in detail with interior, dummies could be placed in the model. Then the injuries of the passengers could be compared with the stress and strain of the dummies. In the long term safer coaches can perhaps be built to prevent this to happen again.