
Why a downloaded CAD model probably isn't what you need for a serious simulation study..

Laurence Marks, Feb 2024

The geometry you need for a simulation project isn't the same as that which is used to define the product for prototyping or manufacture. It can be based on that model, but needs to be different.

Most simulation technologies require a mesh to be defined; loads and boundary conditions will be needed, generally associated with the mesh. And the mesh has to be controllable, and controllable to allow a solution in an appropriate timeframe. We haven't yet reached a level of simulation technology where mesh definition isn't critical to results quality. To achieve this we may need to simplify things, reduce dimensions, and otherwise idealise our geometry. Not all CAD models are suitable for this process. We will also need to be able to change the model, either to explore design options and spaces, or accommodate model and simulation process development strategies.

For these reasons a model you might download from the internet, or other source, is unlikely to be very useful, even if it is a relatively credible geometry set; most aren't even that credible. (If you are working with the actual product designer their CAD models are likely to be a very useful starting point, but you will, unless the part or assembly is very simple, need to create, or derive, variable, simplified geometry sets for simulation.) If you don't do this any study is instantly out of control, in much the same way as a pensioner driving an F40 might be. Things will happen, but you won't have much say in how, when, or what the ultimate result might be.

So the most likely scenario is that you'll have to create a CAD model from the ground up. But the good news is that the best way to define a modelling strategy is to start with something that looks too simple and build complexity when successful simulation results have qualified you to do this. That way you'll remain in control, and have some say in the direction you take. And critically knowledge obtained from one stage can be developed in the next. This isn't about surprises.

This approach also means that you can develop your CAD skill in parallel if necessary. (Good CAD skills are essential to all engineers in the same way that all salesmen need to be able to use Powerpoint, and all writers should be able to use Word – its not the job but makes getting things done downstream a lot easier.)

So the real message is concentrate on robust, variable, and simple CAD models. And only add detail to a model when you have earned the right to do so using simpler configurations. And that won't happen with a dumb solid car model downloaded from Grabcad.

References: Tips and Workarounds for CAD Generated Models, NAFEMS "How to" booklet. First published – January 1998, Revised and Republished – August 2008

