CADfix®

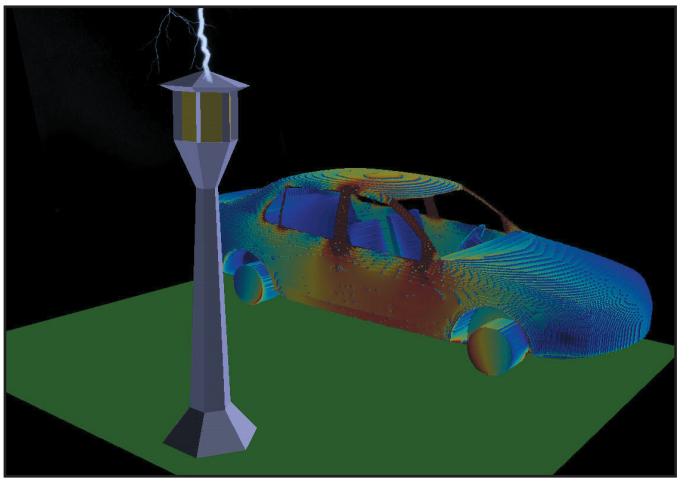
CADfix fosters EM progress

More and more modern technologies are dependent on electromagnetic (EM) waves. From microwave ovens to mobile telephones, from radar to digital radio, EM-based systems are now truly ubiquitous. The accurate prediction of how different EM systems interact with each other, with the world around them and with natural EM phenomena like lightning is now more important than ever if such systems are to continue to work both effectively and safely.

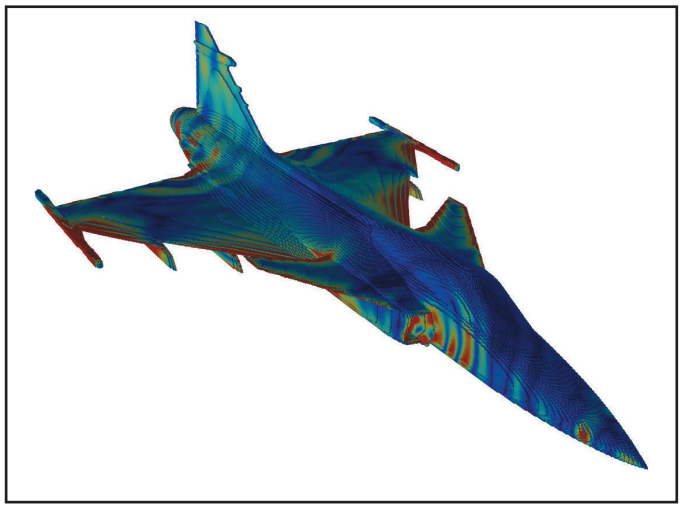
“Prediction of EM behaviour is becoming vital in more and more civil and commercial engineering situations,” says Jonas Gustafsson, a computational electromagnetics (CEM) specialist at Ericsson Saab Avionics. “Not knowing what to expect when lightning strikes an passenger aircraft, for instance, is simply not an option. We are constantly developing innovative techniques to help us with these analysis scenarios.”

Ericsson Saab Avionics (a joint venture between the two Swedish manufacturing giants) undertakes CEM projects on a consultancy basis for clients throughout industry. Applications include efficient positioning of antennae within complex environments and predicting radar cross-section (RCS) profiles for different aircraft, as well as the more extreme lightning strike situations.

“We rely on CADfix throughout our analysis projects,” explains Jonas. “First we need to bring in and repair incoming geometry, often from more than one CAD system. Next we use CADfix to build the complex meshes required for EM analysis, and finally we use it to display the results of our anaylsis.”



Surface currents on a SAAB 95 when lightning strikes a lamppost nearby



Surface currents on the JAS 39 Gripen fighter when illuminated by radar pulse

“Unlike traditional FEA, where scope is quite limited, there are many solvers and algorithms in CEM, each suitable for a particular physical situation,” he explains. “Each of these requires a particular kind of mesh to be built – some of which mix surface boundary elements and body elements in the same mesh – and we would not be able to achieve some of the necessary effects without CADfix.”

Jonas has been working closely with TranscenData Europe Ltd to push the limits of CADfix functionality, providing valuable input in the drive to move from finite difference methods, the current state of the art in CEM meshing, to the next logical level of accuracy and complexity: a hybrid meshing algorithm which combines the finite difference method with triangular surface and solid tetrahedral elements.

“We are working towards GEMS, the general electromagnetic solver, which we hope will be the most accurate and versatile CEM solution available,” says Jonas. “CADfix is at the heart of this technology.”

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