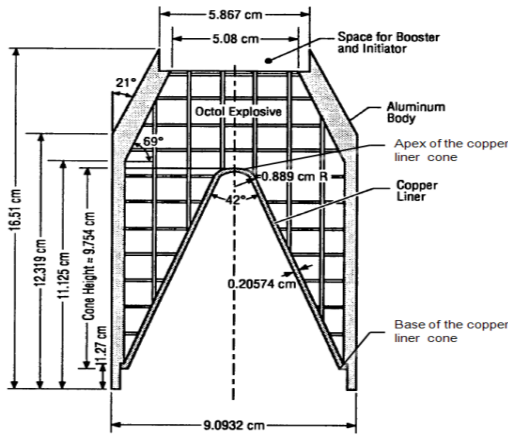


Case study – ALE model for military application

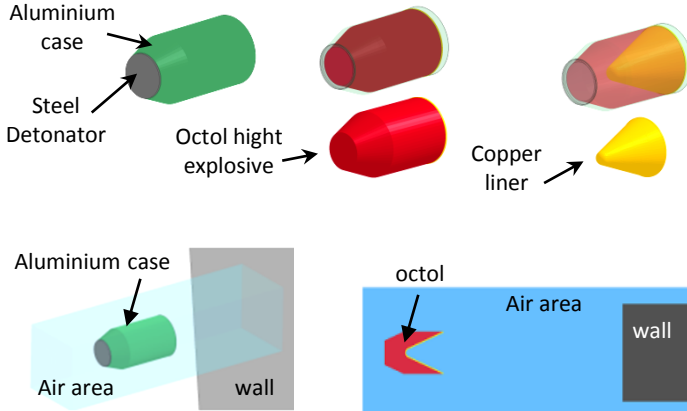
Abstract

A 3D and 2D numerical model of shaped charge against a block has been realized on the LS-DYNA software. The characteristic of blast is the deformation and turn of copper cone by effect of high pressure forming a jet. The model is complex by the material law used and by the great deformation and the fluid/structure interaction.

➤Chape charge:



E. Gürel, These «Modeling and simulation of shaped charges», July 2009

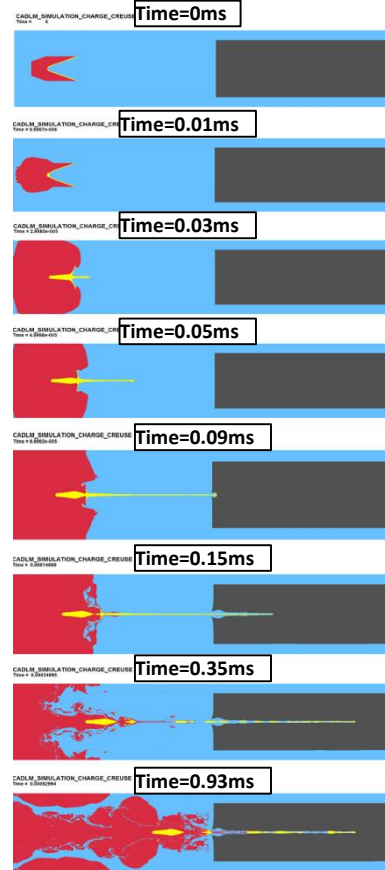


Missile impact Model

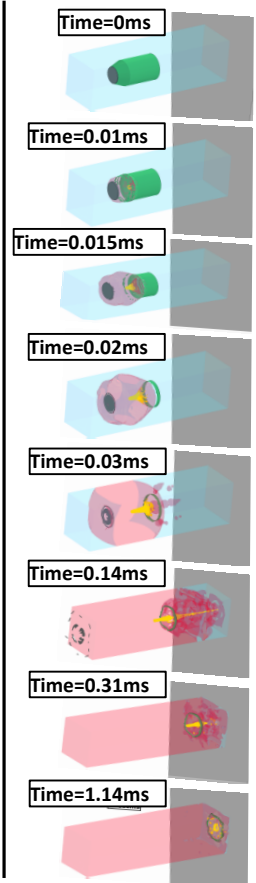
The Eulerian Lagrangian Arbitrary (ALE) is a finite element formulation, allowing the mesh and the material to move in space. Since we are in a case of multiple fluid materials and fluid / structure interaction, we use this ALE method.

Before each model preparation, a bibliographic search is carried out on the materials, the real tests or the previous existing models. A 2D numerical model, made only with ALE elements, has been also modeled to validate materials by comparison at a publication of shaped charge test.

2D model: asymmetric elements



3D model



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- Reduced models for crash / safety applications
- Reduced Complexity Based Robust Optimization
- Early warning systems for real time risk analysis

Note: More the mesh is refined, better is the precision of the fluid propagation and the forces transmission between fluid / structure. However, beyond several million elements, computational times are unthinkable.

Conclusion

The shaped charge modeling couples two types of material: fluid and solid. For modeled the interaction, an ALE element formulation for the fluid material is used. Due to the dimensions of the geometry of the missile and the impact zone, a mesh size of the order of 0.1 mm is necessary to obtain a good transfer of information between the fluid / structure zone. Thus, in this type of study, a2D modeling is favored than a 3D modeling.