

MODELLING OF FLAWED RIVETED STRUCTURES FOR EC INSPECTION IN AERONAUTICS

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Abstract

The eddy current (EC) technique is currently the operational tool used for fastener inspection which is an important issue for the maintenance of aircraft structures. The industry calls for faster, more sensitive and reliable NDT techniques for the detection and characterization of potential flaws nearby rivets. In this context, the use of simulation can reduce the development time, to optimize the design and to evaluate the performances of an inspection procedure.

In this perspective, CEA and EADS have started a collaborative work aimed at extending the simulation capabilities of the CIVA software platform [1] to deal with flaw detection in a fastened assembly.

The configuration under consideration in the paper consists in a layered planar structure with a flaw nearby a fastener. The EC probe is moved along the surface, above the fastener assembly. In a previous work, a model based on a volumetric integral method (VIM) to handle a fastener in a multilayer structure [2] has been built. The latter has been tested with experimental data. Now, we are interested in the addition of a flaw nearby a rivet in the same structure. It mostly has to cope with a scale issue between the size of the rivet and the one of the flaw, the latter being much smaller in a direction than the former. Two different models will be proposed and compared with experimental data in various configurations, one based on a weak form of an integral formulation solved using a finite element method (FEM), the other on a strong form and a method of moment (VIM).

References

[1] CIVA software platform: <http://www-civa.cea.fr>

[2] S. Paillard, G. Pichenot, M. Lambert, H. Voillaume and N. Dominguez, *Eddy Current Modelling for Inspection of Riveted Structures in Aeronautics*, International Workshop on Electromagnetic Nondestructive Evaluation, 2006.