Numerical Study of a Modified ARCAN Device in Dynamic: Application to Bonded Joints

B. Vales[a, *], S. Marguet[a], R. Créach'cadec[b], L. Sohier [c], J.-F. Ferrero[a] and P. Navarro[a]

[a] Institut Clément Ader (ICA)
Université de Toulouse
Espace Clément Ader, 3 rue Caroline Aigle, 31400 Toulouse, France
e-mail: benjamin.vales@univ-tlse3.fr, web page: www.institut-clement-ader.org

[b, c] Laboratoire Brestois de Mécanique et des Systèmes (LBMS)
Web page: www.lbms.fr

[b] ENSTA Bretagne
2 rue François VERNY, 29806 Brest, France

[c] Université de Bretagne Occidentale (UBO)
6 avenue V. Le Gorgeu – CS 93837, 29238 Brest Cedex 3, France

ABSTRACT

Adhesively bonded joints are increasingly used in the transport industry in order to improve the design and reliability of structures of lightweight vehicles [1]. The understanding of the mechanical behaviour of these joints under dynamic and combined loadings appears to be a prerequisite to ensure user safety. Nowadays, numerous tests dedicated to the study of adhesively bonded joints are available but most of them are performed under quasi-static conditions [1]. Among these, the modified ARCAN testing device developed by Créac'hcadec et al. [2, 3] allows the study of joints under quasi-static combined loadings while minimizing the edge effects occurring in the adhesive [4]. An in-depth study of an extension of the use of this device under dynamic conditions is proposed here. The influence of the boundary and initial conditions applied to the system is also investigated. Special attention is paid to the spatial and temporal distributions of the stress fields in the adhesive. Eventually, guidelines are drawn from this study for an improved design of such a device.

REFERENCES

[1] M. D. Banea and L. F. M. da Silva, *Adhesively bonded joints in composite materials: An overview*, Proceedings of the Institution of Mechanical Engineers, Part L: Journal of Materials Design and Applications, 223(1):1-18, 2009.

[2] R. Créac'hcadec, L. Sohier, C. Cellard and B. Gineste, *An Arcan Tensile Compression Shear Test reducing the edge effects suited for the determination of the Load-Displacement Behaviour of Adhesives in Bonded Assemblies*, International Journal of Adhesion and Adhesives, accepted.

[3] J.Y. Cognard, P. Davies, B. Gineste and L. Sohier, *Development of an improved adhesive test method for composite assembly design*, Composite Science and Technology, 65:359-368, 2005.

[4] J. Y. Cognard and R. Créac'hcadec, *Analysis of the non linear behaviour of an adhesive in bonded assemblies under shear loadings. Proposal of an improved TAST test*, Journal of Adhesion Science and Technology, 23:1333-1355, 2009.