

# ACEX2019

*13<sup>th</sup> International Conference on Advanced Computational Engineering and Experimenting  
ATHENS (Greece) from 1-5 July, 2019*

---

## **Smart Behaviour of Novel Adhesive Films for Composites Aircraft Structures: Repair and Skin-Stringer Assembly**

A. Ureña

Materials Science and Engineering Area. Universidad Rey Juan Carlos. Móstoles, Madrid, Spain

The demand of carbon fiber reinforced polymers (CFRP) in commercial aircraft is nowadays increasing due to the expanding complexity of structures and their involved requirements. This increasing use in primary structures leads to the development of adequate assembly techniques that respond to the problems associated both with the structures integration of and with their repair when damage is detected. For the first case, a skin-stringer system is a typical solution to produce stiffened composite structures of aircrafts. Current technologies consist of manufacturing separately the stringers and co-bonded them to the pre-cured skin using an adhesive [1]. On the other hand, when a composite structure sustains damage in service, if the damage has weakened the structure through fibre, fracture or delamination, a structural repair must be applied. This kind of repair involves replacement of the damaged fibre reinforcement to restore the original mechanical properties. The use of adhesively bonded composite repair patches is one of the possible solutions [2].

Present study analyses the application carbon nanotubes (CNT) doped adhesive films to structural health monitoring (SHM) of adhesive joints in both cases where complex CFRP structures are involved. CNT modified adhesive bases its SHS capabilities on the piezoelectric behaviour and the tunneling effect of theses carbon nanostructures [3]. Crack propagation and delamination can be identify and quantified using this SHM technique.

[1] K.B. Katnam, et al. Prog. Aerosp. Sci., Vol. 61, p. 26 (2013).

[2] H. Mahfuz, et al. Appl. Comp. Mat. Vol. 11, p. 155 (2004).

[3] J. Rams et al. Int. J. Smart Nano Mat., Vol 3, p. 152 (2012).