World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:12, No:02, 2018

Numerical Simulation of Lightning Strike Direct Effects on Aircraft Skin Composite Laminate

Authors : Muhammad Khalil, Nader Abuelfoutouh, Gasser Abdelal, Adrian Murphy

Abstract : Nowadays, the direct effects of lightning to aircrafts are of great importance because of the massive use of composite materials. In comparison with metallic materials, composites present several weaknesses for lightning strike direct effects. Especially, their low electrical and thermal conductivities lead to severe lightning strike damage. The lightning strike direct effects are burning, heating, magnetic force, sparking and arcing. As the problem is complex, we investigated it gradually. A magnetohydrodynamics (MHD) model is developed to simulate the lightning strikes in order to estimate the damages on the composite materials. Then, a coupled thermal-electrical finite element analysis is used to study the interaction between the lightning arc and the composite laminate and to investigate the material degradation.

Keywords : composite structures, lightning multiphysics, magnetohydrodynamic (MHD), coupled thermal-electrical analysis, thermal plasmas.
Conference Title : ICCS 2018 : International Conference on Composite Structures
Conference Location : London, United Kingdom
Conference Dates : February 15-16, 2018