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Effect of the patch length on the effectiveness of one-sided bonded composite repair for aluminum panels

Abdulmohsen ALBEDAH[1], Sohail Mohamed MAZHERALIKHAN[1], Bachir BACHIR BOUIADJRA[2], Bel Abbbes BACHIR BOUIADJRA[2,1*], Faycal BENYAHIA[1]

[1]Mechanical Engineering Department, College of Engineering, King Saud University, Riyadh, Saudi Arabia

[2] LMPM, Department of Mechanical Engineering, University of Sidi Bel Abbes, BP 89, Cité Ben M'hidi, Sidi Bel Abbes 22000, Algeria

***** *Corresponding author: Tel. +213559222651, Fax : +21348544100 e-mail : bachirbou@yahoo.fr; belabbes.bachirbouiadjra@univ-sba.dz*

Abstract

This study analyzes the effect of the patch length the repair performance of bonded composite repair. Experimental and numerical approaches are used. In the experimental part of the study, fatigue tests with a constant amplitude were performed on notched specimens of 2024 T3 and 7075 T6 aeronautical aluminum alloys. Two stress ratios of R=0 and R=0.1 were applied. The value of the patch length was varied to highlight its effect on the fatigue life. In the numerical part, the stress intensity factor and adhesive stresses were computed for different sizes of the patch length. The experimental results show that the fatigue life of repaired plates is significantly reduced with increases in patch length irrespective of the type of aluminum alloy and the stress ratio. The numerical results show that the stress intensity factor increases with increases in the patch length, and this is in agreement with the experimental results. This effect is explained by the presence of a secondary bending moment generated by the application of a single sided composite patch.

Key words: Bonded composite repair; patch length; Fatigue life; Stress intensity factor; Adhesive stress; Bending moment