Nondestructive Inspection of Fatigue Crack Propagation beneath Supersonic Particle Deposition Coatings during Fatigue Testing

Matthew E. Ibrahim, Wyman Z.L. Zhuang

PII: S0142-1123(17)30211-6
DOI: http://dx.doi.org/10.1016/j.ijfatigue.2017.05.005
Reference: JIJF 4333

To appear in: *International Journal of Fatigue*

Received Date: 1 February 2017
Revised Date: 27 March 2017
Accepted Date: 3 May 2017

Please cite this article as: Ibrahim, M.E., Zhuang, W.Z.L., Nondestructive Inspection of Fatigue Crack Propagation beneath Supersonic Particle Deposition Coatings during Fatigue Testing, *International Journal of Fatigue* (2017), doi: http://dx.doi.org/10.1016/j.ijfatigue.2017.05.005

Nondestructive Inspection of Fatigue Crack Propagation beneath Supersonic Particle Deposition Coatings during Fatigue Testing

Matthew E. Ibrahim[a,*] and Wyman Z. L. Zhuang[b]

Defence Science and Technology Group, 506 Lorimer St, Fishermans Bend, VIC 3207, AUSTRALIA.

[a]Maritime Division. Email: matthew.ibrahim@dsto.defence.gov.au

[b]Aerospace Division. Email: wyman.zhuang@dsto.defence.gov.au

*Corresponding author

Abstract

Supersonic particle deposition (SPD) is an additive manufacturing technology with demonstrated potential for the repair of corrosion damage in metallic aircraft components. Repairs via SPD are applied with the aim of restoring damaged components to at least the equivalent structural properties of their original design. A successful SPD repair must have sufficient cohesive strength to prevent further cracking under fatigue loading, and the quality of the repair must be able to be monitored nondestructively on a periodic basis during ongoing operation of the repaired aircraft. In this study, we demonstrate the capability of two nondestructive inspection (NDI) techniques, thermoelastic stress analysis and angle-beam ultrasonic inspection, to both assess the health of an SPD coating and to detect and characterise representative fatigue crack growth beneath it. The results obtained via NDI are explained with reference to the microstructural features of the SPD coating and the substrate, as analysed via optical microscopy.

Keywords

Repair technologies, Nondestructive Inspection, Crack detection, Aircraft engineering, Advanced materials.