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P.R. Underhill, J. Juurlink, D.L. DuQuesnay

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P.R. Underhill, J. Juurlink[1] and D.L. DuQuesnay[2]

Department of Mechanical and Aerospace Engineering, Royal Military College of Canada,

PO Box 17000 Station Forces, Kingston, ON. Canada. K7K 7B4

Abstract

Safety cuts (or confidence cuts) are used in the repair of fatigue damaged fastener holes in aircraft structure to ensure that any residual crack is removed in the repair process. The necessity of using safety cuts was investigated by growing cracks in laboratory specimens and then "repairing" the specimens in the manner that would be done on in-service aircraft, both with and without safety cuts. The post-repair fatigue life for the safety-cut specimens showed a bimodal log normal distribution with the lower mode arising from machining flaws in the repair process. The results for the no safety-cut material, while having a similar mean life to the lower mode of the safety-cut coupons, showed nearly four times as much scatter in life. The results strongly suggest that residual cracks in no safety-cut coupons served as initiation sites for further crack growth. Consequently, despite the fact that safety cuts result in lower edge margins, they are a necessary part of the repair process.

Key words: Fatigue; Fastener Hole Repair; Probability of Detection; Crack Growth; Aircraft

Nomenclature

a	Crack size(length along bore)
a_{50}	Crack size, on average, at which one would expect to detect 50% of the cracks
a_{90}	Crack size, on average, at which one would expect to detect 90% of the cracks
$a_{90/95}$	Crack size at which one would expect to detect 90% of the cracks 95% of the time
c	crack size (length along surface)
D	Hole diameter
BHEC	Bolt-hole eddy current
NDI	Non-destructive inspection
OEM	Original Equipment Manufactured
POD	Probability of detection

[1] Present address: Directorate of Technical Airworthiness and Engineering Support (DTAES 7-2-6), National Defense Headquarters, Ottawa, ON. Canada. K1A 0K2

[2] Corresponding author: D.L. DuQuesnay, e-mail duquesnay-d@rmc.ca