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Keith W. Jones, Ralph W. Bush

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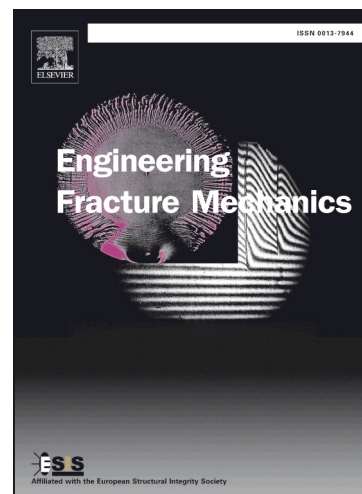
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# Investigation of Residual Stress Relaxation in Cold Expanded Holes by the Slitting Method

Keith W. Jones<sup>a</sup> and Ralph W. Bush<sup>b,\*</sup>

<sup>a,b</sup> Department of Engineering Mechanics, US Air Force Academy U.S. Air Force Academy, CO, 80840, United States

## Abstract

Slitting residual stress measurements were made in aluminum 7075-T651 plates with cold expanded holes to investigate residual stress relaxation during cyclic loading. A two-step cutting procedure released large internal moments adjacent the holes to minimize plasticity errors in residual stress measurement. Residual stresses are represented by symmetric Legendre polynomials on opposite sides of the hole and compliance functions found by finite element analysis. Residual stress convergence with Legendre polynomial order is demonstrated, and residual stress measurement uncertainty is estimated. Measured residual stresses were smaller than predicted by finite element analysis. Residual stress relaxation due to cyclic loading was not observed.

**Keywords:** cold expanded hole, residual stress, slitting, stress relaxation, finite element analysis

## Nomenclature:

A	cross-sectional area
EDM	electrical discharge machining
L	Legendre polynomial
LT	long transverse
m	number of elements in finite element model
n	Legendre polynomial order
$n_c$	number of cut lengths
RMSD	root-mean-square-deviation
x	coordinate dimension
y	coordinate dimension
$\epsilon$	strain
$\epsilon_f$	fit strain
$\epsilon_m$	measured strain
$\mu\epsilon$	microstrain
$\sigma$	residual stress

\*Corresponding author

E-mail address: [ralph.bush@usafa.edu](mailto:ralph.bush@usafa.edu) (Ralph W. Bush)

<sup>a</sup> Author present e-mail address: [jones.keith.w@outlook.com](mailto:jones.keith.w@outlook.com) (Keith W. Jones)

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