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### ACCEPTED MANUSCRIPT

## A Gamma Process Model for the Analysis of Fatigue Crack Growth Data

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#### Abstract

In this paper, the time to reach any given crack size in fatigue testing is directly modeled as a stochastic process. In particular, a gamma process with non-stationary independent increments is assumed for each specimen, where the shape parameter is a suitable function of the crack length. Then, the variability across specimens is accounted for by assuming that the scale parameter is a gamma random variable, resulting in simple mathematical forms for the distribution of service time, its mean and variance. The correlation between the Paris law parameters C and m is also revisited and some useful results are given.

Keywords: Gamma process, Stochastic fatigue crack growth, Lifetime prediction, R-ratio effect, Reliability

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