

# Using Accelerated Life Tests Results to Predict Product Field Reliability

Luis A. Escobar\*

Experimental Statistics  
Louisiana State University

**Abstract:** Accelerated life tests (ALTs) provide timely assessments of the reliability of materials, components, and subsystems. ALTs can be run at any of these levels or at the full-system level. Sometimes ALTs generate multiple failure modes. A frequently asked question near the end of an ALT program, is “What do these test results say about field performance?” ALTs are carefully controlled whereas the field environment is highly variable. Products in the field see, for example, different average use rates across the product population. With good characterization of field use conditions, it may be possible to use ALT results to predict the failure time distribution in the field. When such information is not available but both life test data and field data (e.g., from warranty returns) are available, it may be possible to find a model to relate the two data sets. Under a reasonable set of practical assumptions, this model can then be used to predict the failure time distribution for a future component or product operating in the same use environment. This paper describes a model and methods for such situations. The methods will be illustrated by an example to predict the failure time distribution of a newly designed product with two failure modes.

**Key words:** Bivariate Lognormal Distribution, Censored Data, Competing Risks, Fatigue, Maximum Likelihood, Multiple Failure Modes, Reliability, Warranty.

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