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## **A Note on Reliability Prediction Models and Confidence Levels**

**The RAC is frequently asked the question, "Can a confidence interval be associated with reliability predictions such as MIL-HDBK-217, Telcordia, or PRISM?"**

In general a reliability prediction cannot be linked to a specific confidence interval, as might be done with a demonstration test or when measuring failure rates from field returns. The primary reasons for this inability to define a confidence interval are:

- Reliability prediction models, including RAC's PRISM and MIL-HDBK-217, are typically based on part data gathered from a variety of sources. Complete models are not usually developed from a single data source.
- In some cases, while it might be possible to calculate a confidence interval for some basic part failure rate, it is practically impossible to predict the confidence interval for all of the modifying parameters, even when they are based upon well known and widely used physical acceleration laws, e.g., Arrhenius or the Inverse Power Law.
- In addition to the variability associated with developing the models, there is also human variability involved in making prediction assumptions, analyzing the data, identifying and counting field failures, estimating field operating time, and even in the failure definitions themselves.

Thus the inevitable conclusion must be that:

**Because of the fragmented nature of the part data and the environmental data and the fact that it is usually necessary to interpolate or extrapolate from available data when developing new models, no statistical confidence intervals should be associated with the overall model results for any given prediction.**

Moreover:

**Simply obtaining a specific number should never be the sole purpose of a reliability prediction. Rather, first identifying and then controlling the various factors affecting reliability should always be considered much more important than the predicted number itself.**

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### **For More Information:**

- RAC Publication, SOAR-4, [Confidence Bounds for System Reliability](#).
- Romeu, J.L., [Combining Data](#), RAC START Sheet 2004-1, <http://rac.alionscience.com/pdf/COMBINE.pdf>.
- Romeu, J.L., [Statistical Confidence](#), RAC START Sheet 2002-4, [http://rac.alionscience.com/pdf/STAT\\_CO.pdf](http://rac.alionscience.com/pdf/STAT_CO.pdf).
- Dudley, B., [Reliability Prediction](#), RAC START Sheet 1997-2, <http://rac.alionscience.com/pdf/pred.pdf>.