

Sequential Test for Reliability under Allowance for Target Uncertainty

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Theme – a comparison test which involves a check of the hypothesis that the mean time between failures of a "new" item ($MTBF_n$) – or the MT to a failure – is not less than that of a counterpart taken as basis for comparison ($MTBF_b$). It is assumed that the MTBF is distributed exponentially and that information is available on a known quantity (r_b) of TBF for the basic item.

The Sequential Probability Test (SPRT) is widely used for checking that an MTBF is not less than a specified value. Here, the innovation is that allowance is made for the uncertainty in the $MTBF_b$ estimate, which increases as r_b decreases. Accordingly, a search algorithm was developed for the decision boundaries in the proposed test, as well as for calculating the Operating Characteristic (OC), and the statistical parameters of the test duration and number of failures to stopping the test. Approximative relationships were obtained for the above, depending on the target OC. These straightforward relationships not only simplify the planning process, but will convince the reliability engineer of the indispensability of allowing for the above uncertainty, and of the effectiveness of the proposed test.