



## Operating Characteristic Curve (MTBF)

This app creates a test plan for testing the the null hypothesis  $H_0: MTBF \leq MTBF_0$  against the alternative hypothesis  $H_A: MTBF > MTBF_0$ . The test plan generated is the smallest number of allowable failures and total test time for a type I error rate of  $\alpha$  and a type II error rate at most  $\beta$ .  $MTBF_A = MTBF_0 + \delta$  is the value of MTBF under the alternative hypothesis.

### Assumptions:

- 1.) Failure times are assumed to be exponentially distributed (i.e. constant failure rate).
- 2.) Failure times are independent.

### Calculations:

The number of allowed failures is the smallest nonnegative integer,  $r$ , such that the following inequality holds:

$$\frac{\chi_{\beta, 2(r+1)}^2}{\chi_{1-\alpha, 2(r+1)}^2} \geq \frac{MTBF_0}{MTBF_A}$$

The total test time is

$$T = \frac{1}{2} MTBF_0 \chi_{1-\alpha, 2(r+1)}^2$$

### Disclaimer:

While every effort to ensure the accuracy of this app, we DO NOT guarantee that this app is free from defects. This app is provided "as is", and you use the app at your own risk. We make no warranties as to performance, merchantability, fitness for a particular purpose, or any other warranties whether expressed or implied. Under no circumstances shall we be liable for direct, indirect, special, incidental, or consequential damages resulting from the use, misuse, or inability to use this app.

### Known Issues:

This app may crash for values of  $MTBF_0$  and  $MTBF_A$  close to each other and small  $\alpha$  and  $\beta$ . This failure occurs because the excel function that is called crashes.

The original document contains macros.

To request this tool in the .xlsm format, contact the STAT COE at [COE@afit.edu](mailto:COE@afit.edu).