



Reliability Test Program Kit (Burn-in / HALT / HASS / ESS)

Plan and record HALT, HASS/ESS and burn-in, run FRACAS, and calculate MTBF, demonstration time, Arrhenius factors and Weibull fits.

What's inside

File	What it is / how to use it
01_Reliability_Test_Program_Workbook.xlsx	MTBF and demo calculators, Arrhenius, Weibull, HALT and HASS logs, burn-in log and FRACAS.
02_Reliability_Test_Plan.docx	Plan template.
03_Test_Lab_RFQ_Checklist.docx	What to send an outside test lab.

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Profiles and stress levels in this kit are examples for planning, not a qualification standard. HALT finds design margins and is not a pass/fail test; HASS/ESS screens must be proven not to remove significant useful life (proof of screen) before use in production. MIL-HDBK-781, MIL-STD-810, IEC 60068-2 and JESD22 are cited by number only.

How the calculators work

MTBF lower bound (time-terminated test, chi-square method): $MTBF_L = 2T / \chi^2(CL, 2r+2)$, where T is total unit-hours and r is failures. **Zero-failure demonstration**: required test hours = MTBF target x $\chi^2(CL, 2)/2$ = MTBF target x $-\ln(1-CL)$. **Arrhenius acceleration**: $AF = \exp[(E_a/k)(1/T_{use} - 1/T_{stress})]$, with $k = 8.617e-5$ eV/K and temperatures in kelvin; E_a must come from your failure mechanism data. **Weibull**: median-rank regression with Benard's approximation $F = (i - 0.3)/(n + 0.4)$, $x = \ln(t)$, $y = \ln(-\ln(1-F))$; beta = slope, $\eta = \exp(-\text{intercept}/\text{beta})$. Complete (uncensored) data only. All of these assume their models fit your data; MTBF assumes a constant failure rate.

About the author

Built by Matt Norman, US Navy veteran and former SpaceX Falcon 9 quality inspector and QA supervisor. (Not affiliated with or endorsed by SpaceX.) Norman Quality Tools is Veteran-Owned & Operated. Contains no SpaceX, government, or customer proprietary information; all example data is made up.

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Reliability Test Plan Template

Reliability Test Program Kit (Burn-in / HALT / HASS / ESS) - Document 02 - Rev A (2026-10)

Product / rev		Program	
Plan owner		Date	

1. Goals

Requirement (MTBF, B10, mission profile)	Source	Demonstration method

2. Tests

Test (HALT, HASS/ESS, burn-in, life, environmental)	Reference (MIL-STD-810, IEC 60068-2-x, JESD22-x by number)	Samples	Profile ID	Exit criteria

3. Failure handling

Every failure gets a FRACAS number, analysis and verified corrective action before the test resumes, unless the plan says otherwise.

Role	Name	Signature	Date
Reliability engineer			
Quality			