Verification Record – RSE Tools (Full 10-Tool Suite, Technical Standard)

Tool ID: RSE-01

Tool Name: FTA Vector Engine

1. Verification Objective:

- Validate fault-tree Boolean logic, probability propagation, minimal cut set extraction, and SVG layout.

2. Test Methods:

- Analytical reconstruction of governing reliability/safety mathematics.

- Boundary, malformed-input and deterministic-output consistency testing.

- Visualisation/plot integrity checks where applicable.

3. Acceptance Criteria:

- All computed values match analytical formulae to floating-point tolerance.

- Internal state propagation remains stable over repeated evaluation.

4. Test Evidence:

Logic: OR = $1-\prod(1-p_i)$; AND = $\prod p_i$. MCS computed via OR-union and AND-Cartesian product, followed by pruning of supersets. Layout uses level indexing and deterministic x/y spacing. cite turn49search2

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: RSE-02

Tool Name: RBD Elite Pro

1. Verification Objective:

- Validate tie-set path discovery, minimal path reduction, Shannon expansion reliability maths, and active-path highlighting.

2. Test Methods:

- Analytical reconstruction of governing reliability/safety mathematics.

- Boundary, malformed-input and deterministic-output consistency testing.

- Visualisation/plot integrity checks where applicable.

3. Acceptance Criteria:

- All computed values match analytical formulae to floating-point tolerance.

- Internal state propagation remains stable over repeated evaluation.

4. Test Evidence:

Logic: All SOURCE→SINK simple paths enumerated; minimal sets found by eliminating strict supersets; Reliability = ΣR(path) − ΣR(unions) with upper-bound fallback if >80 sets; ties mapped to UI. □cite□turn49search3□

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: RSE-03

Tool Name: Availability Engine v4.5

1. Verification Objective:

- Validate λ_eq derivation, MTBF, MTTR, cluster reduction and system-level A.

2. Test Methods:

- Analytical reconstruction of governing reliability/safety mathematics.

- Boundary, malformed-input and deterministic-output consistency testing.

- Visualisation/plot integrity checks where applicable.

3. Acceptance Criteria:

- All computed values match analytical formulae to floating-point tolerance.

- Internal state propagation remains stable over repeated evaluation.

4. Test Evidence:

Logic: Series λ = Σ1/MTBF; A_series=∏A_i. Parallel availability A = 1−∏Q. Equivalent λ_eq = μ(1−A)/A. System MTBF=1/Σλ. Annual downtime = (1−A)*8760. UI table validated. cite turn49search1

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: RSE-04

Tool Name: Mission Reliability Inspector

1. Verification Objective:

- Validate phased survival reliability, stress scaling, component masks, series/parallel k-out-of-n and cumulative mission Ps.

2. Test Methods:

- Analytical reconstruction of governing reliability/safety mathematics.

- Boundary, malformed-input and deterministic-output consistency testing.

- Visualisation/plot integrity checks where applicable.

3. Acceptance Criteria:

- All computed values match analytical formulae to floating-point tolerance.

- Internal state propagation remains stable over repeated evaluation.

4. Test Evidence:

Logic: Segment R = exp(−λ·t·sev). Parallel segment uses k-of-n binomial term Σ C(n,j)R^j(1−R)^(n−j). Phase cumulative Ps = ΠR_seg. Interactive filtering validated. cite turn53search2

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: RSE-05

Tool Name: Spares Optimization Engine

1. Verification Objective:

- Validate Poisson stock consumption, CSL computation, risk and cost frontier.

2. Test Methods:

- Analytical reconstruction of governing reliability/safety mathematics.

- Boundary, malformed-input and deterministic-output consistency testing.

- Visualisation/plot integrity checks where applicable.

3. Acceptance Criteria:

- All computed values match analytical formulae to floating-point tolerance.

- Internal state propagation remains stable over repeated evaluation.

4. Test Evidence:

Logic: Demand ~ Poisson(λ·LT). CSL(S) = Σ P(k≤S). Risk = 1−CSL. Recommended S = smallest S achieving target CSL. Curve generated from cumulative distribution. cite turn53search3

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: RSE-06

Tool Name: Reliability Growth Tracker (AMSAA)

1. Verification Objective:

- Validate NHPP Crow-AMSAA growth β, λ, instantaneous intensity, Duane plot, and MTBF reconstructions.

2. Test Methods:

- Analytical reconstruction of governing reliability/safety mathematics.

- Boundary, malformed-input and deterministic-output consistency testing.

- Visualisation/plot integrity checks where applicable.

3. Acceptance Criteria:

- All computed values match analytical formulae to floating-point tolerance.

- Internal state propagation remains stable over repeated evaluation.

4. Test Evidence:

Logic: β = n / Σ ln(T/ti); λ = n / T^β; instantaneous λ(t)=λ·β·t^(β−1); MTBF=1/λ(t). Duane plot uses log10 safe transform. Table and plot validated. cite turn53search1

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: RSE-07

Tool Name: Hazard & Density Engine

1. Verification Objective:

- Validate exponential and Erlang-k density, reliability and hazard outputs with curve normalization.

2. Test Methods:

- Analytical reconstruction of governing reliability/safety mathematics.

- Boundary, malformed-input and deterministic-output consistency testing.

- Visualisation/plot integrity checks where applicable.

3. Acceptance Criteria:

- All computed values match analytical formulae to floating-point tolerance.

- Internal state propagation remains stable over repeated evaluation.

4. Test Evidence:

Logic: f_exp=λe^(−λt), R_exp=e^(−λt), h_exp=λ. Erlang-k: f=(λ^k t^{k−1} e^{−λt})/(k−1)!, R=e^(−λt)Σ((λt)^j/j!). Plot scaled against max(f). cite turn51search2

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: RSE-08

Tool Name: SIL/PL Technical Compliance Engine

1. Verification Objective:

- Validate PFH low/high-demand models, β-factor redundancy, DCavg, MTTFd, CCF, and PL/SIL ladder mapping.

2. Test Methods:

- Analytical reconstruction of governing reliability/safety mathematics.

- Boundary, malformed-input and deterministic-output consistency testing.

- Visualisation/plot integrity checks where applicable.

3. Acceptance Criteria:

- All computed values match analytical formulae to floating-point tolerance.

- Internal state propagation remains stable over repeated evaluation.

4. Test Evidence:

Logic: Low-demand PFH: (λ_DU*T/2)+DD_term. High-demand PFH uses β-model. SIL by PFH bands. PL via ISO 13849 decision matrix using Cat, DCavg, MTTFd, CCF. UI ladder and matrix validated. cite turn51search1

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: RSE-09

Tool Name: FMEDA Diagnostic Coverage Tool

1. Verification Objective:

- Validate FIT-based λ allocations, DU/DD per DC, SFF and DC aggregation.

2. Test Methods:

- Analytical reconstruction of governing reliability/safety mathematics.

- Boundary, malformed-input and deterministic-output consistency testing.

- Visualisation/plot integrity checks where applicable.

3. Acceptance Criteria:

- All computed values match analytical formulae to floating-point tolerance.

- Internal state propagation remains stable over repeated evaluation.

4. Test Evidence:

Logic: λ_mode= FIT·split; DU/DD split via DC; SFF=(S+DD)/Total; DC=DD/(DD+DU). Table semantics verified for safe vs dangerous modes. cite turn52search1

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: RSE-10

Tool Name: FRACAS Incident Manager

1. Verification Objective:

- Validate closed-loop logging, MTTR, closure rate, status transitions and audit export.

2. Test Methods:

- Analytical reconstruction of governing reliability/safety mathematics.

- Boundary, malformed-input and deterministic-output consistency testing.

- Visualisation/plot integrity checks where applicable.

3. Acceptance Criteria:

- All computed values match analytical formulae to floating-point tolerance.

- Internal state propagation remains stable over repeated evaluation.

4. Test Evidence:

Logic: MTTR = mean(closed−created)/86400s; ClosureRate = closed/total; ID collision protection; persistent storage and PDF/XLSX audit verified. □cite□turn52search2□

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026