Future Tank Lab — Technical Math Appendix

1. Threatscape

Drone Density (λ)
Poisson process:
$P(k; \lambda \cdot t) = ((\lambda \cdot t)^k / k!) \cdot e^{(-\lambda \cdot t)}$
where λ = drones per minute, t = time window.

ATGM / Rocket Salvos (R)
Rate expressed as events/hour. Converted to per-minute:
$R_{min} = R / 60$

EW Severity ($E \in [0,1]$)
Penalty factor on APS Pk:
Effective $Pk = (1 - E) \cdot Pk$

2. Protection

APS Layering
n layers, each with probability p.
$Pk_{total} = 1 - (1 - p)^n$

Soft-Kill EW / Obscurants
Reduction in hit probability:
$P_{hit} = (1 - Soft_{kill}) \cdot P_{inbound}$

3. Survivability Metric

Survival Probability (S)
$S = (1 - L)^N$
where L = leak probability per shot
$L = 1 - (Pk_{total} + Soft_{kill\_adjusted})$

4. Thermal Signature

ΔT Contrast
$\Delta T = |T_{skin} - T_{ambient}|$

Detection Probability (D)
Logistic approximation:
$D = 1 / (1 + e^{(-k(\Delta T - \Delta T0))})$

5. Hybrid & Silent Watch

Range (km)
$Range = (Fuel_{energy} + Battery_{energy}) / Power_{draw}$

Silent Watch Time (hours)
$T_{silent} = Battery_{capacity} / P_{silent}$

6. UAV Teaming

Situational Awareness (SA)
$SA = Base_{SA} + \alpha \cdot N_{swarm} + \beta \cdot Tethered$

7. Composite Dashboard Scores

- Survivability Index $\rightarrow$ APS + soft-kill + threatscape
- Detectability Index $\rightarrow$ ΔT, range, camouflage
- Mobility Index $\rightarrow$ hybrid range + silent watch
- SA Index $\rightarrow$ UAV contributions

(All scaled 0–100 for presentation)

Disclaimer

Equations are simplified abstractions.
They are designed for transparency and interactivity, not predictive accuracy.