Fjärrstridsgrupp Alfa (FSG-A) — open-source defence engineering

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Programme Risk Register

Reference Design — Example Risk Categories for a Programme

STATUS — REFERENCE DESIGN / CONCEPT DOCUMENT. This document is a design contribution, not a programme deliverable. It describes a proposed approach, structure, or analysis that researchers at FOI, FMV, Försvarsmakten, or defence industry partners may adapt when building their own prototypes or running their own programmes. FSG-A does not operate a UAS programme at the scale or maturity this document describes; no organisational roles, test schedules, logistics facilities, or maintenance processes named within are currently active. Any dates, RPN scores, MTBF values, budget figures, or organisational structures are **illustrative examples** intended to show how a real programme might approach the subject — they are not commitments, plans, or claims of current capability.

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Revision History

Version	Date	Author	Description
0.1 DRAFT	2026-04-19	FSG-A	Initial draft reference design. Illustrative structure for a funded programme to adapt; not a programme deliverable in its own right.

1. Purpose and Scope

This Risk Register tracks programme-level risks across the FSG-A system. Risks are identified, scored, assigned owners, and linked to specific mitigations. The register is reviewed quarterly by the programme office and any risk with Impact × Probability score ≥ 10 is escalated for monthly review.

This document is an input to the Test & Evaluation Master Plan (FSG-A-TEMP-001) and the Safety Case (FSG-A-SAFETY-001). Mitigations documented here are prerequisites for phase-gate approvals in the T&E; plan.

2. Scoring Guide

Impact (I) — illustrative anchoring on a 1-5 scale. A real programme should replace these thresholds with values appropriate to its own budget and timeline:

• 1 Minor — small schedule slip, limited cost, no operational impact

• 2 Low — moderate slip, recoverable

• 3 Moderate — feature loss acceptable

• 4 High — major capability loss

• 5 Critical — programme viability threatened, safety event

Probability (P) — illustrative 1-5 scale:

• 1 Remote

• 2 Unlikely

• 3 Possible

• 4 Likely

• 5 Near-certain

Score = I × P. Higher scores warrant more frequent review and higher-level sign-off. Specific review cadences [illustrative — programme to set based on its own governance structure].

3. Technical Risks

7 technical risks identified.

ID	Cat	Description	I	P	Score	Owner	Mitigation
T-01	Technical	L3 gate produces false-positive autonomous engagement against civilian target	5	2	10	Safety Officer	Hard gate: confidence ≥0.85, TTI <8s, category-restricted; Article 36 IHL review; adversarial red-team test before each release
T-02	Technical	EKF3 diverges during Aurora magnetic event over Norrbotten	3	4	12	Chief Engineer	Aurora-aware EKF parameters; magnetometer innovation-gate; SLAM fallback; pre-flight space-weather check
T-03	Technical	CRPA antenna fails to null simultaneous multiple jammers	4	3	12	EW Lead	Degrades gracefully from 4-null to 2-null; fallback to pre-planned denied-mode routing

T-04	Technical	YOLOv8 model degrades under adversarial camouflage patterns	3	3	9	AI/ML Lead	Ensemble with thermal stream (IR difficult to spoof); Dempster-Shafer requires 2+ agreeing sensors before L2 action
T-05	Technical	H.265 encoder stalls on cold-start below -25°C	3	4	12	Payload Lead	Pre-heat cycle for CM4 payload; 720p fallback resolution; telemetry independent of video
T-06	Technical	MANET spanning-tree reconvergence exceeds 30s under rapid node churn	3	2	6	Comms Lead	Pre-computed alternate paths cached; application-layer retry; operator alert on persistent outage
T-07	Technical	Wing spar fatigue crack not detected before failure	5	1	5	Structures Lead	STANAG 4671 §21 testing; quarterly ultrasonic NDT at intermediate maintenance; life-limit enforced at 800 flight hours

3. Supply Risks

6 supply risks identified.

ID	Cat	Description	I	P	Score	Owner	Mitigation
S-01	Supply	Silvus radio export blocked (ITAR policy change)	5	3	15	Procurement	3-year strategic reserve stockpile; European alternative qualification program (Bittium TAC WIN, R&S; SDTR evaluated in parallel)
S-02	Supply	LiPo battery supplier discontinues specific chemistry	3	3	9	Procurement	Multiple qualified suppliers (Tattu, SLS, CNHL); 18-month forward buy
S-03	Supply	Raspberry Pi CM4 end-of-life announced	3	2	6	Hardware Lead	Radxa CM3, Banana Pi BPI-M5 qualified as drop-in replacements; 2-year forward buy at EOL notice
S-04	Supply	u-blox GPS module subject to European export controls	2	2	4	Hardware Lead	Alternative: Septentrio, Topcon; increased cost but qualification path clear
S-05	Supply	Carbon fibre prepreg price spike disrupts airframe cost model	2	3	6	Materials Lead	Hedged contracts with 2 suppliers; alternative glass-fibre design reviewed but not preferred
S-06	Supply	Cube Orange autopilot production interrupted	4	2	8	Hardware Lead	Cube Orange+ and Pixhawk 6X qualified; SDK abstracts autopilot-specific code paths

3. Schedule Risks

5 schedule risks identified.

ID	Cat	Description	I	P	Score	Owner	Mitigation

P-01	Schedule	TEMP Phase 1 delayed by lack of bench test facility access	4	4	16	Program Manager	Partnership negotiation with FOI, SP, RISE started Q2 2026; backup: Chalmers University engagement; fallback: limit Phase 1 scope to facilities available
P-02	Schedule	GUTE II live endpoint not available for Phase 2 integration test	3	4	12	Integration Lead	SITL mock-endpoint implemented per published JSON schema; formal endpoint access requested via FMV channels
P-03	Schedule	Physical prototype funding gap delays TRL 4 entry	5	3	15	Program Manager	Design intent: Phase 1 scoped at a capital level [illustrative]; seeking FMV innovation grant, Vinnova funding, or defence prime partnership
P-04	Schedule	STANAG 4671 certification campaign underestimates duration	3	3	9	Certification Lead	Design intent: flight-test campaign budgeted with schedule margin [illustrative — programme to determine]
P-05	Schedule	Norrbotten exercise participation slot not allocated by FMV	3	2	6	Program Manager	Relationship-building via FMV AIR liaison; alternative: Finnish PV exercise participation

3. Operational Risks

6 operational risks identified.

ID	Cat	Description	I	P	Score	Owner	Mitigation
O-01	Operational	Operator fratricide via IFF heartbeat failure	5	1	5	Safety Officer	Design intent: fail-safe MISSING ≠ HOSTILE; safety radius [illustrative]; operator confirmation mandatory; IFF tested in all integration cycles
O-02	Operational	Lisa 26 decision latency exceeds design target under load	3	2	6	Software Lead	Design intent: SDK instrumented; load testing required before each release; degraded-mode automatically notifies operator
O-03	Operational	Kill-chain bypassed by adversarial prompt injection in sensor data	4	2	8	Cybersecurity Lead	Sensor data treated as untrusted; all decisions via deterministic gate (no LLM in kill-chain); red-team testing quarterly
O-04	Operational	Captured drone enables adversary reverse-engineering of cryptographic keys	4	3	12	Cybersecurity Lead	Daily HMAC key rotation (keys cannot be exfiltrated retroactively); DRAM scrubber on shutdown; destructive self-test on low battery
O-05	Operational	Operator decision paralysis in first three combat missions	3	4	12	Training Lead	Mandatory mentor pilot for missions 1-3; stress-inoculation via SITL scenarios before first deployment
O-06	Operational	Weather window below operational ceiling for 72+ hours blocks mission	3	5	15	Operations	Acceptable limitation for fixed-wing; rotary-wing supplement for narrow windows; IR capability for night ops during daylight-restricted winter

3. Compliance Risks

3 compliance risks identified.

ID	Cat	Description	I	P	Score	Owner	Mitigation
L-01	Compliance	Bulgarian Military Equipment Act interpretation requires export licence for wiki content	4	2	8	Legal	CC BY-SA 4.0 license; content restricted to publicly-available military engineering (no ITAR content); legal review annually
L-02	Compliance	GDPR Article 22 challenge against L3 autonomous engagement	4	2	8	Legal	L3 gate restricted to AIR_UAV / AIR_MUNITION categories (no human targets); legal-review precedent documented
L-03	Compliance	Swedish airspace regulation change restricts BVLOS operations	3	3	9	Operations	Transport Agency liaison; military-segregated airspace procedures as backup; FIS-B and NOTAM integration in Lisa 26

3. Financial Risks

1 financial risks identified.

ID	Cat	Description	I	P	Score	Owner	Mitigation
F-01	Financial	Fischer Ventures EOOD capitalisation insufficient for Phase 1	4	4	16	Program Manager	Multiple funding tracks pursued: EU defence fund, Swedish Vinnova, FMV SBIR equivalent; bootstrapping via software/training services

4. Risk Summary

Total risks tracked: 28

Distribution by score:

• Critical (≥15): 5

• High (10-14): 7

• Medium (6-9): 13

• Low (<6): 3

Top three residual risks requiring active management:

1. Physical prototype funding gap (P-03) — blocks TRL 4 entry

2. Bench test facility access (P-01) — blocks Phase 1 execution

3. Silvus supply chain (S-01) — strategic 3-year reserve mandatory

5. References

NATO AEP-7.3 — NATO Programme Risk Management.

ISO 31000:2018 — Risk management guidelines.

FSG-A-TEMP-001 — Test & Evaluation Master Plan.

FSG-A-FMEA-001 — Failure Mode and Effects Analysis.

FSG-A-SAFETY-001 — System Safety Case.