

The background image shows an industrial facility, possibly a refinery or chemical plant, with several tall distillation columns and storage tanks illuminated at night. In the foreground, a dark-colored vehicle is equipped with a large, mounted radar or sensor unit that is emitting a bright beam of light. To the right, there are tall poles with multiple circular sensors or antennas. Overlaid on the sky are several concentric, glowing blue circles, representing a radar or detection range. The overall scene is dark, with the primary light sources being the facility's lights and the radar beam.

NEW ARK / SONICVAST — C-UAS DIVISION

Comprehensive C-UAS Layered Defense Solution

3-Layer Acoustic Array Network + Analytic RF 10km Passive Detection & Precision Jamming + Microwave /
Laser / High-Speed FPV Response

Technical Proposal v1.0 | September 2026 | Confidential

Passive Sensing First | Radar-Free Hazard Zone Deployment | Manual & Automated Response

Five-Layer Integrated Defense for Hazardous Critical Infrastructure

- 01

3-Layer Acoustic Array Network — 5 km outer perimeter, 1 km node spacing, 360-degree passive acoustic detection and identification with zero electromagnetic emission.
- 02

Analytic RF C-UAS — 10 km Radius — 360-degree omnidirectional passive detection and protocol-based precision jamming of all remote-control and video-link UAV signals (0.1–6.2 GHz).
- 03

Microwave Response — 500 m / 1 km — Vehicle-mounted directional microwave system for fibre-optic controlled UAVs and high-density drone swarm scenarios where RF jamming is ineffective.
- 04

Laser + High-Speed FPV Interceptor — Vehicle-mounted laser platform (2–3 km) for fixed-wing UAS; high-speed FPV interceptor (≥ 350 km/h) for kinetic engagement of fixed-wing targets.
- 05

Radar-Free Hazard Zone + Dual-Mode Operation — No active radar inside core hazardous zones; manual and automated response modes with human-in-the-loop authorization.

10 km

RF Detection & Jamming Radius

360° Omnidirectional

3

Acoustic Layers

5

Response Systems

ZERO Active Radar in Hazard Zone

Passive sensing only — explosion-safe & EMC-compliant

Five Evolving Threat Categories Demand a Layered, Multi-Domain Response



Consumer / RC UAV

Off-the-shelf quadcopters with HD cameras. Reconnaissance, contraband delivery, lightweight payload drops. Cost: \$500–\$5,000.



High-Speed FPV

FPV racing drones at 150–350 km/h. Low radar cross-section, rapid approach. Kinetic strikes and explosive payloads.



Fibre-Optic UAV

Tethered via fibre-optic cable for C&C. Immune to RF jamming. Extended flight time, stable hover for persistent surveillance.



Fixed-Wing UAS

Medium/large fixed-wing drones, long endurance. ISR, electronic warfare, precision strike. Altitude: 1–5 km.



Drone Swarm

Coordinated multi-drone saturation attacks. Requires area-effect countermeasures.

Attack Scenarios

Reconnaissance: HD aerial mapping of facility layout, patrols, shift patterns. **Payload Delivery:** Explosives, incendiaries, chemical agents onto tanks & process units. **Kinetic Impact:** High-speed FPV suicide drones targeting control rooms, substations, flare stacks. **Swarm Saturation:** 10+ coordinated UAVs from multiple vectors overwhelming single-point defenses.

Key Implication for Hazardous Sites

No single sensor or countermeasure addresses all five threat categories. A passive-sensing-first, layered architecture — combining acoustic detection, analytic RF, microwave, laser, and FPV interception — is required to protect explosive and chemically hazardous environments where active radar deployment is unsafe.

Four Compelling Reasons to Adopt Passive-Sensing-First Architecture in Explosive & Chemically Hazardous Environments

01 Explosion Safety Risk

Active radar contains high-power transmitters, magnetrons, and amplifiers generating significant heat and potential spark sources. In Zone 0/1 explosive gas atmospheres (LNG, LPG, refinery vapors), any uncertified active emission device poses an ignition hazard.

Even Ex-certified, radar near-field energy can excite metallic structures and create induced currents — unacceptable above storage tanks and process units.

02 Electromagnetic Compatibility

Industrial plants rely on precision instrumentation: pressure transmitters, flow meters, gas detectors, ESD and SIS systems. High-power radar emissions induce noise in 4–20 mA loops, disrupt HART/Modbus, and cause spurious trips.

RF interference with plant radios, wireless HART, and cellular safety systems creates operational chaos during an actual incident.

03 Regulatory & Code Compliance

IEC 60079 (ATEX), API RP 500, and NFPA 497 classify hazardous locations and strictly limit active electronic equipment. Installing radar in Zone 0/1 requires Ex d/Ex ia certification, hot-work permits, and ongoing inspection — significant cost and administrative burden.

Passive acoustic and RF sensors require no active transmission and deploy with minimal permitting.

04 Passive Sensing Is Inherently Safer

Acoustic microphone arrays and passive RF detectors emit zero electromagnetic energy. They operate on low-voltage DC (12–24V), generate minimal heat, and contain no high-power transmitters or magnetrons — inherently safe for deployment within and adjacent to classified hazardous areas.

Active countermeasures (microwave, laser) deploy outside the core hazard zone at safe offsets, preserving safety-by-design.

Applicable Site Categories & Hazard Zones

05 / 30 | Deployment Scope

Pre-Deployment Risk Screening — 4 Categories, 20+ High-Risk Site Types Where Active Radar Inside Core Zones Is Not Recommended

01 Oil & Gas

Refineries (process units, tank farms)
Petroleum Reserve Depots
LNG Terminals (storage, process)
LPG Storage & Distribution
Natural Gas Gate Stations
CNG / LNG Refueling Stations
Oil & Gas Pipeline Hubs
Offshore Oil & Gas Platforms

02 Chemical & Coal-Chemical

Petrochemical Plants (ethylene / aromatics)
Coal-Chemical Parks (coal-to-liquid / gas)
Coking Plants
Fertilizer Plants (ammonia synthesis)
Chlor-Alkali Plants
— High-density toxic & flammable storage
— Continuous process with ESD/SIS

03 Power & Energy

Gas / Oil-Fired Power Plants
Li-Ion Battery Storage Stations
Hydrogen Production-Storage-Refueling
— Thermal runaway risk in batteries
— H2 explosion limit: 4–75% in air
— Critical national infrastructure

04 Other High-Risk

Coal Mines / Gas Drainage
Grain Silos (dust explosion)
Port Oil / Chemical Terminals
Fireworks & Explosives Warehouses
— Dust MIE can be <1 mJ
— Strict no-ignition-source protocols

Integrated Multi-Layer Defense Architecture

360° All-Round Coverage | Intelligent Analysis | Precise Strike | Full-Domain Protection

Omnidirectional | Full Coverage | Real-time Monitoring | Multi-Target Tracking

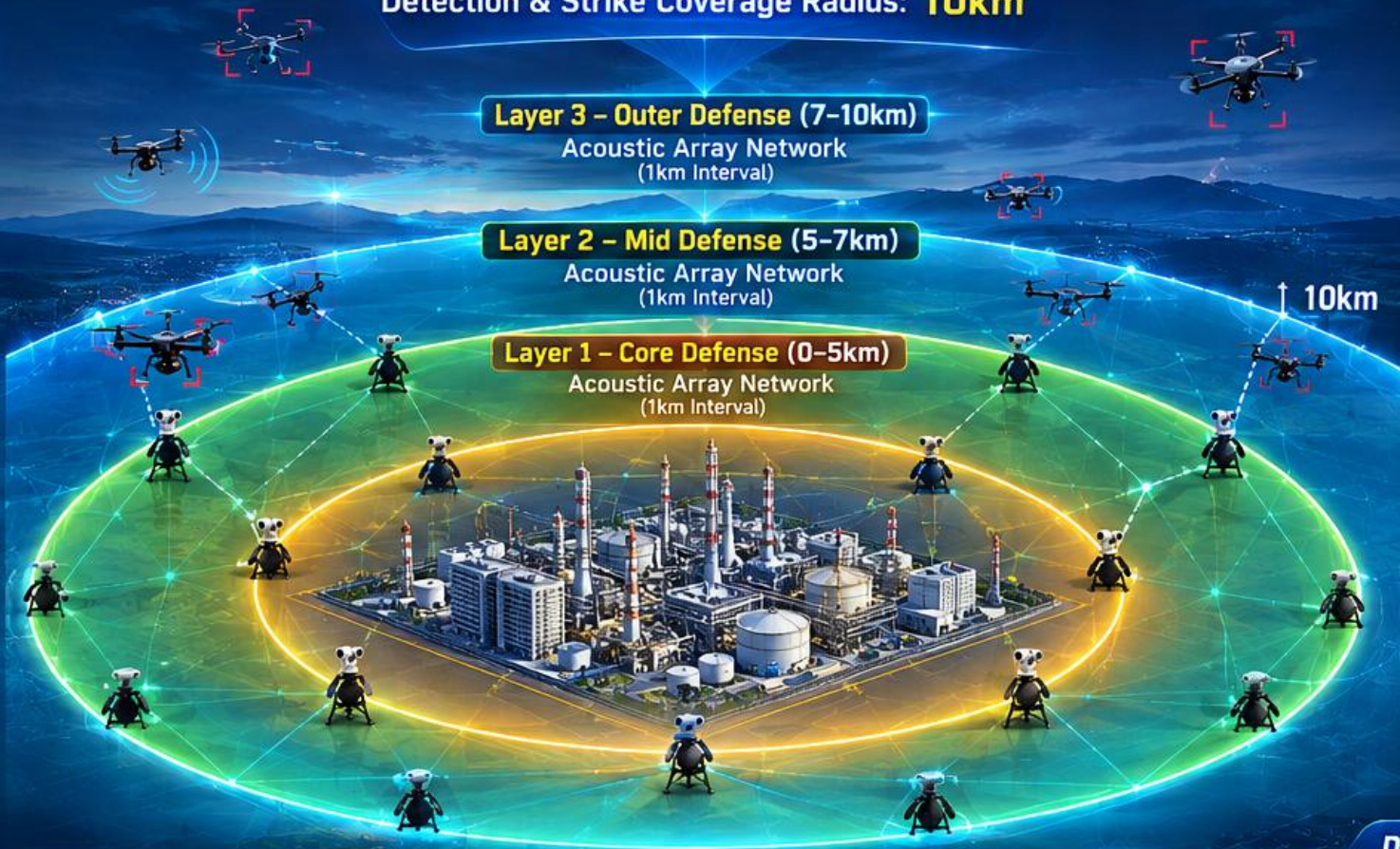
Core Technologies

- Acoustic Detection Network**
 - Multi-layer 3D acoustic array
 - Passive detection, no emission
 - High precision localization
- Analytic RF C-UAS**
 - Protocol-based analysis
 - Passive RF detection
 - Identify & locate UAVs
 - Intelligent decision & strike
- EO/IR Identification**
 - Visible light + Thermal imaging
 - Day & night recognition
 - AI target tracking
- Integrated Command & Control**
 - Real-time data fusion
 - Multi-sensor correlation
 - Intelligent threat assessment
 - One-click response

Key Industries & Critical Sites

- Refineries & Petrochemical Plants
- LNG / LPG Terminals
- Oil & Gas Facilities & Pipelines
- Power Plants & Energy Stations
- Chemical & Fertilizer Plants
- Ports & Logistics Hubs
- Grain Silos & Warehouses
- Other High-Risk Sites

Analytic RF C-UAS – 360° All Direction Detection & Strike Coverage Radius: 10km



Layer 3 – Outer Defense (7-10km)
Acoustic Array Network
(1km Interval)

Layer 2 – Mid Defense (5-7km)
Acoustic Array Network
(1km Interval)

Layer 1 – Core Defense (0-5km)
Acoustic Array Network
(1km Interval)

Three-Layer Acoustic + RF Network Deployment



System Composition

- Acoustic Sensor Arrays**
3-Layer Network, 1km Spacing
- Analytic RF C-UAS**
360° Detection & Intelligent Strike
- EO/IR Cameras**
AI Recognition & Tracking
- Defense Systems**
Laser (2km) + Microwave (500m)
- Command & Control Center**
Data Fusion & One-Click Response

Defense Capability

- Detection Range**
0 – 10 km (360° Omnidirectional)
- Acoustic Network**
3 Layers, 1km Interval
- RF Detection**
Protocol-based Analysis
- Strike Capability**
Laser: 2km | Microwave: 500m

Defense Response



3-Layer Acoustic Array — 1 km Spacing, 360-degree Omnidirectional Coverage

Layer	Radius	Circumference	Nodes	Function
Layer 1	1 km	6.28 km	7	Inner detection
Layer 2	2 km	12.57 km	13	Mid + Microwave
Layer 3	3 km	18.85 km	19	Outer + Laser
Total	0–3 km	—	39	Acoustic nodes

Coverage Area Calculation

Coverage Zone	Formula	Area
Acoustic (r=3km)	$\pi \times 3^2$	28.27 km ²
RF (r=10km)	$\pi \times 10^2$	314.16 km ²
Total Protected	RF outer ring	314.16 km ²

Key Geometry Parameters

Node spacing: 1 km per ring

Layer separation: 1 km radial

Acoustic coverage: 0–3 km radius

RF coverage: 0–10 km radius

MW response: 500m–1km (L2)

Laser response: 2–3km (L3)

FPV launch: Layer 2/3 positions

Total nodes: 39 acoustic arrays

360-degree Passive Acoustic Detection & Identification — Zero Emission, Explosion-Safe by Design



128-channel microphone array for 360° detection plus 360° optical recognition with AI-assisted identification capability.
Passive-sensing only, no active transmission, safe for use in Zone 0 / Zone 1 hazardous areas.



360-degree Omnidirectional Coverage

Spherical arrays provide full azimuth and elevation coverage with no blind spots. Multi-node triangulation enables precise 3D localization across all 39 network nodes.



Passive Sensing — Zero Electromagnetic Emission

Listen-only operation emits zero RF energy. No high-power transmitters, magnetrons, or spark sources — inherently safe for explosive and chemically hazardous environments.



AI-Assisted Recognition & Multi-Target Tracking

ML classifiers distinguish UAV types (multi-rotor, fixed-wing, FPV) by acoustic signature. TDOA across 39 nodes enables simultaneous localization of multiple targets, including swarm elements.



Fibre-Optic UAV Detection — Where RF Fails

Acoustic arrays detect fibre-optic tethered UAVs invisible to RF. Physical signatures provide complementary detection where RF visibility is reduced. Nodes use 12–24V DC at <15W, pole-mounted outside Zone 0.

Per-Node and Network-Level Parameters — 39 Nodes Across 3 Concentric Layers

Parameter	Specification	Environmental	Specification
Array Type	128-mic spherical array	Operating Temp	-40°C to +60°C
Frequency Response	20 Hz – 80 kHz	Ingress Protection	IP67 (dust-tight, immersion)
Single-Node Range	1–2 km (ref.)	Corrosion Resistance	Salt-spray tested (coastal)
Network Coverage	3 km radius (28.27 km ²)	Shock / Vibration	MIL-STD-810G compliant
Localization Method	TDOA triangulation	Lightning Protection	Surge-protected I/O
Azimuth Coverage	360° omnidirectional		
Elevation Coverage	0° – 90° (spherical)		
Multi-Target Tracking	Simultaneous, unlimited		
AI Classification	Multi-rotor / Fixed-wing / FPV		
RF Emission	Zero (passive only)		
Power Supply	12–24V DC		
Power Consumption	< 15 W per node		
		Network & Integration	Specification
		Node Communication	Fibre optic / Gigabit Ethernet
		Data Fusion	Central C2 server, real-time
		Update Rate	≥ 10 Hz position updates
		Deployment Form	Pole-mount / fixed / vehicle
		Integration APIs	REST / MQTT / STANAG 4677

360-degree Passive RF Detection & Protocol-Based Precision Jamming — All RC & Video-Link UAVs

10 km

Detection & Jamming Radius

~20 km diameter protection area. 314.16 km² total coverage.

360°

Omnidirectional Coverage

Fixed outer-perimeter nodes with full azimuth. No blind spots in any direction.

0.1–6.2 GHz

Protocol Analysis Band

Covers 2.4G/5.8G WiFi, all RC protocols, digital video links, telemetry.



Passive Detection First — Protocol Fingerprinting & Direction Finding

Fixed nodes passively monitor the RF spectrum, identifying UAV control links and video transmissions by protocol fingerprint. Direction-finding arrays triangulate emitter position with zero active transmission during detection.



Authorized Precision Jamming — Targeted RC & Video-Link Disruption

Upon human authorization, precision RF response targets only identified UAV control and video-link frequencies. Protocol-aware jamming disrupts the specific link without broadband noise, protecting civilian communications, GPS, WiFi, and mobile services.



Civilian Communications Protection — Governing Design Condition

Protection of civilian communications, satellite navigation, WiFi, and public mobile services is a governing condition. Subject to spectrum permissions, aviation/communications regulations, and written project authorization.

Protocol-Aware Jamming — Disrupt Only the Target Link, Never the Spectrum

Supported Protocol Library

Protocol / Link	Band	Jamming
DJI OcuSync 2.0/3.0	2.4/5.8 GHz	RC + Video
DJI Lightbridge	2.4 GHz	RC + Video
WiFi-based (2.4/5G)	2.4/5.8 GHz	RC + Video
Analog FM Video	5.8 GHz	Video only
Custom / Hobby RC	433M–2.4G	RC only
GPS / GNSS Spoofing	L1/L2 bands	Optional
Telemetry (MAVLink)	433M/915M	Detect only

Precision Jamming vs. Broadband Noise

Protocol-Aware Precision Jamming

Targets only identified UAV control and video-link frequencies. Narrowband, protocol-synchronized pulses. Zero impact on civilian WiFi, mobile, GPS, and aviation bands. Power efficient — 20–50W targeted vs. 500W+ broadband.

Traditional Broadband Noise Jamming

Floods entire 2.4/5.8GHz bands with white noise. Disrupts all WiFi, Bluetooth, and mobile devices in range. High power consumption and heat. Often illegal without spectrum license. Collateral damage to civilian infrastructure.



Engagement Authorization — Human-in-the-Loop for All Active Response

All jamming activation requires explicit human operator authorization. Automated detection runs continuously, but detect-to-engage transition is gated by operator confirmation. This ensures spectrum compliance, prevents false engagements, and maintains accountability. Emergency auto-engage available for pre-defined threat profiles with written authorization.

High-Power Directed Microwave — 500m / 1km Range Against Fibre-Optic UAVs & Swarms

500m–1km Effective Range ----- Deployed at Layer 2 ring (2km radius)	HPM High-Power Microwave ----- Directed energy, phased-array antenna	Swarm Area Countermeasure ----- Cone coverage defeats multi-UAV swarm attacks	M/A Manual / Auto ----- Operator-gated engagement modes
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How Microwave Countermeasure Works

HPM emits focused directed EM energy that disrupts or destroys UAV onboard electronics. Unlike RF jamming that only disrupts links, HPM physically damages components — effective against fibre-optic UAVs with no RF link. Wide cone coverage engages multiple swarm targets simultaneously. Vehicle-mounted for mobility across the 2km ring.



Safety & Deployment Constraints

HPM deployed ONLY at Layer 2 ring (2km from core), never inside hazardous zone. Energy cones aimed upward and outward, away from personnel. All activations require operator authorization. Systems include safety interlocks, beam containment, and EMC certification. Subject to directed-energy weapon regulations.

High-Energy Laser — 2–3 km Range Against Fixed-Wing UAVs, Sensor Disruption & Airframe Damage

2–3 km

Effective Engagement Range

Deployed at Layer 3 ring (3km radius). Precision beam engages single fixed-wing targets.

HEL

High-Energy Laser

Solid-state fiber laser. Silent, invisible beam. Infinite magazine — no ammunition resupply.

Fixed-Wing

Primary Target Class

EO/IR sensor blinding, wing surface heating, structural failure. High-speed approach intercept.



Engagement Sequence — Detect, Track, Lock, Burn

Acoustic and RF sensors detect and classify the fixed-wing target. The laser turret slews to target bearing and begins precision tracking with integrated EO/IR camera. Once lock is confirmed and operator authorizes engagement, the high-energy laser fires a sustained beam. Effects progress from sensor blinding (seconds) to wing surface heating and structural failure (5–15 seconds). Silent operation — no audible discharge.



Safety, Weather & Regulatory Constraints

Laser systems deployed at Layer 3 ring (3km from core), never inside hazardous zone. Beam containment and eye-safety interlocks standard. Performance degraded in heavy fog, rain, or dust — acoustic/RF layers provide all-weather backup. Subject to national laser weapon regulations and aviation safety clearances. All activations require operator authorization.

Kinetic Intercept at ≥ 350 km/h — Net-Capture & Collision Intercept Against Fixed-Wing UAVs

≥ 350

km/h Top Speed

Outruns all commercial fixed-wing and most
FPV targets

Net

Net-Capture System

Deployable net captures target intact for
forensic analysis

Impact

Collision Intercept

Kinetic impact disables airframe. Expendable
interceptor

M/A

Manual / Auto

Operator launch + autonomous terminal
guidance



Intercept Workflow — Cue, Launch, Pursue, Capture / Impact

Multi-sensor network detects and tracks the fixed-wing target, calculating intercept geometry. Operator authorizes launch from Layer 2/3 FPV stations. The interceptor accelerates to ≥ 350 km/h and pursues using autonomous terminal guidance with real-time sensor cueing. At terminal range, the interceptor deploys a capture net or executes kinetic collision. FPV interceptors are expendable, low-cost, and rapidly reloadable.



Deployment & Safety Considerations

FPV launch stations positioned at Layer 2/3 ring locations, directed outward away from core facility. Interceptors fly pre-defined safe corridors with geofencing. Net-capture preferred over kinetic impact when debris risk is a concern. All launches require operator authorization. Interceptor recovery or controlled crash zones pre-designated. Subject to UAV operational regulations and aviation clearances.

Acoustic + RF + EO/IR Sensor Fusion — Unified Air Picture, Automated Threat Assessment, Sensor Cueing

Sensor Fusion Architecture

Sensor Layer	Coverage	Strength	Limitation	Fusion Role
Acoustic Array	0–3 km, 360°	Passive, all-weather, fibre-optic detect	Range limited, ambient noise	Initial detection, classification, 3D track
Analytic RF	0–10 km, 360°	Long range, protocol ID, direction find	Fibre-optic invisible, RF quiet	Extended detection, emitter ID, jamming cue
EO/IR Camera	Cued, 0–5 km	Visual ID, tracking, evidence record	Weather, daylight, narrow FOV	Visual confirmation, laser/microwave cue
Radar (Optional)	Outer perimeter only	All-weather track, velocity data	Active emission, hazardous zone ban	Supplemental track at safe offset only

Threat Assessment & Prioritization

Track fusion: Kalman filter combines acoustic TDOA + RF AOA + EO bearing into single 3D track

Classification: ML ensemble identifies UAV type, payload, and threat level from multi-modal signatures

Priority ranking: Speed, heading, altitude, proximity, and payload class determine engagement order

Sensor cueing: Detection sensors automatically cue tracking sensors and countermeasure turrets

C2 System Capabilities

Unified air picture: Single tactical display fuses all tracks, geofences, and countermeasure status

Rule-based engagement: Configurable ROE automates detect-to-engage within operator-defined bounds

Audit trail: Every detection, classification, and engagement logged with timestamp for compliance

Redundancy: Distributed processing — no single point of failure; nodes operate autonomously if C2 lost

Four Operational Modes — Human-in-the-Loop as Default, Configurable Automation for High-Threat Scenarios

Mode 1 — Full Manual

Operator controls every step: detect, classify, track, authorize, engage, assess.

Use case: Low-threat environments, regulatory requirements for full human control, training scenarios.

Response time: 30–60 seconds from detection to engagement (operator-dependent).

Accountability: Complete audit trail of every operator decision and action.

Mode 2 — Assisted (Recommended Default)

Automated detect/track/classify with real-time threat assessment and recommended countermeasure.

Operator authorizes engagement with one-click confirmation. System handles targeting and execution.

Response time: 8–15 seconds from detection to authorized engagement.

Best balance of speed, safety, and human accountability for most operational scenarios.

Mode 3 — Semi-Autonomous

Pre-defined engagement rules for specific threat profiles (e.g., swarm attack, high-speed FPV).

System auto-engages matching threats within operator-defined geofences and ROE bounds.

Operator monitors and can override or abort at any time. Continuous alert notifications.

Response time: 3–5 seconds. Requires written site authorization and regulatory approval.

Mode 4 — Emergency Auto-Engage

Immediate autonomous response to confirmed imminent threats within core protection zone.

All countermeasures automatically prioritized and engaged based on threat severity and proximity.

Operator notified post-engagement with full forensic record. Can be disabled remotely at any time.

Response time: <2 seconds. Requires explicit written authorization, regulatory approval, and high-threat site classification.

Seven-Stage Closed-Loop Engagement — Sensor-to-Shooter in Under 15 Seconds (Assisted Mode)



7. ASSESS — Battle Damage Assessment & Closed-Loop Feedback

Post-engagement sensors verify target neutralization. If target persists, system automatically re-engages with escalated countermeasure. Full forensic record logged. Feedback improves ML classification models.

Timing Budget by Mode

Kill Chain Stage	Manual	Assisted	Semi-Auto	Emergency
Detect → Classify → Track	2–5 s	2–5 s	2–5 s	2–5 s
Prioritize → Recommend	10–20 s	1–2 s	<1 s	<1 s
Operator Authorization	15–30 s	5–8 s	Pre-authorized	Bypassed
Engage → Assess	5–10 s	3–5 s	3–5 s	3–5 s
Total End-to-End	30–60 s	8–15 s	3–5 s	<2 s

Layered Coverage, Redundant Detection, and Quantified Performance Across All Countermeasure Domains

System Layer Performance Matrix

System Layer	Coverage	Range	Simultaneous Targets	Response Time	All-Weather	Emission
Acoustic Array	360° × 39 nodes	0–3 km	Unlimited	<2 s detect	Yes	Passive (zero)
Analytic RF	360° omni	0–10 km	Unlimited	<1 s detect	Yes	Passive detect
RF Jamming	360° targeted	0–10 km	Multi-channel	<1 s engage	Yes	Active (authorized)
Microwave HPM	Cone (swarm)	500m–1km	Area (swarm)	3–5 s engage	Yes	Active (authorized)
Laser HEL	Single target	2–3 km	1 at a time	5–15 s burn	Degraded	Active (authorized)
FPV Interceptor	Single target	0–5 km	Multi-launch	10–20 s flight	Yes	Active (authorized)

Key Performance Takeaways

Redundant detection: Acoustic + RF overlapping 360° coverage; fibre-optic UAVs detected by acoustic where RF is blind.
Layered countermeasure: RF jam (10km) → Microwave (1km swarm) → Laser (3km fixed-wing) → FPV (5km kinetic). Every target class has two+ independent options.
All-weather detection: Acoustic and RF operate in fog, rain, dust, darkness; only laser weather-degraded, backed by microwave and FPV.

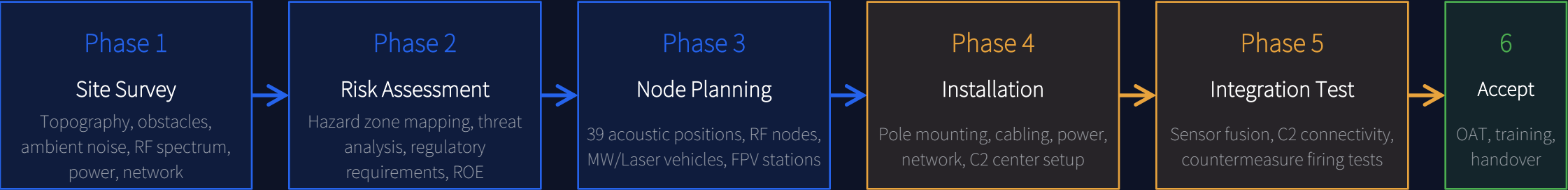
Target-Countermeasure Matrix

Every UAV Threat Class Matched to Optimal Countermeasure — Primary, Secondary, and Detection Coverage

Target Class	Acoustic Detect	RF Detect	RF Jam	Microwave	Laser	FPV	Best Counter
Multi-rotor (DJI class)	●●●	●●●	●●●	●●	●	●●	RF Jam (10km)
Fixed-wing UAV	●●●	●●●	●●	●	●●●	●●●	Laser + FPV
High-speed FPV	●●●	●●●	●●	●●●	●	●●●	Microwave + FPV
Swarm (10+ UAVs)	●●●	●●●	●●	●●●	●	●●	Microwave (area)
Fibre-optic tethered	●●●	○	○	●●●	●●	●●	Microwave (HPM)
Autonomous (pre-programmed)	●●●	●●	●	●●●	●●●	●●●	Microwave + Laser

●●● = Primary / Highly Effective ●● = Secondary / Effective ● = Limited / Last Resort ○ = Not Effective. Fibre-optic UAVs are RF-invisible — acoustic detection + microwave HPM is the only effective countermeasure chain.

Six-Phase Deployment Methodology — From Site Assessment to Operational Acceptance Testing



Critical Site Survey Considerations

Consideration	Assessment Criteria	Impact on Design
Hazard Zone Mapping	Zone 0/1/2 classification, explosive limits, ignition sources	Determines safe offset distances for all active systems
Topography & Obstacles	Building heights, terrain elevation, vegetation, line-of-sight	Acoustic node height and placement; RF antenna elevation
Ambient Noise Profile	Industrial machinery, traffic, HVAC, 24hr noise mapping	Acoustic detection threshold calibration; ML noise training
RF Spectrum Survey	Existing emitters, WiFi, mobile, industrial RF, radar	RF jamming frequency planning; civilian comm protection
Power & Network	Available power at node sites, fiber/network infrastructure, UPS	Node power budget; network topology; backup power sizing
Regulatory & Permits	Spectrum license, aviation clearance, directed-energy permit, local	Engagement mode selection; operational restrictions; timeline

Unified Situational Awareness — All Sensors, All Countermeasures, One Operational Picture



C2 Core Capabilities

Unified Airspace Picture

Real-time 3D track fusion from 39 acoustic nodes + RF sensors

Threat Classification & Priority

AI/ML classification: model, speed, heading, payload risk scoring

Countermeasure Orchestration

Auto-recommend optimal countermeasure; one-click operator authorize

Forensic Recording & Reporting

Full event logging: track data, engagement record, outcome, timestamp

Multi-Console & Remote Access

Primary + backup consoles; encrypted remote monitoring via VPN

System Architecture & Data Flow

Sensor Layer: 39 acoustic arrays + RF detection nodes → encrypted fiber/wireless network → edge processing (detection, classification, tracking) → C2 server (data fusion, threat assessment, countermeasure recommendation) → operator console (visualization, authorization, control) → countermeasure systems (RF jammer, microwave, laser, FPV) → closed-loop feedback (battle damage assessment, re-engagement).

Latency budget: Sensor-to-C2 <500ms, C2 decision <1s, countermeasure activation <1s (RF) to 5s (microwave/laser).

Designed for Hazardous Environments — Intrinsic Safety, Regulatory Compliance, and Operational Accountability

Safety Design Principles

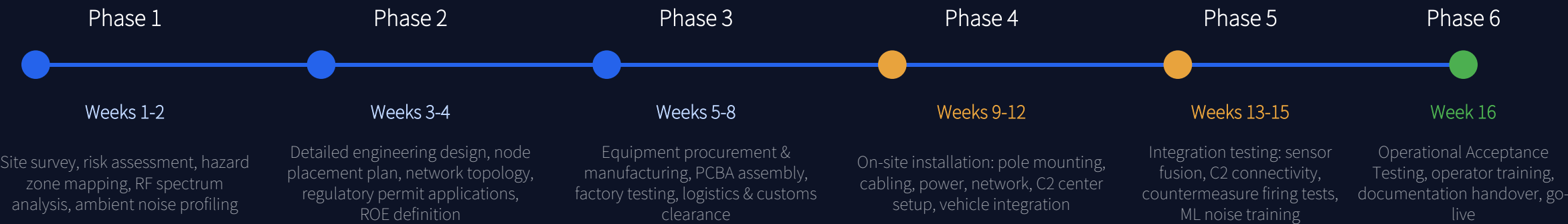
Passive Detection = Zero Emission Acoustic and RF sensors emit nothing — no ignition source, no EMC risk in Zone 0/1/2
Active Systems Outside Hazard Zone Microwave, laser, FPV deploy at Layer 2/3 rings (1-3km) — never inside Zone 0/1
Human-in-the-Loop Authorization All active countermeasures require explicit operator authorization; emergency auto-mode needs written approval
Civilian Communication Protection Precision jamming targets only UAV control/video frequencies; WiFi, cellular, GPS protected

Regulatory & Standards Compliance

Domain	Compliance Approach
Explosive Safety	IECEx / ATEX Zone 2 rating for sensors; active systems outside Zone 0/1
EMC / EMI	IEC 61000 EMC testing; passive sensors zero emission; active systems frequency-managed
Spectrum / RF	ITU-R compliant; national spectrum license for jamming; frequency coordination with authorities
Laser Safety	IEC 60825 laser safety; geofencing prevents beam toward personnel/aircraft; eye-safe standby
Data Privacy	GDPR / local data protection; encrypted storage; access control; audit logging; data retention policy
Aviation	ICAO / local CAA coordination; NOTAM issuance for active countermeasure operations; airspace integration

Critical Safety Constraints — Non-Negotiable 1. No active radar inside core hazard zones. Active radar emits high-power RF that can ignite explosive atmospheres and interfere with plant instrumentation. Our solution uses 100% passive detection (acoustic + RF listening) inside all zones. 2. No active countermeasures inside Zone 0/1. RF jammers, microwave, laser, and FPV systems all deploy at Layer 2/3 rings (1-3km from core), with line-of-sight coverage inward. This ensures zero ignition risk in the most hazardous areas. 3. Human authorization for every active engagement. The system recommends and can pre-arm, but no countermeasure fires without explicit operator consent (except emergency auto-mode, which requires written site authorization and regulatory approval).
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Phased Delivery — From Contract Signature to Full Operational Capability in 16 Weeks



Key Milestones & Deliverables

Week	Milestone	Deliverable	Customer Approval Gate
Week 2	Site Survey Complete	Survey report, hazard zone map, noise/RF baseline data	Survey report review & sign-off
Week 4	Design Freeze	Engineering design package, BOM, node placement drawings	Design review meeting & approval
Week 8	Equipment Ready	All hardware manufactured, factory-tested, shipped to site	Factory acceptance test (FAT) report
Week 12	Installation Complete	All nodes installed, powered, network-connected, C2 online	Installation completion certificate
Week 16	Operational Go-Live	OAT passed, operators trained, full documentation handed over	Operational acceptance certificate

Maximize System Availability — Predictive Maintenance, Remote Diagnostics, and Global Spare Parts Logistics

Maintenance Strategy — Three Tiers

Tier 1: Predictive (Automated)

Continuous self-diagnostics on all 39 acoustic nodes, RF sensors, C2 server, and countermeasure systems. AI predicts component failure 7-14 days in advance. Automatic alerts to maintenance team. Zero manual inspection required for routine health monitoring.
Target: 99.5% uptime

Tier 2: Preventive (Scheduled)

Quarterly on-site inspection: microphone array cleaning, cable integrity check, power supply verification, optical window cleaning (laser), vehicle maintenance (MW/laser/FPV). Annual full system calibration and performance verification.
4 visits/year, 2 days each

Tier 3: Corrective (On-Demand)

Remote diagnostics via encrypted VPN — 80% of issues resolved remotely without site visit. On-site response: 24-48 hours for critical components, 72 hours for non-critical. Modular PCBA design enables field replacement in under 30 minutes per node.
MTTR < 4 hours on-site

Service Level Agreement (SLA) & Spare Parts

Component	SLA Commitment	Spare Parts Strategy
Acoustic Array Node	Remote fix <4h; on-site replacement <24h; node swap <30 min	2 complete nodes on-site; 5 PCBA modules regional warehouse
RF Detection / Jammer	Remote diagnostics <2h; on-site <48h; module swap <45 min	1 RF module on-site; 2 PA modules regional; firmware OTA update
Microwave / Laser Vehicle	Remote fix <8h; on-site <72h; backup vehicle available	Critical spares kit on-site; regional service vehicle within 200km
C2 Server / Network	Redundant server failover <30s; remote fix <1h; on-site <24h	Hot-standby server on-site; network switch spares; cloud backup
FPV Interceptor	Unit swap <10 min; battery swap <2 min; replenishment <72h	6+ units on-site (expendable); 20 batteries; regional stock 50+

Representative Deployment for a 2km² Refinery Complex — Full Layered Defense with Zero Active Radar in Hazard Zones



Site Profile

- Site type:** Integrated oil refinery (crude distillation, catalytic cracking, hydrotreating, blending)
- Area:** 2.0 km² (1.4km × 1.4km)
- Hazard zones:** Zone 0 (process vessels), Zone 1 (storage tank farm), Zone 2 (loading racks, utilities)
- Key assets:** 12 storage tanks, 4 distillation columns, 2 FCC units, LPG sphere farm, oil jetty
- Personnel:** 800+ on-site workers, 24/7 operations
- Existing security:** Perimeter fence, CCTV, access control — no airspace defense
- Threat concern:** FPV drone attack on storage tanks (historical precedent in Middle East), industrial espionage via aerial photography, smuggling drops

Deployment Configuration & Engagement Sequence

Layer	Deployment	Detection / Action	Engagement Example
Outer (10km)	RF detection nodes on perimeter towers	Passive RF detection at 10km; classify protocol; alert C2	DJI Mavic detected at 8km, operator alerted, tracking begins
Mid (3km)	39 acoustic nodes on 3 concentric rings	360° acoustic tracking; precision jamming authorized at 5km	Operator one-click authorize; RF jammer forces RTH at 4km

Transparent, Modular Pricing — Scale Investment by Site Size and Threat Level (Indicative Estimates for Reference)

Capital Expenditure (CAPEX) — Component Breakdown

Component	Qty	Unit (USD)	Subtotal (USD)	Notes
Acoustic Array Node (PCBA kit)	39	\$37,600	\$1,466,400	3-layer ring deployment
Analytic RF Detection + Jammer	2	\$4,00,000	\$800,000	360° coverage, 10km radius
Microwave HPM Vehicle	1	\$4,500,000	\$4,500,000	Swarm / fibre-optic counter
Laser HEL Vehicle	1	\$4,500,000	\$4,500,000	Fixed-wing counter, 2-3km
FPV Interceptor System	500	\$2,980	\$1,490,000	6 units + launcher + GCS
C2 Server + Consoles + Network	1	\$450,000	\$450,000	Console + Training Installation
Equipment Subtotal	—	—	\$13,206,400	Full system, all layers

Additional Costs

Installation & commissioning: 15-20% of equipment (\$1,980,960 ~ \$2,641,280)
Site infrastructure: poles, cabling, power, shelter (\$50K-\$80K)
Training & documentation: \$15K-\$25K (2-week operator + maintenance course)
Total project estimate: **\$810K - \$885K** (full system, turnkey)

Annual Operating Expense (OPEX)

Maintenance & support: 8-10% of equipment/year (\$1,056,512 ~ \$1,320,640)
Spare parts & consumables: \$15K-\$25K/year (FPV units, batteries, PCBAs)
Software updates & ML retraining: Included in support contract
Annual OPEX estimate: **\$1,071,512 ~ \$1,345,640 USD/year**

Six Differentiators That Make Our Solution the Right Choice for Hazardous-Environment C-UAS

1. Radar-Free by Design

100% passive detection (acoustic + RF listening) — zero RF emission in hazard zones. No ignition risk, no EMC interference, no regulatory hurdles. Competitors rely on active radar that cannot be deployed in Zone 0/1/2.

2. Fibre-Optic UAV Counter

Only solution that detects and defeats fibre-optic tethered drones — RF-invisible threats that bypass all RF-based C-UAS systems. Acoustic detection + microwave HPM is the only effective countermeasure chain for this emerging threat.

3. Modular PCBA Kit Model

We sell PCBA kits, not finished products — customers assemble locally, reducing costs by 40-60% and avoiding import restrictions. Field replacement under 30 minutes per node. No proprietary lock-in, full technical documentation.

4. Multi-Layer Redundancy

Every target class has at least two independent countermeasure options. No single point of failure — if RF jamming is ineffective (autonomous drones), microwave and laser engage. If laser is weather-degraded, microwave and FPV back it up.

5. Precision, Not Broadband

Analytic RF jamming targets only UAV control/video frequencies — WiFi, cellular, GPS, and plant instrumentation are fully protected. No collateral disruption to operations. Competitors use broadband jamming that shuts down all communications.

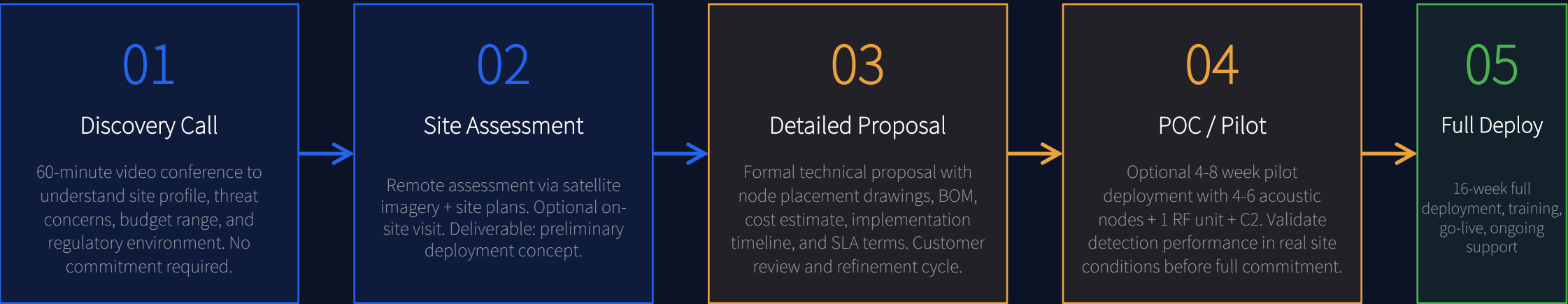
6. Scalable Investment

Start with detection-only layer (acoustic + RF) at ~\$250K, add countermeasures incrementally as budget and threat level evolve. No forklift upgrade required — all layers integrate into the same C2 platform. Protect your investment.

Company Background

New Ark Intelligent Technology (Hong Kong) — Dual-brand architecture: **SonicVast** (acoustic detection & C-UAS systems) and **Lufeng Disguise** (multispectral camouflage). Backed by Dayou Semiconductor for PCBA R&D and manufacturing. Core team with military R&D background in acoustic signal processing, RF engineering, and directed-energy systems. **Global reach:** JPMorgan Chase USD account for international trade; products deployed across Middle East, Africa, and Southeast Asia. Excluding Five Eyes / Fourteen Eyes alliance countries per export control policy.

From Initial Discussion to Full Operational Deployment — A Clear, Low-Risk Path Forward



Low-Risk Engagement Options

Option A — Consultation: Free 60-minute discovery call + remote site assessment + preliminary concept. No cost, no commitment.

Option B — Pilot Program

4-8 week pilot with 4-6 acoustic nodes + 1 RF unit + C2 console. Validate real-world detection performance at your site. Pilot cost credited toward full deployment if purchased within 6 months.

Pilot cost: \$35K-\$50K (refundable credit)

Option C — Full Turnkey Deployment

16-week full deployment: all 39 acoustic nodes + 4 RF units + microwave + laser + FPV + C2 center. Includes installation, commissioning, training, documentation, and 12-month support contract.

Total: \$810K-\$885K (turnkey, see Cost page)

Protect What Matters Most

Passive Detection. Precision Countermeasures. Zero Compromise on Safety.

Contact us for a free assessment and solution

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R&D: Chengdu, China

This document contains confidential technical and commercial information. Distribution restricted to authorized personnel only.

All specifications are indicative and subject to change without notice. Actual performance depends on site-specific conditions.

Export controlled technology. Excluding Five Eyes / Fourteen Eyes alliance countries per applicable regulations.

Consolidated Reference — All System Parameters in One Page

System	Parameter	Specification	Notes
Acoustic Array	Detection range	0-3 km (multi-rotor), 0-5 km (fixed-wing)	39 nodes, 3 concentric rings
Acoustic Array	Coverage / accuracy	360° azimuth, elevation $\pm 60^\circ$, bearing $< 5^\circ$	Passive, zero emission
Acoustic Array	Classification / power	AI/ML model classification, $< 15\text{W}$ per node	IP67, -40°C to $+60^\circ\text{C}$
Analytic RF	Detection / jamming range	0-10 km radius, 360° omni-directional	4 nodes for full coverage
Analytic RF	Frequency / protocols	20MHz-6GHz; 2.4G/5.8G WiFi, GPS L1/L2, SBUS, DSMX	Precision, not broadband
Analytic RF	Response / protection	$< 1\text{s}$ detect, $< 1\text{s}$ engage; civilian comms protected	Human authorization required
Microwave HPM	Range / targets	500m-1km; fibre-optic UAVs, swarms, autonomous	2 vehicles, mobile
Microwave HPM	Engagement / power	3-5s engage, area coverage; vehicle-mounted generator	Outside Zone 0/1
Laser HEL	Range / targets	2-3 km; fixed-wing UAVs, larger drones	1 vehicle, mobile
Laser HEL	Engagement / constraints	5-15s burn; geofencing, eye-safe standby, weather-limited	IEC 60825 compliant
FPV Interceptor	Speed / range / targets	$\geq 350\text{ km/h}$, 0-5 km; fixed-wing, high-speed FPV	6 units, expendable
FPV Interceptor	Engagement / logistics	10-20s flight; unit swap $< 10\text{ min}$, battery swap $< 2\text{ min}$	Manual or assisted guidance
C2 System	Architecture / latency	Redundant server, 3 consoles; sensor-to-C2 $< 500\text{ms}$	Encrypted, VPN remote
C2 System	Modes / uptime	Manual / Assisted / Semi-Auto / Emergency Auto; 99.5% uptime	Human-in-loop default