



SWARM DRONE

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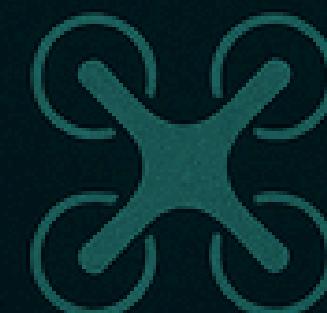
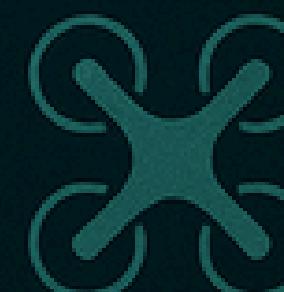
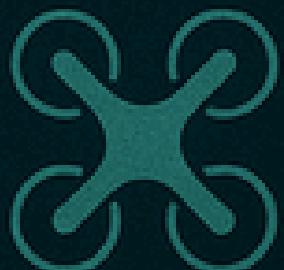
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PBS6: Optimizing Swarm
Drone Logistics and
Deployment in Battlefield
Conditions



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Swarm Dynamics: Redefining the Battlefield Edge

Reimagining Combat with Swarm Autonomy

Drones, especially Swarms, are revolutionizing warfare—but deploying them effectively in real-time warzones is still a challenge for India. Our goal is to develop a swarm drone system that:

- Deploys instantly
- Operates with minimal human input
- Recovers safely
- Functions autonomously without lag or jamming

Our Solution: AeroShakti

AeroShakti aims to deliver a fast, reliable, and intelligent swarm drone system designed for India's defense. By combining AI-driven autonomy, real-time coordination, and resilience in harsh conditions, AeroShakti will redefine aerial warfare and enhance battlefield strategy for India.





KEY CHALLENGES IN SWARM DRONE SYSTEMS

01 **Real-Time Decision Making**

02 **Ethical & Legal Concerns**

03 **Swarm Coordination & Decentralization**

04 **Jamming & Signal Disruption Resistance**





KEY CHALLENGES IN SWARM DRONE SYSTEMS

05

Poor Efficiency

06

Hardware Failure Management

07

Target Detection in Harsh Conditions

08

Reinforcement Learning in Real-World Applications





Global Approaches to Swarm Drone Systems

USA – DARPA OFFSET & AMASS

DARPA is developing autonomous, scalable swarms for urban combat and counter-A2/AD (Anti-Access/Area-Denial) operations.

China – Zhuhai Airshow Swarms

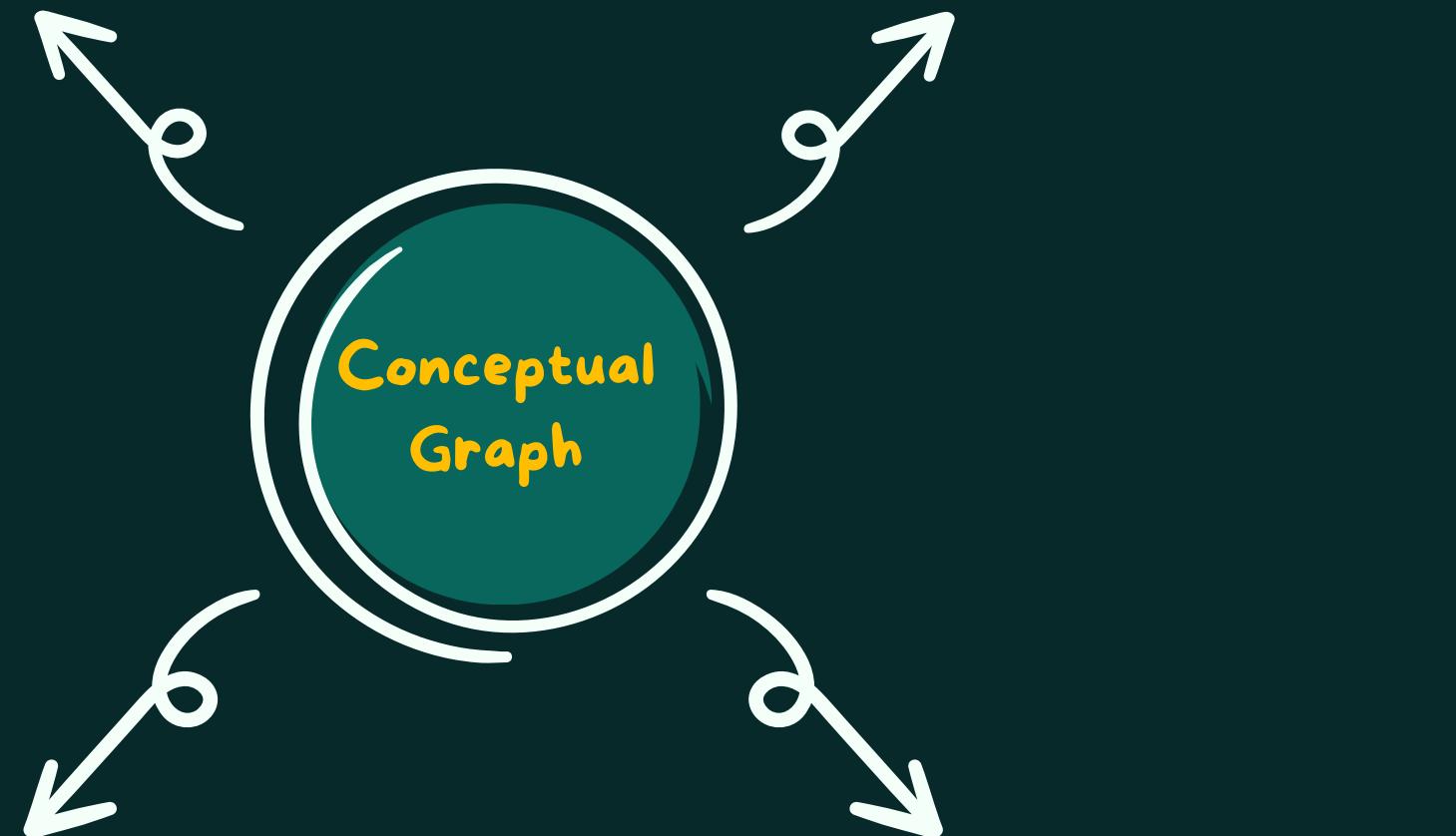
Demonstrated over 1,000 coordinated drones using AI for strategic propaganda and advanced battlefield simulation.

Israel – Harpy & Harop Systems

Loitering munitions with autonomous strike capabilities — effective in target elimination and anti-radar missions.

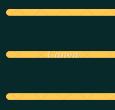
Russia – SIRIUS & Grom Project

Focus on electronic warfare resistance and integration with existing UAV fleets for enhanced defense systems.

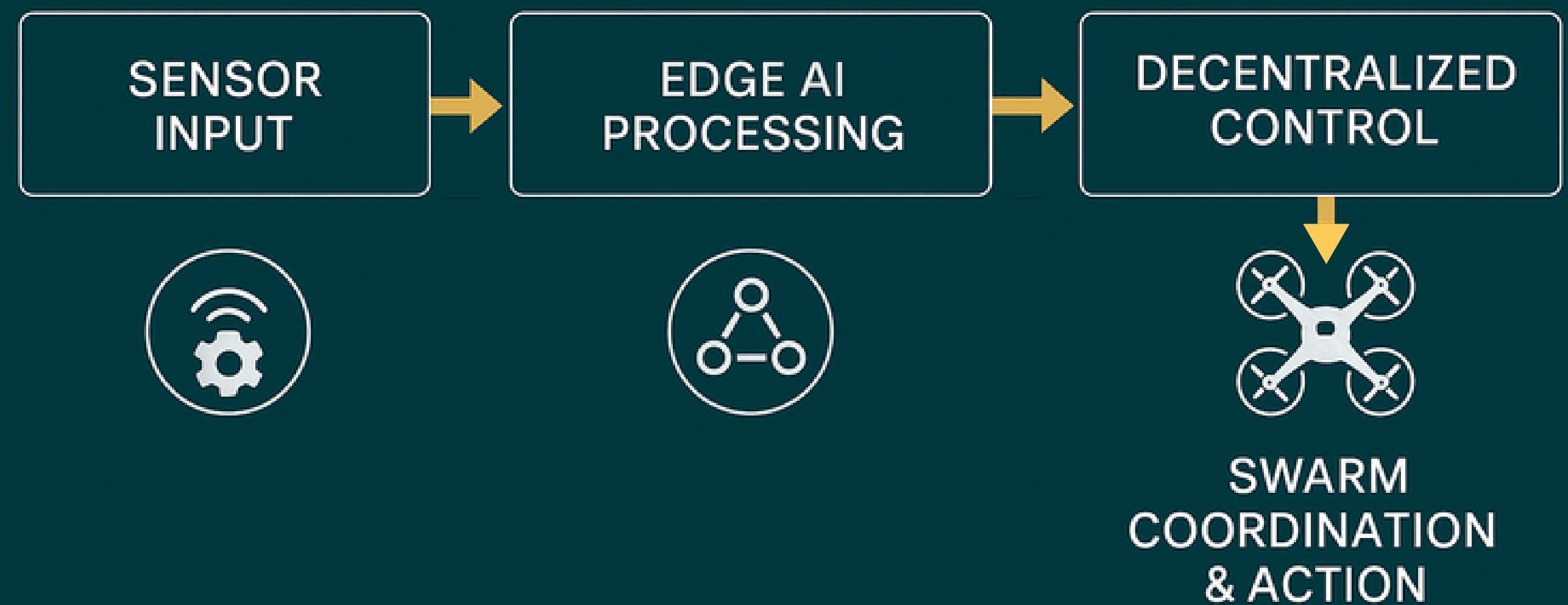


Comparative Table: Global Swarm Drone Programs

| Nation | Program | Focus | Key Tech |
|--------|--------------------|-------------------------------|-------------------------------|
| USA | DARPA OFFST, AMA-S | Urban combat Counter-A2/AD | Decentralized AI |
| China | Zhuhai Swarm Demo | Mass coordination PsyOps | AI Path Planning GPS-free Nav |
| Israel | Harpy Harop | Loitering munition Anti-radar | Autonomous Targeting, EW-safe |
| Russia | SIRIUS Grom | EW resistance Fleet sync | Jamming Shield Swarm AI |



AeroShakti - Architecture Overview



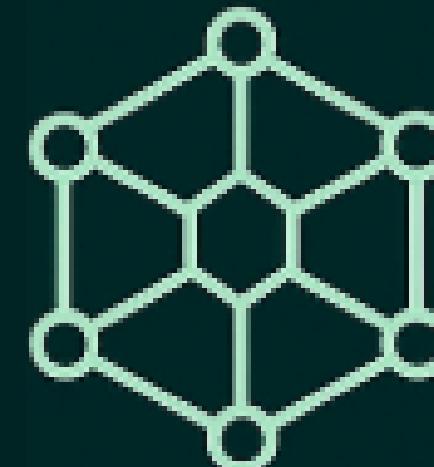


How AeroShakti Operates in Mission-Critical Scenarios



Edge AI + ML at Node Level

Real-time inference for obstacle avoidance, threat detection, and autonomous decision-making



Decentralized Swarm Communication

Blockchain-style consensus ensures resilience against jamming and central point failures



Battery & Power Optimization

Adaptive routing + AI-based energy-aware path planning prolongs swarm endurance



REINFORCEMENT LEARNING

Applying RL techniques to improve performance

COMMUNICATION VIA MESH NETWORK

Ensuring reliable communication through mesh networking

CORE TECHNOLOGIES WE'RE USING

CLOUD-BACKED DECISION FEEDBACK

Leveraging cloud resources for informed decision-making



ANTI-JAMMING PROTOCOLS

Protecting the system from interference and jamming



ATTACK AVOIDANCE VIA CV

Using computer vision to detect and avoid obstacles

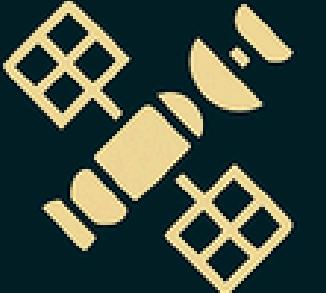


DEPLOYMENT PLAN



PROTOTYPE

Simulations
& lab testing



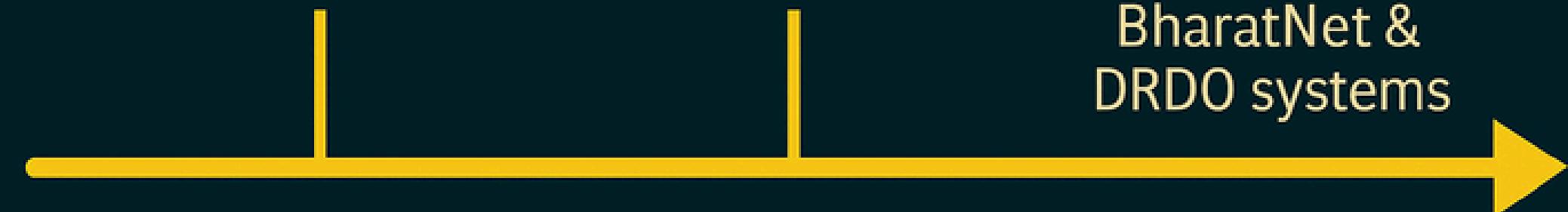
FIELD-TRIALS

High-altitude
& border zones



DEFENSE DEPLOYMENT

Integration with
BharatNet &
DRDO systems





APPLICATION STRATEGIES



BORDER SURVEILLANCE

AUTONOMOUS
TARGET MARKING

HUMANITARIAN
SEARCH & RESCUE

REAL-TIME
RECON

ELECTRONIC
WARFARE



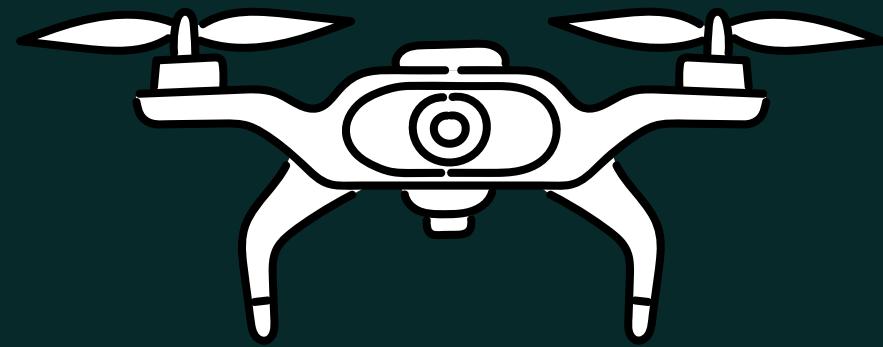
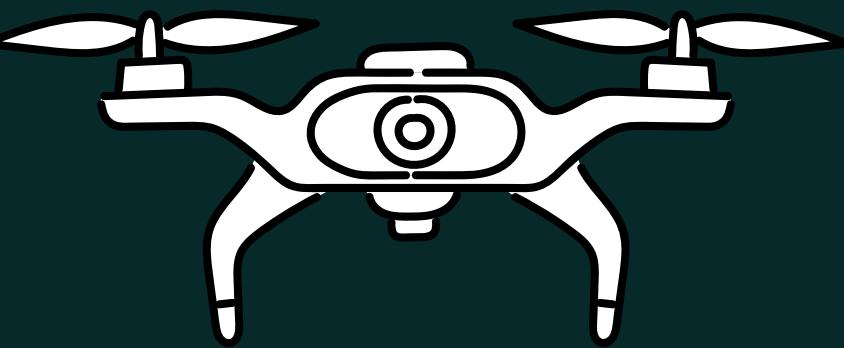
ETHICAL & SECURITY FRAMEWORK

- ✓ Minimize civilian collateral risk
- ✓ Transparent AI models
- ✓ Command override by humans
- ✓ Controlled export to allies only





FUTURE SCOPE



AI-generated swarm adaptation

Swarms dynamically reconfigure using real-time AI decision-making

Underwater drone swarms

Expanding swarm capabilities to sub-surface surveillance and missions.

International defense collaborations

Partnering globally for tech exchange and joint development.

Export potential (Quad, ASEAN)

Positioning for strategic exports to allied nations and defense blocs.



IMPACT & CONCLUSION



SAVES 1000s OF SOLDIER LIVES



MADE-IN-INDIA TECH,
NO IMPORT DEPENDENCY



ENHANCES INDIA'S
DETERRENCE CAPABILITY



DUAL USE: CIVILIAN + DEFENSE



THANK YOU

AeroShakti

Swarm Intelligence, Empowering India's Defense