

# Indigenous UAVs and the Transformation of Indian Air Force Capabilities

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## **Abstract**

This paper investigates the transformative role of indigenous Unmanned Aerial Vehicles (UAVs) in strengthening the operational and strategic capacities of the Indian Air Force (IAF). With asymmetric warfare, rapid-response mechanisms, and real-time intelligence forming the core of contemporary military doctrine, UAVs have emerged as indispensable force multipliers. India's pursuit of self-reliance under the Atmanirbhar Bharat and Make in India initiatives has accelerated the development and integration of domestically produced UAVs. The study analyzes operational platforms, assesses doctrinal and capability-based integration, and evaluates implications for air power and national security. Drawing comparisons with global UAV powers like the United States and China, it highlights how India is aligning itself with next-generation warfare trends. It concludes that while technological and institutional bottlenecks remain, indigenous UAVs are reshaping the IAF's doctrine and transforming India's aerial defence strategy.

**Keywords:** Indigenous UAVs, Indian Air Force, Atmanirbhar Bharat, UAV Doctrine, Strategic Autonomy, Military Modernization

## **1. Introduction**

Technological superiority has become central to modern combat readiness. As India's security environment becomes increasingly volatile—particularly in the Indo-Pacific and continental theatres—the Indian Air Force (IAF) is undertaking rapid modernization. Among its most notable developments is the induction and operational integration of Unmanned Aerial Vehicles (UAVs) for reconnaissance, surveillance, and combat roles.

UAVs offer operational flexibility, reduced risk to human life, and persistent ISR (intelligence, surveillance, and reconnaissance) capability. They allow India to maintain tactical advantage along the Line of Actual Control (LAC) and in counter-insurgency operations. Furthermore, UAVs have become critical components of the Fourth Industrial Revolution (4IR) in defence, where autonomous systems, AI-driven mission control, and data fusion are reshaping air warfare.

Historically, India relied on foreign-origin UAVs such as Israel's Heron and Searcher and considered U.S. MQ-9 Reapers for acquisition. However, foreign dependence created vulnerabilities related to data security, limited customization, and constraints during crises. Recognizing this, India has pivoted under Atmanirbhar Bharat toward building a sovereign UAV ecosystem. This paper explores how indigenous UAVs are influencing IAF doctrine, operational effectiveness, and strategic autonomy.

## 2. Literature Review

Early studies on UAVs in India focused on acquisition from foreign allies. Singh (2020) emphasized the role of Israeli Herons and Searcher-II drones in enabling persistent surveillance across India's vast terrain. These imports, while technologically advanced, denied India access to software codes and hardware modifications.

Post-2015 literature shows a shift in focus. Sharma (2023) and Banerjee (2021) argue that policy frameworks such as the Defence Acquisition Procedure (DAP) 2020, the Innovations for Defence Excellence (iDEX), and the Defence India Start-up Challenge have enabled the rise of domestic UAV producers. The Manohar Parrikar Institute for Defence Studies and Analyses (IDSA) highlights how start-ups like IdeaForge and NewSpace Research are filling gaps in swarm and tactical drone development.

Comparative studies reveal that Pakistan and Bangladesh remain dependent on Chinese or Turkish UAVs, while India's ecosystem allows greater strategic autonomy. However, scholars note a research gap: limited academic work links UAV development to doctrinal transformation in the IAF. This paper contributes by bridging that gap, assessing UAV integration into IAF doctrine, and analyzing future trajectories.

## 3. Methodology

This study employs a qualitative and comparative research design. It uses document analysis of government policies (DAP 2020, Vision 2047), DRDO and HAL reports, IAF publications, think tank studies (IDSA, CENJOWS, ORF), peer-reviewed articles, and defence media coverage. Selection of sources followed three criteria: (a) relevance to UAV development and policy frameworks, (b) credibility of institutional or peer-reviewed origin, and (c) relevance to India's doctrinal adaptation. Comparative analysis with U.S. and Chinese UAV programs contextualizes India's position globally.

The methodology also incorporates thematic coding of sources into three categories: (1) policy and institutional frameworks, (2) indigenous technological platforms, and (3) doctrinal and strategic implications. This structured approach ensures analytical depth rather than descriptive narration.

## 4. Results

### 4.1 Indigenous UAV Platforms

Rustom-II (TAPAS-BH-201): A MALE-class UAV for real-time surveillance and target acquisition.

Archer-NG: Designed for ISR and limited strike missions.

SWiFT and Ghatak UCAV: Stealth combat UAVs under development for autonomous deep strike roles.

Private Sector Contributions: IdeaForge's SWITCH and NETRA drones, along with NewSpace Research's swarm technologies, have enhanced tactical ISR and swarm warfare capabilities.

### 4.2 Operational Deployment

Indigenous UAVs monitor the LAC and LoC with live ISR feeds.

Swarm drone simulations featured in Vayu Shakti 2024.

UAV integration demonstrated in tri-service exercises like Gagan Shakti.

UAVs support disaster relief and humanitarian missions.

DRDO-Navy collaboration adapts UAVs for maritime surveillance in the Indian Ocean Region.

### 4.3 Strategic Advantages

Enhances operational autonomy and data security.

Reduces cost and dependence on imports.  
Strengthens India's defence exports and soft power profile.  
Improves IAF's readiness in hybrid and network-centric warfare.

## 5. Discussion

### 5.1 Global Comparisons

United States: UAVs like MQ-9 Reaper and RQ-170 dominate in long-range autonomy and strike capability.

China: Mass-produced UAVs such as Wing Loong are widely exported and employed in conflicts.

India: Advances in swarm and tactical drones but lags in stealth propulsion, AI-enabled autonomy, and high-altitude jet-powered UAVs.

### 5.2 Challenges

Lack of indigenous UAV-specific jet engines.

Gaps in sensor miniaturization and combat AI.

Bureaucratic delays in procurement and testing.

Fragmented coordination between DRDO, private industry, and the IAF.

### 5.3 Policy Recommendations.

Accelerate UCAV programs (Ghatak, SWiFT) and AI-drone integration.

Expand iDEX and Special Purpose Vehicle (SPV) models for faster funding.

Establish UAV testing corridors and streamline export facilitation.

Strengthen academia-industry-military collaboration for core R&D.

### 5.4 Future Battlefield Scenarios

As warfare evolves into grey-zone conflicts and multi-domain operations, UAVs will become critical for swarm strikes, electronic warfare decoys, and manned-unmanned teaming (MUM-T). India's future-ready air force must embed these capabilities to remain credible against peer adversaries.

## 6. Conclusion

Indigenous UAVs are redefining India's approach to air power by reducing import dependence and enabling adaptation to hybrid, autonomous, and asymmetric warfare. Collaborative innovation between state and private actors highlights India's growing capacity for self-reliance. While gaps in propulsion, automation, and coordination persist, sustained investment and institutional reforms can make India a leader in affordable UAV solutions for both domestic and global markets. This paper contributes to scholarly discourse by linking indigenous UAV development to doctrinal transformation in the IAF, offering a framework to understand India's trajectory in next-generation air warfare.

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