UAVs in Modern Warfare

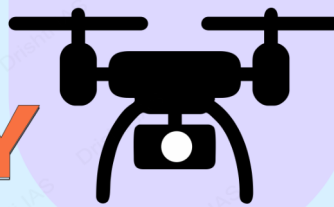**Source: TH**

Why in News?

The sighting of two Chinese **unmanned aerial vehicles (UAVs)** near Okinawa (Japanese island) has raised concerns over the **increasing role** of **UAVs** in military and surveillance operations.
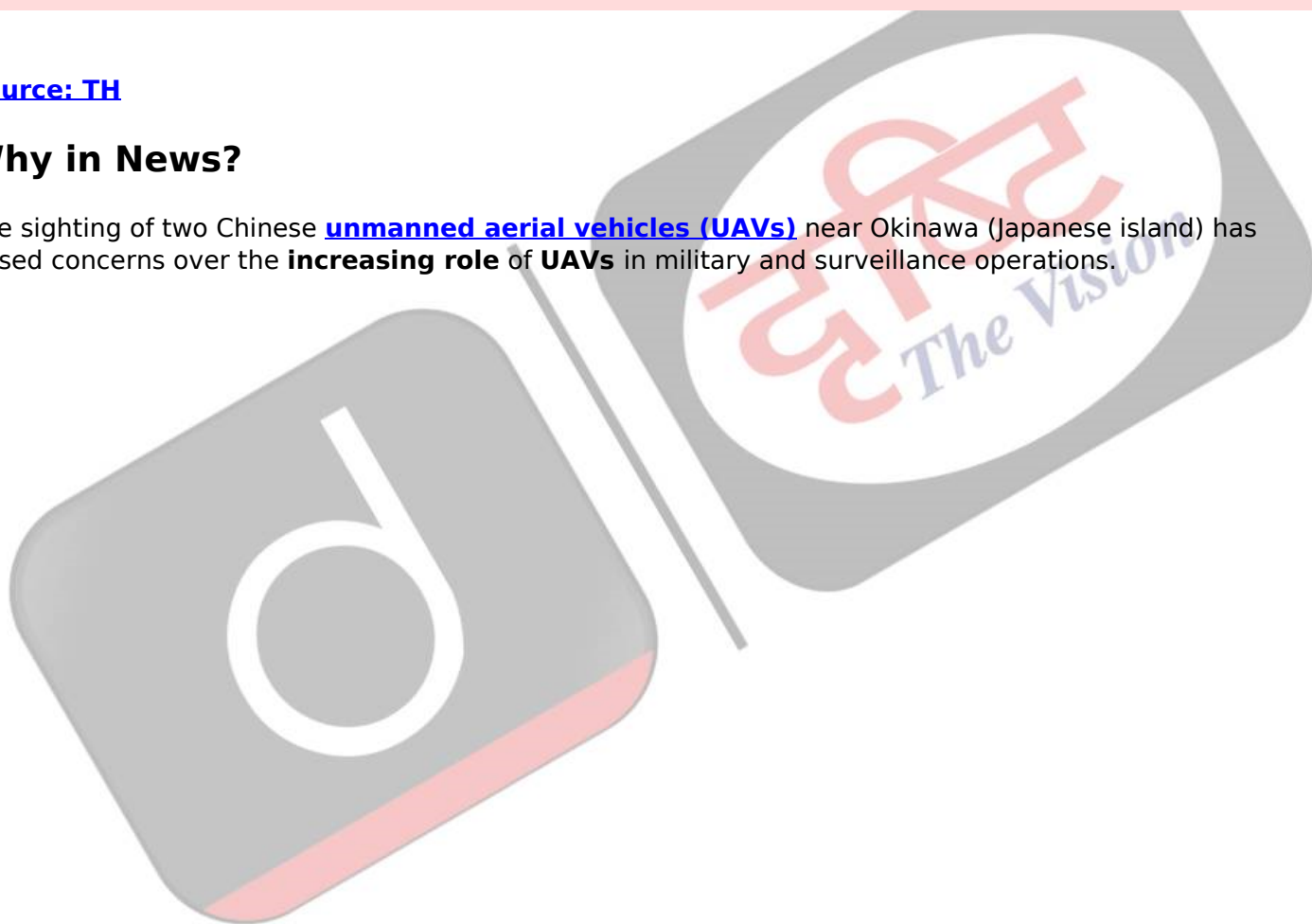
DRONE TECHNOLOGY

Drone is a pilotless flying machine, using aerodynamics for lift, can operate autonomously or remotely, and may carry lethal or nonlethal cargo.

COMPONENTS

- Unmanned aircraft (UA)
- Control system (ground control station - GCS)
- Control link (specialized datalink)
- Other related support equipment

CLASSIFICATION

(as per Drone Rules, 2021)

- Nano: <250 gm
- Micro: 250 gm to 2 kg
- Mini: 2 kg to 25 kg
- Small: 25 kg to 150 kg
- Large: >150 kg

APPLICATIONS

- **Mapping & Surveying** (asset Inspection, roof inspections)
- **Agriculture** (bird control, crop spraying & monitoring etc)
- Multispectral/thermal/NIR cameras, **Aerial Photo/videography** and Live streaming events
- **Emergency Response** (search and rescue, marine rescue, fire fighting)
- **Disaster** (zone mapping, disaster relief etc)
- **Mining**
- **Monitoring Poachers**
- **Meteorology**, Aviation, Payload carrying

DRONES IN DEFENCE

Purpose

- Surveillance and Reconnaissance
- Search and Rescue
- Maritime Surveillance
- Combat Drones
- Offensive (heterogeneous SWARM drones)
- Counter-Terrorism Operations

India's Counter-Drone System

- **Indrajaal** (India's inaugural autonomous drone-defense dome)
- Procurement of combat-capable **Heron drones from Israel**
- Acquisition of **MQ-9B Armed Drones from the US**

RELATED REGULATIONS

- Aircraft (Security) Rules, 2023
- Drones Rules, 2021 and Drone (Amendment) Rules, 2022

INDIA'S INITIATIVES

- Digital Sky Platform
- No-Permission-No-Takeoff (NPNT) framework
- PLI Scheme for Drones
- Drone Shakti Scheme

ISSUES

- Increased risk of armed attacks
- Data security
- **Cheaper cost** enables a larger population to procure drones
- Use of drones in warfare **(remote warfare)**
- **Procurement by non-state actors** can pose serious threats
- Ease in **delivering mass destruction weapons**

What are the Advantages of Drones for Military Operations?

- **Cost-Effectiveness:** Drones have **lower purchase and operational expenses** (fuel, maintenance, and logistics).
  - An **MQ-9 Reaper drone** costs **USD 32 million**, while an **F-35** exceeds **USD 80 million.**
- **Reduced Human Risk:** Drones **reduce the risk of pilot casualties**, making them ideal for **high-risk missions** in hostile environments. E.g.,
  - **US-Iran 2019:** Iran shot down a **US drone** over the **Strait of Hormuz**. Despite tensions, the **US did not retaliate.**
- **Persistent Surveillance:** Drones can stay over a battlefield for **long periods**, providing **real-time intelligence** and improving situational awareness for decision making.
  - AI-powered drones operate **autonomously, quickly identifying and engaging targets** with less human involvement.
- **Operational Flexibility:** Drones can swarm for **coordinated attacks** and serve in **reconnaissance, surveillance,** and **precision strikes**.
  - In the **Nagorno-Karabakh conflict**, UAVs, particularly **Turkish Bayraktar** and **kamikaze drones** by Azerbaijan, played a key role in weakening the Armenian army, leading to **Armenia's defeat**.

- **Suitability for Asymmetric Warfare:** Drones are highly effective in **counterinsurgency and counterterrorism**, delivering precise strikes with minimal damage.
  - The **US, and Turkey** have used them in the **Middle East and Africa** for eliminating terrorists.
- **Lower Logistical Requirements:** Drones **do not require** extensive infrastructure like **airbases, refueling tankers, or pilot support systems**.
  - E.g., Russia easily deployed **Iranian Shahed-136 drones** to weaken **Ukraine's defenses**.

How Concerns are Related to Use of UAVs?

- **Facilitating Conflict:** Drones reduce the risk and cost of warfare, making it **easier f**or states to engage in **military actions without deploying troops**. E.g., use of US drones in the Ukraine war.
- **Empowerment of Non-State Actors:** Drones enable **non-state actors** to compete with state militaries. E.g.,
  - The **Houthis attacked Saudi oil facilities** with drones, while **ISIL** used commercial drones for **surveillance in the battlefield**.
- **Escalation of Regional Tensions:** The expanding drone market, led by **China, Turkey, and Israel**, fuels arms races and conflict.
  - E.g., the US drone strikes in Afghanistan from Pakistani soil have triggered retaliation and escalated **terrorism in Pakistan**.
- **Deniability and Proxy Warfare:** Drones allow nations to carry out strikes without direct attribution, maintaining **plausible deniability.**
  - It enables indirect involvement in conflicts by supplying drones to **allies or rebel groups,** fueling **proxy wars**.
- **Prolonged Warfare:** Civilian casualties from drone strikes, such as those in US operations in the Middle East, have fueled **public outrage and radicalization**, perpetuating **cycles of violence**.

What are the Impacts of Rivals Using UAVs Against India?

- **Increased Security Threats:** Growing drone incursions on India's borders with Pakistan and China pose **military and internal security threats** due to **weapon and drug smuggling.**
  - AI-powered drones enhance surveillance for **Pakistan in Kashmir and China in Ladakh**, challenging India's **strategic secrecy.**
- **Military Asymmetry:** China leads in drone warfare with **AI-driven surveillance** and strikes, while Pakistan leverages Chinese UAVs for better **reconnaissance and combat**.
  - Despite India's development of **Indrajaal** (an AI-powered anti-drone system), it **lags in counter-drone capabilities** compared to China.
- **Cybersecurity Risks:** Indian **drone hacking** incidents near the border expose cybersecurity risks. Strengthening **electronic warfare** remains a challenge.
- **Dependence on Foreign Drones:** India's reliance on **imported drones like the MQ-9B** risks **supply chain disruptions** and limits military self-reliance.

How India Can Strengthen Its UAVs Capabilities?

- **Counter-Drone Measures:** Strengthen systems like **Indrajaal** to detect and neutralize threats and invest in **jamming** and **hacking** countermeasures.
  - Improve drone **battery efficiency** and **stability** in harsh **Himalayan conditions** to counter cross-border threats.
  - **Expand eagle training** by defense forces to **intercept enemy drones**.
- **Indigenous Drone Development:** Promote **domestic manufacturing**, strengthen public-private partnerships, and **support drone startups & MSMEs** with funding and incentives.
  - Promote development of **drone nets** to **entangle drone rotors mid-flight**, disabling propulsion and bringing them down
- **R&D Investment:** Invest in **AI, robotics, pilot training**, and research on **autonomous drones, swarm technology, and high-altitude UAVs**.

Conclusion

The increasing use of UAVs in **military and surveillance** operations presents both **strategic advantages and security threats.** While India faces growing drone incursions from adversaries, strengthening **counter-drone systems, promoting indigenous development, and investing in AI-driven drone technology** are crucial for enhancing national security and maintaining military competitiveness.

Drishti Mains Question:

How can India strengthen its counter-drone capabilities to address cross-border threats?

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. Consider the following activities: (2020)

1. Spraying pesticides on a crop field
2. Inspecting the craters of active volcanoes
3. Collecting breath samples from spouting whales for DNA analysis

At the present level of technology, which of the above activities can be successfully carried out by using drones?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

Ans: (d)

Mains

Q. Border management is a complex task due to difficult terrain and hostile relations with some countries. Elucidate the challenges and strategies for effective border management. (2016)

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