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Drone Swarms: Technology and Tactics

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Drone Swarms: Technology and Tactics

In September 2025 Russia sent over 800 drones and decoys at Ukraine in a single attack. UPSC's 2026 question asks something sharper. How do swarm drones talk, and how do you stop them? This lesson explains what a swarm is, how its two links work, and how jamming, spoofing and India's Bhargavastra counter it.

Must know: what a swarm is and how it communicates

1 What is a drone swarm?

In this lesson, a drone swarm is a group of drones that fly together. They coordinate in real time to finish one mission. Numbers alone do not make a swarm. Real-time coordination does. This is a working definition for study, not a quote from any source.



A civilian display of 1,000 drones in Japan, December 2024. Image credit: 空の青さが目に染みる, licence CC BY-SA 4.0, source Wikimedia Commons.

Why is a big salvo not always a swarm?

Think of a hundred drones launched at a target. If each drone flies its own fixed route, that is a mass attack. It is dangerous, but it is not a swarm.

A swarm adds a second ingredient. The drones share information and change plans together.

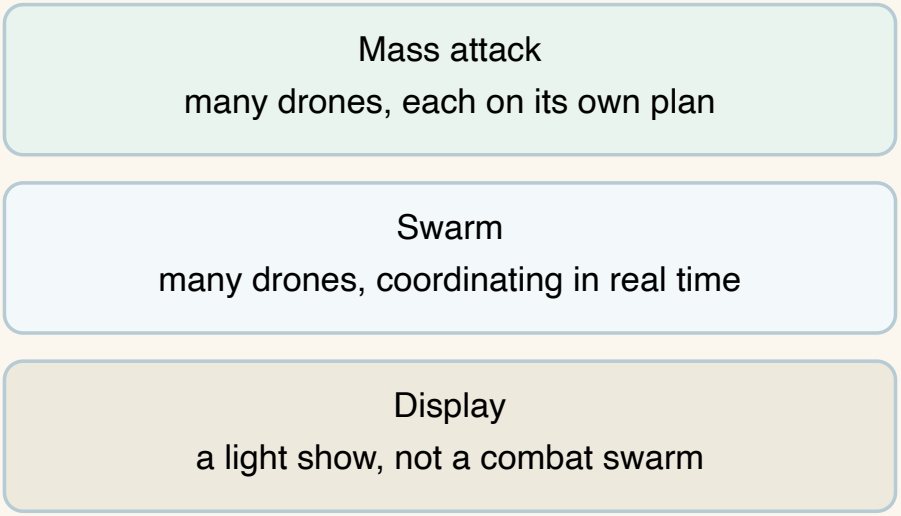
- **Mass attack:** many drones, each following its own plan.
- **Swarm:** many drones that coordinate in real time.
- **Display:** a light show of drones, which is not a combat swarm. PIB called the 2022 show a drone light show.

Where does the idea come from?

The concept borrows from natural swarms. Birds, bees and fish are good examples. Each animal is simple. Together they do things one animal could never manage alone.

What should you remember?

- A swarm is defined by coordination, not by count.
- Many simple units can beat one complex unit.
- Always ask whether the drones coordinate before calling a group a swarm.



Coordination, not count, makes a swarm. Original explanatory diagram.

> **Quick check 1.** A salvo of many drones counts as a swarm even if the drones do not coordinate in real time. *(True or False?)* See answer ↓

Sources: pib.gov.in; opb.org

2 How do swarm drones communicate?

UPSC's 2026 question tests two kinds of talk in a swarm. One runs between the swarm and its command centre. The other runs between the drones themselves.

What does the official key say?

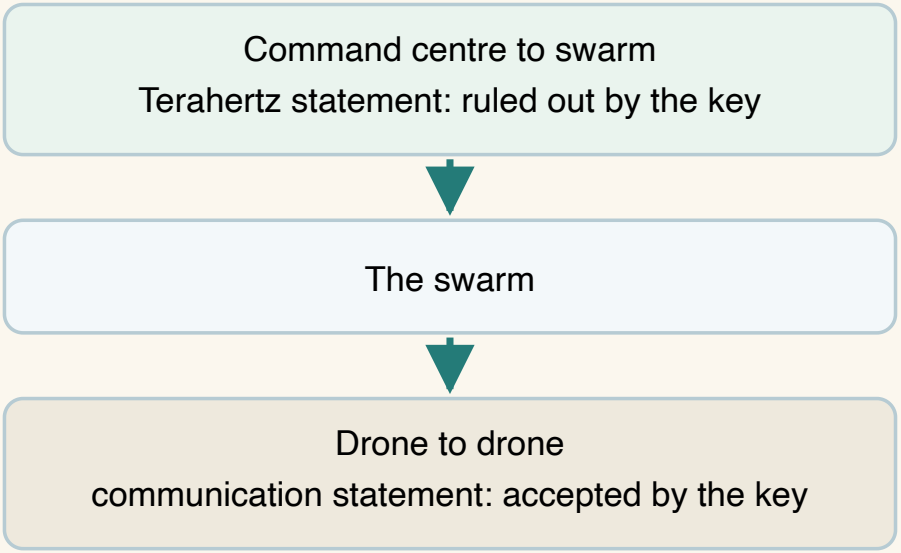
UPSC's provisional answer key for the question gives option (b), "2 and 3 only". That means statement 2 is accepted as true. Statement 2 says individual drones in the swarm can communicate with other drones in the swarm.

What is the Terahertz trap?

Statement 1 says swarms use the Terahertz band of frequency to communicate with the command centre. The provisional key rules this statement out. The key gives no reason, so treat it as a fact to remember.

What should you remember?

- Drone to drone: UPSC accepts that individual drones can communicate with each other.
- Swarm to command centre over Terahertz: UPSC's provisional key rules it out.
- The key is provisional. The final key may follow.



Based on UPSC statements 1 and 2 and the provisional key. Original explatory diagram.

Quick check 2. Swarm drones use the Terahertz band to link with their command centre. *(True or False?)* See answer ↓

Sources: upsc.gov.in

Good to know: countering swarms and India's Bhargavastra

3 How do jamming and spoofing stop a swarm?

Electronic countermeasures attack the signals a drone relies on. They do not need to destroy the drone.

What are jamming and spoofing?

In plain words, jamming drowns a radio signal with noise. Spoofing sends fake signals, such as fake GPS signals, so the receiver believes a false position.

Why does UPSC mention spoofing?

Statement 3 reads: “GPS Spoofing is a commonly used technique to counter drone swarm attack.” UPSC’s provisional key accepts it as correct.

Do these methods always work?

Indian Defence News says traditional jamming or spoofing methods are inadequate against such threats. It says Bhargavastra was designed as a hard-kill solution. Hard kill means physically destroying the drone.

Business Today says the system can add an optional soft-kill layer for jamming and spoofing. Soft kill means disabling a drone without destroying it.

What should you remember?

- **Jamming:** drowns a signal with noise.
- **Spoofing:** feeds false signals to derail navigation.
- **Hard kill:** destroys the drone. Bhargavastra has hard-kill layers.

> **Quick check 3.** GPS spoofing works by blocking the satellite signal with radio noise. *(True or False?)* See answer ↓

Sources: businesstoday.in; indiandefensenews.in; upsc.gov.in

4 What is Bhargavastra?

Bhargavastra is India's indigenous low-cost counter-swarm drone system. Business Today says Solar Defence and Aerospace Ltd (SDAL) developed it. Indian Defence News says Economic Explosives Limited is a collaborator.

How do its layers work?

The system uses two hard-kill layers, plus an optional soft-kill layer.

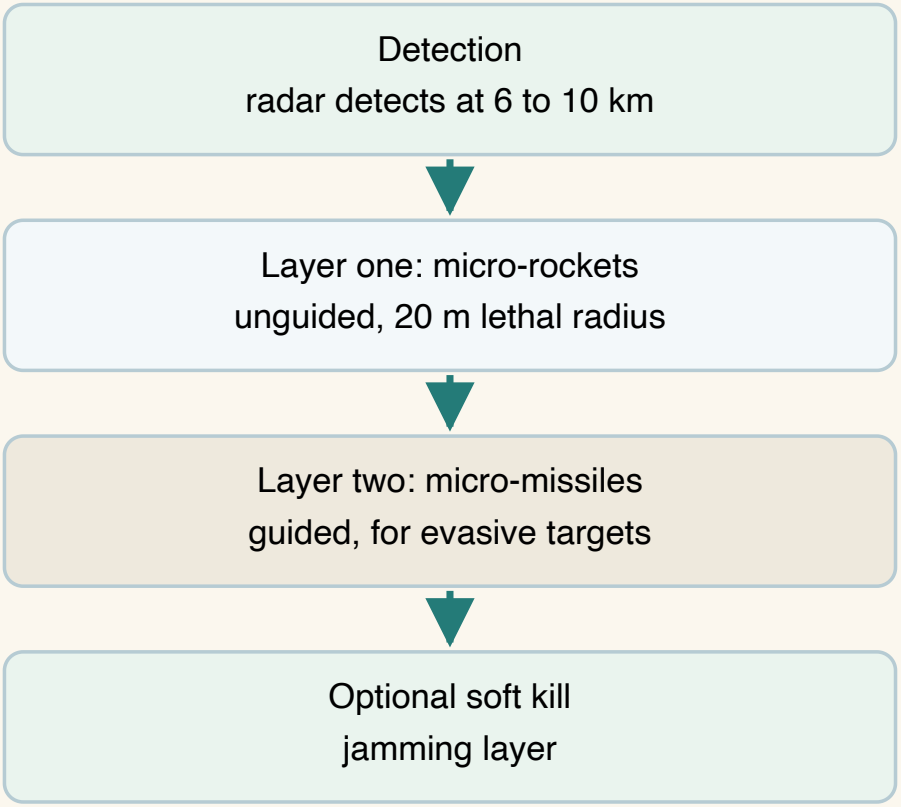
- **Layer one:** unguided micro-rockets clear dense swarms. Their lethal radius is about 20 metres.
- **Layer two:** guided micro-missiles hit evasive targets.
- **Soft kill:** an optional jamming layer.

What is the exam trap about 20 metres?

The 20 metre figure is the rockets' lethal radius. It is not their range. Business Today says the system can detect and eliminate small drones up to 2.5 km away. Indian Defence News says detection reaches beyond 6 km, with interception up to 2.5 km.

What else is reported?

- It is designed for use above 5,000 m.
- Business Today says its radar can detect small aerial threats from 6 to 10 km away.
- In a 2025 trial at the Gopalpur range, a salvo fired two rockets within two seconds.



Detection beyond 6 km, interception up to 2.5 km. Original explanatory diagram.

> **Quick check 4.** The 20 metre figure is the range of Bhargavastra's micro-rockets. *(True or False?)* See answer ↓

Sources: businesstoday.in; indiandefensenews.in

5 What changed after Operation Sindoor?

On 10 May 2025 Pakistan attacked Indian bases. It used missiles, drones, rockets and electronic warfare. India’s air defence and counter-drone systems thwarted the attack. No vital asset was damaged.

What did the CDS say?

CDS Gen Anil Chauhan said none of Pakistan's drones damaged Indian military or civil infrastructure. At a workshop on 16 July 2025 he stressed indigenous counter-UAS systems. He wanted Indian-made systems instead of foreign ones. That India sped up its counter-drone work is this lesson's inference, not an official claim.

What is Mission Sudarshan Chakra?

- PM Modi announced it from the Red Fort on 15 August 2025.
- The aim is a nationwide security shield covering all public places by 2035.
- SDAL's chairman calls Bhargavastra the foundation of a layered shield. The layers have 2.5 km, 6 km and 25 km ranges.
- He said that by 2030 SDAL will be completely successful in making such a shield, as reported on 24 July 2026. This is a company claim. PIB gives 2035 for the nationwide shield.

Sources: pib.gov.in; newsonair.gov.in; newkerala.com

6 Where do the Bhargavastra trials stand?

All facts here are as of 24 July 2026.

What do the reports say?

- Radar detects threats up to 10 km. The electro-optical tracker works up to 6 km.
- Both exceed the Army's stated need of 2.5 km.
- Internal trials are due to finish in 2-3 months, said the SDAL chairman.

- Navy and Army officers saw demonstrations, with the Army visit at Nagpur. Actual rocket firing was not done, for safety reasons.
- The Army visit was a Make-II programme status review.
- A press report of 16 May 2026 expected trials to finish by the end of 2026.

Did all three services review it?

The sources show Navy and Army reviews in the week of 24 July 2026. They do not show an Air Force review. The May 2026 report says the Air Force has expressed interest.

What should you remember?

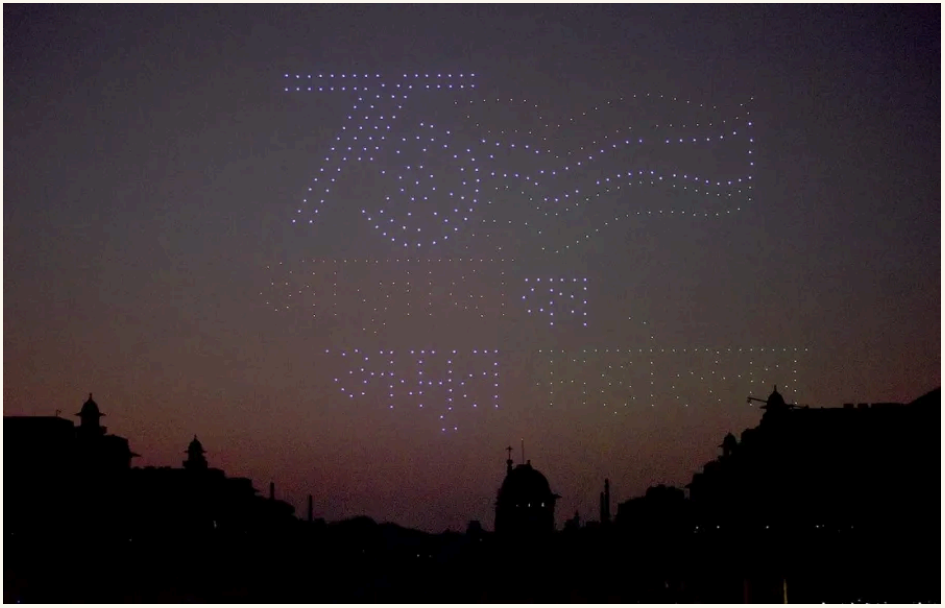
- Radar 10 km, tracker 6 km, Army need 2.5 km.
- Trials are still internal. The system is not yet in service.

Sources: newkerala.com; indiandefensenews.in

Great to know: India's 2022 milestone, Ukraine and the 2026 UPSC question

7 What did India achieve in 2022, and what has changed since?

On 29 January 2022 India flew a 1,000-drone display at the Beating Retreat ceremony. Botlabs Dynamics built it. PIB’s release of 28 January 2022 said India would become the fourth country to fly a display at that scale.



A 1,000-drone light show over Vijay Chowk, New Delhi, on 29 January 2022. Photo: Ministry of Defence, Government of India, GODL-India, via Wikimedia Commons. Resized.

Which countries came before India?

PIB names China, Russia and the UK. The release quotes the minister on this point.

Who backed the show?

- The Department of Science and Technology (DST) gave Botlabs a Rs 1 crore seed fund.
- The Technology Development Board (TDB) added Rs 2.5 crore for scale-up.
- PIB describes Botlabs as led by IIT Delhi alumni.
- PIB lists IIT Delhi among those who worked together on the show. It says the firm was incubated at an IIT.

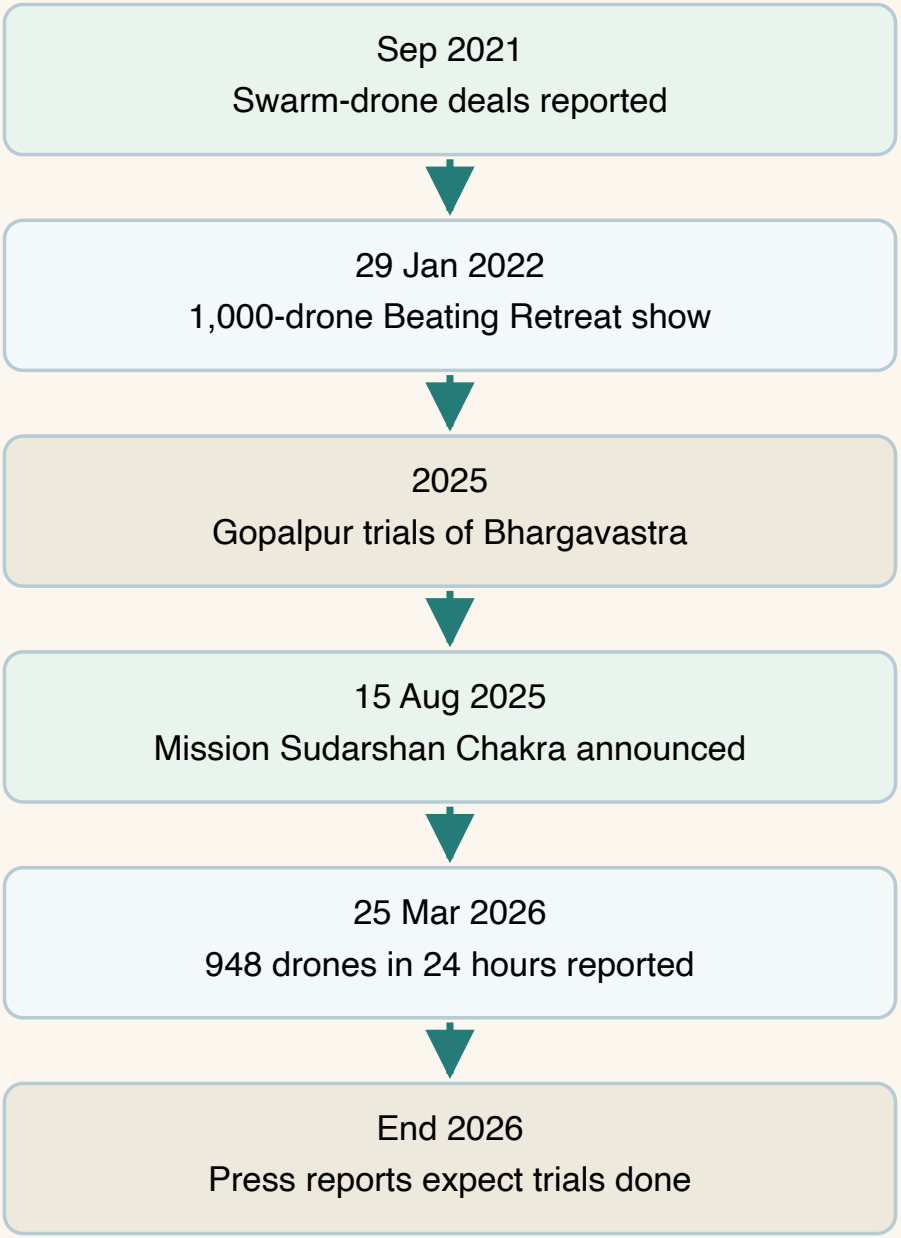
Was it a combat swarm?

No. It was a light show. Do not confuse a display with a combat swarm.

What about the Services' swarm-drone deals?

The deals came before the 2022 show. ThePrint reported them on 4 September 2021. Its story covered Army, Navy and Air Force drone deals together.

- Two swarm-drone deals worth over Rs 200 crore went to NewSpace Research and Tech of Bengaluru and Raphe of Noida.
- NewSpace's drones can hit targets, do surveillance and carry medical supplies.
- Raphe's deal is worth over Rs 100 crore. It covers surveillance and load-carrying drones.
- Raphe's deal is part of the Rs 200 crore total, not an extra deal.



Dates in the order they happened. Original explanatory diagram.

Sources: pib.gov.in; theprint.in

8 How big are drone attacks now?

Ukraine shows what mass drone attacks look like at war scale. These are key current affairs of 2025-26.

What happened in September 2025?

On 7 September 2025 Russia launched about 805 drones and decoys. It also fired 13 missiles. Ukraine's Air Force called it the largest Russian drone strike since the full-scale invasion began.

The attack hit 37 locations, not one city. Smoke rose from the roof of the Cabinet of Ministers building in Kyiv. AP said it was unclear whether that was a direct hit or debris.

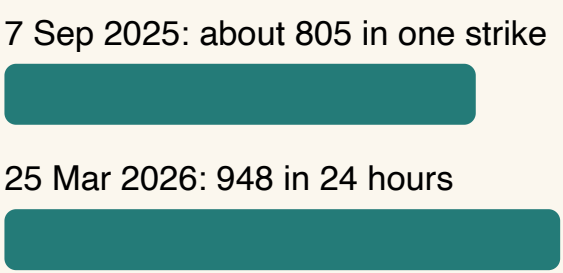
How does the 948 figure compare?

All India Radio reported on 25 March 2026 that Russia fired 948 drones in 24 hours. It called this the largest aerial attack on Ukraine over 24 hours. More than 400 of them came in an unusual daytime attack.

The 805 figure is one strike. The 948 figure is a 24-hour total. The two do not compare directly.

What should you remember?

- Always date a figure, and say whether it is one strike or a total.
- A big attack shows scale. It does not by itself show a swarm.



Bar lengths show the drone totals. One is a single strike and one is a 24-hour total, so they do not compare directly. Original explanatory diagram.

> **Quick check 5.** The 805 drones of 7 September 2025 and the 948 drones of March 2026 are the same kind of count. *(True or False?)*
>
> See answer ↓

Sources: opb.org; newsonair.gov.in

9 How did UPSC test this?

UPSC Civil Services Prelims 2026, GS Paper I, Series A, question 47, asked about drone swarms. The wording below is UPSC's own.

What was the question?

"Which of the following statements with regard to drone swarms is/are correct?"

1. They use Terahertz band of frequency to communicate with the command centre.
2. Individual drones in the swarm can communicate with other drones in the swarm.
3. GPS Spoofing is a commonly used technique to counter drone swarm attack.

“Select the answer using the code given below:”

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 2 only
- (d) 1, 2 and 3

The provisional answer key for Series A gives (b), 2 and 3 only.

Why is each statement right or wrong?

- Statement 1 is ruled out by the key. UPSC gives no reason.
- Statement 2 is accepted as correct.
- Statement 3 is accepted as correct.

How do you answer it fast?

Spot the one statement the key rules out. It is the Terahertz one. Drop statement 1. Only 2 and 3 remain, which is option (b).

Sources: upsc.gov.in

Review the feedback after each answer. The understanding-check score lasts for this page session.

Reset the checks when you want another attempt. This score is separate from the Native Practice score below.

Questions to think through

Why is a mass attack different from a swarm?

A mass attack overwhelms defences by numbers. In this lesson’s working definition, a swarm coordinates in real time as it flies. The drones share information and revise the plan as a group. That makes a

swarm harder to predict.

Why does Bhargavastra add hard-kill layers?

Indian Defence News says traditional jamming or spoofing methods are inadequate against swarm threats. A hard-kill layer destroys the drone physically. Bhargavastra also offers an optional soft-kill jamming and spoofing layer.

Why was the 2022 display not a combat swarm?

It was a light show of 1,000 drones. The drones followed a planned pattern for an audience. It shows the technology can control a large number of drones. It does not show combat coordination.

Why must you date every drone-attack record?

Records fall, and measures differ. The 805-drone attack of September 2025 was called the largest Russian drone strike at that time. The 948 figure of March 2026 is a 24-hour total. Always give the date and the measure.

Practice MCQs

1. Consider the following statements:

1. Drone swarms typically use the Terahertz band to link with their command centre.

2. Individual drones within a swarm can communicate directly with each other.

3. Jamming and spoofing are common electronic countermeasures against drone swarms.

Which of the statements given above is/are correct?

A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

See answer ↓

2. Which countries does PIB name as having flown a 1,000-drone display before India did in January 2022?

A. Russia, Israel and the UK

B. China, Japan and the UK

C. China, Russia and the UK

D. The US, Russia and China

See answer ↓

3. What does the 20 metre figure for Bhargavastra's unguided micro-rockets measure?

A. The height of the launcher vehicle

B. Their maximum range

C. Their lethal radius

D. The size of the radar blind zone

See answer ↓

4. Which mission was announced from the Red Fort on 15 August 2025, aiming for a nationwide security shield by 2035?

A. Mission Sudarshan Chakra

B. Mission Shakti

C. Operation Sindoor

D. Mission Drishti

See answer ↓

5. How many drones and decoys did Russia launch at Ukraine on 7 September 2025? Ukraine's Air Force called it the largest such strike then.

A. About 805

B. About 650

C. About 948

D. About 1,000

See answer ↓

6. At a workshop on 16 July 2025, what did CDS Gen Anil Chauhan stress after Operation Sindoor?

A. Indigenous counter-UAS systems

B. Banning civilian drone shows

C. Buying foreign counter-UAS systems quickly

D. Replacing drones with manned jets

See answer ↓

7. In which year did ThePrint report two swarm-drone deals, worth over Rs 200 crore, with Indian start-ups?

A. 2019

B. 2021

C. 2020

D. 2022

See answer ↓

Answer Key

1. **B.** The correct answer is 2 and 3 only. UPSC's provisional key for the 2026 paper gives 2 and 3 only for this question. So statement 1, about Terahertz, is the false one. Statement 2 is right because individual drones in a swarm can communicate with each other. Statement 3 is accepted as right. Business Today says Bhargavastra can add an optional soft-kill layer for jamming and spoofing. Indian Defence News says traditional jamming or spoofing methods are inadequate against such threats, so Bhargavastra is built as a hard-kill system. ↑ Q1
2. **C.** PIB's release of 28 January 2022 names China, Russia and the UK. It said India would become the fourth country to fly a display at that scale. The show was held on 29 January 2022. It was a light show, not a combat swarm. The swarm-drone deals were reported earlier, in September 2021. ↑ Q2
3. **C.** Twenty metres is the rockets' lethal radius, not their range. Business Today says the system can detect and eliminate small drones up to 2.5 km away. Reports of 24 July 2026 say its radar sees threats up to 10 km. The electro-optical tracker works up to 6 km. Both exceed the Army's stated need of 2.5 km. ↑ Q3
4. **A.** PM Modi announced Mission Sudarshan Chakra on 15 August 2025. It aims to cover all public places by 2035. SDAL's chairman calls Bhargavastra the foundation of a layered shield with 2.5 km, 6 km and 25 km ranges. He said SDAL will be completely successful in making it by 2030, as reported on 24 July 2026. That is a company claim. Operation Sindoor is the May 2025 operation, not this mission. ↑ Q4
5. **A.** On 7 September 2025 Russia launched about 805 drones and decoys plus 13 missiles. Ukraine's Air Force called it the largest Russian drone strike since the full-scale invasion. All India Radio later reported 948 drones in 24 hours, on 25 March 2026. That is a 24-hour total, not a single strike, so the two do not compare directly. The 7 September attack hit 37 locations, not Kyiv alone. ↑ Q5
6. **A.** He stressed indigenous counter-UAS systems instead of foreign ones. He said none of Pakistan's drones damaged Indian military or civil infrastructure. PIB says India's air defence and counter-drone systems thwarted the attack of 10 May 2025. No vital asset was damaged. ↑ Q6

7. **B.** ThePrint reported it on 4 September 2021, before the 2022 Beating Retreat show. The two deals went to NewSpace Research and Tech of Bengaluru and Raphe of Noida. Raphe's deal, worth over Rs 100 crore, is part of the Rs 200 crore total. The 1,000-drone show came later, on 29 January 2022. ↑ Q7

Quick-check answers

1. **False.** A swarm needs real-time coordination. A salvo of drones that each fly a fixed plan is a mass attack. ↑ 1
2. **False.** UPSC's provisional key rules out the Terahertz statement in the 2026 question. ↑ 2
3. **False.** Blocking with noise is jamming. Spoofing sends fake satellite signals so the receiver believes a false position. ↑ 3
4. **False.** Twenty metres is the rockets' lethal radius. Business Today says the system can detect and eliminate small drones up to 2.5 km away. ↑ 4
5. **False.** The 805 was one strike. The 948 was a 24-hour total, reported on 25 March 2026, with more than 400 in a daytime attack. ↑ 5

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