SoCTA 2025 Drone Challenge

Date: December 27, 2025
Venue: NIT Jalandhar

Registration Details:

- **Registration Fee (Indian teams)**: ₹500 + GST per team
- **Registration Fee (Foreign teams)**: $50 + GST per team
- **Last Date for Registration**: December 15, 2025

Overview:

The **SoCTA 2025 Drone Challenge** is an international competition designed to test the engineering, technical, and problem-solving skills of young innovators in drone technology. Organized by the Agastya Club at NIT Jalandhar, this event features four critical rounds where teams will demonstrate their drone's capabilities in real-world disaster-response scenarios.

Mission Statement:

The competition aims to foster innovation in drone technology and its application in humanitarian missions, specifically in post-disaster scenarios. The event will challenge participants to integrate advanced drone systems for precision flying, payload management, autonomous navigation, and computer vision analysis.

Operation Lifeline Drone Challenge: Official Rulebook

1. 🎯 Competition Objectives & Eligibility

Section	Rule / Requirement
Objective	To design, build, and pilot a drone to execute a four-stage disaster response mission: Navigation, Reconnaissance (CV), and Precision Aid Delivery.
Eligibility	Open to all students (10+, 12+, UG, PG, PhD).
Team Size	Mandatory 3 to 5 members per team.
Registration	Must pay the ₹500 fee and register by 15 December 2025.
Conduct	All participants must follow the spirit of fair play. Decisions of the judges (DRDO/Army/BSF experts) are final.

2. ⚙ Drone Specifications & Constraints

Parameter	Mandatory Requirement
Maximum MTOW	3.0 kg (Maximum Take-Off Weight, including payload and battery).
Physical Size	Max dimensions 400 mm × 400 mm × 250 mm (L × W × H), measured at the widest/highest point while at rest.
Propeller Guard	Mandatory. Must cover at least 75% of the propeller blade area.
Payload	Must be able to securely carry and remotely release the standard 100 g aid package provided by the organizers.
Camera	Minimum 720p resolution (for video and still image capture).
Power	Battery type must be declared during registration. No combustion engines are allowed.

3. ⚠ Safety Guidelines & Disqualifications

Safety is non-negotiable—violations lead to immediate mission halt and potential DQ.

- **Flight Area**: Confined to a marked 20 m × 20 m netted arena. Teams must stay clear of the netting.
- **Failsafe**: Auto-return-to-home or motor cut-off must activate within 5 seconds of signal loss.
- **Emergency Stop**: Every team must have a clearly labeled, functional Emergency Motor Stop mechanism accessible to the pilot.
- **Protocols**: Pre-flight checklist must include weight verification and frequency check (declare 2.4 GHz or 5.8 GHz channel to avoid interference).
- **Medical**: Teams are advised to have basic first-aid knowledge. A medical station will be on-site.

Violation	Penalty / Consequence
Unsafe Flight	Immediate mission halt. Judges may award a -100 point penalty.
Intentional Damage	Immediate Disqualification (DQ) of the team.

Violation	Penalty / Consequence
Flying Out-of-Bounds	-50 points and immediate relaunch from the starting base.
Exceeding MTOW	Team is DQ before flight (weight check is mandatory).

4. 🚀 Competition Structure: Four Progressive Rounds

The mission time starts when the drone motors are armed and stops when the drone lands safely after completing the final task of the round.

Round	Objective	Time Limit	Base Scoring	Key Criteria
Round 1: Basic Payload & Nav	Take off, carry the 100 g payload, fly A to B, and land accurately.	3 minutes	150 points	Landing fully within the 1 m × 1 m marked zone.
Round 2: Obstacle Course	Navigate a course simulating debris, including gates, tunnels, and elevation changes. (No payload required).	5 minutes	200 points	Successfully clear all 5 obstacles (40 points per obstacle).
Round 3: Multi-Point Recon & CV	Scan three locations (Mandir, Main Ground, IT Park), capturing footage for Computer Vision detection.	7 minutes	300 points	Reach and hover/scan all three locations.
Round 4: Final Aid Delivery	Pickup payload at IT Park and execute two precise drops at the two most critical zones identified in Round 3.	6 minutes	400 points	Successful pickup + scoring accuracy in two target rings.

5. 📊 Scoring & Time Efficiency

A. Accuracy and Technical Scoring

Task / Achievement	Points Awarded	Notes
R3 CV Human Detection	150 Bonus Pts	Awarded for ≥ 80% accuracy in identifying simulated victims.
R4 Precision Drop (Inner)	150 points × 2	Payload lands fully inside the 50 cm Inner Circle.
R4 Precision Drop (Middle)	100 points × 2	Payload lands fully inside the 100 cm Middle Circle.
R4 Precision Drop (Outer)	50 points × 2	Payload lands fully inside the 150 cm Outer Circle.

B. Time Efficiency Bonus

Time bonuses are awarded for finishing the round significantly under the time limit, emphasizing mission speed.

- **R1 Bonus**: +20 points for every 10 seconds saved below the 3-minute limit.
- **R2 Bonus**: +25 points for every 15 seconds saved below the 5-minute limit.
- **R3 Bonus**: +30 points for every 20 seconds saved below the 7-minute limit.
- **R4 Bonus**: +30 points for every 20 seconds saved below the 6-minute limit.

C. Penalties

Action	Penalty
Minor Contact (R2)	-10 points (maximum two contacts allowed).
Skipping Obstacle (R2)	-100 points (must immediately re-attempt obstacle).
Restart/Relaunch	-50 points (for manual intervention/crash requiring relaunch).
Delivery Failure (R4)	0 points for that specific drop (if payload lands outside the 150 cm outer ring).

6. 📝 Logistics & Judging

- **Judging**: Expert evaluators (DRDO/Army/BSF) will judge performance.
- **Tie-Breaker**: In the event of a tie in the final cumulative score, the team with the lowest total cumulative mission time across all four rounds will be ranked higher.
- **Video Evidence**: Teams must retain recorded video from Round 3 for verification of CV detection accuracy.
- **Mission Restart**: Only one mission restart (after a crash/technical issue) is allowed per team per round, incurring the -50 point penalty.

Proposed CV Technical Specifications for Round 3

Parameter	Requirement
Detection Target	Simulated human victims (e.g., mannequins with thermal/visible markers) at each location.
Accepted Output Format	JSON timestamped logs from onboard CV software (e.g., {"location": "Mandir", "timestamp": "YYYY-MM-DD HH:MM:SS", "detections": [{"confidence": 0.85, "class": "victim", "bbox": [x1,y1,x2,y2]}]}). Submitted post-round via USB/email.
Latency Limit	Real-time processing required; detection latency ≤ 2 seconds per frame (verified via video timestamps). Exceeding this incurs -20 points per violation.
Accuracy Metric	≥ 80% precision/recall on at least 5 detections per location, evaluated by judges using ground truth annotations. False positives/negatives deducted at -10 points each.
Software Constraints	Open-source libraries (e.g., OpenCV, TensorFlow Lite) encouraged; no cloud processing during flight. Code submission optional for bonus review (+50 points for innovative implementation).

These additions ensure measurable, reproducible outcomes while keeping the challenge accessible.