



Horn Bill



AI-POWERED AUTONOMOUS Reforestation Drone

Identifies canopy gaps, calculates wind drift, and plants seeds all autonomously.

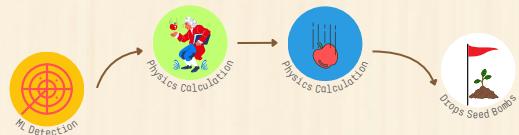
Problem Statement

- Deforestation continues to claim 10 million hectares of forest annually [FAO, 2020].
- Manual reforestation is slow, expensive, and dangerous in inaccessible terrain.
- Seed dispersal methods like planes or manual planting are inaccurate, wasteful, and often harm seed survival rates.
- We need a precise, scalable, and eco-friendly solution that can restore forests efficiently.



Project Overview

- Horn Bill is an AI-powered autonomous reforestation drone designed to plant seeds in hard-to-reach and degraded forest areas.
- It identifies canopy gaps, calculates wind drift, and drops eco-engineered seed bombs with high precision, all without human intervention.
- With a payload capacity of 1.5 kg, a 25-30 minute endurance, and a modular CNC payload system, Horn Bill can plant over 1,000 seeds per flight, making large-scale reforestation faster, cheaper, and more accurate.



Objectives

- Automate seed planting in degraded and inaccessible areas.
- Improve drop accuracy and seed survival rate.
- Use biodegradable, eco-safe seed delivery systems.
- Minimize human labor while maximizing impact.





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System Architecture (Drone)

- **Flight Modes:** Manual & autonomous [ArduPilot]
- **Payload Capacity:** 1.5 kg
- **Endurance:** ~25-30 minutes per flight
- **Navigation & Stabilization:** GPS + onboard sensors for accurate drops
- **Frame:** Modular carbon-fiber frame with detachable arms for transport



Payload System

- CNC-cut detachable wooden box with aerograde mount
- Integrated Raspberry Pi 4 running AI-based inference
- Lever-action servo gate drops seeds only at verified GPS coordinates
- Plug & play design for rapid swapping between flights



The Seed Bomb

Eco-Engineered for Precision Germination

- **Weighted Clay Shell:** resists wind drift and propwash for accurate landing
- **Biodegradable & Eco-Safe:** breaks down naturally, leaving no waste
- **Moisture-Retaining Core:** hydrogel and compost keep seeds alive until germination
- **Impact-Triggered Dispersion:** seeds spread evenly on ground contact





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• Component	• Specification
• Frame	• F450
• Motor	• BLDC, 935KV
• Flight Controller	• APM2.5 (ArduPilot firmware)
• Camera	• USB/HD webcam for AI processing
• Onboard Computer	• Raspberry Pi 4B
• Battery	• 3S LiPo, 3200 mAh
• Payload Capacity	• 1.5 kg
• Flight Time	• 25–30 minutes
• Range	• ~5–7 km
• Accuracy	• ~89.7%

Innovation & USP

- AI-based real-time drop validation
- Modular payload swap system
- Eco-friendly, biodegradable seed delivery
- Scalability with multiple drones for large-area coverage.

