

### What is the Problem ?

#### Background :

- Bird nests on power line utility poles can cause issues for electrical companies including fires and power outages
- These nests are **expensive** and **dangerous** to remove using traditional methods
- Our team has to create a reliable and cost effective solution to safely remove bird nests from power lines for Baltimore Gas and Electric.
- Removing these nests will prevent potential power outages, fires, and bird electrocutions which can cause infrastructure damage and safety risks for humans and birds.

#### Expenses :

- It costs BGE **\$5,000** to remove the exact nest seen here. Traditional methods (such as cherry pickers) have an expensive equipment cost.
- Power outages can cause power companies to lose money.



### Vision and Goal

#### Customer Requirements :

- Safely remove nest
- Keep drone attachment payload under 6 lbs
- Remotely control nest removal mechanism
- Maintain drone functionality and stability
- Prevent further damage to power lines

#### Our Objective :

- Our goal is to develop a drone attachment which quickly breaks apart and extracts bird nests from power lines for Baltimore Gas and Electric

### Product Concept

#### Bird Nest Characteristics

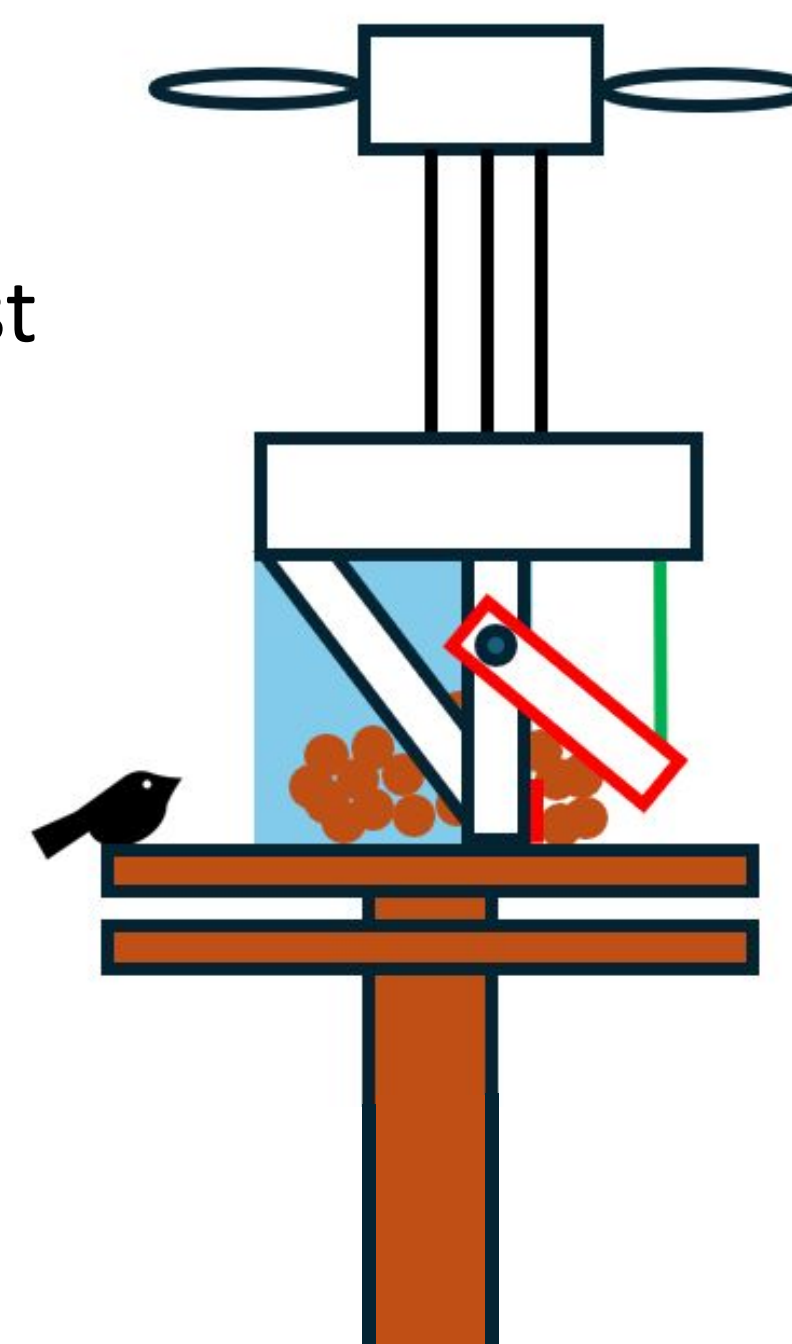
- Nest Diameter = 2-4 ft
- Nest Thickness = 3-6 inches
- Estimated Nest Weight = 10 lb

#### Product Dimensions

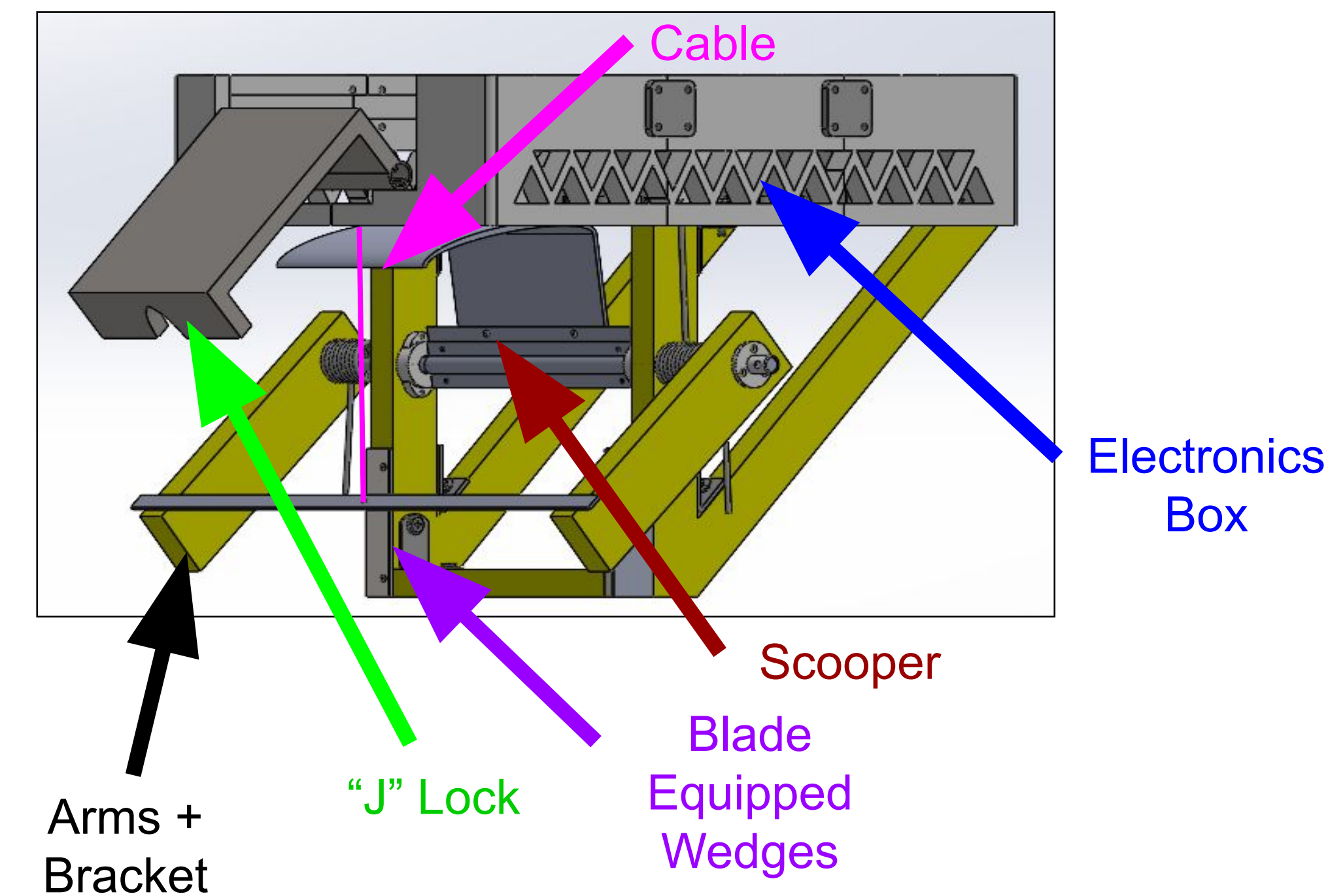
- Frame Height: 10"
- Frame Width: 9.6"
- Arm Length: 8.3"
- Locking Device Length: 7"
- Blade Protrusion: 0.75"
- Box: 11.44 x 10.89 x 4.05"

#### How does it work ?

- Drone positions device behind nest wall.
- Spring-loaded arms are released, forcing sticks against wood splitters and scooping broken sticks into receptacle.
- Arms are repositioned by cable and locked in place.
- Motor unwinds cable.
- Repeat until entire nest acquired.



### Product Design

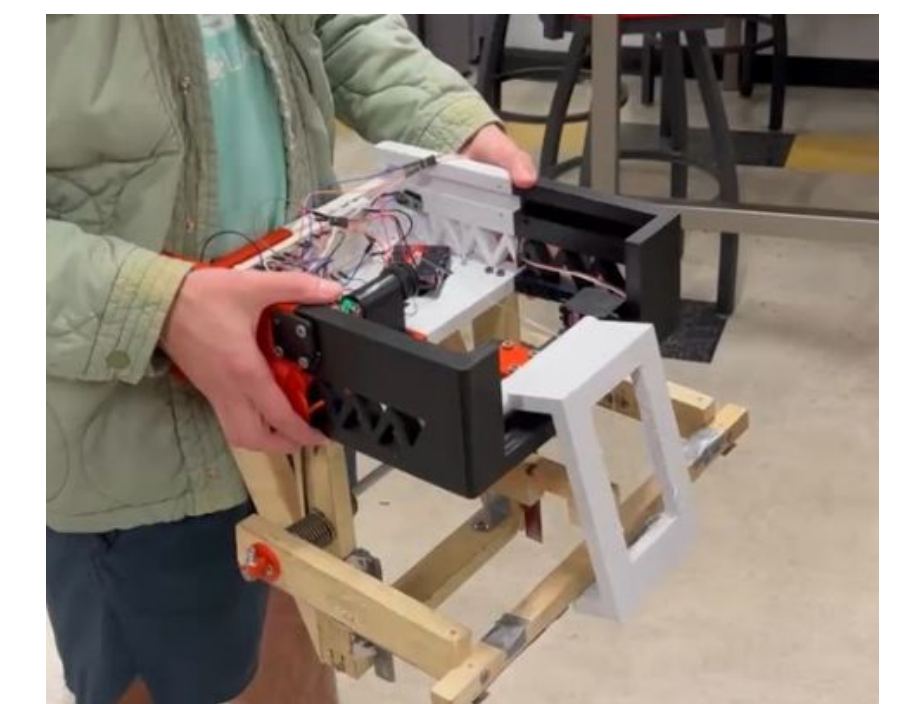


#### Key Features :

- Locking arms at final position is crucial to avoid backdriving motor.
- Scooper fixed to shaft crucial for directing sticks into storage.

#### Subsystem Break down

- Electronics Box
  - Housing for controls and lifting electronics.
  - Attaches to drone hitch.
- Lifting Mechanism
  - Lift, lock, then release arms.
  - Motor, servo, pulleys and overhead "J" lock
- Cutting Mechanism
  - Break sticks and scoops into storage.
  - Lower frame, arms, wedges and scooper



#### Design Sustainability :

- Social: Prevents power outages, reduces maintenance time, saves 30 linemen a year who die working on bird nest related power line issues (estimated lineman deaths in a year is 150 and 25% are bird nest related)<sup>1</sup>
- Economic : Using our design will save around \$4,700 per use
- Environmental : Removing bird nests from power lines prevents wildfires and power outages.

1. <https://www.nfpa.org/news-blogs-and-articles/blogs/2024/02/15/occupations-whose-workers-are-most-likely-to-die-from-electricity>

### Testing, Results, and Improvements

#### Testing :

- Device is hooked up to drone and is flown around to ensure no issues with stability or weight
- Device is landed and prepped for testing
- Device is flown into position by drone operator and is remotely activated by a team member
- Process is repeated until stick weight limit is reached

#### Results :

- Device is able to break up to 6 sticks per snap
- Nests with branches of higher diameters can be broken in multiple swings
- Drone can maintain stability without issue during a swing

#### Improvements :

- Higher stick breaking efficiencies
- Greatly reduces costs
- Weight reductions

