“Bionic Scarecrow” Bird Scare Device
Bionic Porcupines 2.0

Mark Snaufer - coach

Ben Holt - coach

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*https://www.**facebook**.com/**bionicporcupines***

Team Introduction

- First Lego League Robotics Team
  - Four six grade students from Sandy, Utah
- First Lego League is for kids age 9-14
- State Level Competition (200+ teams)
  - Robot Game
  - Core Values
  - Project
- 2016 Project theme was ANIMAL ALLIES℠
  - Improve a human-animal interaction
- Bionic Porcupines 2.0 project entry was a Bird Scare Device

Bird Scare Device Project Highlights

- **Thank you SLC Airport Wildlife Staff !**
  - **Team supported by SLC USDA and SLC airport staff**

- **Winners of 2016 EPA Region 8 President's Environmental Youth Award**

- **Winners Northern Utah FLL State Tournament Innovation Award**

- **Winners University of Utah High School Entrepreneurial Challenge**

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Bionic Porcupines 2.0

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Presentation Outline

- Problem Identification
- Solutions Development
- Prototype
- Testing
- Conclusions

Problem Identification – Bird Strikes

Damage from a Bird Strike

Grease, traps, habitat removal, pyrotechnics

SLC Airport Wildlife Control Team

- The human animal interaction problem we identified for the ANIMAL ALLIES℠ project was bird strikes at the airport
- Each bird strike injuries or kills a bird(s) and endangers people in the airplane
- $900M/yr. – Cost for bird strikes[1]
- 218 bird strikes at Salt Lake City International Airport (SLC) in 2015[2]
- SLC Airport is progressive and is looking for new solutions to preventing bird strikes

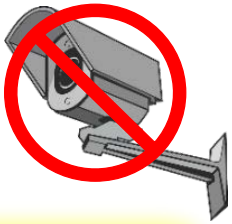
We had to do something to save the birds and make air travel safer by finding new and more permanent ways to scare birds away from the airport and prevent birdstrikes

1-Bird strike USA Press Kit; http://www.birdstrike.org/news-info/press-kit/
2- FAA Base Bird Strike Database www.wildlife.faa.gov

Solutions Development – Brainstorm Ideas

A. Predator Call: Works at first, but birds get used to it and ignore it

B. Robotic Bait: This solution is both complicated and expensive, making it very hard to get anything done



C. Remote Sensing: This would be very hard to build, expensive, and the SLC airport has very restricted wireless frequencies

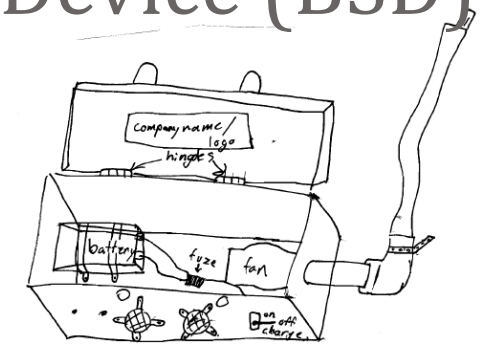
This is what our final idea looks like

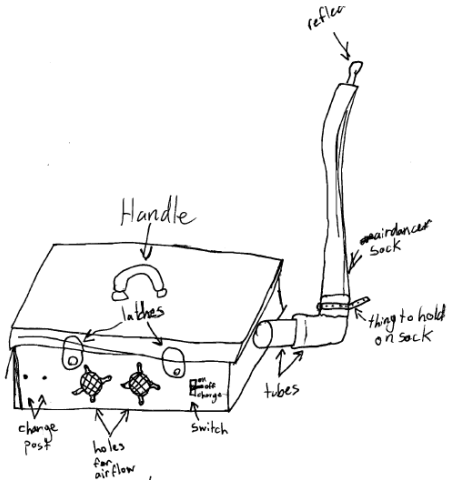
D. Tube Dancer: Create an airsock that moves in a random manner to scare birds. Cornell University did a study showing random motion scares birds away, a tube dancer provides lots of random motion.[3] This solution is portable, easy to build and cost effective.

3-Cornell University College of Agriculture and Life Sciences, New York Berry News, Volume 13, Number 4, May 30, 2014, "Air Dancers as a Potential Bird Deterrent in Blueberries"

Solutions Development – Bird Scare Device (BSD)

A mini tube dancer that fits in a toolbox





- Portable
  - Airsock, power, and fan are all carried in one unit
- Small (to be carried by one person)
  - Our tube dancer is very lightweight (only 14 pounds)
- Effective at scaring birds away for a long period of time
  - A battery can power the tube dancer for many hours
- Self-contained and every part of our tube dancer fits in a toolbox
- Easy to access parts and maintain
  - Parts are easily accessed through simply opening the lid
- All weather - Water-resistant, works in rain, snow, hot and cold temperatures
- Cost effective
  - Our Bionic Scarecrow tube dancer costs much less than commercial air dancers

"Bionic Scarecrow" is the name for our Bird Scare Device

Solutions Development – Prototype Schematic

- This is the schematic for our design
- We used this schematic to buy parts and as a guide to build the first unit
- Patent pending

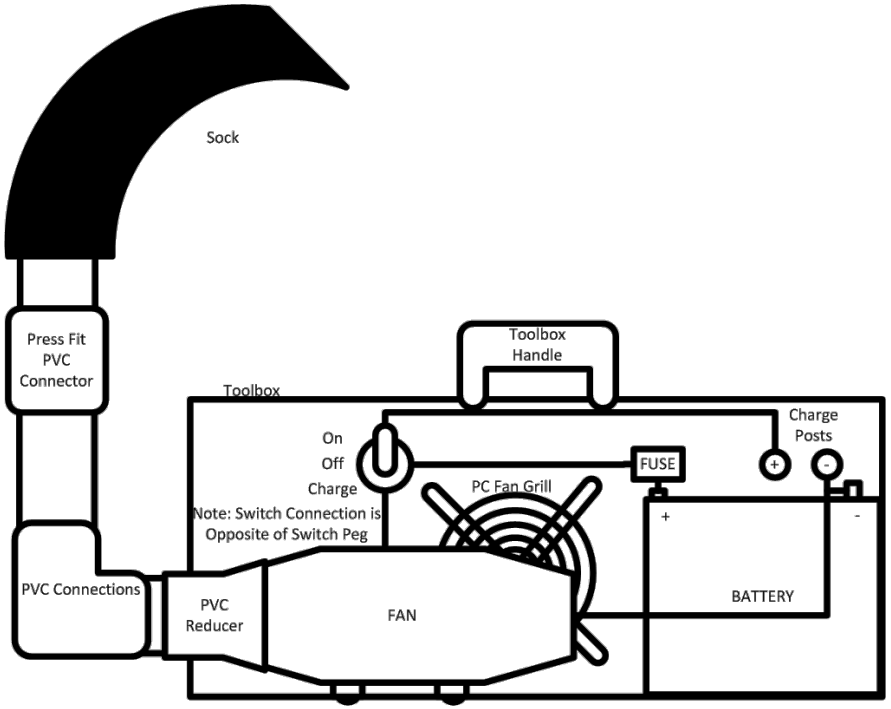
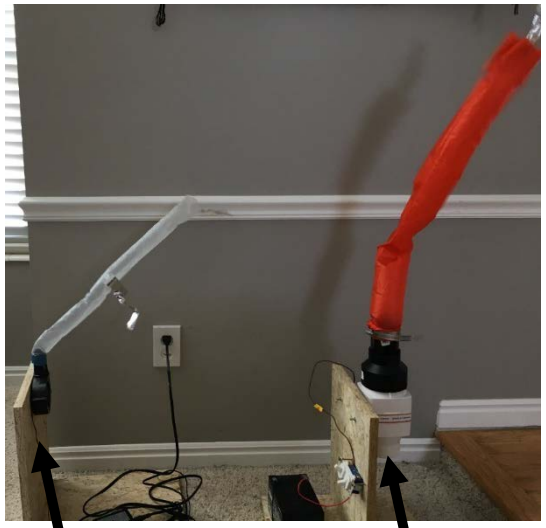


FIG. 1

Solutions Development – Fans and Airsock

- Two types of fans were tested
  - PC squirrel cage and marine bilge air blower
  - Marine bilge blower inflated a 36” airsock and is made for water resistance so we chose it
- We tested different airsock materials to check how easily they moved and for durability
  - Mylar – too stiff
  - 1 mil plastic sheeting - good motion but not durable
  - Ripstop nylon – easy to cut to length and sew, durable and good motion so we chose it



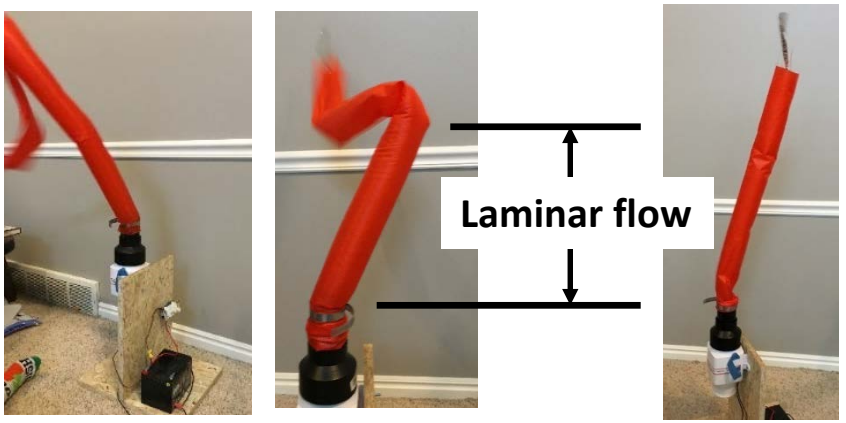
PC squirrel cage fan with plastic sheet airsock

Marine fan with nylon airsock

From our testing we found a marine bilge air blower and Ripstop nylon to be the best materials for the tube dancer

Solutions Development – Airsock Testing

- Tested different nylon airsock lengths to find out which one was most effective in generating random motion in a 2”diameter airsock
- Measured the length of smooth (laminar) flow in the airsock. This is the distance from the base of the pipe to where the airsock begins to curl over

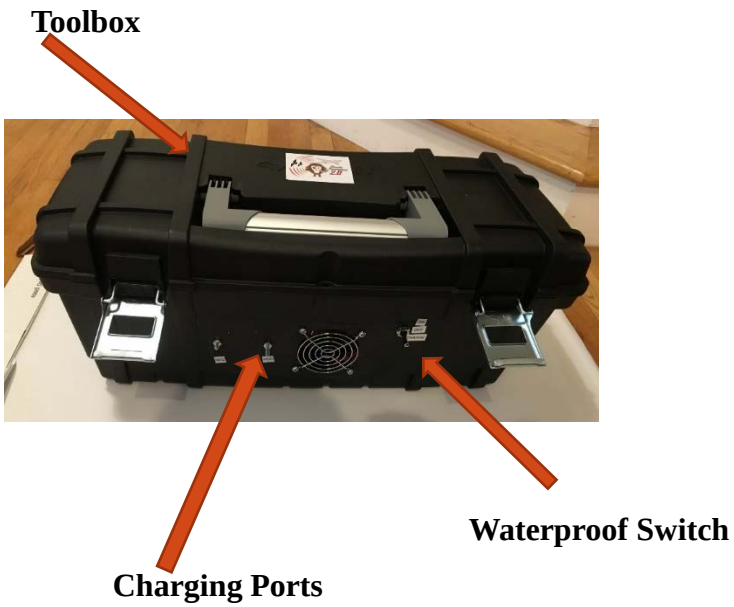


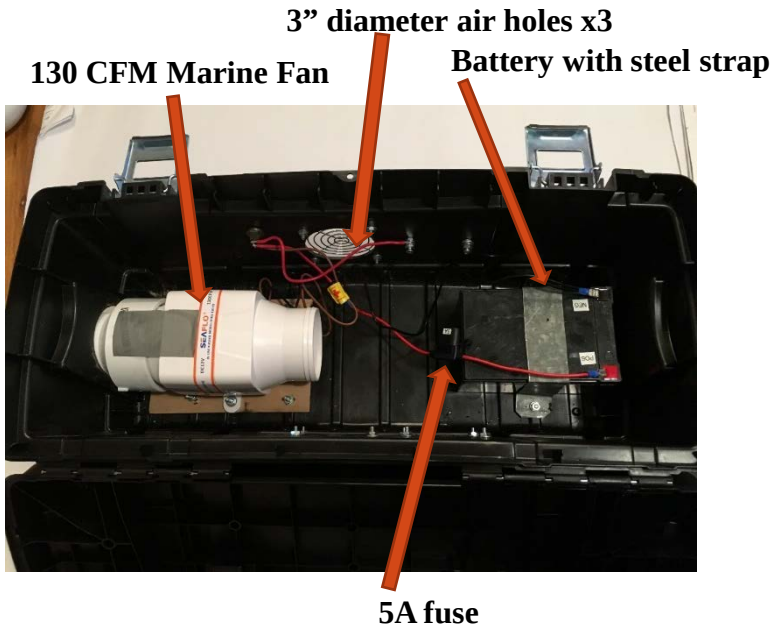
From our testing we found a 36” Ripstop nylon airsock worked best

Airsock Length (in)	45.00	37.25	27.50
Laminar Flow (in)	11	25	25
Good Random Motion	No	Yes	No

Prototype Layout

- Our tube dancer features a compact and durable design using readily available parts
  - The airsock is made of nylon and is 36” long
  - The toolbox is plastic and has a handle
  - The fan is a marine fan for wet conditions
  - The switch is waterproof
  - The fuse protects the fan from shorting out
  - The Bionic Scarecrow is 31” long x 13” wide x 15” high with airsock attachment
  - 12V Battery is user supplied





Field Testing

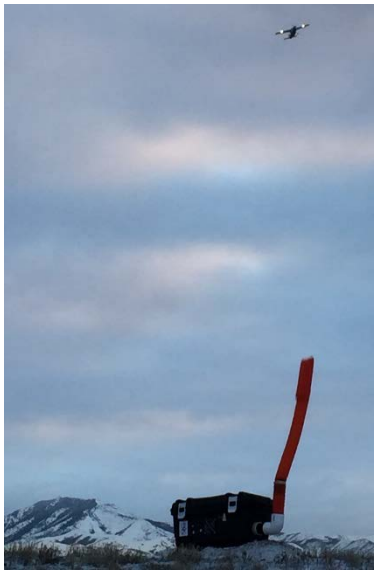
Three units at SLC airport

- The SLC International airport is currently using the Bionic Scarecrow from January 2017 – present for over 140 hours of use
  - Placed on closed golf course next to airport
    - (geese gathering location near wetlands)
  - Placed on pontoon at mouth of culvert
    - (swallow nesting location)
- It works at scaring birds!
  - Estimated 10 ft. – 50 yards effectiveness (species dependent)
  - When our BSD was operating in an area, the birds (geese) stayed away from the golf course
    - Pulled from area and geese came back, repeated with same results
  - Swallows did not nest in the culvert when the Bionic Scarecrow was in use for 11 days
  - Mr. Boswell, SLC USDA biologist, liked using the unit
    - Easy to operate, set up and move. Operated 2-3 days on a car battery

"Bionic Scarecrow" works !

Bionic Scarecrow Benefits

- A more permanent and portable means of scaring birds
- No one has ever done a small, non-polluting, portable tube dancer (Bionic Scarecrow) for scaring birds away
- The design can be used under bridges, out in a field or on a pond
- The Bionic Scarecrow is versatile and adaptable with growth options in the patent filing including
  - Larger fan
  - Different airsock colors and lengths
  - Solar power
- The Bionic Scarecrow is another bird control tool and will save the airport wildlife control staff time and money
- It is proven to scare away many types of birds (including geese, swallows, and duck) helping to protect birds from striking airplanes
- Other use options include buildings, golf courses, gardens



Project Conclusions

- Problem
  - Birdstrikes at airports affects safety, hurt birds and cost airlines money
- Solution
  - Our innovative, small, portable, and non-polluting Bionic Scarecrows scare birds away before they become a problem
- Development
  - We used the engineering design process to develop our solution and verified it meets our requirements
- Prototype
  - 140+ hours of testing at SLC airport
  - It works and scares birds!
  - Provisional Patent Application filed
  - SLC Airport has three units in use
- Implementation
  - Easy to build and inexpensive

"Nothing else exists like the Bionic Scarecrow that provides 16 hrs. of dispersal. In a wetlands area, you cannot use long term solutions such as habitat mitigation but you can use the Bionic Scarecrow." - Mr. Bobby Boswell

"Bionic Scarecrow" in the Field

The Inventors

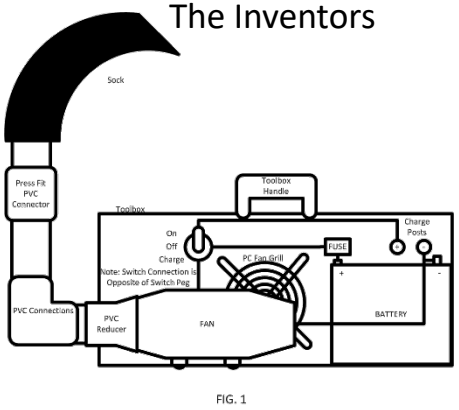


FIG. 1

The Invention