# Flight Camp 2013-14


**Ms. Amy Jameson & Prof. Kelly Cohen**

Ohio Space Grant Consortium

**National Space Grant Directors' Spring Meeting, 2015**

College of
**Engineering & Applied Science**

# Flight Camp Pilot Program

## Participating Teachers/Schools

- Amy Jameson, Dater High School
- Audra Fields, Western Hills High School
- Lillian Sims, Shroder High School

## UC Students

- Bryan Brown, Andrew Stubblebine, Tim Arnett, Nathaniel Richards, Vince Dechillis,

  Jutshi Agarwal, Sarthak Kukreti

## Laboratory Support

- Mr. Curtis Fox


College of
Engineering & Applied Science

# Flight Camp

## Main Goal & Method

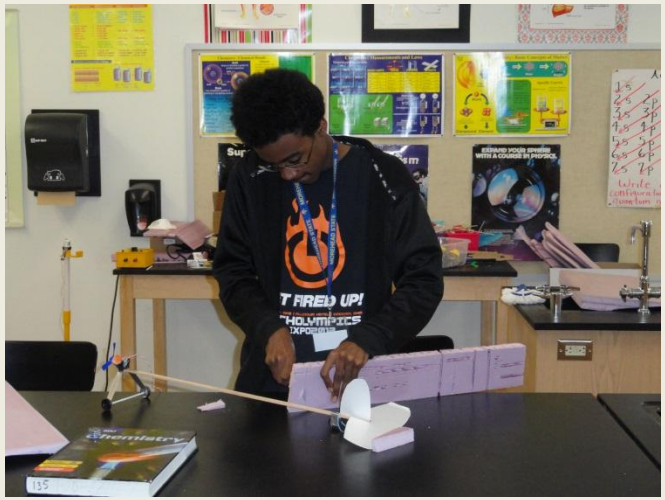
This project aims to positively impact urban students' attitudes toward engineering and other STEM careers

### Method

- Learn fundamentals of flight
- Work with UC students to build and fly a flapping micro UAV and/or a tethered UAV that is bio-inspired
- Showcase finished product and tour UC College of Engineering & Applied Science

# Resources

- NASA education website used to introduce Flight
- Engineering Design Process to help students plan their work
- Materials from AIAA Cargo Plane Challenge were adapted for use in investigating Bio-Inspired Flight



# Participant Selection

- To pilot the project we started with 3 Cincinnati Public Schools (grades 7-12)
- Initially we planned on 2 teams of 4 students each per school
- 1 middle school team and 1 high school team from each building
- Students were chosen based on interest in Flight

# Format for Flight Camp

- Traditional camps bring students to the campus daily in the summer
  - Cost of Transportation/Lunch

VS

  - Ease of Access

These factors were weighed and we chose to conduct camps at the home schools to improve attendance

# Flight Camp, Final Day at UC
# Wednesday, June 4, 2014


As the school year progressed, transportation home from a weekly after-school program took its toll on the middle school students and their parents. The remaining high school teams completed the challenge.

# For Maximum Benefit

**Middle School (grades 7 & 8)**

- Bringing students to campus for week-long intensive experience is more likely to keep younger students attending and engaged
- Cost of food, transportation and reliability of attendance are factors which create additional challenges with urban demographic

**High School (grades 9-11)**

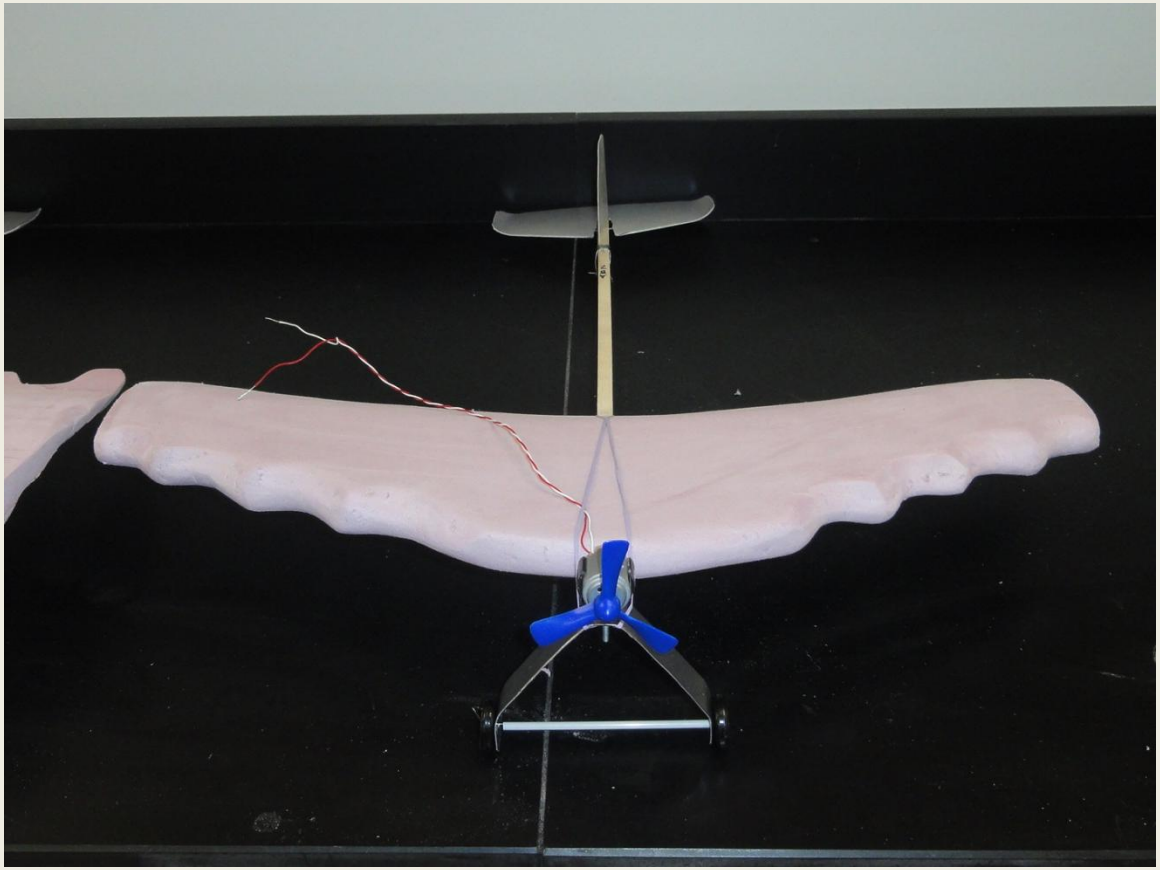
- Students this age are more likely to remain engaged and have the autonomy to arrange their transportation
- Flight Camp Day for showcasing their work was a great incentive to students
- Cost savings allowed each school to receive quadrotors

# Flapping flyers built from inexpensive kits

# Flying a wing off the balcony above Zimmer Auditorium due to rain

**Pink insulating foam is carved into airfoils designed to carry maximum payload in the form of small wheel weights added to the underside of the wing.**

# Whale  Bio- Inspired Airfoil



# Dater student flying a quad rotor at UC

# Bryan Brown, graduate student explains a UC Aero cats model design

# Deliverables

- Students made working planes which flew several ounces of payload
- Each team made a windows movie outlining their design process and finished product
- Students worked with flapping flyers from Birdkits.com to practice their new flight knowledge
- Shroder team produced an excellent poster

Dater High
http://www.youtube.com/watch?v=nN6TpueiYks&feature=youtu.be

Shroder high http://www.youtube.com/watch?v=ba_frpPofXE

# Mikele Boyd - Success Stories

- One of Sims' students, Mikele Boyd, rose above and beyond the flight camp challenge. "When we initiated the flight camp at Shroder, I had eight to 10 students join the camp," Sims explains. "However, with such a harsh winter, many of my students were not able to stay after school.

- Mikele was the one student who persevered with the project because he was fascinated by the challenge."

- Boyd graduates from Shroder in 2016 and plans to enroll at UC CEAS.

- "I've grown up with a deep appreciation for flying. This flight camp was a great, fun experience that allowed me to hone my engineering skills. I look forward to working closely with my teachers in the coming years to fulfill the requirements needed for my acceptance into the UC CEAS aerospace engineering program."

https://www.youtube.com/watch?v=ba_frpPofXE&feature=youtu.be

# Shroder student, Mikele Boyd, presenting his poster and cargo plane on Flight Camp Day

# Flight Camp Airplane Designs

**Mikele Boyd**
Shroder High School

## Defining the Problem

**Essential Question:**

•How can I design and refine a model airplane to be most efficient in carrying different weights?

**Guiding Questions**

•How does airfoil affect the load an aircraft can carry in real life.

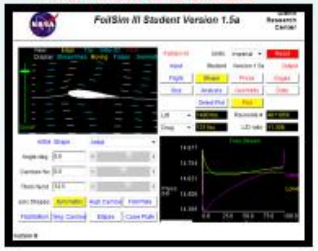
•What guidelines should I follow when creating my airfoil?

•How do I create an airfoil that will fly?

## Gathering Information

- Used air foil simulation on NASA website.
- Studied the airfoil of multiple freighter aircrafts. These aircraft are large and able to carry tons of weight.
- Such as the boieng 747-400
- Studied all the type of wing shapes and types that have different features and excel in one way or another.
- Rectangle-shaped wings that are swept back are often used in freighter aircrafts.

NASA Online Airfoil Simulator



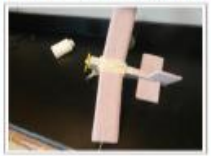

Studied features of wing types


## Design and Revisions

Making the airplane models

Airplane Model 1 - Base Design

Model 2 – A smaller plane



Model 3 – Revised version of model 2

## Implementing Solutions

Consultation about the base airplane design

Testing the first design

Testing the first design

Scaling up model 2

## Assessment

- The first model was not successful. It did fly but not well. The tail was heavy.
- The second model was great at flying but was too small to even consider carrying weight.
- The second model was scaled up 200% to make a third model that could carry more mass. This extra mass could not be supported by one motor so three more motors we added.
- The third prototype carried more mass but did not fly very high.

## What I've Gained

- Experience using the engineering design process and thinking like an engineer.
- Ability to think on a more innovative level.
- Additional ways to express my abilities to colleges.
- Ability to build model aircrafts.
- New aerospace vocabulary.
- Lifetime memories.
- A greater desire to become an aerospace engineer.

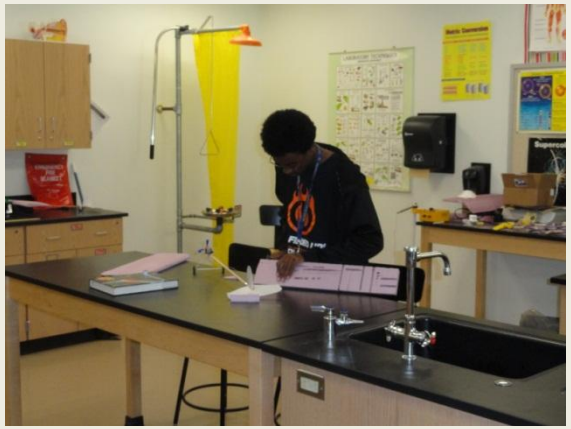
# Testimonial – Ms Lillian Sims


## Science Teacher, Shroder High School

## 513.363.6945, simslil@cps-k12.org


- When we initiated the Flight Camp at Shroder, I had 8-10 students join the camp; however, with such a harsh winter, many of my students were not able to stay after school. Shroder is a late-start school, so going home late on especially cold days also affected the turn out. Mikele was the one student who persevered with the project because he was fascinated by the challenge. He later shared that this project helped him determine the career he wants to pursue. After doing the research and developing an understanding about how planes fly, he decided he wants to become an aerospace engineer. Last week Mikele's grandmother called and left me a message. She said that she was so thankful that her grandson could participate in the program because all Mikele talked about was flight camp and how excited he was to participate in the program. She thanked me for the many evenings that he was able to stay and work on his airplane designs. (He worked on planes all year long!). Now Mikele has a clearer vision of what he wants to do and see the opportunity to do it. My challenge as his teacher is to help him fulfill the requirements he needs to get in the aerospace engineering program at UC.

# RESULTS



- Students showed extraordinary creativity in designing their airfoils for the cargo planes
- The challenge was to fly the largest payload (in the form of wheel weights)
- There were hours of frustrating failures, and endless carving, sanding, redesigning and re-testing before we had lift off!

# John Davis - Success Stories

- “Thank you for allowing our school to visit today. The entire program was nothing but inspiring and has made me want to become an aerospace engineer even more than before. I'm looking forward to applying to UC's engineering program next year and hope I can visit the program again.”

John Davis, Dater High School

# Future Direction

- Students enjoyed working with the UC students who came to the schools to help, they loved making a vehicle that flies, and they had a great time touring the campus and interacting with faculty.
- Many of them have indicated an interest in helping with future camps as student assistants
- Two Students from the camp have indicated an interest in careers in aerospace engineering

# Acknowledgments

## UC Team of students

- Graduate Students
  - Bryan Brown
  - Jutshi Agarwal,
  - Sathyan Anoop
  - Sarthak Kukreti
  - Wei Wei
- Undergraduates
  - Vince DeChellis
  - Nathaniel Richards
  - Tim Arnett
  - Andrew Stubblebine

# Flight Camp - News Story

- **2014 OSGC UC Flight Camp a Soaring Success**
- **High-school and middle-school students attended a UC Flight Camp, thanks to an Ohio Space Grant Consortium mini-grant awarded to associate professor Kelly Cohen.**
- Date: 6/6/2014 12:00:00 AM
  By: Ashley Duvelius
  Other Contact: Arthur Davies
  Other Contact Phone: (513) 556-9181

- http://www.uc.edu/news/NR.aspx?id=19973

# NEXT STEPS

- Create a new state wide network of urban university-teacher partnerships from our model by

-organizing training for teachers and university staff

- fund teacher/graduate student stipends

- create a central website for students to post their results and videos