2017 NAITC Conference
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Show Me Agriculture!

Drone Technology Takes Flight – In Agriculture!

Presented by the "North Dakota Team"

Food, Land & People Facilitators

Ginger Deitz and Jill Vigesaa

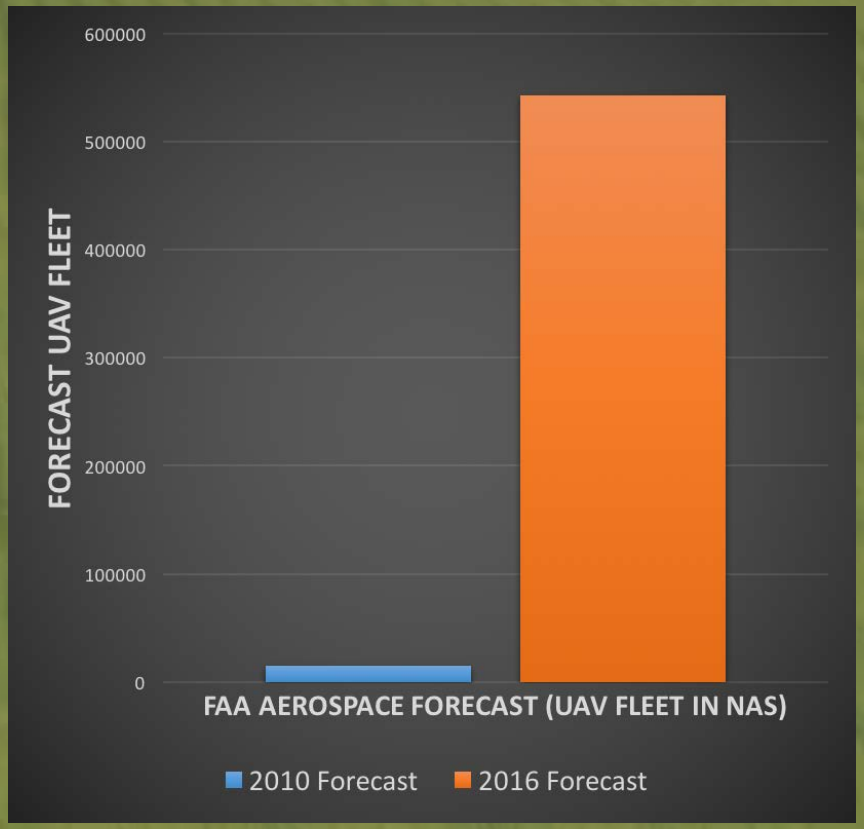
NDSU Extension Specialist – 4-H Youth Development for Science

Lindsey Leker

WHAT IS A DRONE OR AN UNMANNED AERIAL VEHICLE?

- Essentially, a **drone** is a flying robot. Drone is the broad term used to apply to any UAV. Drones may be remotely controlled or can fly autonomously through software-controlled flight plans in their embedded systems, working in conjunction with onboard sensors and GPS.
- “Quadcopter” is a more specific term used to refer to a drone that is controlled by four rotors. These UAVs are always controlled remotely instead of being controlled by a pre-programmed, onboard computer.

Explosive Consumer Growth!



- FAA Aerospace Forecast for number of UAV's in consumer hands by 2020 – 2010 predictions compared to 2016 predictions
- 15,000 estimated number raised to 542,500!?!

The Explosive Growth in the Use of UAV's

WHERE ARE UAV'S BEING USED?

Opportunities for STEM Students

- USDA's National Institute of Food and Agriculture estimates there will be some 58,000 high-skilled annual job openings in the food, agriculture, renewable natural resources, and environment fields.
- However, there are an average of 35,400 new U.S. graduates with a bachelor's degree or higher in agriculture related fields
- Let’s INSPIRE students by educating them about opportunities in ag related fields and technology….

Drone Overview

- Unmanned Aerial Vehicle (UAV).
- Four main parts of the drone system: platform (aircraft), sensor (camera), target (what is observed), and ground control station (where the person operates the drone).
- Drones are useful for dull, dirty, dangerous jobs.

Flight Dynamics

- Flight Dynamics: The study of performance, stability and control of vehicles flying through the air.
  - Roll: Rotation around the front-to-back axis
  - Pitch: Rotation around the side-to-side axis
  - Yaw: Rotation around the vertical axis
    - A Propcopter doesn't have wings (blades) or a tail, so it operates mostly on yaw.

- Awesome website: AMA Flight School

Four Forces of Flight

- Force of Flight:
  1. Lift: The force opposite of gravity. Upward force created by airflow under the wing.
     - Lift is different for propcopter vs. planes. Why?
  2. Gravity: The force opposite of lift. Causes an object to be pulled downward.
  3. Thrust: The force that moves an object through the air.
  4. Drag: The force that limits the speed of an object.

Things that Fly

Objectives:

- Learn about the drone platform.
- Design flying devices to explore forces of flight and flight dynamics.

Materials:

- Propcopters
- Foam plates
- Scissors
- Clear tape
- Pattern
- Pen
- Penny

Drone Discovery- National Youth Science Day 2016

- How to find the experiment online:
  http://4-h.org/parents/national-youth-science-day/4-h-nysd-2016-drone-discovery/

- On the website:
  - Youth and facilitator guide
  - How-to-videos
  - Information on Scratch

Take Off- Agriculture Challenge

Community Setting

- Corn field
- Residential suburb
- Farm

Issue Challenge

- Corn plants are being crowded out by weeds
- A bison escaped from the zoo
- A cow and calf are missing

Drone Action

- Survey a field
- Take a video

Group Action

- Observes invasive plants
- Locate the bison
- Locate the cow and calf

Our Challenge…

- Your farm is facing a challenge: A missing cow and calf You and your engineering team decide to find out more. Ginger says, “I think drones can help with this!”
- They suggest using a drone to take a video.
- Your team locates the missing cow and calf.
- Success! Your engineering team decides to celebrate by posting the picture the drone took of the cow and calf on Facebook.

- **Discuss:**
  - What do you think about your scenario? Does it seem possible? How do you think the drone will help? What does success look like in this scenario?

Foam Drone

Objectives:

- Learn how to use the keychain camera.
- Understand remote sensing.
- Design a remote sensing system model to solve the problem.

Materials

- Foam Glider
- Keychain camera
- SD card
- USB cable
- Computer
- Velcro
- Tape
- Target

Foam Drone- Team Roles

**We won't do this part, but this may be an important part to incorporate with youth.

Project Manager: Coordinates work for the team, keeps everyone on task.

Lead Engineer: Leads the building process. Takes the lead in assembling the aircraft.

Flight Engineer: Repairs the plane.

Sensor Engineer: Works with the flight engineer to place the camera, and play the video.

Product Owner: The voice of the customer the engineering team is working with.

Design Engineer: Responsible for graphic design. Decorates the aircraft.

Documentarian: Keeps records of the design process.

Marketing Specialist: Takes pictures and posts about progress in order to communicate about STEM to the public.

Data Manager: Transfers video data from the camera to the computer for viewing.

Code Copters

Objectives:

- Sign up for Scratch account
- Find NYSD 2016 Scratch program: https://scratch.mit.edu/projects/116115355/
- Explore remote sensing principles through basic coding.
- Practice writing and using specific code.
- Use a coordinate system to program a drone flight pattern.

Materials:

- Code Copters IRL: Masking tape, command cards
- Code Copters: Computer with internet access

Code Copters- Team Roles

Flight Plan Engineer

- Thinks about the best strategy to move the drone.

Programmer

- Take the pathway from the flight engineer and creates the code to make the drone move.

Prototype Engineer

- Reads the code to the drone. Reports back about if the code needs any changes.