Mar 2nd, 8:00 AM - 9:30 AM

Drones are Everywhere!

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AVIATION TECHNOLOGY

DRONES ARE EVERYWHERE!

UAS Education at USU

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Assistant Professor

AGGIEAIR™

aggieair.usu.edu

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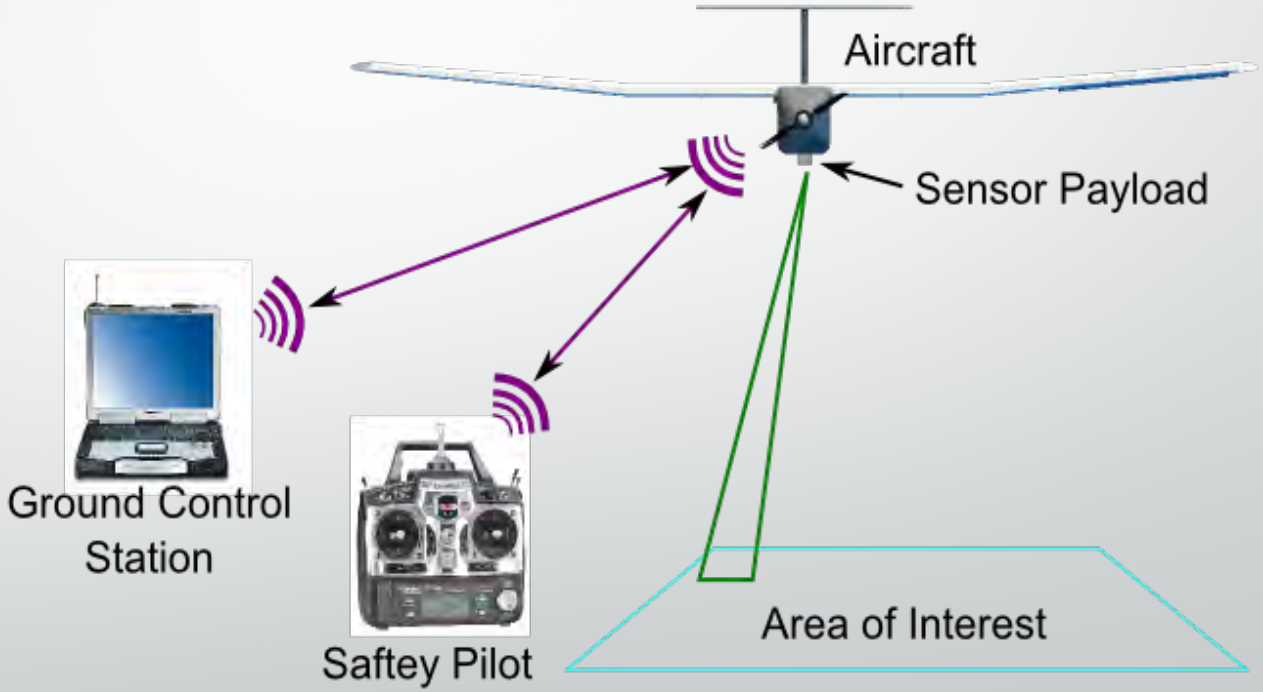
November 2, 2017

Expectations for Today

- Not a PART 107 Course
- Not about Research
- Not how to get money for program
- But how to use in education

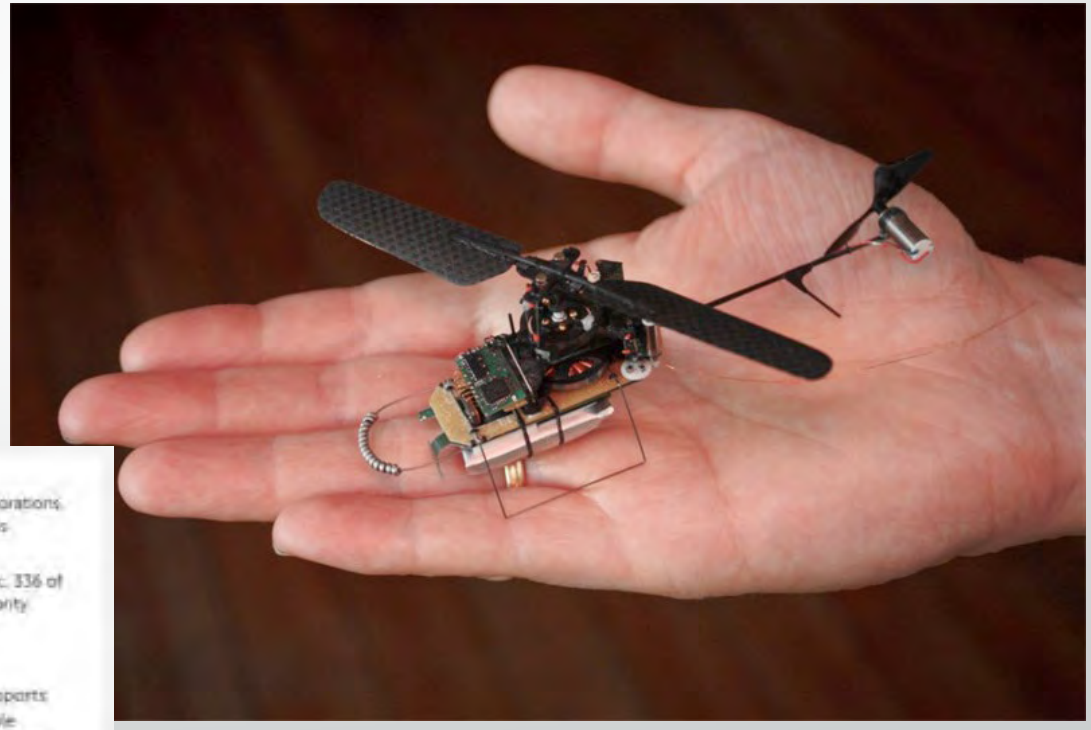
UAS

- UAS = Unmanned Aerial System.
- This includes everything from the actually vehicle that flies, any autopilot, payload and the ground support equipment.



sUAS

- sUAS = small UAS systems as defined by less than 55 pounds



Federal Aviation Administration

Small UAS Certificate of Registration

CERTIFICATE HOLDER FIRST LAST

UAS CERTIFICATE NUMBER FA-333-339A

ISSUED 12/09/2015 EXPIRES 12/09/2018

For U.S. citizens, permanent residents, and certain non-citizen U.S. corporations, this document constitutes a Certificate of Registration. For all others, this document represents a recognition of ownership.

For all holders: for all operations other than as a model aircraft under sec. 336 of Pub. L. 112-95, additional safety authority from FAA and economic authority from DOT may be required.

Safety guidelines for flying your unmanned aircraft:

- Fly below 400 feet
- Never fly near other aircraft
- Keep your UAS within visual line of sight
- Keep away from emergency responders
- Never fly over stadiums, sports events or groups of people
- Never fly under the influence of drugs or alcohol
- Never fly within 5 miles of an airport without first contacting air traffic control and airport authorities

- RPA = Remotely Piloted Aircraft
- RPV = Remotely Piloted Vehicle
- Another name used for UA, mainly in military settings

RPA

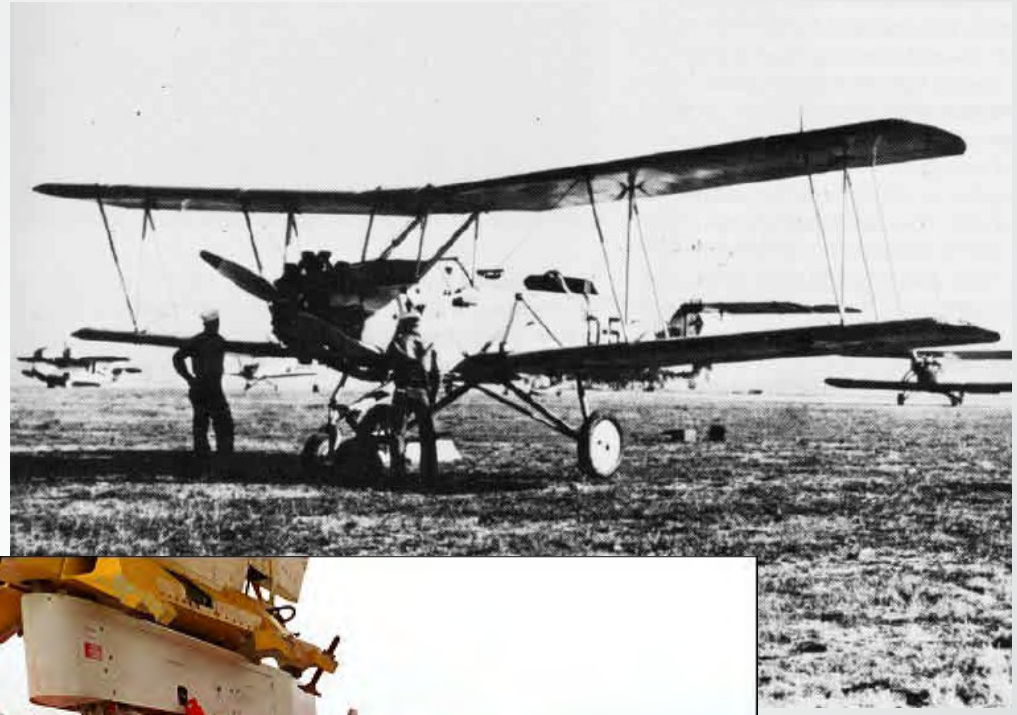
RPV

Drone

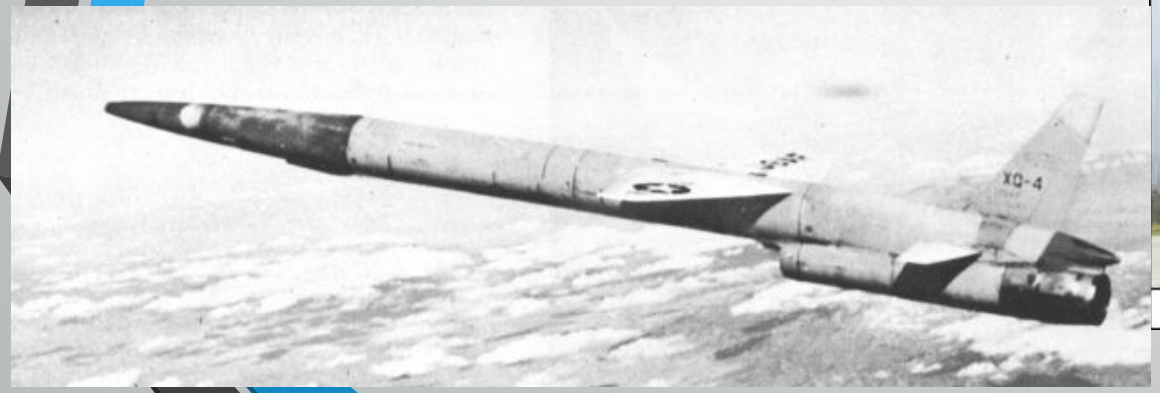
- The word drone actually came from the use of targeting aircraft that were flown autonomously during the wartime. Current usage of the word drone can mean a number things, from a military UAV to the hobbyist toy.

First use of term

British DH 82B Queen Bee



BQM-74C CHUKAR III (NORTHROP GRUMMAN)

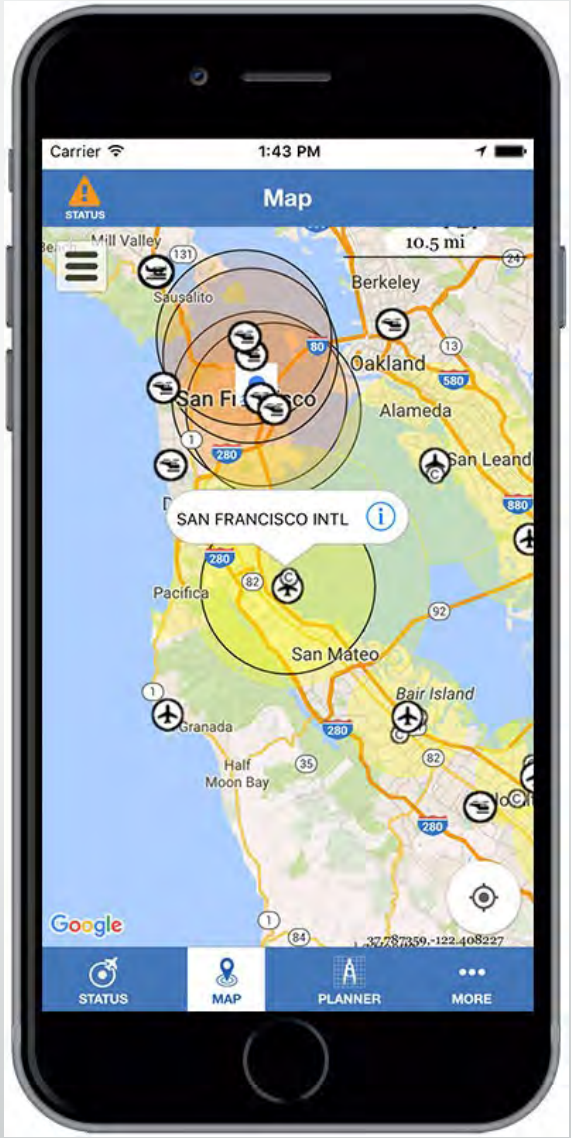


Uses for a UAS 'drone'

1. Weather Tracking – Hurricane Hunting
2. Mapping
3. Wildlife Tracking
4. Agriculture
5. Search and Rescue
6. Disaster Relief
7. Package Delivery
8. Aerial Photography

B4UFLY APP

- Clear status indicator shows you can fly (or not, as over Washington DC)
- Information on parameters that drive status indicator
- Planner Mode for future flights
- Interactive maps with filtering options
- Links to other FAA UAS resources



PROPELLERS ARE SPINNING UP

DJI came from out of nowhere (a Hong Kong dorm room, actually) to become one of China's few global consumer technology brands.

Phantom 3

DJI Flame Wheel F330

(Revenue $mil.)

$1,000
900
800
700
600
500
400
300
200
100
0

2009 — **Annual revenue** $500,000 **North American revenue** $310,000 *Sales began in Asian, European and North American markets that year.*

2010 — **Revenue** $1.1 million **North American revenue** $560,000

2011 — **Revenue** $4.2 million **North American revenue** $1.26 million

2012 — **Revenue** $26 million **North American revenue** $5.6 million *July 2012: creation of DJI North America*

2013 — **Revenue** More than $130 million *Phantom 1 debuts in January.*

2014 — **Revenue** About $500 million

2015E — **Projected revenue** $1 billion *Phantom 3 debuts in April.*

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- Dr. Mac McKee
- 2006
- Utah Water Research Lab
- Invited Dr. YangQuan Chen

USU Flying Wing

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Minion


Ark


BluJay

Genesis of UAS education at USU

- Feb 2015 — First meeting between Baron & Dan
- Summer 2015 — Logan Cache Airport Open House
- Spring 2016 — Planning Meeting with UAS group
- Spring 2017 — AV 5910 Intro to UAS (42 students!)
- Spring 2020 — 10 courses, 225 students enrolled

UAS Courses

- New UAS Minor June 2018
- Fun classes!
- Get FAA certified
- Learn how to build, fly and repair your drone

AV 3500 Intro to UAS (F/S/Su) AV 3505 Intro to UAS for Pilots (F/S)
Introduction to the small Unmanned Aerial Systems of today.

AV 3510 UAS Design, Construction and Maintenance (F)
Students will learn how a sUAS is designed, will build a fixed wing and rotorcraft UAS, and will learn basic concepts of sUAS maintenance. Course will cover plastic, foam, metal and composite material construction.

AV 3520 UAS Sensors, Guidance and Control (S)
Students will learn how to program a sUAS, and how to direct guidance for both fixed wing and rotary wing sUAS, and how to collect different kinds of data from the flights.

AV 3550 UAS Advanced Design and Construction (S)
Students will design wings and body from scratch. Varied materials and techniques will allow students much freedom in application of course.

AV 3560 UAS Aerial Photography (Su/F)
Students will learn aspects of aerial mapping, photo mosaic construction, and video creation with both fixed and rotary wing applications. Students will also complete a project taking video from a helicopter and aircraft. *(If already drone pilot certified, may take course with instructor approval and challenge).*

AV 3900 Independent Study (F/S)
Students may select an independent project with their instructor approval, that includes project design, and written or oral presentation.

Curriculum

UtahStateUniversity

AV 3500 – Introduction to Unmanned Aerial Systems
Fall 2017 – 1530 – 1645 MW

Instructor:
Office:
Office Phone:
E-mail:
Classroom: TECH 108
Credit Hours: 3

Description:

The course will cover the history of Unmanned Aerial Systems (UAS), focusing on the recent developments of the small UAS (sUAS), and the future of this emerging technology in commercial applications. Topics will include flight and ground safety, regulations, design and construction, and flying skills required for both rotary and fixed wing sUAS. Completion of the FAA certification exam required for course completion, which will lead to certification as a remote pilot.

Text: ASA Remote Pilot Test Prep

Prerequisites: none

Course Fees: $250

Course fee covers class materials, including the use of and maintenance of program Unmanned Aerial Vehicles. The fee also includes the $165 FAA written test fee. If students require a second attempt, the additional cost of $165 will be required.

- Safety
- FAA RULES: Part 107
- Courtesy and Respectful operation
- EDUCATION at all levels from K12 to University to Public

Drone Course Student Success

Deseret UAS Grand Opening

- **Hunter Buxton now Aggie Air pilot**

DRONE CAMPS

- Aggie Aviation Adventure
- Summer Citizens
- High School Educators
- Week long camp 2019

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OUTREACH


DELTA
UtahStateUniversity


Aviation
Technology
UtahState University
AVIATION TECHNOLOGY


AVIATION
AGGIES
UtahStateUniversity

Potential UAS applications in education

Drone maintenance

- A full aviation maintenance program could be designed around the maintenance and upkeep of drones and their systems
- Students could learn the new processes that are involved in small UA S applications such as wiring and engine maintenance

Drone design

- Program to help students understand the design and manufacturing process of drones including items like composites, Electrical systems, Controls in flight programming, and aerodynamic engineering

Potential UAS applications in education

Flight in piloting education

- A program could be put together to teach students the dynamic structure of flying UAVs in a modern national airspace

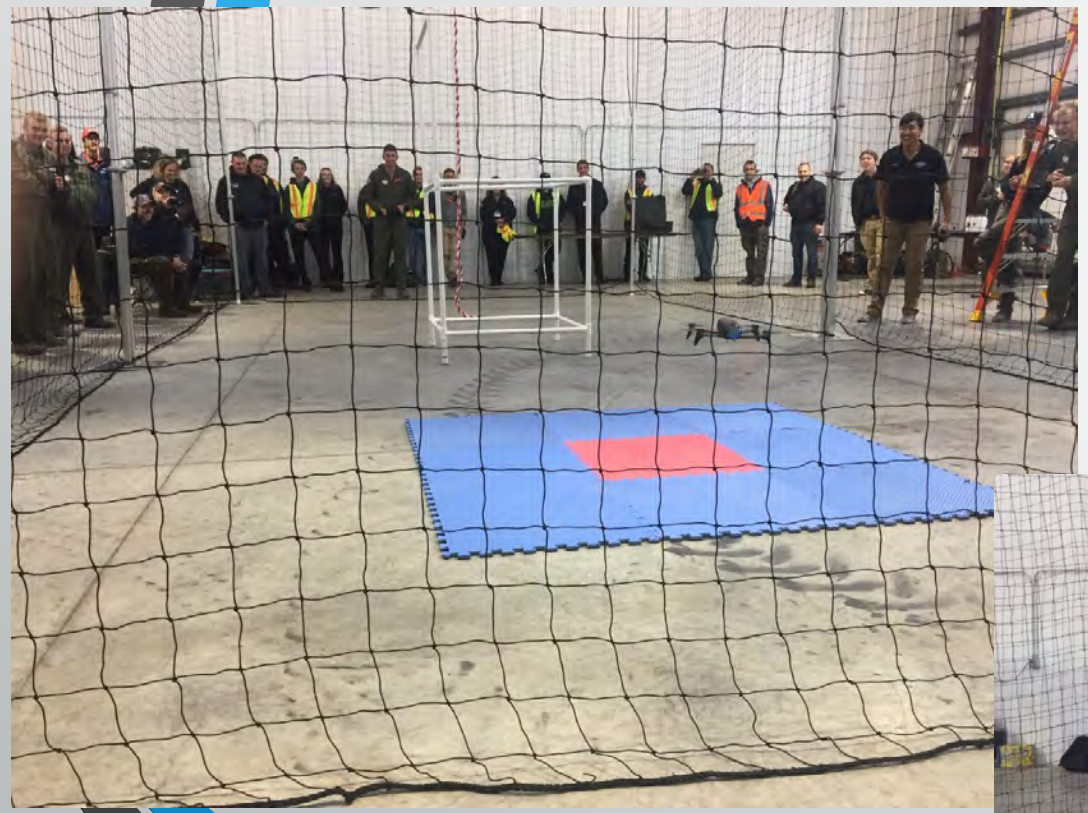
UAV business and law

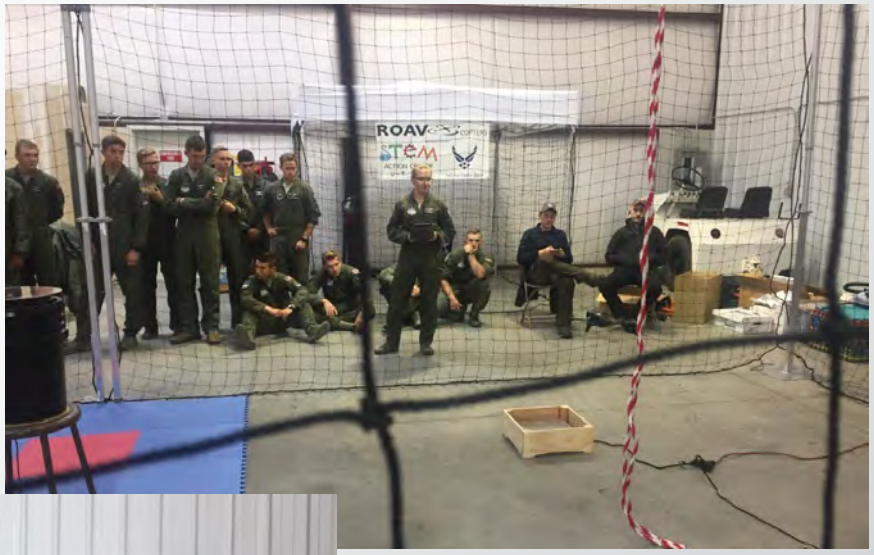
- The UAV business side is one of aviation's largest and fastest-growing industries, Students could learn how to run manage and operate UAV business and legal processes

How to Use UAS in AG EDUCATION

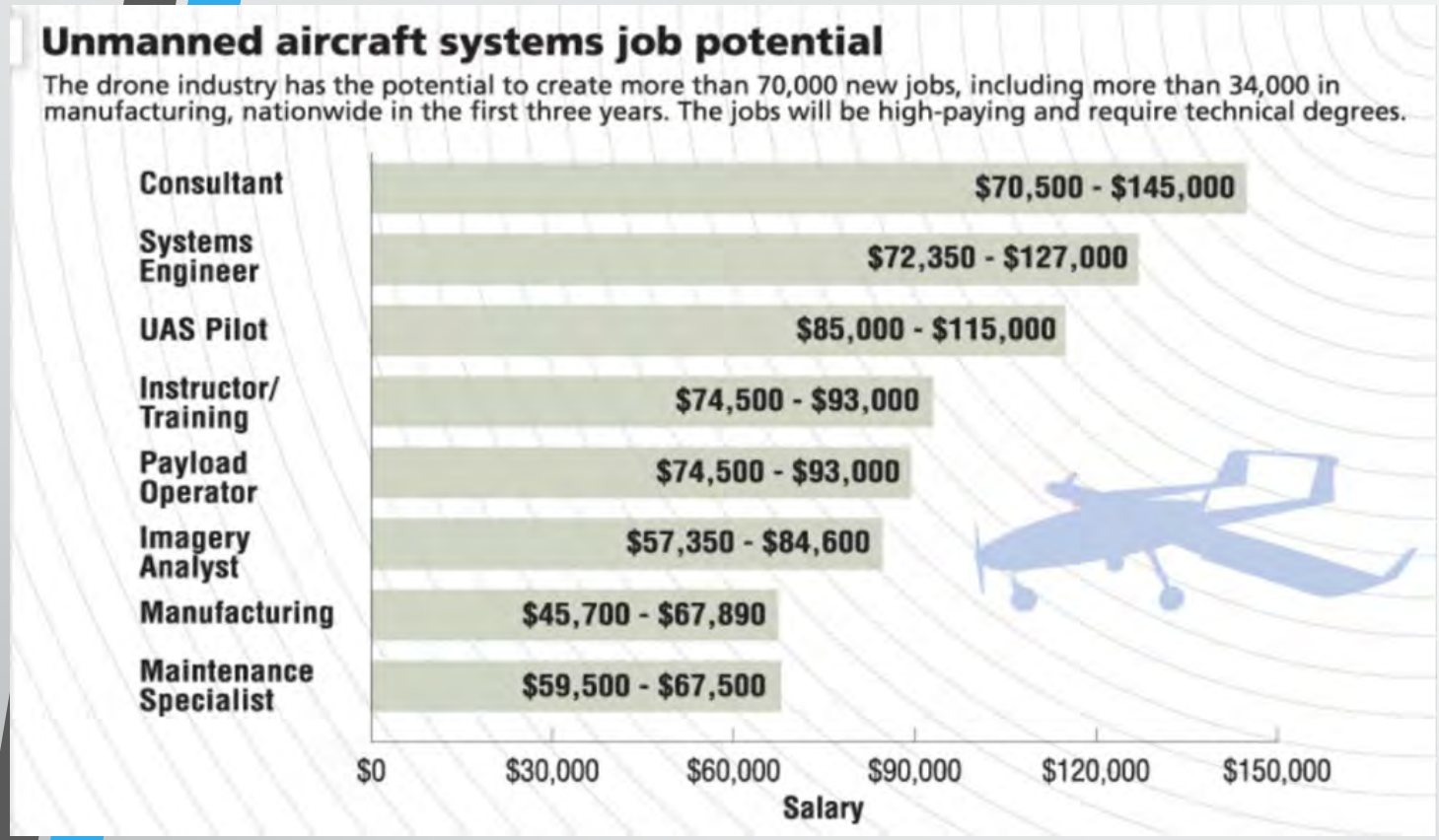
- STEM EDUCATION
  - Design, Construction, Science of Flight, Weather
- Research Tool
  - Field Mapping, Photosynthesis Rates, Precision Farming, Water Saturation, Data Collection
  - NDVI (Normalized Difference Vegetation Index)
- Videos, Sensors
- FUN!!

ROAV COPTERS





Future



www.faa.gov/uas/regulations_policies/

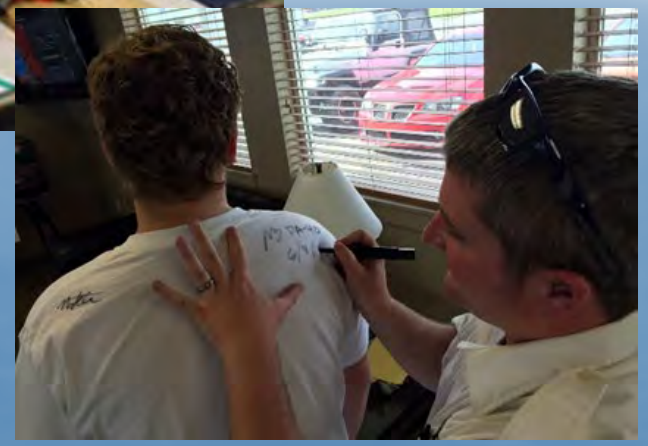
Objectives

- UAS at USU
  - **Aggie Air**
  - **Drone Minor**
- ROAVCOPTER
- Future

LET's FLY!

Q & A

AGGIE AVIATION ADVENTURE



- **Aviation Summer Camp**
- **June 1-5 & 8-15, 2020**
- **Logan, Utah**
- **Lodging, food, fun**
- **Flight at the controls of a DA-40 and Helicopter**
- **Flight in a 3-axis motion REDBIRD & CRJ-700 simulator**
- **Fly a drone—both fixed wing and quadcopter**
- **Only $500**