Vertical Flight Society
Arizona Chapter

VFS-AZ STEM Drone Program Update

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Vertical Flight Society
Arizona Chapter

A special thank you to **Triumph** for providing financial support!

Background

The Arizona Chapter of the Vertical Flight Society wanted to increase their involvement with local students, serve as coaches and mentors, and introduce kids to the exciting field of STEM.

A STEM drone building team was created that focused on promoting team building, perseverance, engineering practices, and communication while teaching students to how to design, build, program and flying drones.

Larry C. Kennedy School, a Title I School located in Phoenix, Arizona (2702 East Osborn Road) was chosen for this activity.

This school has more than 90% of their population on free and reduced lunch. They have over 700 students enrolled and currently serve grades preschool through eighth grade.

Project Progress

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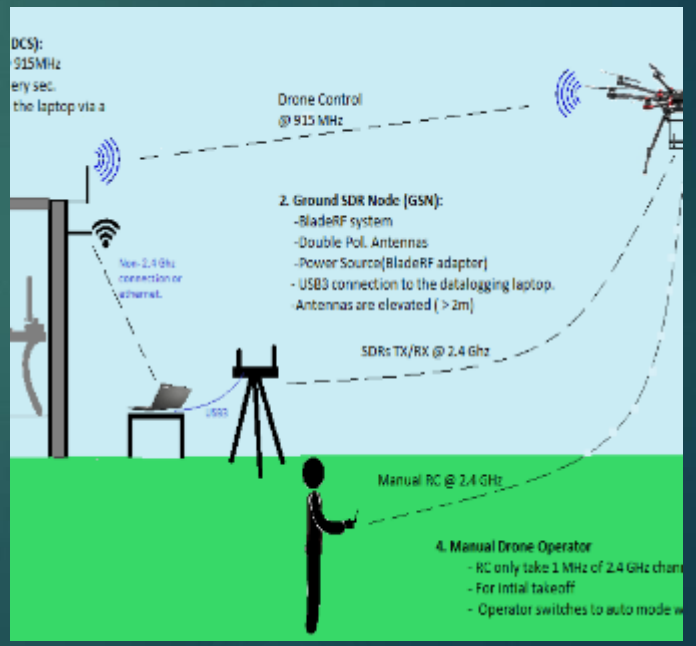
The first class started with an introduction to the program and expectations, followed by an overview of what is a Unmanned Vehicle (UAV) (drone), Unmanned Aircraft System (UAS). We also shared the Intel Video of the drones used during the open ceremony the Winter Olympics .



The Drone Project (November 2018)

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The Class then worked on building a small drone. During this time we introduced the parts of the drone and their purpose

- Quad Copter
  - Parts
    - Motors
    - Propellers
      - Discuss CW/CCW
    - Flight Control Board
      - Gyro
      - Accelerometer
      - Power Management
    - Battery

The Drone Project (November 2018)

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- Once the Drone was built, we taught the students basic drone safety
- General Safety
  - Never arm a drone unless the flying area is clear
  - Never approach a drone after a flight until disarmed
  - Never fly over or near people, cars, buildings, or near airports
  - Setup your drone for an engine cutoff failsafe in cases of loss of signal from the transmitter
  - If you lose control of your drone, move the throttle to zero (do not throttle up in a panic!)

The Drone Project (December 2018)

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Next we taught the basics to flying the drone

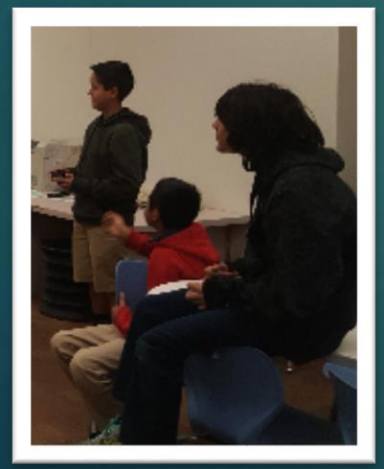
Pitch- Tilts the Drone up or down causing the drone to fly forwards or backwards

Roll- Tilts the drones left or right causing the drone to fly left or right

Yaw- moving the stick causing the drone to rotates the heading to the left or to the right

Throttle- To increase push the stick forwards cause the motor to speed up the altitude to increase. Pushing the stick down causing the motor to slow down and the altitude to decrease.

All the movement is based on the front heading of the drone.



The Drone Project (December 2018)

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We taught about the history of drones

1907: The world's first quadcopter was created by inventor brothers Jacques and Louis Bréguet

1917: Launched only 16 years after the Wright Brothers' pioneering Kitty Hawk flight, the Ruston Proctor Aerial Target became the first pilotless winged aircraft in history.

1960s: Breakthroughs in transistor technology meant that, for the first time, miniaturized radio-controlled components were available to customers at a reasonable cost.

2001: In the aftermath of 9/11, the CIA began flying armed drones over Afghanistan as part of the war against the Taliban.

2006: Recognizing the potential of non-military, non-consumer drone applications, the FAA issued the first commercial drone permits.

2010: The French company Parrot released their Parrot AR Drone, the first ready-to-fly drone which can be controlled entirely via Wi-Fi, using a smartphone.

2013: In December 2013, Amazon released a concept video showcasing founder Jeff Bezos' dream for a drone-based delivery system.

2016: Drone makers produce drone toallowed it to avoid obstacles and intelligently track (and photograph) people, animals, or objects — rather than being limited to following a GPS signal

The Drone Project (January 2019)

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Once the students built and flew the smaller drone, we started building the larger drone.

Triumph provided the finances for our AZ VFS Chapter to purchase an OnPoynt STEM Ranger Drone.

This drone requires more technical activities that were not required for the small drone, such as:

- Soldering the electrics
- Programing the drone
- Using GPS
- Flying outside
- Registering the Drone with the FAA
- Learning how to notify airport when flying

The Drone Project (January 2019)

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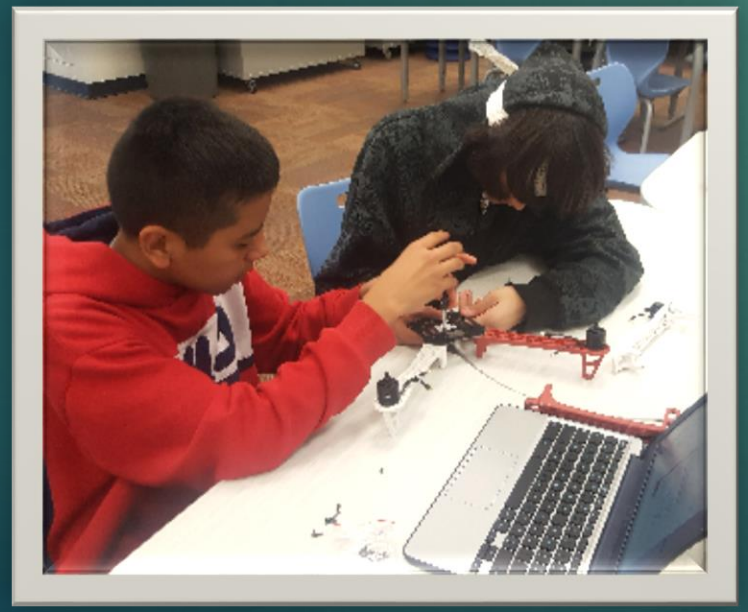
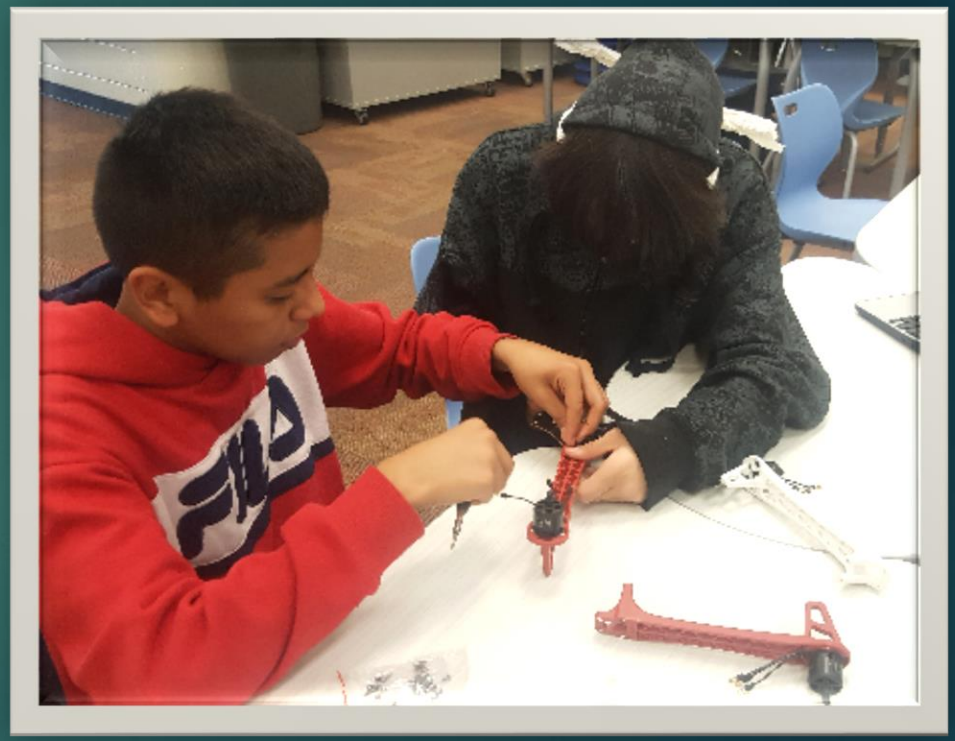
The students learned how to assemble the bottom base

This required assembly of the bottom part and required wiring the motors. The students learned about the direction needed for the motor to spin properly





The Drone Project (January 2019)

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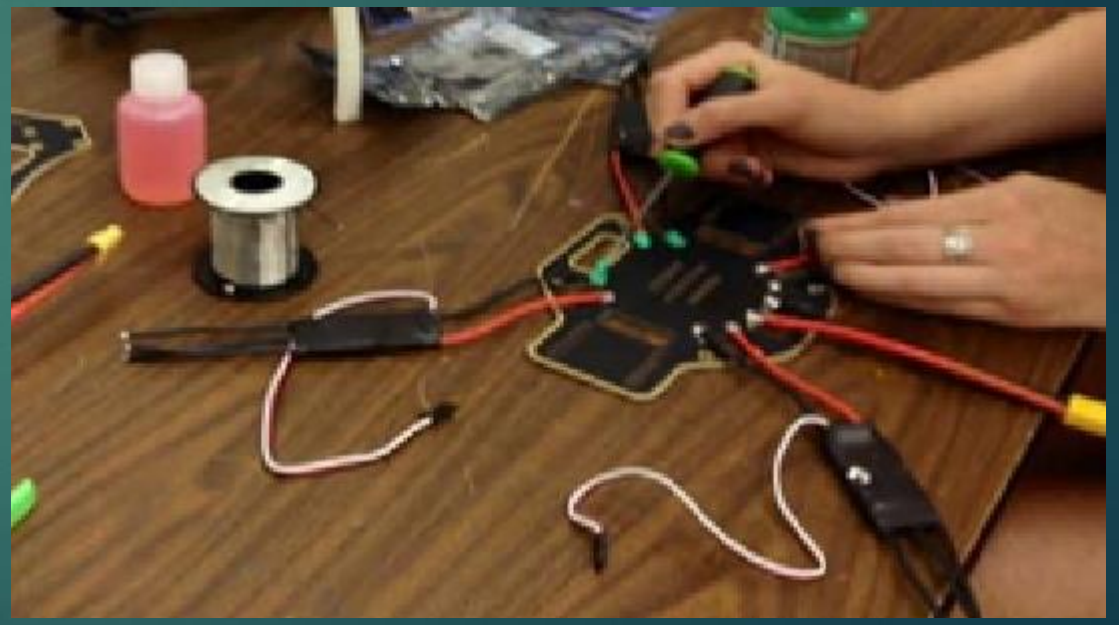
The students learned how to solder the electronics.



The Drone Project (January 2019)

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- The students completed assembly of the frame
  - Once all the electronics were soldered, the frame and landing gear were assembled.
  - The students also completed putting together the base electronics

The Drone Project (February 2019)

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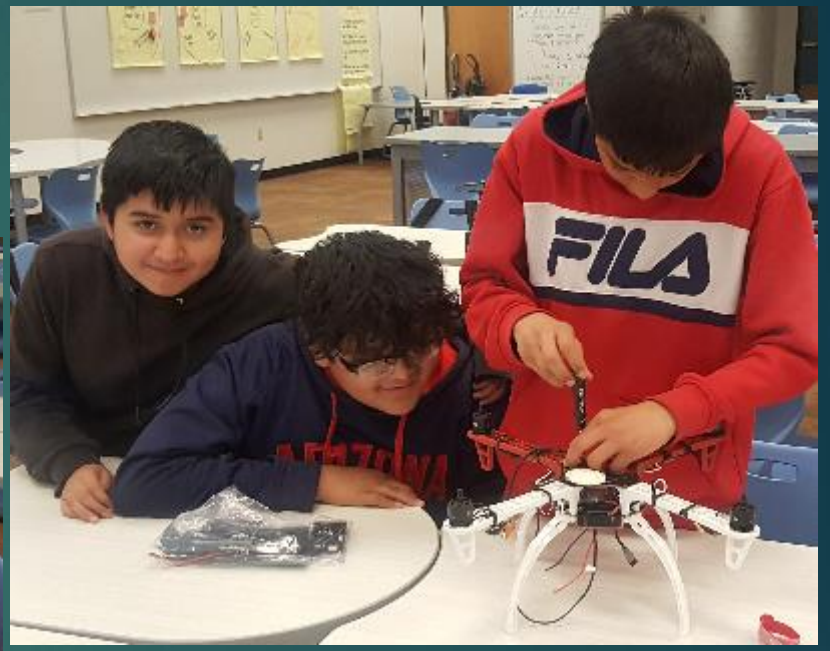
Assembly continued which included installing the lights, GPS unit and battery.



Future Tasks

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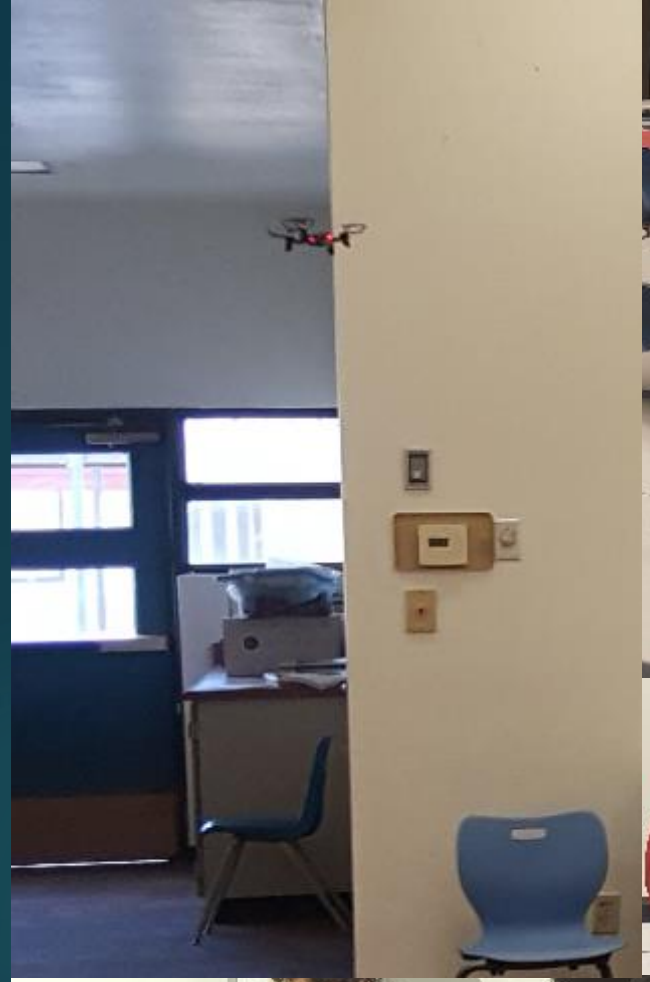
- Teach basic programming and program the flight controller of the drone (February 2019)
- Test the drone system (March 2019)
- Update the programming or assembly as needed (March 2019)
- Practice Flying the drone Inside (April 2019)
- Register the Drone with the FAA (April 2019)
- Learn how to notify airport when flying (April 2019)
- Flying outside (April 2019)

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