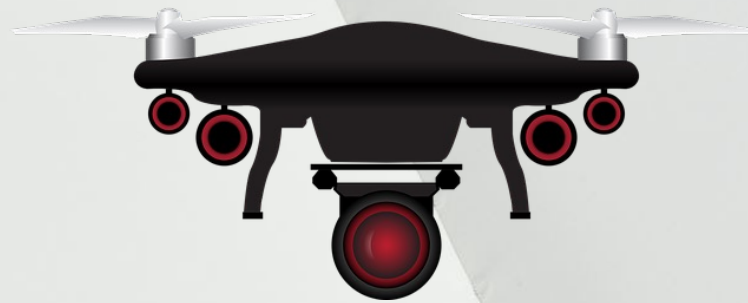


DIY Building Block Drones Unit



sUAS Scholars Program 2020-2021



Objective

- To engage students in a hands-on activity that promotes teamwork, problem-solving, and creativity by building a drone using TR-D5 DIY building blocks.
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Materials

TR-D5 DIY Building Blocks Drone kit (one per group)

Instruction manual

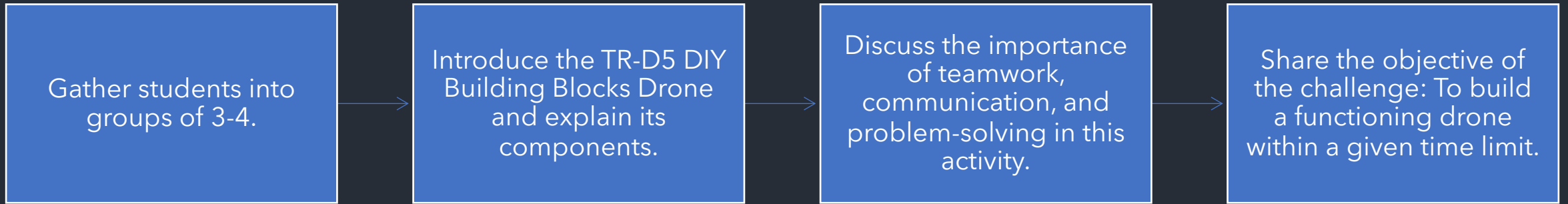
Additional building blocks (optional)

Timer or stopwatch

Pen and paper for note-taking

UNIT INSTRUCTIONS





Introduction (10 minutes):

Review the Instruction Manual (10 minutes):

- Distribute the instruction manual to each group.
- Instruct students to carefully review the manual, familiarizing themselves with the steps and components required to build the drone.
- Encourage them to take notes or ask questions about any unclear instructions.



Building Phase (30 minutes):



Start the timer or stopwatch to track the building phase.



Instruct each group to follow the instruction manual and begin building their drone.



Encourage students to communicate, assign roles, and collaborate effectively.



Remind them to be cautious with the delicate components and to refer to the manual for any troubleshooting or clarification.

Test Flight and Modification (15 minutes):

Once a group completes building the drone or when the time is up, allow them to test their drone's functionality.

Each group should designate a pilot who will fly the drone.

Encourage students to observe the drone's flight performance and identify any issues or areas for improvement.

If time permits, allow them to modify their drones using additional building blocks to enhance stability, agility, or aesthetics.

Drone Showcase and Reflection (10 minutes):



Gather all groups together for a drone showcase.



Each group will have a chance to present their drone to the class, highlighting its features, modifications, and flight performance.



After each presentation, encourage the class to ask questions and provide constructive feedback.



Facilitate a brief discussion about the challenges faced, problem-solving strategies employed, and the importance of collaboration in the activity.

Conclusion and Wrap-up (5 minutes):

01

Summarize the key learnings from the activity, emphasizing teamwork, problem-solving, and creativity.

02

Thank the students for their participation and congratulate them on their successful drone builds.

03

If possible, display the drones in the classroom as a visual reminder of their achievements.

FLIGHT TIME EXPERIENCES

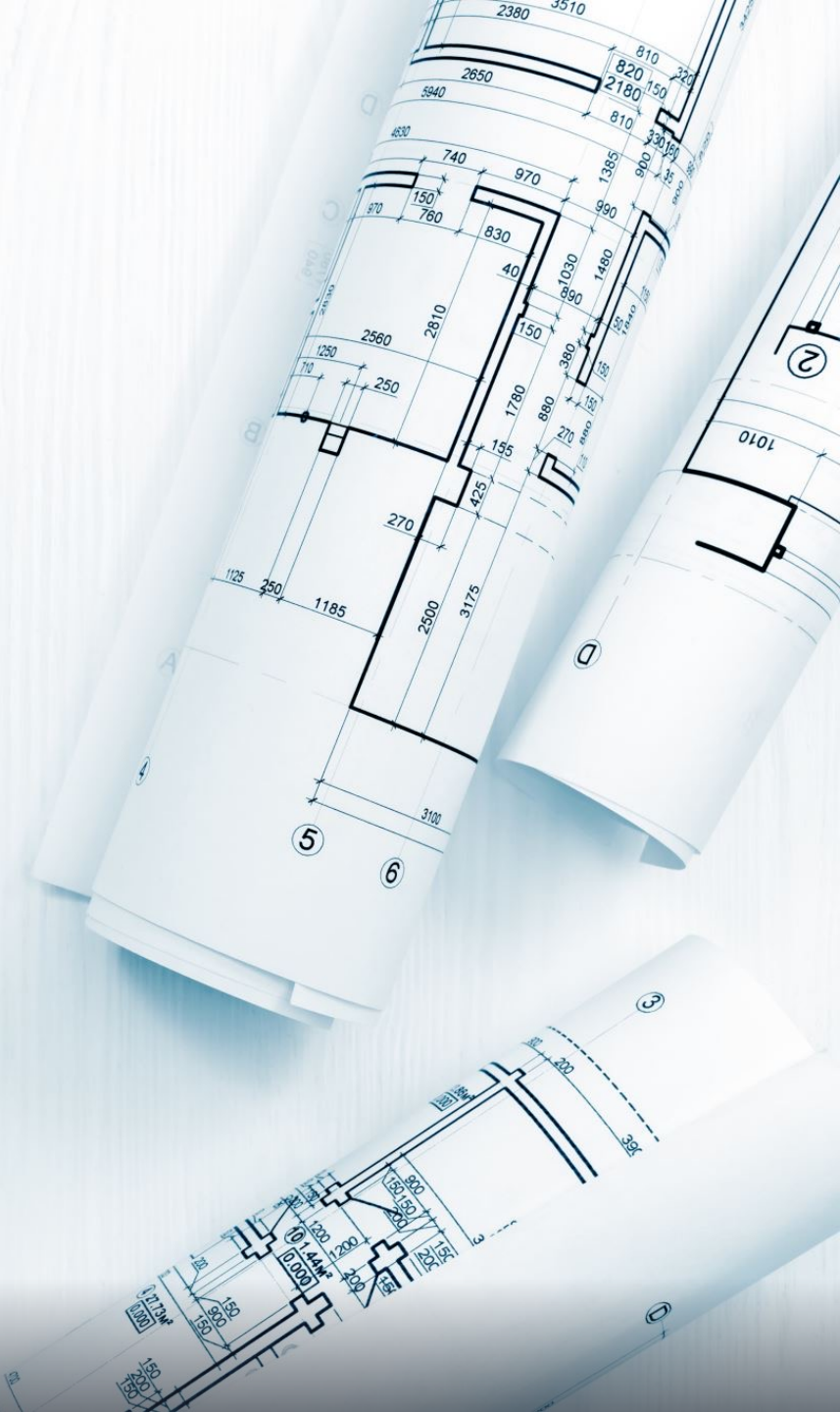


- Flight Time #1 - Construction of Drones - Build and Test
- Flight Time #2 - Presentation of Experiences
- Flight Time #3 and so on....
- Each flight time experience, students should be improving in the balancing of the DIY drones.

FLIGHT TIME DAY ONE

Lesson: Build and Test

- DRONE CONSTRUCTION -Unboxing of the drone kit and reviewing the components. Take the DIY Kit and go over the kit with your scholars.
- SEE VIDEO [MODEL TR-D5](#)
- REFER TO Drone Construction Checklist
- Test Drone (Make sure you are way from people, cars, other objects, etc.,)
- Record your Experiences-See Guiding Questions.



FLIGHT TIME

#1



ESSENTIAL QUESTIONS

What is a hobby drone?

What are the functions of a drone?

How do you build the TR-D5 drone?

How do you charge the battery?

What is Headless Mode?

What is Gyroscope Calibration?

What is Blade Installation?

What is flight preparation?

How do I maintain batteries?

What are the recycling procedures?

Discussion Questions



Define Flight Preparation



See Key Terminology

Key Terminology

1. TR-D5: The model name of the DIY Building Blocks Drone.
2. DIY: Stands for "Do-It-Yourself," indicating that the drone requires assembly.
3. Building Blocks: Interlocking pieces that are used to construct the drone's frame and components.
4. Drone: An unmanned aerial vehicle (UAV) that is capable of autonomous or remote-controlled flight.
5. Assembly: The process of putting together the drone's components and building blocks.
6. Frame: The structure of the drone that holds all the components together.
7. Propellers: Rotating blades that generate the thrust needed for flight.
8. Motors: Electric motors that power the propellers and control the drone's movement.
9. Battery: The power source that supplies electricity to the drone's motors and other electronic components.
10. Controller: A handheld device used to remotely operate and control the drone's flight.

Key Terminology

11. **Remote Control:** A wireless device that sends commands to the drone, allowing the user to control its movement.
12. **Flight Modes:** Different modes or settings that dictate how the drone behaves during flight, such as stability mode, acrobatic mode, or autonomous mode.
13. **GPS:** Global Positioning System, a satellite-based navigation system that provides location and positioning information to the drone.
14. **Camera:** An onboard camera that captures photos or videos during flight.
15. **FPV:** First-Person View, a feature that allows the user to see the drone's perspective in real-time through a video feed.
16. **Altitude Hold:** A feature that enables the drone to maintain a consistent altitude automatically.
17. **Headless Mode:** A flight mode in which the drone's orientation is relative to the pilot's position, regardless of its actual direction.
18. **LED Lights:** Lights on the drone that provide visibility and orientation cues, especially useful during low-light conditions or night flights.
19. **Transmitter:** The device used to send control signals from the controller to the drone.
20. **ESC:** Electronic Speed Controller, a device that regulates the speed and direction of the motors based on input from the transmitter.

RULES FOR DIY KIT

Scholars are held to ACOUNTABILITY

- **SAFETY FIRST**

- Before construction, keep all parts in the DIY Drone Kit.
- Refrain from going ahead of your Teacher/Instruction before constructing the drone.
- Included in your kit is the Instructional Manual and Assembly Manual. Ensure these manuals are kept in your kit.
- Please adhere to the safety warnings on the Instructional Manual which are also included in this PowerPoint.

SAFETY WARNINGS

INSTRUCTIONAL MANUAL

- 1. Please keep small aircraft parts out of the reach of children.
- 2. The aircraft is powerful, when first learning to fly, slowly push the throttle (left lever) to avoid aircraft collisions and damage. With experience, you can learn to fly faster.
- 3. After each use, turn off remote control and the aircraft and remove batteries for before storing it in a dry space.
- 4. Always keep batteries away from high temperatures or sources of heat to avoid potential damage.
- 5. During flight, try and keep a 6 foot space between other users to avoid collisions and to maintain a safe area for landing.
- 6. This aircraft is recommended for users age 14+. Children should operate with adult supervision.
- 7. Never attempt to recharge non-chargeable batteries. Always install batteries with the correct polarity (according to battery compartment diagram, and never mix different types of batteries.

SAFETY WARNINGS CONCL.

INSTRUCTIONAL MANUAL

- 8. Use caution to avoid short circuiting to power supply.
- 9. To avoid eye damage, never look directly into any of the LED light emitters.
- **Adhere to warnings on page. 7**
- If the aircraft is damaged, repair it immediately. Do not use aircraft with damaged propellers.
- Please remove the batteries to avoid leakage when they will not be used for a long time.
- Be careful to avoid crashes or collisions as it will severely impact performance and the life cycle of the aircraft.
- **NOTE: Push the throttle control slowly to fly the craft steadily. If flying become erratic, use the trim functions to correct any drifting or side flight.**



FLIGHT PREPARATION

- **Pairing the aircraft to the transmitter:** Connect the battery to the aircraft, the front LED lights will keep flashing. Turn on the controller and push the left stick up and pull it down to pair the aircraft. When you hear an audible beep, it means the controller has matched the aircraft. The LED lights will stop flashing.
- **Calibration:** At the same time, push the left joystick on the transmitter to the bottom right, and push the right joystick to the bottom left. The front LED lights will change from flashing to solid bright. Calibration can also be done by pressing the "one-key calibration" button for 3 full seconds, when the remote control makes one beeping sound, calibration is completed.

FLIGHT PREPARATION

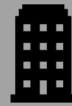
- **Low Power Alarm:** Whenever the aircraft reaches a low battery state, the front two LED lights will keep flashing slowly. Stop flying immediately and recharge the aircraft.



Journal Guiding Questions



What was effective building your aircraft?



What were some of the building challenges?



Were you able to build the drone without the video? Explain.



Discuss your flight preparations. Were you able to fly? What was your flight time? Beginning and End.



Did you have to troubleshoot your aircraft? Please explain.

FLIGHT TIME

#2



FLIGHT TIME DAY TWO

Lesson: TAKE A 10 MINUTE FLIGHT

- The object of this lesson is for students to see if they can maintain flying their aircraft.
- Students must do the following:
 - 1) Check your battery usage before flight time.
 - 2) Students must time their flight time. (Flight span)
 - 3) Record the date of the flight.
 - 4) Time You Begin Operations
 - 5) Time You End Operations
 - 6) Location/area of their flight.
 - 7) Was the flight a smooth one?
 - 8) What were the challenges? If so, were you able to troubleshoot.
 - 9) Record any accidents if any. Explain.



ESSENTIAL QUESTIONS

- What is flight span?
- What is the purpose of flight logbook?



Unit Resources in MTeam Folder

- Journal Rubric
- Flight Time Log Handout



FLIGHT TIME EXPECTATIONS



- Plan your flight and make observations. Record your experiences. Visual Observer? Weather? See Safety Checklist. How long did you fly? Location? Flight time? Challenges? Strengths? Troubleshooting?
- Journal Reflection