DRONE: AERONAUTICS

The Association for Unmanned Vehicle Systems International, projected more than 100,000 new jobs in unmanned aircraft by 2025.

OVERVIEW

In the Aeronautics Level 1 Kit, students will learn about the science of travel through the air. They will watch videos, participate in experiments, and perform research to investigate flight, evaluate the effects of air pressure, discover how birds fly, identify the basic parts of an airplane, and demonstrate an understanding of the concepts of lift and thrust. Using the Engineering Design Process, students will participate in a paper airplane challenge, which will allow them to apply their knowledge in real time to create and improve upon a far-flying paper airplane design. The kit culminates with students examining a real-life drone up close and in flight.

MATERIALS

- drone (1)
- vocabulary word cards (30)
- markers (12 sets)
- balloons
- pencils (30)
- cup (6)
- index cards (1 pack)
- empty bottle
- crayons (30 packs)
- string
- straws
- funnel
- ping pong balls
- student journals (30)

COPIES OF

- Airplane Handout (30)
- High and low air pressure worksheets (30)

*** Device Required — Computer, tablet, or Laptop (no Chromebook)— minimum 15 per kit

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DRONES: GETTING READY FOR FLIGHT

The Association for Unmanned Vehicle Systems International, projected more than 100,000 new jobs in unmanned aircraft by 2025.

OVERVIEW

In this course, students will gain valuable experience in piloting small aerial vehicles. Students will use a simple UAV to learn important vocabulary surrounding the use of personal drones. Each student in these lessons will be able to pilot the drone and act as the Visual Observer to develop good habits for safe flying. Each lesson in this unit is designed to progressively build on the previous, challenging students to increase knowledge and experience from piloting missions and challenges. At the end of the course, students will be able to verbalize important basic features of drones as well as vocabulary of movement in space. Students will gain physical, hands-on experience piloting and spotting for drone missions.

MATERIALS

- permanent marker sets (6)
- masking tape
- take of and landing target (6)
- drones (6)
- battery voltage testers (6)
- battery charging bags (6)
- remote control batteries AAA (6)
- Hula Hoop
- hula hoop stand
- Cones (6)
- Stopwatch (6)
- Pipe cleaners, 1 pack of 100
- Rubber bands
- string
- wire
- wire cutters
- Blindfolds (6)
- Box of paperclips, 1 pack of 300
- Zip Ties
- Pencils
- Crayons (15)

COPIES OF

- Drone Controller Directions (6)
- Drone Photograph with Labeled Parts (6)
- Phonetic Alphabet Sample (6)
- Mission #1 Objective (30)
- Mission Preflight Checklist (30)
- Take-of and Landing Target (6)
- Team Flight Log (6)
- Mission #2 Objective (30)
- Mission #3 Objective (30)
- Top Flight Team Certificate (6)
- Mission #4 Objective (30)
- "Wings" Certificate (30)
- Up/Down Arrows (6)
- Left/Right Arrows (6)

*** Device Required – Computer, tablet, or Laptop (no Chromebook)– minimum 15 per kit

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DEPLOY DRONE: BUILD YOUR DRONE

The Association for Unmanned Vehicle Systems International, projected more than 100,000 new jobs in unmanned aircraft by 2025.

OVERVIEW

The Deploy Drone Level III kit prepares young pilots for true success in flight. Working with safety and drone regulations, students will acquire the knowledge and appreciation needed to fly safely in and out of the classroom. This kit supports students in improving piloting skills while also exploring the science behind flight and drones. Allowing for research and hands-on application, the modules build into challenges and tasks to give plenty of flight time with support. The kit begins with students building a snap together drone then culminates by combining flight skill, science, and teamwork with fun competition.

MATERIALS

- drone (6)
- fire retardant bag
- journals (30)
- drone pilot licenses (30)
- tape measures (6)
- Smart Weigh Professional Digital Kitchen and Postal Scale (6)
- Legos (1)
- masking tape (6)
- sidewalk chalk (1)
- stop watch (15)
- note cards (3 packs)
- paper clips (1 pack)
- twist ties (100)
- pipe cleaners (100)
- craft sticks (1 pack)
- glue sticks (30)
- student journals (30)

COPIES OF

- I can Drone checklist for student self assessment (30)
- QR Codes and images for module 2
- Drone word cloud
- cargo template (30)
- Module 3 Exit Ticket (30)
- Module 4 Rubric (30)
- Team challenge cut outs (15)

*** Device Required – ANY - minimum 15 per kit

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DRONES: READY FOR FLIGHT

The Association for Unmanned Vehicle Systems International, projected more than 100,000 new jobs in unmanned aircraft by 2025.

OVERVIEW

In the Drones Level III Kit, students will gain valuable experience in piloting small, aerial vehicles. They will use a simple UAV to learn important vocabulary surrounding the use of personal drones. Every student will take turns piloting the drone and also acting as the Visual Observer to develop good habits for safe flying. Each module is designed to progressively build on the previous, challenging students to increase knowledge and experience from piloting missions and challenges. At the end of the course, students will verbalize important basic features of drones as well as vocabulary of movement in space. Students will gain hands-on experience piloting and spotting for drone missions.

MATERIALS

- Permanent Markers (6) sets
- Masking Tape (6)
- Drone (6)
- Hula Hoops (6)
- Hula Hoop Stands (6)
- timer
- pencils(30)
- zip ties (1 pack of 100)
- rubber bands
- scotch tape (6 rolls)
- string/twine
- wire
- wire cutters
- paperclips
- dimes (6)
- crayons (6)
- Bic pens
- AAA batteries (pack of 8)
- dry erase markers (pack of 12)
- chalk
- scale
- blindfolds

COPIES OF

- Drone Controller Directions (6)
- Drone Photograph with Labeled Parts (6)
- Phonetic Alphabet Guide Sheet (6)
- Mission #1 Objective (30)
- Mission Preflight Checklist (30)
- Takeoff and Landing Target (6)
- Team Flight Log (6)
- Mission #2 Objective (30)
- Mission #3 Objective (30)
- Top Flight Team Certificate (6)
- Mission #4 Objective (30)
- Flight Team "Wings" Certificate (30)
- Up/Down Arrows (6)
- Left/Right Arrows (6)

*** Device Required – Any - minimum 15 per kit

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Over the course of the semester, students will explore various drone topics, including soldering, electronics, avionics, kit maintenance, preflight procedures, batteries, and battery technology.

Students will also be introduced to other general aviation topics, including weather, aircraft design, flight skills, dynamics, safety, and ethics. In addition, they will be studying for their FAA Part 107 (Pilot License) through an online training course, which includes question and answer sessions with a live pilot.

Course Outline:

1) Soldering – Students will be introduced to soldering through interactive demonstrations and hands-on activities. They will learn to identify the tools, equipment, materials, wires, and terminals associated with soldering. They will be given ample hands-on practice time prior to soldering customized drone arms for their drones.

2) Avionics – Students will learn the basics of flight, how wings and lift work, as well as related physics principles.

3) Intro to Flight – Students will learn to prepare their aircraft by following a preflight checklist. They will review how latitude and longitude work, where to find accurate weather reports, and how to discover local flight restrictions on drones and small aircraft. They will also be taught how to log hours and perform maneuvers.

4) Basic Flights – During these flight sequences, students will gain valuable time behind the controller. They will learn basic maneuvers, safety procedures, and gain piloting hours. In addition, they will be challenged to fly a series of basic patterns and missions.

5) Literacy: The Martian – Students will read the book "The Martian" by Andy Weir and watch sections of the corresponding movie. They will complete missions relating to the science depicted in the novel. Students will be challenged to bring the fictional story in the book to life with a series of missions relating to the novel and its themes.

6) Intermediate Maneuvers – In these missions, students will work with their teams to complete a series of more complex flight patterns and maneuvers. This will result in valuable time logged behind the controller as the pilot and visual observer.

7) Flight Dynamics – This challenging section of the course adds some integration with math and physics. This module will introduce more of the science of flight, specifically the physics behind an aircraft lifting a payload. Students will be challenged to build a mechanism to lift a payload and deliver it safely. This module is as much about creativity and problem solving as it is about the physical science of lift and thrust.

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8) Advanced Maneuvers – As the students become more comfortable with controlling and managing flight, they will be required to compete progressively more complicated maneuvers. In this module, students will log time on a series of obstacle courses. They will be challenged to build a course that has multiple directional and height changes. Each team will be challenged to complete the course in a limited timeframe to be successful.

9) Safety and Ethics – As drones become more prevalent in our world, it is important to make sure that student pilots understand the rules and ethics of drone use in public. Here we will challenge students to analyze current events and laws surrounding drone use. This unit also involves discussions about proper ethical use of drones (safety, privacy, intellectual property, etc.).

10) CRM Blind Pilot – This module is all about team building and collaboration. Teams will build an obstacle course for the pilot to navigate. The challenge is to build and foster excellent communication skills between the flight crew and the pilot. To do this, the pilot controlling the aircraft will be blindfolded, relying on the crew for complete support of the flight mission. The pilot and crew will have to work together to successfully navigate an obstacle course under the pressure of time, without a crash!

11) Time on Course – A substantial portion of this course is dedicated to logging flight time and experience. Several of the modules include "practice" flight time where each student will be challenged to fly through patterns, missions, and maneuvers, thereby logging flight time in their pilot's binders.

12) Preparation for Part 107 (Pilot License) Exam – One of the underlying goals of the course is to prepare students to become licensed, commercial drone pilots. To become a legal pilot, students must sit for the FAA Part 107 exam. Throughout this course, students will gain vocabulary and operational knowledge that will move them toward the pilot's exam. Multiple modules in this course are specifically geared toward preparation and sitting for this exam.

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