



## LAUNCHING INTO AVIATION - SEMESTER ONE

### Materials needed throughout the semester

- Poster board or rolled paper (included in 5 lessons)
- Markers
- Scissors
- Paperclips
- Clear tape

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### Unit 1 - Aviation 101

- *Unit 1.A Lesson 2 – Engineering Practices in Action*

#### Heavy Lift Rocket Activity (materials per group)

- Large binder clip
- Fishing line/smooth string
- 4 long balloons - 5" x 24" or 3" x 60"
- Bathroom size (3 oz.) paper cup
- 2 straight drinking straws
- 50 small paper clips
- Sandwich-size plastic bag
- Masking tape
- Wooden spring-type clothespins (optional)
- Scissors

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### Unit 2 - Taking Flight—Early Aviation Innovations

- *Unit 2.A Lesson 2 – Da Vinci and His Flying Machines*

#### Create Your Own Paper Helicopter (materials per student)

- Paper
- Paperclip
- Scissors

#### DaVinci's Design Dilemma (materials per team)

## MATERIALS LIST



- Scissors
- Clear Tape
- Fishing line or string
- Washers or marbles
- Template for spacecraft
- Area to drop from (or ladder)
- Plastic grocery bags
- Rulers
- Digital Scale or Balance (one per class) [Amir Digital Pro Pocket Scale](#)
- Stopwatch/other timing device (app on cellphone)
- Small resealable sandwich bag
- Cardstock or old file folders for spacecraft template
- Tissue paper or plastic tablecloths

- *Unit 2.B Lesson 1 – Hot Air and Gas Ballooning*

Density Demonstration Activity (materials per class)

- Large clear tank or tub filled with water
- Pairs of sinking and floating objects
  - Two cans of soda—regular and diet
  - Orange with peel and orange peel only
  - Two bowling balls—one more than 12 lbs and one less than 10 lbs

Hot Air Balloon Activity

Materials per team:

- 13 sheets of tissue paper (approximately 20"x 30") (bright, mixed colors)
- Glue stick
- Scissors
- Straight edge (yard or meter stick works best)
- Marker (any dark color)
- Large bowl with smooth, rounded bottom and sides
- Masking tape

Materials per class:

- Camp stove with propane fuel converter and metal heating duct to hold over camp stove
- Lighting device
- Fire extinguisher
- Heat protection for hands
- Optional heat sources:
  - Metal ice bucket or small metal garbage can with 3-4 cans of Sterno or similar gel fuel

## MATERIALS LIST



- Should be large enough to hold multiple cans of gel fuel
- Sides should be more than 6 inches high
- Hot air popcorn popper
- Hair dryer set on low speed with high heat

- *Unit 2.C Lesson 2 – Glider Flight and Early Innovators*

### Warm-Up Activity

- Large pieces of cardboard (about 20 x 30 inches)
- Fan

### Paper Tent Activity (materials per student)

- 8 1/2-inch x 11-inch piece of paper for each student

### Glider Building Activity (materials per team)

- Balsa-wood gliders (one kit per student or per pair of students) [Jetfire Balsa Gliders](#)
- Extra balsa wood [Small Box o' Balsa](#)
- Craft knives (one per student pair)
- Stopwatch or other timing device (may use cell phone app)
- Tape measure
- Masking or electrical tape
- Glue
- Other simple materials for modifying glider designs (index cards, paper, tape, sticky notes, paper clips, putty, etc.)

- *Unit 2.D Lesson 2 – Build and Test a Wind Tunnel*

### Build and Test a Wind Tunnel Activity

#### Materials per wind tunnel:

- Large pieces of cardboard cut into the following dimensions:
  - Four (4) 21" x 25" x 8"
  - Four (4) 40" x 8"
- Four small pieces of cardboard for two support stands (5.75" inches in height)
- Box fan (highest powered fan available)
- Box knife
- Metal straight edge
- Measuring tape/ruler
- Drinking straws (recommend using jumbo size straws)
- One (1) 8" x 10" piece Lexan/Plexiglass (can be purchased pre-cut at a major hardware store)
- Duct tape
- Hot glue gun and glue sticks
- Digital scale (measures to 0.1g, at a minimum) [Amir Digital Pro Pocket Scale](#)

## MATERIALS LIST



- Safety glasses

### Airfoil Build (per team)

- Box knife
- Metal straight edge
- Measuring tape/ruler
- Hot glue gun and glue sticks
- Pliers/wire cutter
- Protractor
- Safety glasses

### Airfoil Mount

- Three (3) 7 ½" pieces of wire (can be from a wire hanger)
- Foam board cut into the following pieces (recommend [Dollar Tree](#) foam board)

#### Airfoil Mount

One (1) 6" x 6"

Eight (8) 1" x 3"

#### Symmetrical Airfoil foam board pieces

One (1) 16" x 5 ¼"

Three (3) 5 ¼" x 1"

#### Asymmetrical Airfoil foam board pieces

One (1) 16" x 5 ¼"

Three (3) 5 ¼" x 1"

#### Airfoil of student's own design

One (1) 16" x 5 ¼"

Three (3) 5 ¼" x 1"

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## Unit 3 - From Theory to Practical Reality—Rapid Developments in Powered Flight

- *Unit 3.C Lesson 2 – One For All, All For One*

### Riveting Activity (Going Further activity - optional)

- Pop rivet gun (minimum one gun per class) [Hand Rivet Tool](#)
- 1/8" x 1/8" aluminum rivets (minimum one per student) [Aluminum Rivets](#)
- No. 6 metal washers (minimum two per student) [Steel Flat Washers](#)
- Safety goggles



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## Unit 4 - To the Stars—Making Jet and Space Travel Possible

- *Unit 4.A.1 – Development of the Jet Engine*

### Jet Engine Lab Activity

Materials per class:

Intake Station

- One desk fan
- Sheets of paper

Compression Station

- Two desk fans
- Six-inch pieces of string
- Index cards
- Tape
- Markers
- Paper clips

Combustion Station

- 250-500 milliliter Erlenmeyer flask
- Balloon
- Can of sterno or other heat source
- Matches or lighter
- Tongs
- Heat/oven mitts
- Timer
- Safety glasses

### Jet Engine Schematic Activity

Materials per student:

- One paper towel or toilet paper tube (approximately 4-inches long)
- One flexible straw
- One 12x12-inch sheet of aluminum foil
- Four paper circles 1 ½ inches in diameter
- One small paper clip
- One three-ounce paper cup
- Scissors
- Tape
- White glue

## MATERIALS LIST



- *Unit 4.B Lesson 1 – The Space Race Begins*

Rocket Launch Activity (Going Further activity - optional)

- Digital Scale (one per class)
- Tape Measure (minimum one per class)

Materials per student:

- Scissors
- Clear tape
- Paper
- Straw
- Pencil
- Ruler
- Protractor
- Masking tape
- Clay
- Other materials as provided by teacher

- *Unit 4.B Lesson 3 – The Space Race Winds Down*

Let's Dock! Activity

Materials per team:

- One larger water bottle representing the Apollo module (empty)
- One smaller water bottle representing the Soyuz module (empty)
- Four 6-foot strings
- Ring cut from a Styrofoam cup
- Clear tape

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## Unit 5 - Creating the Future—What's New and Next in Aviation and Aerospace

- *Unit 5.A Lesson 2 – Aircraft Navigation*

VFR Chart Practice Activity

- VFR sectional aeronautical charts (one per student or small group – see Explore section of lesson plan for ways to acquire charts)

## MATERIALS LIST



- *Unit 5.A Lesson 3 Composites and Structures*

### Build-Your-Own Composite Activity

Materials per class:

- Balance or digital scale (to measure the weight of the flour and measure the weight of the composite structures)
- Graduated cylinders (50-100 mL, several per class or one per group)
- Counterweights or other weights (i.e. books) to test strength
- Measuring cups and spoons (several per class or one per group)
- Several types of flour for use in making paste
- Warm water
- Materials to cover work surfaces
- Vaseline
- Variety of fabrics (biodegradable and other), such as paper towels, newspaper, tulle, cotton, burlap, nylon, etc. Each student will need several strips of one or two types of fabric about 2 inches x 6 inches.
- Mixing bowls and utensils for making paste
- Empty plastic containers to use as molds (empty yogurt cups, sour cream containers, margarine tubs work well).
- Safety goggles per student
- Hair dryer or fan

- *Unit 5.C Lesson 1 - End of the Semester Project*

### End of Semester Project – Exhibit Construction

Materials per student:

- Suggestions for physical exhibits include, but are not limited to, poster board/foam board, markers, pencils, scissors, glue, video presentation device, other basic presentation materials