Lesson Plan 1

Instructor: JD Poulos
Grade Level: Junior High (8-9)
Course: Power, Energy, and Transportation
Unit: CO_2 Airplanes

Lesson Duration: 1 class period (50 Minutes)

Summary: This lesson is an introduction to flight and some of the factors that have helped develop the way we travel. Students will also be shown an example of an air powered foam airplane (the next project) and given homework that is to draw a design of their own.

Rationale/ Purpose: The purpose of this lesson is to introduce the students to some of the events in history that have made major contributions to flight. Students will also get an explanation of the next project the class will be working on.

Objective: Students will be able to:

- List three (3) famous people associated with the history of flight and of aircraft.
- Label the parts of the airplane project given a picture of the materials.

Standards Addressed: TE 1941.10.18

Materials: Transparency of History of Flight Timeline, Timeline handout, Airplane project kit, Completed airplane kit (as an example), Airplane launcher, Picture handout of the parts of the airplane kit with blanks for famous names.

Pre-assessment: Ask students who is credited for the first flight. Ask students if they can name any famous pilots. Ask students if they know any famous events in history that are associated with flight and airplanes.

Anticipatory Set (Attention getter): Launch a foam airplane from one side of the room to the other and explain that the next project will be to design and test their own airplanes. Tell students that before we can start to build the airplanes we need to understand some of the events in history that influenced the way we travel today. The airplane has gone through some extensive design over the years and has been redesigned for many different purposes. After the test flight demonstration, begin lesson with passing out the timeline handout.

Instructional Procedures/ Activities:

Step 1: Pass out copies of incomplete timeline handout.

Step 2: Put copy of transparency on overhead and explain some of the major events in flight history

Step 3: Have students fill out missing blanks on their copies of the timeline handout as the items are discussed.

Step 4: Introduce the project. The project is going to be an air powered foam airplane. Show the model of the completed project. Explain that students will be constructing the airplane in the following days and will be flying them once they are completed.

Step 5: Show students the individual parts of the airplane project and give a brief explanation of how they will be assembled after they have all been shaped.

Step 6: Hand out graph paper and explain that the dark lines are drawings in the shape of the airplane pieces. Explain they are to draw what shape they would like their planes to be. Explain that this assignment will be homework due the next day before they can get their airplane kits.

Fun incorporated into the lesson: Students watching the test flight demonstration at the beginning of class.

Review/ Recap/ Summary: Review the parts of the airplane kit that the students will be using for the next few lessons and put timeline transparency back on overhead projector to allow students time to complete their sheets.

Post-assessment: Give students a handout with pictures of the airplane parts included in the kit and have them label the parts. Also have them name 3 people associated with flight and airplanes.

Clean Up: Have students put away their timeline papers in the class folders and their homework in their binders to take home and complete. Also put away the overhead transparencies.

Homework: Students will be given two pieces of graph paper with the airplane parts outlined and are to sketch 2 different designs for their airplane. The homework will be due before the students will be allowed to begin their projects the following day.

Additional Reminders: Make sure there is an overhead projector in the room. Also have an airplane kit and a completed kit for an example.

Self Assessment (Reflection): TBD after lesson

Lesson Plan 2

Instructor: JD Poulos
Grade Level: Junior High (8-9)
Course: Power, Energy, and Transportation
Unit: CO_2 Airplanes

Lesson Duration: 1 class period (50 Minutes)

Summary: This lesson will provide students with a basic understanding of Bernoulli's Principle as it relates to airplanes. During this class period students will also have the opportunity to begin working on their airplane projects.

Rationale/ Purpose: The purpose of this lesson is to introduce students to Bernoulli's Principle and discuss why an airplane wing is shaped the way it is. This lesson also will provide students with the materials of the airplane project and allow them to begin their construction.

Objective: Students will be able to:

- In their own words explain how Bernoulli's Principle works,
- Be able to locate the high and low pressure areas around an airplane wing on a drawing.
- Identify the components of the airplane project by name when given a picture containing them all.

Standards Addressed: TE 1940.09.01, TE 1940.09.05, TE 1940.09.11, TE 1941.10.19

Materials: Pictures of airplane project materials, Actual airplane materials, Overhead projector, Transparency of Bernoulli's Principle, Completed airplane as an example.

Pre-assessment: Ask students if they know who Bernoulli was. Ask students what Bernoulli did and why it is so important to our lives now.

Anticipatory Set (Attention getter): Bernoulli's Principle- Using a ShopVac as a blower, suspend a ping pong ball in the air flow coming from the blower. Hold the hose of the ShopVac upright and turn on the vacuum. While the air is coming out of the hose, hold a ping pong ball in the air stream. The ball should stay floating in the air coming out of the vacuum. Explain that the demonstration represents Bernoulli's Principle that states: As air moves faster past an object it reduces the pressure around an object. By the reduction of the air pressure around the ball the pressure acting on the ball is reduced and so it is able to stay suspended inside the air moving around the ball. The air around the ball is a low pressure area and the outside air has a higher pressure.

Instructional Procedures/ Activities:

Step 1: Demonstrate the Bernoulli Principle using the ShopVac and Ping pong ball and explain how Bernoulli's Principle works in relation to airplanes.

Step 2: Show students the transparency of an Airplane wing and show how Bernoulli's Principle works. Explain to students how Bernoulli's Principle is used for airplane wings.

ASK: What part of the wing is under low pressure? TOP OF WING
Where is the high pressure on an airplane wing? BOTTOM OF WING
What happens if the bottom of the wing is curved like the top? THE CURVE CAUSES THE AIR TO TRAVEL FASTER AND CREATE A LOW PRESSURE AREA. THIS DOESN'T CREATE THE PRESSURE DIFFERENCE NEEDED TO LIFT THE WING.

Step 3: Once the explanation is done, hand out materials for the project.

Step 4: Work time for students to begin shaping the parts of their airplane.

Fun incorporated into the lesson: Anticipatory set with the ShopVac and ping pong demo. Students will work on airplane project.

Review/ Recap/ Summary: With 10 minutes left in the class period review the parts of the airplane that will be used for the project. Also review the Bernoulli Principle.

Post-assessment: Have students draw an airplane wing on a piece of paper and label the low pressure and high pressure areas. Also have students label the airplane project parts on the picture handout.

Clean Up: Have students put away airplane materials and sweep the floor. Also have students put the tools away at the 5 minute bell. After everything is cleaned up the students may talk quietly until the teacher dismisses the class at the bell.

Homework: Invite students to research airplanes and the history of flight for extra credit. Tell students that if they write up a 1 page report about airplanes and the history of flight it may be worth the same amount as one class assignment.

Additional Reminders: Have ShopVac, ping pong balls, transparencies, handouts, and airplane materials ready at the start of class. Also have overhead projector in the room.

Self Assessment (Reflection): TBD after lesson

Lesson Plan 3

Instructor: JD Poulos
Grade Level: Junior High (8-9)
Course: Power, Energy, and Transportation
Unit: CO_2 Airplanes

Lesson Duration: 1 class period (50 Minutes)

Summary: This lesson will show students how the airplane kit (they received the day before) is assembled. Students will have the opportunity to work on their kits during this class period.

Rationale/ Purpose: The purpose of this lesson is to demonstrate to the students how the airplane kit is assembled and give them some ideas as to the different shapes of airplanes. Students will also have time to work on their projects.

Objective: Students will be able to:

- Assemble the airplane kit after each component has been completed

Standards Addressed: TE 1940.09.01, TE 1940.09.05, TE 1940.09.11

Materials: Students airplane kits, Demonstration airplane kit, Sandpaper, Hot wire foam cutter, Airplane magazines and pictures, Pressurized air hose and blow gun, A few sheets of copy paper

Pre-assessment: Ask if any students know how the parts of their kits should be assembled in order to build the plane without breaking the components.

Anticipatory Set (Attention getter): Review of Bernoulli's Principle. Use an air hose with a blow gun attached to demonstrate how the faster air causes a low pressure area and lifts a piece of paper when pressurized air passes over it. Tie this into the construction of the airplane kit that they will be working on that class period.

Instructional Procedures/ Activities:

Step 1: Begin class by using the air hose and blow gun activity to raise a piece of paper and reviewing the Bernoulli Principle.

Step 2: Demonstrate the proper way to attach the main wing, tail wing, and tail rudder using the rubber bands that were included in the airplane kit. It is important that care is taken when assembling the kit so the parts are not broken during the process.

Step 3: Carefully disassemble the plane and ask for a volunteer to help re-assemble the kit.

Step 4: Review the process of assembly asking students what the next step should be. Have the student volunteer assemble the kit as the other students give the directions.

Step 5: Allow students to get out their projects and work on them for the remainder of the class period (until the 5 minute bell)

Fun incorporated into the lesson: Students work on their projects

Review/ Recap/ Summary: After students have cleaned up and are waiting for the bell, ask students if they feel that they will be able to assemble the planes when all of the parts are complete. Also ask if anyone has gotten far enough to begin the assembly.

Post-assessment: Students will be graded at the conclusion of the unit as to whether or not they were able to assemble the planes correctly

Clean Up: At the 5 minute bell have students clean up the tables, sweep all dust on workbenches to the floor, sweep the floor to the dust collection vent, put all tools away and turn off hot wire foam cutter

Homework: None for this lesson

Additional Reminders: Have demonstration airplane kit, hot wire cutter with extra wires, multiple grits of sandpaper, and airplane magazines prior to class. Have an air hose and blow gun for the opening discussion.

Self Assessment (Reflection): TBD after lesson

Lesson Plan 4

Instructor: JD Poulos
Grade Level: Junior High (8-9)
Course: Power, Energy, and Transportation
Unit: CO_2 Airplanes

Lesson Duration: 1 class period (50 Minutes)

Summary: This lesson will give students the information they will need in order to get the required balance of their projects. Students will also be given time to work on their projects and balance the planes if they have them assembled.

Rationale/ Purpose: The purpose of this lesson is to show the students how they will balance the airplanes that they are building prior to flight. The balance will be a very critical part of the construction of this project to insure proper flight. The students will also have class time to work on their projects.

Objective: Students will be able to:

- Use drywall screws provided to balance their airplanes to achieve proper flight conditions.

Standards Addressed: TE 1940.09.01, TE 1940.09.05, TE 1940.09.11

Materials: Balance tool for airplane balancing, One pound of 1 inch drywall screws, Airplane launch setup, Two sample airplanes (one in balance and another that is not balanced), Air hose

Pre-assessment: Ask students if they can give some examples as to why a plane should be properly balanced. Ask the students if they can think of a way to balance the planes now that they have had a couple of days to work on them.

Anticipatory Set (Attention getter): Launch a couple of examples of correct and incorrectly balanced planes across the front of the room at low pressure to demonstrate how much better a balanced plane flies. Use the launcher that will be used during the flight of the students planes so they understand how it will work.

Instructional Procedures/ Activities:

Step 1: Begin the class period with the demonstration of flight between the correct and incorrect balanced planes.

Step 2: Demonstrate how to use the balancing tool and how to install drywall screws to get the proper balance of the airplane.

Step 3: Ask if there are any questions about balancing the project and answer those that come about.

Step 4: Allow students to work on their projects for the remainder of the class period (Until the 5 minute bell).

Fun incorporated into the lesson: Demonstration of the planes, working on individual projects

Review/ Recap/ Summary: After students have cleaned up and are waiting for the bell, ask students if they feel that they will be able to balance the planes when it is all assembled. Also ask if anyone has tried to balance their planes .

Post-assessment: Students will be graded at the conclusion of the unit as to whether or not they were able to balance their planes correctly.

Clean Up: At the 5 minute bell have students clean up the tables, sweep all dust on workbenches to the floor, sweep the floor to the dust collection vent, put all tools away and turn off hot wire foam cutter

Homework: None for this lesson

Additional Reminders: Make sure there are enough drywall screws available for students to balance their plane projects, have launcher ready, make 3 additional planes to use as demonstration tools, have balancing setup ready.

Self Assessment (Reflection): TBD after lesson

Lesson Plan 5

Instructor: JD Poulos
Grade Level: Junior High (8-9)
Course: Power, Energy, and Transportation
Unit: CO_2 Airplanes

Lesson Duration: 1 class period (50 Minutes)

Summary: This lesson will allow students to grade themselves on how well they completed their projects and will also give students some time to work on their projects in order to finish them before the class period is over.

Rationale/ Purpose: The purpose of this lesson is to have the students do a self evaluation of the progress of their project and their performance in relation to their work ethic.

Objective: Students will be able to:

- Accurately analyze themselves based on the rubric provided

Standards Addressed: TE 1940.09.01, TE 1940.09.05, TE 1940.09.11, TE 1941.10.03

Materials: Tool for airplane balancing, One pound of 1 inch drywall screws, Sandpaper, Hot wire foam cutter, Airplane magazines and pictures, Self assessment student rubrics, Teacher completed project rubric

Pre-assessment: Ask students if they have ever filled out a self assessment grade sheet. If some respond with "yes" ask what is covered with the assessment.

Anticipatory Set (Attention getter): "Who thinks they deserve an "A" on this project? Today is your chance to grade yourselves based on your work performance for the week. You will all have the chance to give yourselves the grade that you feel is appropriate for the project that you have been working on all week. I will be handing out the grade sheets and you will have to fill them in today before you leave class. Your evaluations will be taken into account when I grade your completed project."

Instructional Procedures/ Activities:

Step 1: Hand out copies of self assessment to each student so that they can follow along with teacher as the grading is explained.

Step 2: Allow students to work on their projects

Step 3: Have students clean up the classroom/ shop and return to their seats with about 10-15 minutes remaining in class.

Step 4: Have students fill out their self evaluations and turn them in.

Step 5: Have students turn in their projects before they are allowed to leave classroom at the end of the period

Fun incorporated into the lesson: Time to work on their projects and get them completed.

Review/ Recap/ Summary: Review the requirements of the self assessment that must be met as well as the completed project. Make sure students all turn in both the self assessments and their airplane for grading

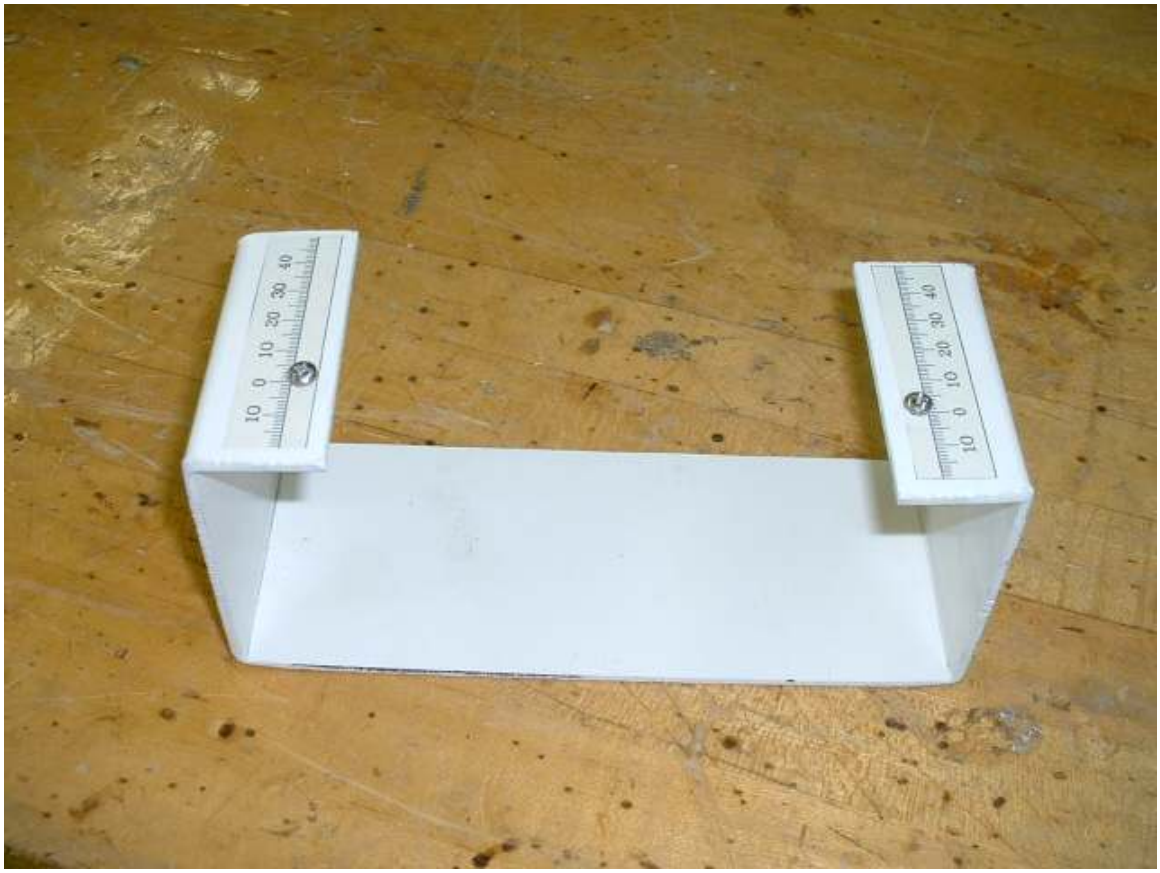
Post-assessment: Grading of airplane projects using a grading rubric, also evaluation of student self assessments.

Clean Up: With 15 minutes left in the class have students clean up the tables, sweep all dust on workbenches to the floor, sweep the floor to the dust collection vent, put all tools away and turn off hot wire foam cutter. Students will also turn in their completed airplane projects for grading at the end of the class period.

Homework: None for this lesson

Additional Reminders: Make self assessment rubric and have copies for each student,

Self Assessment (Reflection): TBD after lesson

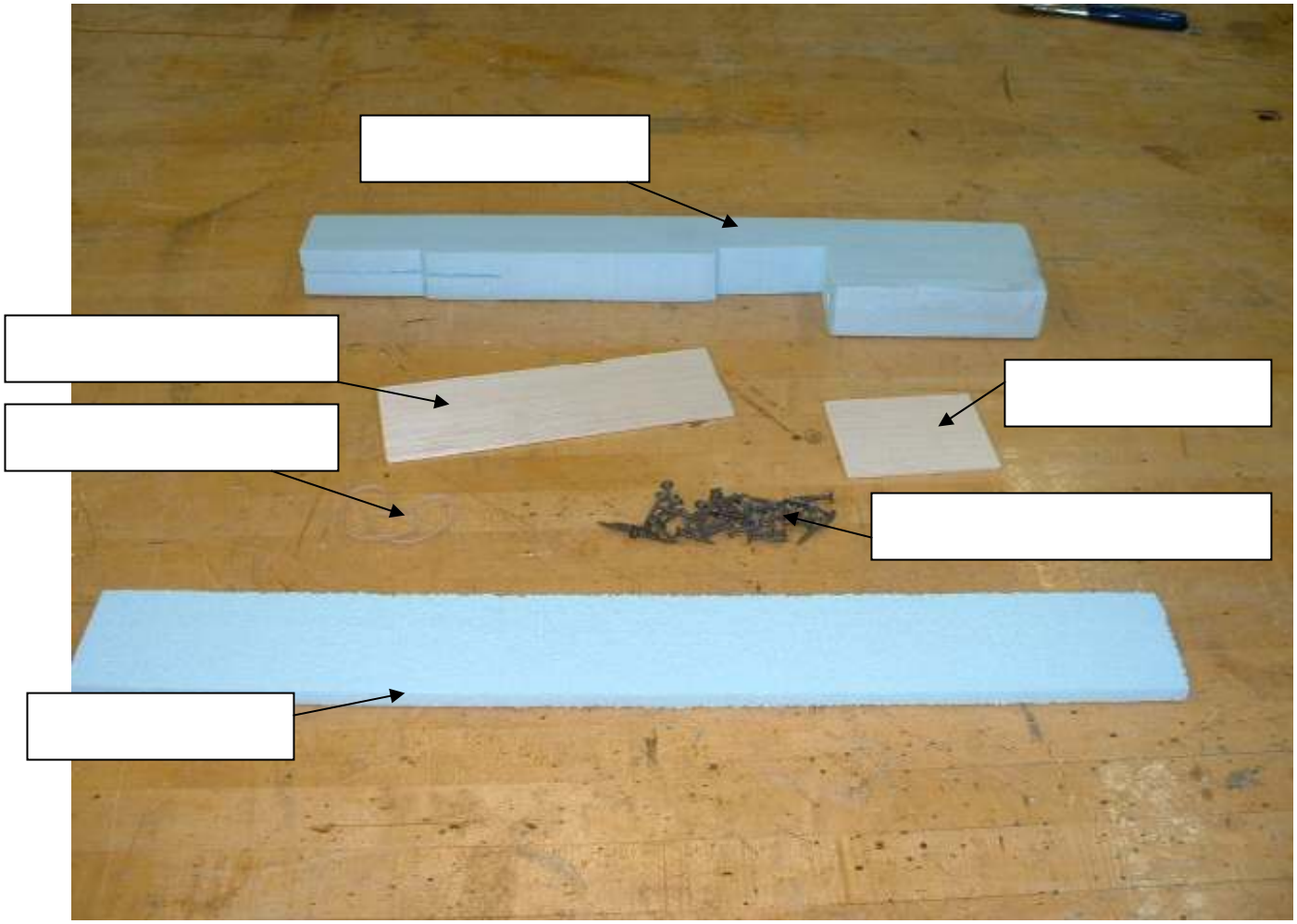


Airplane Balancing Tool

(Photo for lesson planning)

Name _____
Class Period _____

Airplane Kit



List 3 famous names or events that are associated with Aviation and Airplanes:

1. _____

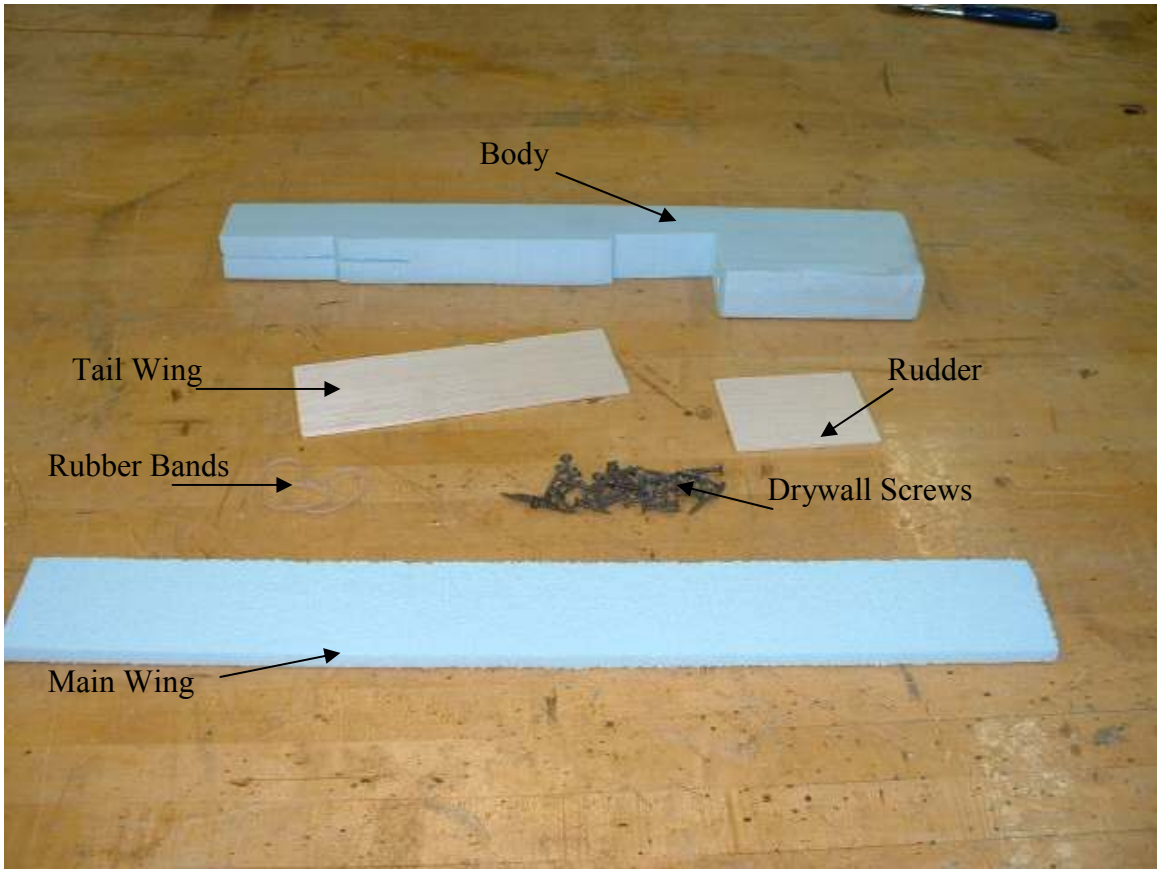
2. _____

3. _____

(Student Handout)

Airplane Launcher

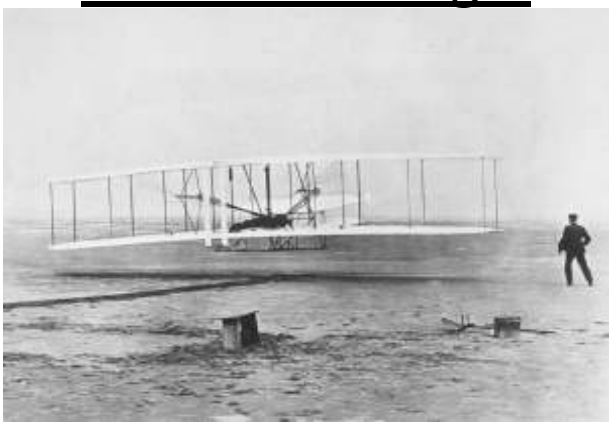
(Photo for lesson planning)



Airplane Kit

(Transparency copy)

Timeline of Flight



1903 _____ make the first controlled, powered flight. The flight lasted 59 seconds and went 852 feet.

1909 Louis Bleriot was the first person to cross the English Channel. The flight was _____minutes and covered _____ miles of water.

1911 Eugene Ely was the first pilot to land an airplane on a_____. The ship had ropes and a small landing platform to aid the landing of the airplane**.**

1912 Harriet Quimby becomes the first American _____to get a pilots license. She is also the first woman to fly across the English Cannel.

1921 Bessie Coleman was the world's first African American pilot and she was the first woman to get an_____ pilot's license.

1922 Jimmy Doolitle flew coast to coast in less than a_____. He flew from Florida to California with only one stop in Texas. The trip took 21 hours.

1927 Charles Lindbergh flew the first solo flight across _____. His flight was over 3,600 miles and about half was over the ocean. The trip took 33 hours and 30 minutes.

1932 _____ flew across the Atlantic Ocean. She was the only person to do it twice at that time. She also had a record for doing the trip the fastest.

1933 Wiley Post set a record of 7 days and 19 hours for flying _____ solo. He did it making only 11 stops and having to repair his plane numerous times.

1937 The _____ blimp starts on fire and crashes to the ground.

1947 Chuck Yeager is the first person to fly an airplane and break the _____

1961 _____is the first man in space.

1969 Neil Armstrong is the first man to _____ _____

1981 The first _____ mission. The entire trip was two days, six hours, 13 minutes.

1986 Space Shuttle Challenger accident. The Space Shuttle _____during takeoff and all seven crew members die.

2003 Aviation celebrates _____ years of flight

Name _____
Class Period _____

Air Powered Airplane Rubric

Completed Project:

Is the kit assembled completely (10 Points) …….._____

Was the project turned in on time w/ Student Self Assessment rubric (5 Points)……._____

Did the student require additional materials (5 Points)……._____

Body design:

Does the body have the correct hole for air launcher (10 Points)….._____

Is there enough material around air hole for safety (10 Points)……._____

Is the body shaped to represent an airplane (5 Points)……..._____

Is body broken anywhere (5 Points)……..._____

Main Wing design:

Is the main wing shaped correctly for effective flight (5 Points)…...._____

Is the main wing attached correctly (5 Points)……._____

Is the main wing broken anywhere (5 Points)…….._____

Tail Wing/ Rudder design:

Is the tail wing/rudder shaped correctly to effective flight (5 Points)_____

Is the tail wing/rudder on correctly (5 Points)……..._____

Is the tail wing/ rudder broken anywhere (5 Points)……..._____

Overall Design of Airplane:

Does the airplane project represent a real aircraft (5 Points)……._____

Is the project painted/ decorated to look like an airplane (5 Points).._____

Student's management of class time (10 Points)…….…..._____

Total Points (100 Possible Points)……_____

(Teacher Rubric)

Name _____
Class Period _____

Student Self Assessment

Completed Project: (20 Points Possible)

Is the kit assembled completely (10 Points)…….._____

Was the project turned in on time w/ Student Self Assessment rubric (5 Points)……_____

Did the student require additional materials (5 Points)……._____

Body design: (15 Points Possible)

Does the body have the correct hole for air launcher (5 Points)..….._____

Is the body shaped to represent an airplane (5 Points)……..._____

Is body broken anywhere (5 Points)……..._____

Main Wing design: (15 Points Possible)

Is the main wing shaped correctly for effective flight (5 Points)…..._____

Is the main wing on correctly (5 Points)……._____

Is the main wing broken anywhere (5 Points)……._____

Tail Wing/ Rudder design: (15 Points Possible)

Is the tail wing/rudder shaped correctly to effective flight (5 Points)_____

Is the tail wing/rudder on correctly (5 Points)……..._____

Is the tail wing/ rudder broken anywhere (5 Points)……..._____

Overall Design of Airplane: (10 Points Possible)

Does the airplane project represent a real aircraft (5 Points)……._____

Is the project painted/ decorated to look like an airplane (5 Points).._____

Student's management of class time: **(25 Points Possible)**

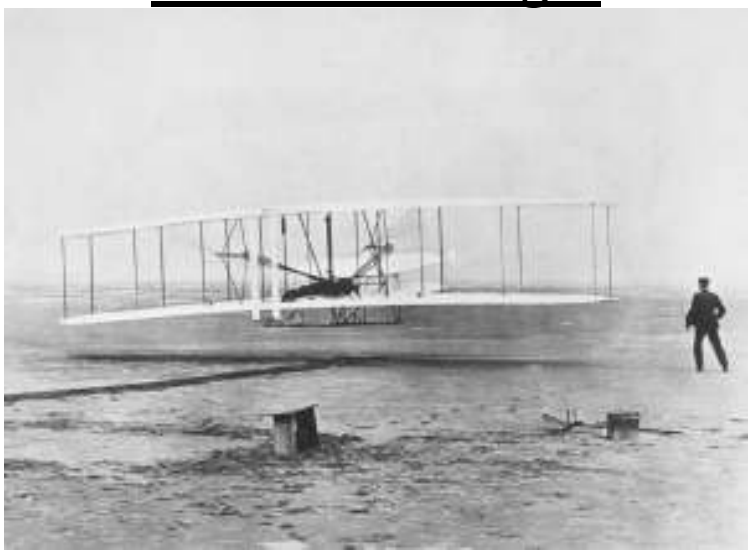
Did you work on the project during every class period (10 Points if you worked on the plane everyday)……..……._____

Did you work efficiently during each class period (10 Points if you worked hard everyday)……_____

Did you start with an idea and follow it through (5 points if your project looks like your drawing)……..…._____

Total Points (100 Possible Points)……_____

Timeline of Flight



1903 Orville and Wilbur Wright make the first controlled, powered flight. The flight lasted 59 seconds and went 852 feet.

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1937 Hindenburg blimp starts on fire and crashes to the ground.

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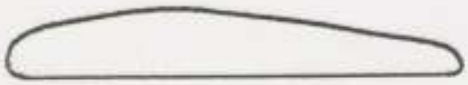
1986 Space Shuttle Challenger accident. The Space Shuttle explodes during takeoff and all seven crew members die.

2003 Aviation celebrates one hundred years of flight.

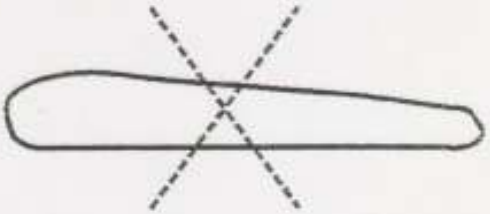
(Transparency)

PROPER AIRFOIL SHAPE

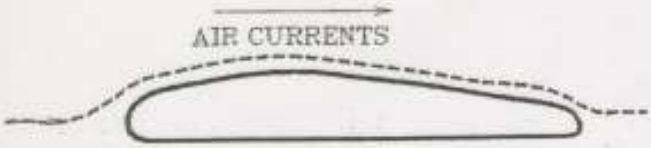
CRITICAL INFORMATION – FOR A GOOD FLIGHT PATTERN



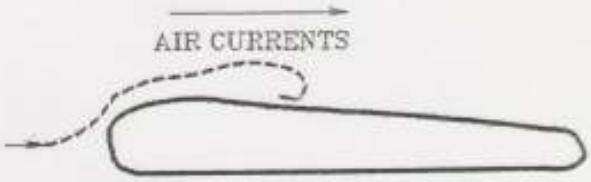
This airfoil shape is **correct.** This is the shape of a real airplane wing.



This airfoil (wing) shape is not correct. It will not furnish adequate lift. The plane will not glide at slow speeds.



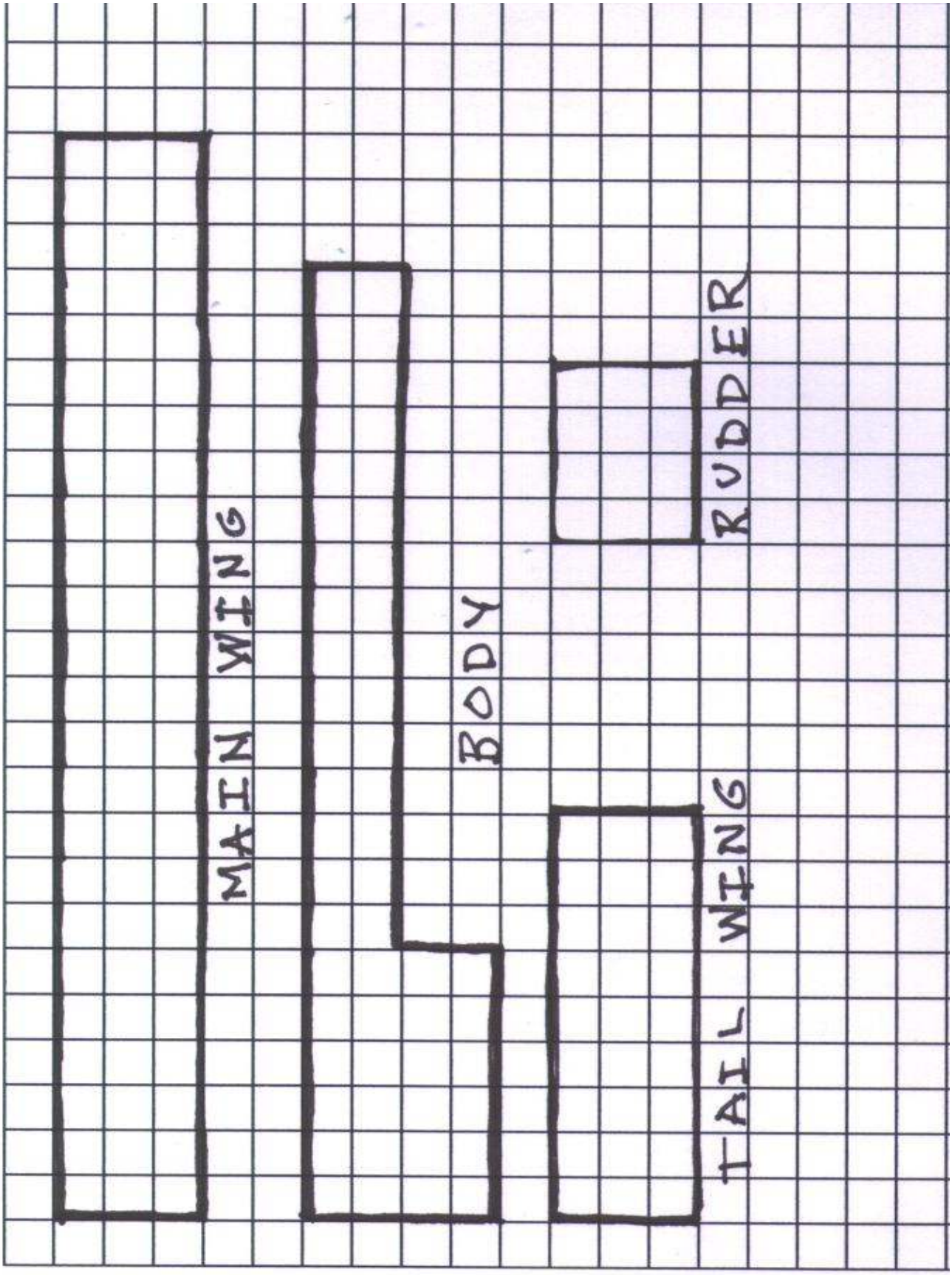
The air currents hug the air foil. The air speed is much greater above the wing than below the wing, thus resulting in proper lift.
(Bernoulli's Principle)



The air currents cannot change direction this rapidly, thus creating a turbulence, not a smooth air flow.

(Air Foil Design Transparency)

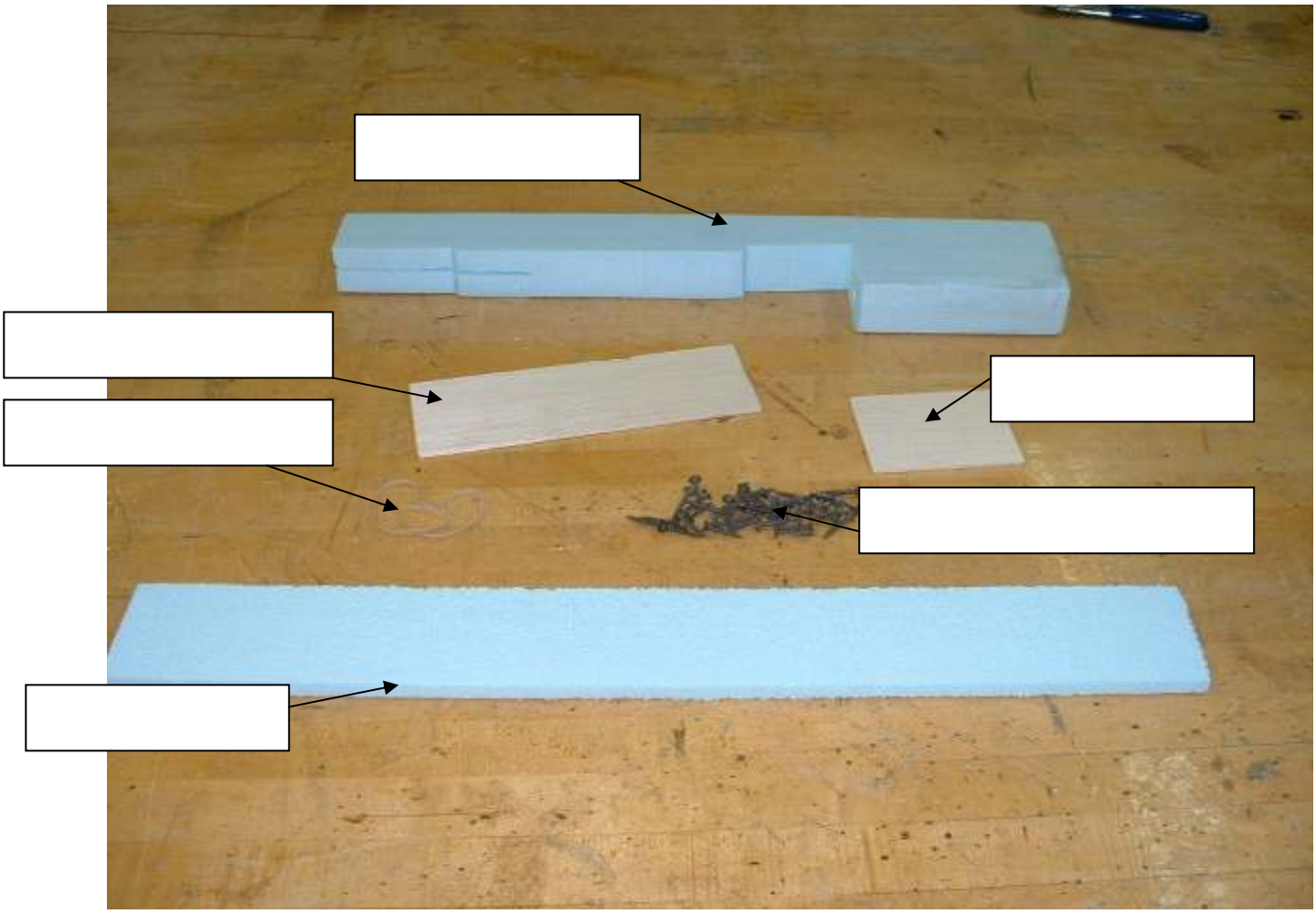
Name _____
Class Period _____



(Student Airplane Design Homework)

Name _____
Class Period _____

Airplane Kit



In your own words, explain how Bernoulli's Principle works and show the high and lower pressure areas on the drawing below: