

NAME: _____

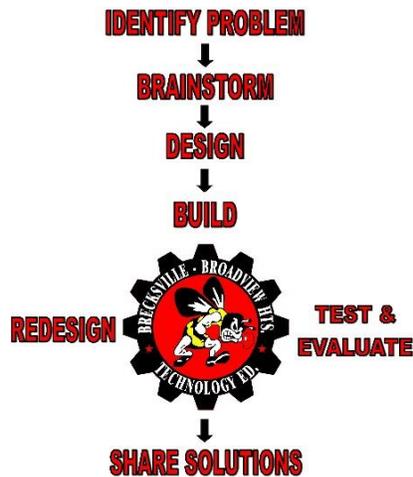
PERIOD: _____

PLANES

Quarter 4 Project



THE DESIGN PROCESS



IDENTIFY PROBLEM (Problem Statement)

In this unit we are studying the form of transportation technology, Airplanes. Your job is to use the design process to help you learn about, design, and build your very own plane to compete in a class competition. The competition will take place on the plane testing stand in the front of the class. The winner of the competition is the student who creates the plane that is most efficient. Efficiency is determined by whose plane can still fly with the least amount of voltage supplied to the motor. Students will be given time to test and evaluate their designs, then redesign and change them as necessary.

Constraints:

- Wingspan: Max 13"
- Length: Max 13"
- Height: Unlimited

BRAINSTORMING

First, research and consider all possible ideas and configurations of your design. Then the next step is to create sketches of 4 different designs. Fold your paper into 4 equal sections and draw on good size sketch in each section. At least 1 of the 4 sketches needs to be an isometric representation of the idea. The other 3 sketches can be any view of your choice (top, front, side). For this project you are to create at least 1 section view of the wing (Airfoil) as well to show what type of airfoil you you plan to use.

Considerations:

- Weight distribution
- Balance
- Overall weight
- Aerodynamics
- Friction

- Push or Pull
- Airfoil & Wing type

DESIGN

In this step a multiview drawing, section view of the wing showing the airfoil design, and isometric view (using AutoCAD) of the Plane is produced. This is a formal and professional method of communicating the design to peers and making the design replicable (capable of being produced by anyone).

The multiview drawing must:

- Full scale
- Include all parts except wires
- Include proper views (top, front, side)
- Section view of wing
- Isometric view in correct orientation
- Use construction lines to project geometry
- Fully dimensioned (anyone should be able to build your exact car)
- 1 inch spacing between views

BUILD

The building process first starts by taking inventory of the provided building materials.

Everyone should receive:

- 1 piece of balsa wood 36"x3"x3/16"
- 1 high speed motor
- 1 propellor
- 1 battery snap

Other materials that may be used later:

- Masking tape
- Electrical tape
- Solder
- Glue
- Snadpaper

Once all materials are accounted for the first step is to print and tape the template created earlier in AutoCAD to the corresponding piece of wood to help cut out the parts of the plane on the band saw. The next steps are up to the engineer. All the parts of the plane must be sanded smooth and can be painted. Also all of the parts need to be assembled using glue. Then the motor and propellor need to be attached to the plane and the battery snap soldered to the motor. For best results be carefule to run the wires of the battery snap in a way where they do not tangle the front of the plane.

TEST & EVALUATE

After the plane is fully constructed it is time to test it. Take it to the testing stand and with permisson from the teacher perform a few test runs. Make sure to make observations on how your plane is performing.

Things to look for:

- **Balance**
- **Wire connection**
- **Does is glide smooth?**
- **Rolling, Pitching or diving**

REDESIGN

Use information observed durring testing & evaluation to change the design for the better. The first thing that you change may not fix the problem, it may even make the problem worse. A helpful hint is to only change one variable at a time so that it is clear if and which adjustments you are making are working or not.

SHARE SOLUTIONS

This is thought of as the “final” step in the design process. Now the design is finalized and it is time find out how well you have done. For this project this is where we have our class competition (drag race).

Competition rules/info:

- **Each students has 3 attempts**
- **You have 30 seconds to place your plane on the tester after your name is called**
- **A false start and an incomplete pass count as an attempt**
- **All 3 scores are recorded and the lowest score is the one that counts**
- **Lowest time in the class is the winner!**

GRADING

For this project the grade will be determined by both formative and summative assessments. The larger (summative assessment) part will be comprised of everything done within the design process to design, build, test & evaluate, and redesign the project. The smaller (formative assessment) part is determined by the performance of the Plane constructed compared to the performance of the others in the class.

SUMMATIVE

Category	50% - 69%	70% - 84%	85% - 100%
Sketches (10)	5-6.9	7-8.4	8.5-10
Brainstroming sketches	2 complete sketches.	3 complete sketches. 1 ISO.	All four sketches complete. 1 ISO with labels.
Multiview CAD (50)	15-20	21-25	26-30
Top, front, side, section and iso of plane design in AutoCAD	One side represented, missing dimensions or drawings misplaced.	Only two sides represented, missing dimensions or drawings misplaced.	All 3 sides represented (top, front, side). Fully dimensioned and geometry projected.
Plane (50)	25-34.5	35-42	42.5-50
Project constructed	The project created follows all requirements, only uses correct materials, student follows the design process, and produces a poorly thought out and uncreative design. Little effort displayed.	The project created follows all requirements, only uses correct materials, student follows the design process, and produces a working moderately thought out and creative design. Moderate effort displayed.	The project created follows all requirements, only uses correct materials, student follows the design process, and produces a working well thought out and creative design. A lot of effort displayed.
Project Summary (30)	0-9	10-19	20-30
Evaluate your work in the Maglev process	Few questions complete with well thought out responses.	All answers completed with not well thought out or incomplete responses.	All questions answered fully with well thought out responses.

FORMATIVE

Category	Bottom 3 rd	Middle 3 rd	Top 3 rd
Performance (10)	7-7.9	8-8.9	9-10
How well did the plane work?			