



**iLEAD PROJECT DESIGN GUIDE**  
[kathleen.fredette@ileadschools.org](mailto:kathleen.fredette@ileadschools.org)

Project Name:	Estimated Duration:	Grade Level:
<b>Aeronautics/Gliders</b>	<b>6-8 weeks</b>	Middle to High School

Begin with the “Why” - What is the purpose of the project?

*As children, we look up at the sky and point at birds and planes in wonder, taking for granted their ability to fly. Many of us have fantasies of flying. Tapping into our curiosity about flight, this project takes us into the forces behind flight, answering the age old question “how do things fly?” Aerodynamics introduces learners to the forces described by Newton and Bernoulli to make sense of how our physical universe works.*

*Through this project, learners will use the engineering design process to fabricate and launch their own gliders through a design challenge, interact with a full scale glider and glider pilots to support their understanding of the parts of a glider, flight controls and aerodynamics and actually fly in a glider in a partnership with Southern California Soaring Academy. Preflight training on simulators will support the development of flight and navigation skills. The history of flight, anatomy of birds, current experimental gliders, meteorology, can be woven in to extend and enhance knowledge, giving meaning to research and writing.*

**CHALLENGING PROBLEM/QUESTION**

Driving Question(s)

- *What are the forces in our world and how do they affect us?*
- *How do we use the engineering design process to develop excellent products?*
- *How can I design and build a model glider to meet specific flight challenges?*
- *How can I understand and explain forces through the model I create and launch?*
- *How can I use historic and current aircraft and birds to understand the dynamics of flight?*
- *In what ways has our ability to fly changed the world?*



**NOTE:** Begin the PBL experience using

- [KNOWS/NEED TO KNOWS/ NEXT STEPS](#) or
- [KWL in PBL](#)

**DEEPER LEARNING AND ACADEMIC MINDSET**

<b>Learning Targets</b>	<b>RUBRICS (SEL and AR)</b>	<b>Interdisciplinary Connections/ Makery/Exploratorium</b>
<ul style="list-style-type: none"> <li>● The Engineering Design Process</li> <li>● Newton’s Laws of Motion</li> <li>● Gravity</li> <li>● Glider Exterior</li> <li>● lift, thrust, drag, weight</li> <li>● Wing Design               <ul style="list-style-type: none"> <li>○ Aspect Ratio</li> <li>○ Winglets</li> </ul> </li> <li>● Basics of aerodynamics</li> <li>● Flight instruments/avionics</li> <li>● Principles of Lift               <ul style="list-style-type: none"> <li>○ Bernoulli vs Coanda vs Angle of Attack</li> <li>○ Natural elements of Lift</li> </ul> </li> <li>● Expository Writing</li> <li>● Arduino based sensors for telemetry</li> </ul>	<p>SEL: Curiosity &amp; Growth Mindset</p> <p>AI: Innovation/Creation &amp; Problem Solving and Risk-taking</p> <p>Rigor: Thoughtful Learning</p>	<ul style="list-style-type: none"> <li>● SS: History of flight. Innovations in Flight</li> <li>● ELA Writing: Persuasive Piece on NASA</li> <li>● ELA Writing: Timeline of Events</li> <li>● Research Skills</li> <li>● Makery: fabrication of Gliders (two ways)</li> <li>● Math: ratios, measurement, linear equations, data analysis</li> <li>● Art: Perspective Art Pieces</li> <li>● Technology, coding and electronics, arduinos</li> <li>● Engineering: Fabrication and EDP, modeling</li> <li>● SMEs as guest presenters, ex: NASA Pilot, Manny Antimisiaris, Chief Scientist, NASA Amrstrong on Prandtl Wing</li> </ul>



## SUSTAINED INQUIRY

*What happens between the Entry Event and the POL that keeps the learners engaged?*

### Performance Tasks/Assessments

- Learners utilize a Science Aviation Notebook
  - Includes notes, diagrams, artifacts relating to:
    - Parts of exterior plane and uses
    - Instruments and uses
    - Principles of Lift (Bernoulli's Principle vs Coanda vs Angle of Attack)
    - Natural Elements of Lift (Slope, Wave, Thermal)
    - Wing Design Elements (why taper? Why winglets? Why aspect ratio is important, etc...)
  - Informal oral assessment after each section of notes is completed
  - Learners put together and model a prefabricated gliders to understand "trimming"
- Learners create, and eventually fly, their own gliders out of scrap materials such as foam board or balsa wood
  - multiple components of learning assessed including 4 C's (communication, critical thinking, collaboration, creativity)
  - Distance, Accuracy, Finished Product
- Learners develop and complete 1-3 written essays using rubrics
  - Persuasive Writing (To fund NASA, or not)
  - Research Piece (most influential person in Aviation)
  - Schematic (Favorite plane, importance, disadvantages, etc..)
- Vocabulary quizzes, language of the discipline (Glider parts, instruments, uses)

### Differentiation

Dependent on learner needs, modification and extensions will be utilized so with the goal of learner success



### AUTHENTICITY

**Presentation of Learning** (*How will the learners showcase their answers to the Essential Question to an authentic audience?*)

Learners explain and demonstrate their understanding, examples:

- "A Glider Expo," learners present to pilots, aviation experts
- "Glider Shark Tank"- learners try to convince "investors" to invest in their glider prototype by explaining their design and potential in details

**Entry Event** (*How will the learners become engaged, curious, and begin thinking about the Driving Question?*)

Guest presenter, NASA jet pilot and glider pilot uses videos and story to share his experiences with learners, including the journey to becoming a pilot and how it's affected his life.

### NEXT STEPS

Resources /Community Connections Needed:

Critical Friends/Data Protocol Reflection (*What did you take away from these discussions? What part of this project design needs to be changed?*)

CALENDAR



## **POST PROJECT REFLECTION**

[Project Reflection \(After the POL\)](#)

*MS-PS2-1-- Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects*

*MS-PS2-2-- Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.*

*MS-PS3-1-- Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.*

*MS-ETS1-3--Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.*

*CCSS.ELA-LITERACY.WHST.6-8.4*

*Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.*

*CCSS.ELA-LITERACY.WHST.6-8.8*

*Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.*

*CCSS.ELA-LITERACY.WHST.6-8.2.F*

*Provide a concluding statement or section that follows from and supports the information or explanation presented.*

*CCSS.ELA-LITERACY.WHST.6-8.2.E*

*Establish and maintain a formal style and objective tone.*

*CCSS.ELA-LITERACY.WHST.6-8.2.B*

*Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.*

*CCSS.ELA-LITERACY.WHST.6-8.1.D*

*Establish and maintain a formal style.*

*CCSS.ELA-LITERACY.WHST.6-8.1.A*



*Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.*

*CCSS.ELA-LITERACY.SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence.*