

## Apogee Program Session 1

**Course Title:** Up, Up & Away: The Science of Aerodynamics & Flight

### Course Description

The mysteries of flight have intrigued human beings for centuries. Like the Wright brothers and Charles Renard, students study the principles that underlie aerodynamics — motion, force, energy, density, and the work of Galileo, Newton, and Bernoulli — and apply these concepts daily in lab and project work. Students follow the historical development of flying machines by constructing their own kites, parachutes, hot air balloons, gliders, helicopters, planes and rockets. This course introduces students to the concepts of physics and aeronautical engineering.

### Essential Questions

1. What major scientific principles make flight possible?
2. Who were the major contributors to the evolution of human flight?
3. What process can be taken to improve experiment results?

### Outcomes

Upon successful completion of this course, students will:

- a. work in small groups to share knowledge, expertise and skills
- b. design and execute experiments where meaningful data is obtained in order to test hypotheses
- c. manipulate and analyze data from experiments
- d. graph and interpret data
- e. form conclusions by comparing results with those of other class members
- f. use experimental results to modify and improve original designs of models
- g. submit a research paper on an aeronautical topic

### Instructional Strategies

To differentiate, students will be pre-assessed before each unit of study. Based on results, we will utilize cluster and flexible grouping, interest-based grouping and tiered assignments. Students will also engage in an independent study of their own design.

### Resources and Materials

- a. Various internet resources for research and demonstrations
- b. Instructor handouts

### Student Assessment

- Pre-Assessment

Formal and informal assessments will be used prior to each unit of study to aid in differentiation.

- **Documentation of Learning**

Student experiment data, reflections, and conferences will be used to document daily learning, as well as weekly quizzes to determine the level of growth made.

- **Post-Assessment**

Students will launch each of their major projects during Expo. Student reflections will be used to drive discussions during parent conferences.

## Schedule

Date(s)	Topic(s)	In-class Activities	Assignments/Assessments
June 27	Parts and functions of airplanes	Introductions; rules Ice-breakers Goal setting Paper airplane design, building and testing Independent study topic	Journaling and data analysis of airplane flight
June 28	Bernoulli's Principle Air pressure	Model airplane building Research in lab	Pre-assessment and journaling
June 29	Independent study planning Newton's Laws	Fly testing Mini-experiments demonstrating Newton's Laws	Pre-assessment and journaling
June 30	Kite design, use and history	Kite building and testing	Pre-assessment and journaling
July 1	Continuation of kite study Student reflection Research	Kite modifications Self-assessment Research in lab	Self-assessment
July 4	Hot air balloon parts, use and history	Team balloon building and testing	Pre-assessment and journaling
July 5	Helicopters parts, use and history	Drop Heli's Wingbats	Pre-assessment and journaling
July 6	Galileo's Law Parachutes	True/False assessment Parachute design and testing	Pre-assessment and journaling
July 7	Egg drop design	Egg drop	Journaling
July 8	Field Trip – Palwaukee Airport	Field Trip – Palwaukee Airport	Journaling and reflection
July 11	Rocket design, use and history	KWL Straw rocket building and testing	Pre-assessment and journaling
July 12	Field Trip – Museum of Science and Industry	Field Trip – Museum of Science and Industry	Journaling

July 13	Rockets	Bottle rocket building and testing	Journaling
July 14	Rockets	Solid fuel rocket building and testing	Journaling
July 15	Expo Day and Parent Conferences		

**CTD Statement on Third-Party Web Sites**

Instructors are required to thoroughly review any third-party web sites they intend to use in their courses for inappropriate content. However, because web content continuously changes, CTD disclaims any responsibility for any of the content contained on third-party web sites used in course materials. If you become aware of anything that may be inappropriate, please notify CTD staff immediately.

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