HANDS DOWN EDUCATION · 6-WEEK UNIT STUDY PLANNER

Airplanes & Flight unit study

A K-12 airplane and flight homeschool curriculum: paper airplanes, the four forces, the Wright brothers, navigation and aviation math, in a six-week plan.

GRADE BANDS K-2 · 3-5 · 6-8 · 9-12
FULL GUIDE https://handsdowneducation.com/homeschool/airplanes

How to use this planner

The six weeks below are the guide's authored scope and sequence: one focus, one key activity and one portfolio output per week. Run the activity at the level your child is at (the grade band notes tell you how), keep the output, and by week six you have a portfolio that shows the unit end to end.

Pace is yours. A week here is three to five working sessions; a topic that is going well can take two calendar weeks, and one that has run dry can be closed early. Tick the box when a week's output is in the portfolio.

Six-week scope and sequence

Wk	Focus	Key activity	Portfolio output	Done
1	**Air and motion**	Pushes and pulls, air pressure demonstrations, the first paper airplane contest and measuring flights.	A data table of the first flights.	☐
2	**The four forces**	Lift, weight, thrust and drag, with a demonstration of each, and balanced and unbalanced forces.	A four-forces diagram with explanations.	☐
3	**Designing and testing**	Fair tests, changing one variable at a time, averages and graphs; glider building for older students.	A design log with at least three tested versions.	☐
4	**The parts of a plane and how pilots control it**	Wings, fuselage, tail and control surfaces; how ailerons, elevators and rudder turn a plane.	A labeled airplane diagram or model.	☐
5	**Navigation and the world**	Maps, globes, great-circle routes, speed, distance and time, and time zones.	A planned flight with route, time and time-zone conversion.	☐
6	**The history of flight**	The Wright brothers, Amelia Earhart, the jet age and space flight; final contest or presentation.	A timeline, diary entry or research essay, and a final flight record.	☐

Running it at your child's level

Grades K-2: pushes, pulls and paper airplanes

Young children learn flight by playing with air. They fold and throw paper airplanes, feel the push of wind on a sheet of cardboard, watch maple seeds and birds glide, and learn the parts of a plane and the jobs at an airport. Measuring how far each plane flies, in footsteps or with a tape measure, makes the play into real science and math.

- Throw strong, throw gently: fly the same paper airplane with a soft push and a hard push, measure each flight and talk about how a bigger push changes the motion.
- Air is real: hold a sheet of paper under your lip and blow across the top to see it rise, catch air in a plastic bag, and race a flat sheet of paper against a crumpled one.
- Parts of a plane: build a plane from a cardboard tube and craft sticks, then label the wings, body, tail and engines.
- Airport pretend play: set up a check-in desk, a security line and a cockpit, and take turns as the pilot, the air traffic controller and the passenger.

  Reading: Airport by Byron Barton, a simple picture book that follows passengers from the terminal into the sky, and Violet

the Pilot by Steve Breen, about a young inventor who builds her own flying machines.

Grades 3-5: the four forces and fair tests

Upper elementary students can name the four forces of flight, explain balanced and unbalanced forces, and run fair tests that change one variable at a time. Paper airplane experiments become real engineering, with data tables, averages and redesigns, and the story of the Wright brothers shows the same method in action.

- Fair test: fly one paper airplane design with zero, one and two paper clips on the nose, five flights each, average the distances and explain what the added weight changed.
- Four forces poster: draw a plane in level flight with arrows for lift, weight, thrust and drag, and show what happens when one force grows larger than the one opposite it.
- Balloon rocket: thread a straw on a string across a room, tape a balloon to it and release it, measuring how far it travels with different balloon sizes to explore thrust.
- Wright brothers timeline: record the main steps from their bicycle shop to the 1903 flights, including the kites, the gliders and the wind tunnel, and note the problem each step solved.

  Reading: Who Were the Wright Brothers? by James Buckley Jr. for a clear, illustrated biography, and Amelia Lost by Candace Fleming, which alternates Earhart's life story with the search for her lost plane.

Grades 6-8: Newton's laws, iterative design and navigation

Middle schoolers can apply Newton's laws of motion to flight, design and improve a glider through several test cycles, calculate speed from distance and time, and learn how pilots navigate with headings, maps and time zones. The NGSS middle-school forces and engineering standards map directly onto this band.

- Glider design challenge: build a glider from foam trays or balsa, test it, change one feature at a time (wing area, dihedral, nose weight), log every trial and present the final design with the data that justified each change.
- Speed and time: time paper airplane flights with a stopwatch, calculate average speed in meters per second, and compare with the speeds of a hot-air balloon, a small plane and a jetliner.
- Newton in the air: explain how each of Newton's three laws shows up in a takeoff, a turn and a landing, with diagrams.
- Plan a flight: choose two airports, find the distance, estimate flight time at a typical cruising speed, and convert the departure and arrival times between time zones.

  Reading: The Wright Brothers: How They Invented the Airplane by Russell Freedman, a Newbery Honor book illustrated with the brothers' own photographs, alongside NASA's free Beginner's Guide to Aeronautics for the science.

Grades 9-12: lift, drag and the history of aviation

High schoolers can analyze flight quantitatively, relate lift to air density, speed and wing area, apply Newton's second law to takeoff, and write about aviation's effect on war, trade and daily life. With lab reports and a research paper, this unit supports a physics or engineering credit and a history elective.

- Variables of lift: using NASA's lift equation, predict how lift changes when speed doubles or wing area halves, then test the trend with a wing on a kitchen scale in front of a fan.
- Takeoff calculation: estimate the acceleration and runway length a light aircraft needs using its mass, thrust and takeoff speed, and state your assumptions.
- Aviation history essay: write on how flight changed one field, such as warfare, mail and trade or international travel, using at least three primary or secondary sources.
- Navigation lab: plot a route on an aeronautical chart or a free online sectional, calculate a heading that corrects for a crosswind, and estimate fuel for the trip.

  Reading: The Wright Brothers by David McCullough, a narrative history drawn from the family's letters and diaries, and the Federal Aviation Administration's free Pilot's Handbook of Aeronautical Knowledge for the principles of flight chapter.

A sample week, subject by subject

Reading & Writing

Read a short biography of the Wright brothers and write a diary entry as Orville or Wilbur on 17 December 1903 at Kitty Hawk, using at least three real details from the reading.

Math

Fly three paper airplane designs five times each, measure every flight with a tape measure, find the average distance for each design and show the results in a bar graph.

Science

Demonstrate the four forces of flight: lift with a strip of paper you blow across, thrust with a balloon rocket on a string, drag with a parachute and weight with paper clips added to a paper airplane.

Social Studies

Plan an imaginary flight between two cities on a globe, stretch a string between them to see the great-circle route, and work out the time difference at your arrival.

Art

Design a livery for your own airline: a logo, colors and a side view of the plane, then label the wings, fuselage, tail, rudder, elevators and ailerons.

Books, sites and kits

- Airport by Byron Barton (Book (K-2)) — Bold, simple pictures of a trip through an airport and into the air; the K-2 opener.
- Violet the Pilot by Steve Breen (Book (K-3)) — A picture book about a girl who builds flying machines from junkyard parts; good for design talk.
- Who Were the Wright Brothers? by James Buckley Jr. (Book (3-5)) — A short, illustrated biography in the Who Was series, ideal for the timeline activity.
- Amelia Lost by Candace Fleming (Book (4-7)) — Earhart's life alternated with the story of the search for her plane in 1937.
- The Wright Brothers: How They Invented the Airplane by Russell Freedman (Book (5-9)) — Newbery Honor biography illustrated with photographs taken by the Wrights themselves.
- The Wright Brothers by David McCullough (Book (9-12)) — Narrative history based on the family papers; strong readers can take it on earlier.
- NASA Glenn Research Center: Beginner's Guide to Aeronautics (Website) — Free, clear explanations of lift, drag, thrust and weight, with interactive simulators.
- Smithsonian National Air and Space Museum (Website) — Free online collections including the 1903 Wright Flyer, with articles and educator resources.

Standards this unit covers

- K-PS2-1 (NGSS) — Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object — soft and hard paper airplane throws.
- 3-PS2-1 (NGSS) — Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object — the four forces of flight.
- 3-5-ETS1-3 (NGSS) — Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved — the paper-clip test.
- MS-PS2-2 (NGSS) — 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 — glider weight and thrust tests.
- MS-ETS1-4 (NGSS) — Develop a model to generate data for iterative testing and modification of a proposed object, tool or process such that an optimal design can be achieved — the glider design challenge.
- HS-PS2-1 (NGSS) — Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass and its acceleration — the takeoff calculation.

- CCSS.MATH.CONTENT.6.RP.A.3 (CCSS Math) — Use ratio and rate reasoning to solve real-world and mathematical problems — speed, distance and flight time.
- CCSS.ELA-LITERACY.W.5.3 (CCSS ELA) — Write narratives to develop real or imagined experiences using effective technique, descriptive details and clear event sequences — the Kitty Hawk diary entry.

Common questions

What should an airplane unit study include?

Six strands: how air pushes on objects, the four forces of flight (lift, weight, thrust and drag), designing and testing aircraft, the parts of an airplane and how a pilot controls it, navigation and maps, and the history of aviation. The six-week scope and sequence above runs one strand a week, and each week produces something to keep: a data table, a design, a diagram or a written piece.

How do airplanes fly, in simple terms?

An airplane's wings are shaped and tilted so that they turn the air flowing past them downward. Pushing air down pushes the wing up, which is lift. The engines provide thrust to keep the plane moving forward fast enough for the wings to make enough lift to balance its weight, while drag, the air resisting the plane's motion, pulls back. When lift equals weight and thrust equals drag, the plane flies straight and level. Children can feel each force with simple experiments in the grade-band sections above.

What age is an airplane unit study best for?

Every age. Young children fold and fly paper airplanes and learn the parts of a plane and an airport; upper elementary students run fair tests and learn the four forces; middle schoolers apply Newton's laws and design gliders through several iterations; high schoolers calculate lift and drag relationships, study navigation and write on the history of flight. The grade-band sections give one row per child.

Can I run an airplane unit study with several ages at once?

Yes, and a paper airplane contest is the shared spine. The same afternoon a five-year-old folds and decorates a plane, a nine-year-old measures and averages each flight, a twelve-year-old changes one variable at a time to improve a design, and a fifteen-year-old explains the results with forces and calculates the plane's average speed from distance and time.

Does this unit work for secular and faith-based homeschools alike?

Yes. The unit is forces, motion, engineering design, measurement, navigation and the history of invention, which are the same in any home, and nothing in it depends on a particular worldview. The biographies on the reading list are about inventors and pilots and fit any family's approach.

How much does an airplane unit study cost?

Almost nothing. Printer paper, paper clips, tape, a tape measure, balloons, string, straws and a hair dryer cover the experiments. A balsa-wood glider kit is a worthwhile few-dollar extra, and a trip to a local airport viewing area or an air museum is an optional highlight. NASA's Beginner's Guide to Aeronautics and the Smithsonian National Air and Space Museum's online collections are free.

How do I start an airplane unit study?

Start with a paper airplane contest. Fold three different designs, fly each one five times down a hallway, measure every flight and talk about why the winner won. That evening read a picture book about the Wright brothers or an airport. You will have data, a question and a story by the end of the first day, and the grade-band section above that fits your child takes it from there.

Is airplanes and flight a good homeschool subject?

It is one of the best physical-science units because every idea can be tested at home. It maps onto the standards for forces and motion at every grade, from pushes and pulls in kindergarten to Newton's second law in high school, and onto the engineering design standards through repeated test-and-improve cycles, with measurement, averaging, rates and history along the way. The skills list above names each with its strand and standard.

Turn this into a full, standards-aligned curriculum

Generate a complete plan around airplanes & flight for your child's grade and pace — free to try, no account required.
https://handsdowneducation.com/curriculum/generate