

Take Flight

Pre-VC Program Lessons Provided by:



Lesson: How Long is the USS Intrepid?

Grades: 3-8th Grade

Duration: One class period (approximately 45 minutes)

National Learning Standards:

Measurement

NM-MEA.3-5.2, NM-MEA.6-8.2

Apply appropriate techniques, tools, and formulas to define measurements.

Number and Operations

NM-NUM.3-5.3, NM-NUM.6-8.3

Compute fluently and make reasonable estimates

Algebra

NM-ALG.3-5.3, NM-ALG.6-8.3

Use mathematical models to represent and understand quantitative relationships.

Problem Solving

NM-PROB.PK-12.2

Solve problems that arise in mathematics and in other contexts.

Overall Goal:

Students will understand the relative size of the Intrepid's flight deck in comparison to airport runways.

Objectives:

Students will:

- Discover the length of the Intrepid and the length of familiar airport runways*
- Graph the lengths*
- Use mathematical equations to determine the relationship in length of Intrepid and other runways to mile measurement and to each other*

Background Information:

An aircraft carrier acts as an airport to allow aircraft to launch (take off), be recovered (land) and stored on its 900 foot long decks. An aircraft carrier's flight deck is much shorter than a runway on land, therefore, carriers are equipped with catapults that assist the planes in acquiring enough speed to launch from the flight deck in a quick fashion. To land on a carrier's flight deck, tailhooks located on the back of an aircraft hooked onto arrestor cables which allowed planes to stop quickly, similar to a controlled crash. For storing and maintenance Intrepid was built with a hangar located below the flight deck which could hold up to ½ of its contingent of up to 100 aircraft. Other technologies similar to an airport were housed aboard the Intrepid including radar, air traffic control and an array of communication devices to keep the ship connected with its pilots.

Note: This lesson should be conducted first.

Materials Teacher to provide:

Pencils
Crayons

Materials Package from Intrepid:

Pictures of USS Intrepid

Procedure:

- Teacher will introduce the students to the USS Intrepid by handing out pictures of the ship.
 - Trigger questions:
 - *What kind of ship is the Intrepid?*
 - *How big do you think it is?*
 - *What is its function?*
 - *What do you think happens on the flight deck?*
 - *Where else do aircraft take off and land?*
- Teacher will ask students to think about different airports that they know of in the United States. Some examples are given to you on a supplemental page with this packet.
 - Trigger questions:
 - *Are there any airports near us?*
 - *Where are they?*
 - *How do you think the lengths of their runways compare to the length of the Intrepid?*
- Students will take out their graph paper and pencils to graph the length of Intrepid compared to runways at major airports in the United States. If desired, the students can research airports in nearby areas. Students will use bar graphs to show their results and include a legend on the side of their paper.
- The y-coordinate will show the increment lines for each 1000 feet. Increment lines are supplied on the worksheet and have been started for the students. Students will continue to fill in the rest.
- Teachers will provide students with a list of airport runways and the longest runway lengths by writing them on the board or allowing the students to pick from a list you provide. Use the suggestions in this lesson plan or find your own airport runway lengths.
- On the x-coordinate, students will write the Intrepid and the names of the three (3) airports. Lines beneath the x-coordinate are provided for the students to write the names of the airports.
- Once the bar graphs are filled in, the students will interpret their results and hypothesize why airport runways are long while Intrepid's flight deck is short. They will be required to answer the questions below.

Student Worksheet Questions/Answer Key:

Intrepid is _____ feet _____ than the longest runway at _____ airport.
Shorter/longer

Intrepid is _____ feet _____ than the longest runway at _____ airport.
Shorter/longer

Intrepid is _____ feet _____ than the longest runway at _____ airport.
Shorter/longer

Intrepid is _____ feet _____ than the longest runway at _____ airport.
Shorter/longer

Take a guess!

What is the advantage of an airport having long runways?

Because they are so long, runways at an airport allow aircraft enough time for them to get to a speed where they can attain maximum lift to get off the ground.

Why do you think Intrepid's runway is so short compared to the runways at the airport?

Intrepid is equipped with catapults that allow aircraft to be launched off the carrier's flight deck at high speeds, lessening the need for an exceptionally long runway.

Airport Runway Lengths

Name	Longest Runway*
Denver International Airport, Colorado	16,000 feet
George Bush International Airport, Texas	12,001 feet
John F. Kennedy International Airport, New York	14,572 feet
Laguardia Airport, New York	7003 feet
Lambert-St. Louis International Airport, Missouri	11,019 feet
Los Angeles International Airport, California	12,091 feet
Minneapolis-St. Paul International Airport, Minnesota	11,000 feet
O'Hare International Airport, Illinois	11,900 feet
Palm Beach International Airport, Florida	10,008 feet
Philadelphia International Airport, Pennsylvania	10,506 feet
Phoenix-Sky Harbor International Airport, Arizona	11,489 feet
Raleigh-Durham International Airport, North Carolina	10,000 feet
Seattle-Tacoma International Airport	11,900 feet

*Source: www.wikipedia.com

Title: How far can you fling it?

Grades: 5-8

Duration: Two 45 minute class periods (one class period to build catapult, one class period to launch and take measurements)

National Standards:

Science as Inquiry

NS.5-8.1

As a result of activities in grades 5-8, all students should develop

- Abilities necessary to do scientific inquiry*
- Understandings about scientific inquiry*

Physical Science

NS.5-8.2

As a result of their activities in grades 5-8, all students should develop an understanding of

- Motions and force*
- Transfer of energy*

Science and Technology

NS.8-8.5

As a result of activities in grades 5-8, all students should develop

- Abilities of technological design*
- Understandings about science and technology*

Overall Goal:

Students will learn about catapult technology and how catapults are related to the Intrepid.

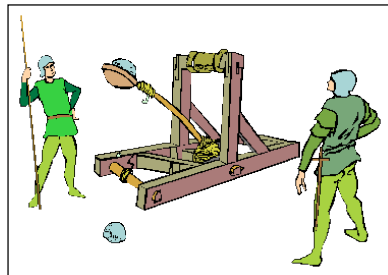
Objectives:

Students will:

- Construct their own catapult*
- Conduct three trials for catapulting an object out of their catapult*
- Record the distance their object travels for each of the three trials*
- Determine what reasons there might be for their trials to have different results*
- Explain how their catapults work and how they relate to the USS Intrepid*

Background Information:

Catapults have a long history dating back to ancient Greece around 400 BCE. Catapults are mechanical lever devices used to provide thrust to an object to hurl it a great distance.



Today's modern aircraft carriers launch planes based on the principle of the catapult. The Intrepid as an example of a sophisticated aircraft carrier, houses 2 steam generated catapults built into the flight deck located at the bow of the ship. The amidships area (see photo below) and deck behind it are angled slightly from the centerline of the ship so that planes that are landing will not interfere with those being launched over the bow. Although the carrier's flight deck is approximately 900 feet long, the ship only used about 250 feet of its flight deck for take offs. With the help of steam catapults, Intrepid's jets could be thrust off the carrier flight deck at the rate of 150 mph in 2 seconds.

Note: This lesson would best be done after the activity "How long is the Intrepid?"



View of the USS Intrepid docked at Pier 86 in 2006

In this activity the students will be challenged to design a catapult that will fling a small crumpled piece of paper at a pre-determined target. This could be a waste paper basket, a bucket or a large bowl. In many ways this principle is similar to the catapult device that was used on the Intrepid.

Materials:

- Small milk or orange juice carton
- Scissors
- Hole punch
- Tape
- Pencils
- Small crumpled pieces of paper
- Tape Measure
- Small crumpled pieces of paper
- Toothpicks
- Rubber Bands

Materials per group:

- One (8 ounce) milk carton
 - Scissors
 - One rubber band (approximately 5 cm)
 - Toothpick
 - Tape
 - Small matchbox (you can make a small box from a 3 x 5 card and tape)
 - Hole punch
 - Small crumpled pieces of paper
 - Two wooden pencils
 - Measuring tape
- (Note: assorted sized rubber bands will be available from your teacher if needed)

Procedure:

- Teachers will review previous lesson “How Big is the Intrepid?”
 - Trigger Questions:
 - *What did we learn?*
 - *Why do airports have long runways?*
 - *Why is Intrepid’s runway so short?*
 - *How does the Intrepid’s aircraft take off with such a small runway?*
 - Teacher will explain briefly what catapults are and why they are important on Intrepid.

Note: Background information for this lesson is a good, brief explanation of how catapults are used on Intrepid. During the video conference, students will view a video that explains the process of launching and recovering an aircraft on an aircraft carrier.

- Teacher will introduce the activity of creating a catapult. Please be sure to note to students that although the simple machine used during medieval times is very different than the catapults aboard the Intrepid, the essential function and purpose remains the same.
 - Trigger Questions:
 - *What is a catapult?*
 - *How do they work?*
 - *What is thrust and why is it needed for a catapult to be successful?*
 - *What is lift and why is it needed for a catapult to be successful?*

(Note: The teacher should create the catapult prior to having the students create one in class. This will enable the teacher to work out any kinks or problems with the design.)

- Teacher will model the construction of the catapult or ask students to follow the written instructions on their worksheet.
- Teacher will finish activity by having students fill out student worksheet. Students can do this together or with their teacher.

Student Worksheet Questions/Answer Key:

How Far Can You Fling It?

Let's think about what the different parts of our catapult did:

What part of your catapult helped to provide thrust to your crumpled piece of paper?

The rubber band helped to provide thrust because when I pulled back on the pencil, it stretched and when it let go, it constricted to make the pencil propel the crumpled piece of paper.

What part of your catapult helped to provide lift to your paper?

The Pencil helped to provide lift because it was the part that flung forward to propel the crumpled piece of paper.

Let's think about what your paper did:

What distances did your paper go?

In Trial #1 my crumpled paper traveled varied answers inches.

In Trial #2 my crumpled paper traveled varied answers inches

In Trial #3 my crumpled paper traveled varied answers inches

Did your crumpled paper go the furthest on the first, second or third trial? Varied Answers

Which statement best describes why there would have been a different distance on each of your trials?

- a) The crumpled paper was in a different part of the box when the catapult threw it through the air.
- b) *We pulled back either less or more on the pencil for each of the trials. (Correct answer).*
- c) It just happened that way

Let's make some comparisons to Intrepid:

If you had to compare your catapult to Intrepid, what parts would correlate:

The milk/juice carton represented The Intrepid

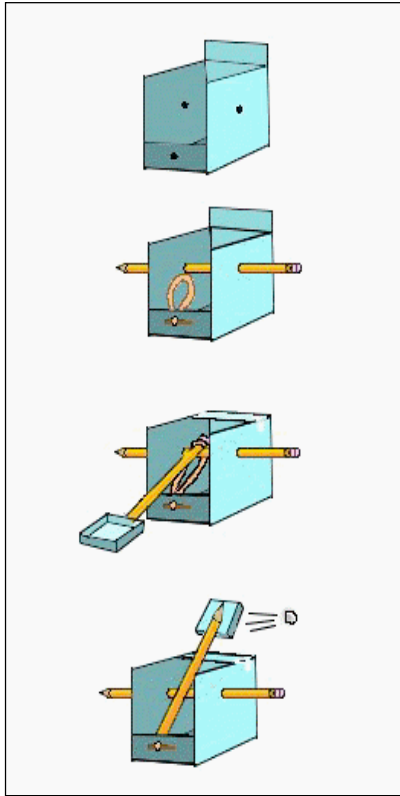
The pencil represented The Catapult

The crumpled paper represented The Airplane

“Intrepid Challenge: How far can you fling it?”

Procedure:

Follow the diagrams below to construct your paper clip catapult, making any modifications on the basic design so that your catapult will be able to launch a paper clip accurately to hit the designated target the distance that your teacher has specified in the “firing range” that has been established in your classroom.



1. Cut off the top of the milk carton and then cut the carton as show in diagram 1. Cut holes the size of a pencil in both sides and in the back.

2. Push a rubber band through the hole in the back and hold it in place with a toothpick. Push a pencil through the holes in the sides.

3. Cut the tray of a match box in half lengthwise. If you don't have a matchbox make one from a 3 by 5 card and tape. Using tape, attach the box to the sharpened end of the second pencil with the pencil to the outside.

4. Select one of the three rubber bands to complete the remainder of the procedure.

5. Lay the pencil across the other with the eraser end facing the front of the catapult. Loop the rubber band over the eraser end. Fold the front flap of the milk carton inward, then crease it, and tape it down.

6. Do a trial test of your catapult to make sure it works properly. Place a paper clip in the holder; pull back the pencil, and then release. Make any adjustments needed, and modifications to make the catapult work better.

Your teacher will tell you when it is your turn to launch a paper clip in the designated firing range. You will have three tries. Record your data in chart below. You can use a meter stick or string to measure the distance from your catapult to the landing.

LAUNCHES	DISTANCE TRAVELED TO TARGET	SUCCESS IN HITTING TARGET (Y/N?)
1		
2		
3		

Lesson: How Does Shape Affect the Movement of an Object Through the Air?

Grades: 3-8 (lesson can alter depending on age level and experience of students)

Duration: One class period (about 45 minutes)

National Learning Standards:

Science as inquiry

NS.5-8.1

As a result of activities in grades 5-8, all students should develop

- Abilities necessary to do scientific inquiry*
- Understandings about scientific inquiry*

Physical Science

NS.5-8.2

As a result of their activities in grades 5-8, all students should develop an understanding of

- Motions and force*
- Transfer of energy*

Overall Goal:

Students will understand that drag affects objects differently according to their shape.

Objective:

Students will:

- Make observations of how quickly two pieces of paper fall to the ground from the same height*
- Use a stop watch to measure the time that it takes for those pieces of paper to fall*
- Make a hypothesis of how quickly the papers fall when one of those papers are crumpled*
- Determine which piece of paper has fallen the quickest why they acted the way they did*
- Explain what forces are working on the papers to make them fall the way that they do*

Background Information

Drag is an important part of aviation. Always at odds with the force of thrust, drag's affect on aircraft can either be positive or negative.

Drag is the force which delays or slows the forward movement of an aircraft as it moves through the air. As air comes into contact and passes over the aircraft and its components, friction is created and slows the plane. Modern aircraft have a streamlined shape to make them more aerodynamic, allowing the aircraft to move more quickly and easily through the air.

In contrast to this, airplanes are also designed with flaps, ailerons and other devices which increases drag to help aircraft land steadily and effectively. The wings are equipped with these flaps which, when extended give the wings more surface area to decrease the speed as it comes in for a landing.

Note: This lesson will be best done after "How Far Can You Fling It?"

Materials:

- Copy Paper
- Pens/Pencils
- Fifteen (15) Stop Watches
- Worksheets
- Fifteen (15) Measuring tapes

Procedure:

- Teacher will ask students to define “surface area.”
 - Trigger Questions:
 - *What is surface area?*
 - *How does surface area affect how fast something goes through the air?*
 - *Why does it matter?*
 - *Does this have anything to do with what we talked about with the catapult?*
- Teacher will tell the students that they are going to conduct an experiment.
- Teacher will divide the students into groups of three. Each group will receive a piece of copy paper and one stop watch.
- Teacher will ask students to make observations about their papers
 - Trigger Questions:
 - *How would you describe your paper?*
 - *Is it light/heavy?*
 - *What shape is it?*
- Teacher will assign roles to each student in group:
 - Paper Dropper: *Person who drops paper for experiment. Students must drop from the same height for each trial.*
 - Time Taker: *Person who uses the stop watch to measure the amount of time it takes for the paper to fall to the ground.*
 - Recorder: *Person who writes down the information the time taker is measuring.*
- After each trial students should rotate roles.
- Teachers will ask the students to share their results with their peers.
 - Trigger Questions:
 - *Did your papers fall at the same rate?*
 - *How long did it take for them to fall?*
 - *What happened if the papers were dropped from different heights?*
 - *If you had significant differences in time, why could that be? (Human error is always something that scientists have to take into consideration)*
- Teacher will introduce the mathematical terms of mean (average).
- Students will use mathematical expressions to determine the mean, or average, time it took for the papers to fall to the ground.
- Teacher will ask the student groups to crumple their paper.
- Teacher will ask the students to measure the time it takes the paper from the same height to get to the ground. Like the last experiment, students should take turns being the Paper Dropper, Time Taker or Recorder. Remind students to drop their papers from the same height as before.
 - Trigger Questions:
 - *Did the papers drop at the same rate as the ones before?*
 - *Did they drop more quickly or more slowly?*
 - *What made the difference in the rate in which they fell?*
- Students will finish out the period by answering the questions in their worksheets pertaining to this program.

Student Worksheet Questions:

How does shape affect the movement of an object through the air?

Drag is the force which slows down the movement of an object as it moves through the air. You are going to conduct an experiment today to see how the same piece of paper moves through the air when it is flat and when it is crumpled. Use the boxes below to record your data and then answer the questions to interpret your data.

Flat Paper:

	Height	Time (in seconds)
Trial #1		
Trial #2		
Trial #3		

What was the average time it took for your flat paper to reach the ground?

Depending on the height the students drop from it should take approximately 2 seconds.

Crumpled Paper:

	Height	Time (in seconds)
Trial #1		
Trial #2		
Trial #3		

What was the average time it took for your crumpled paper to reach the ground?

Depending on the height the students drop from it should take approximately 1 second.

Let's interpret the information we gathered.

Why did the paper that was flat fall at a slower rate than the one that was crumpled?

The flat paper had more surface area that made it slow down more as it moved through the air. The crumpled paper had less surface area so it moved through the air faster than the flat piece of paper.

Take a Guess!

What would be a better shape to use for designing aircraft? Why?

Student answers will vary. Aircraft are designed to be aerodynamic so that there is less drag affecting the speed of the aircraft. However an aircraft would not be able to be created in the shape of a ball, because lift cannot be achieved. The flat paper would be comparable to the wings of an aircraft which not only helps create lift on an aircraft, but also helps the plane to slow down when it is coming in for a landing.

Glossary

After completing the pre-visit lessons, students should have a basic understanding of the following terms and concepts:

Aerodynamic is the word used to describe an object that is streamlined and can effectively cut through the air without producing too much drag.

Aerodynamics is concerned with studying the motion of air, particularly when it interacts with a moving object.

Ailerons are hinged control surfaces attached to the wing of an airplane.

Aircraft Carrier is a large ship designed to complete its primary function which is to launch and recover aircraft on its flight deck.

Airport is a land based airfield equipped with control tower and hangars as well as accommodations for passengers and cargo.

Catapult is a mechanical device used to throw a projectile a great distance.

Correlation is a relation between two or more variables.

Data is a collection of facts from which conclusions can be drawn through interpretation.

Drag is the phenomenon or resistance to motion through a fluid.

Flaps are moveable airfoils that are part of an aircraft wing used to increase lift or drag.

Flight Deck is the upper most full deck of an aircraft carrier where take offs (launches) and landings (recovery) of aircraft is accomplished.

Force is the influence that produces a change in a physical quantity.

Foot is a unit of length that equals 12 inches or a third of a yard.

Graph is a visual representation of the relations between certain quantities plotted with reference to a set of axes.

Gravity is the force of attraction between all masses in the universe; especially the attraction of the earth's mass for bodies near its surface.

Hangar Deck is the deck of the aircraft carrier where aircraft are stored and maintained when they are not in use. The hangar deck is located below the flight deck.

Hypothesis is a guess, or a proposal intended to explain certain facts based on observations made.

Interpret is to explain or tell the meaning of recorded data.

Launch is to propel with force.

Lift is to raise from a lower to a higher position.

Observation is the act of making a remark expressing careful consideration after observing something.

Prediction is a statement foretelling possible outcomes of an experiment.

Rate is a magnitude or frequency relative to a time unit.

Record is to document an event or data by writing it down.

Recover is to return to or land on an aircraft carrier.

Result is the final consequence of an event or action.

Runway is a strip of surface on land where an airplane can take off and land.

Surface Area is the measure of how much exposed area a solid object has.

Theory is a well-substantiated explanation of some aspect of the natural world.

Thrust is the force used in pushing an object.

Time is an instance or single occasion for some event.

Suggested Reading for Aviation/Aeronautics

All Annotations provided from Amazon.com or BarnesandNoble.com

3rd-5th Grade

A is for Airplane: An Aviation Alphabet, Mary Ann McCabe Riehle. Chelsea, MI; Sleeping Bear Press, 2009.

In the Alphabet Series' usual cheerful style, each spread in this picture book combines a quick rhyme for each letter, a dramatic watercolor painting, and a long detailed sidebar packed with history and technology. The science and engineering will grab older readers, from the facts about the International Space Station (orbiting the Earth every hour and a half at an altitude of over 200 miles) to the details about becoming a pilot. Then there is the fascinating history of the Tuskegee Airmen, including the prejudice they suffered and their achievements; the biographies of pioneers Amelia Earhart, Charles Lindbergh, and the Wright Brothers; and the National Air and Space Museum today.

Amelia Earhart: The Legend of the Lost Aviator, Shelley Tanaka. New York; Abrams, Harry N Inc, 2008.

Ever since Amelia Earhart and her plane disappeared on July 2, 1937, people have wanted to know more about this remarkable woman. Amelia Earhart follows the charismatic aviator from her first sight of an airplane at the age of ten to the last radio transmission she made before she vanished. Illustrated with original artworks, contemporary photographs, quotes, and details, this is a great introduction to the famous pilot. The book includes a bibliography and an index.

Born to Fly: The Heroic Story of Downed U.S. Navy Pilot Lt. Shane Osborn, Shane Osborn. New York; Delacorte Books for Young Readers, 2001.

A fascinating story of endurance, courage, and patriotism. French has adapted Osborn's adult book for young people. He tells the story of a boy's dream to become a pilot, his formal flight training in the Navy, and how his skill and stamina were tested as commander of an EP-3E reconnaissance aircraft. In April, 2001, an in-flight collision with a Chinese fighter over China during a routine surveillance mission turned into an international incident. Osborn managed to land the damaged aircraft, save his crew, and survive interrogation and imprisonment by the Chinese. He inspired his crew to get through their ordeal and came out a hero to all. The book reads like fiction, with lots of dialogue. The brief glossary of aviation terms is useful and the photos and map enhance the readable text. Black-and-white photos appear in an eight-page center section. A good choice for anyone considering a career in the military and for fans of true-adventure survival stories.

Career Opportunities in Aviation and the Aerospace Industry, Susan Echaore-McDavid. New York; Checkmark Books, 2005.

Since September 11, 2001, the airline industry has faced severe setbacks and economic losses, but with heightened security measures and increased sales, it is finally stabilizing and making room for new jobs and opportunities.

Cromwell Dixon's Sky Cycle, John Nez. New York; Putnam Juvenile, 2009.

In 1907, a 14-year-old boy named Cromwell Dixon took to the sky in a flying bicycle that he designed and built with the help of his mother. Nez re-creates his amazing feat in this lively account filled with informative and fascinating images. Despite disappointment (an early prototype caught fire) and mistakes (a too-heavy vehicle), the teen persevered. He eventually made a glorious showing in his flying bicycle, soaring above the highest buildings in his hometown of Columbus, OH. Later that year, Dixon entered his Sky-Cycle in the St. Louis Airship Carnival, taking home a prize. The time period is depicted with often-amusing illustrations that exude an old-fashioned flair while also inviting inspection. A one-page biography tells of Dixon's lifelong endeavors.

DK Pockets: Aircraft, DK Publishing. New York; DK Publishing, Inc, 2005.

Back by popular demand, this series of information books for children ages 8 and over are the same handy size with a fresh new design. All the facts kids need to know about natural history, science, and history topics are in these information-packed little books. Also included are reference books everyone can use-dictionaries in English and Spanish, encyclopedias in key areas, a thesaurus, and a spelling dictionary.

Flying Machine, Andrew Nahum. New York; DK Publishing, Inc, 2004.

Be an eyewitness to how humans first realized the dream of taking flight, and see the remarkable and stunningly different machines that have whisked us up, up, and away. Discover why a rotary engine is designed to rotate when in use. See a hot-air balloon being inflated. Find out about the construction of a World War I fighter plane.

Seaplanes: And Naval Aviation (The Story of Flight), Ole Steen Hansen. New York; Crabtree Publishing Company, 2003.

Describes aircraft that take off from ships or land on water and their use in military action and rescue, as well as for scientific research and commercial purposes.

6th-8th grade

Black Eagles: African Americans in Aviation, Jim Askins. New York; Scholastic Inc, 1995.

A labored effort to create a comprehensive picture of pioneers in black aviation, from Eugene Bullard, who served in the French flying corps in World War I when the U.S. Army would only allow whites to fly, to the first black astronauts. Readers who think that the story of African Americans in aviation begins with the World War II Tuskegee squadron and ends with astronaut Mae Jemison will note that nearly a third of this book is devoted to African Americans who flew during the period before World War II.

Carrier War: Aviation Art of World War II, Paul Stillwell. New York; Friedman Fairfax, 2007.

Breathtaking paintings by the most respected aviation and military artists, preserve the moment when the aircraft carrier became the cornerstone of naval warfare. The British, Japanese, and US fleets all obtained true carriers, with their numbers growing wildly by World War II. Written, with gripping historical anecdotes, by a renowned military historian.

Flight: A history of aviation in photographs, T.A. Heppenheimer. Buffalo, NY; Firefly Books, 2004.

Fortunately the Wright brothers' first flight was captured forever by photography. A spectacular visual record accompanies every step of aviation's astonishing advances, and memorable images record travel events, such as the Hindenburg disaster. Flight is a comprehensive history of air travel as told through four hundred dramatic photographs. The book covers aviation history from the first attempts at flight to the latest aircraft. Flight includes the early pioneers of gliders and even a steampowered model plane that predated the Wrights' success at piloting a sustained powered flight.

The Wright Brothers: Inventors and Aviators, Andrew Santella. Chanhassen, MN; Child's World, 2003.

Briefly describes the life and accomplishments of Orville and Wilbur Wright, aviation pioneers.

U. S. Army Special Operations Command: Night Stalkers Special Operations Aviation, Andrea L. Weiser. Mankato, MN; Capstone Books, 2000.

Introduces the special force of the United States Army known as the Night Stalkers including their history, training, and equipment.

6th-12th grade

Amelia Earhart: Legendary Aviator, Brenda Haugen, Rosemary G. Palmer, and Michele Cervone. Minneapolis, MN; Coughlan Publishing, 2006.

Amelia Earhart gained worldwide fame in 1928 when she became the first woman on a transatlantic flight. Her lifelong accomplishments as an aviator influenced pilots in the United States and throughout the world. Her bravery encouraged women to learn to fly and fulfill their dreams. On her attempt to circum-navigate the globe at the equator, Earhart and her plane vanished and were never found. But her memory endures as a symbol of adventure, courage, and perseverance.

Federal Aviation Administration, Chelsea House Publications. New York; Chelsea House Publishers, 2002.

Discusses the history and development of the Federal Aviation Administration, current issues facing this agency, and challenges for its future.

Flight: 100 years of Aviation, R. G. Grant. New York; DK Publishing, inc, 2002.

This sweeping compendium of milestones in 20th-century aviation history is published in association with the Smithsonian's National Air and Space Museum, which may account for its rigorous attention to detail. Grant (The Berlin Wall) offers a wealth of supportive information to complement his engagingly written text. Succinct offset biographies sketch the lives and contributions of aviation's pioneers (both men and women), scientists, promoters, businessmen, barnstormers, racers, designers and manufacturers, aces (from World War I to Vietnam), and astronauts and cosmonauts.

Flyboys: A True Story of American Courage, James Bradley. New York; Little, Brown and Company, 2003.

Flyboys is the true story of young American airmen who were shot down over Chichi Jima. Eight of these young men were captured by Japanese troops and taken prisoner. Another was rescued by an American submarine and went on to become president. The reality of what happened to the eight prisoners has remained a secret for almost 60 years. After the war, the American and Japanese governments conspired to cover up the shocking truth. Not even the families of the airmen were informed what had happened to their sons. It has remained a mystery—until now.

Mastering the Sky: A History of Aviation from Ancient Times to the Present, James P. Harrison. New York; Sarpedon, 2000.

This remarkable book begins with the "miracle" of a 747 taking off, and then goes back to the very beginning of man's attempts to fly. The courageous, and sometimes tragic, story of flight includes dreamers, inventors, fighters, machines and now countless individuals who routinely travel in the air.

Unlocking The Sky: Glenn Hammond Curtiss and the Race to Invent the Airplane, Seth Shulman. New York; Harper Collins, 2002.

Unlocking the Sky tells the extraordinary tale of the race to design, refine, and manufacture a manned flying machine, a race that took place in the air, on the ground, and in the courtrooms of America. While the Wright brothers threw a veil of secrecy over their flying machine, Glenn Hammond Curtiss -- perhaps the greatest aviator and aeronautical inventor of all time -- freely exchanged information with engineers in America and abroad, resulting in his famous airplane, the June Bug, which made the first ever public flight in America. Fiercely jealous, the Wright brothers took to the courts to keep Curtiss and his airplane out of the sky and off the market. Ultimately, however, it was Curtiss's

innovations and designs, not the Wright brothers', that served as the model for the modern airplane.