

LESSON PLAN Step 3

Flying through Time

In this lesson, your students will observe photographs of selected twentieth-century aircraft at the National Air and Space Museum and note differences in the design of aircraft wings, fuselages, and engines.

Begin the activity by telling your students that they'll be looking at photographs of twentieth-century aircraft at the Smithsonian's National Air and Space Museum in Washington, D.C. Stress that these photographs will help them to understand some of the many approaches to aircraft design.

Direct your students to the Take-Home Page activity on pages 11–14. (*Depending on time and resource availability, you may complete the lesson as either a take-home or in-class activity.*) Tell them to observe carefully each aircraft. How are the wings shaped? How is the aircraft's body (fuselage) shaped? What type of engine does the aircraft appear to have? Is there any evidence of *streamlining* (designing the body of an aircraft so that it moves easily through the air)?

After your students have completed their observations, begin a class discussion about their findings. Ask them to consider if any of the aircraft display evidence of streamlining. Answers may vary, but students will probably note the wheel coverings and engine cowling of the Vega as well as the retractable landing gear and long, narrow fuselages of the 727 and the X-15.

Next, direct your students to a comparison of the X-15 and the Vega. How do their wings differ? Students will probably conclude that the X-15 has shorter, thinner, and more swept back wings. Emphasize that airplanes designed to fly faster than the speed of sound use wings like these to reduce the substantial force of drag in supersonic flight.

Conclude the activity by asking your students to evaluate the type of materials used in each aircraft. Students will likely conclude that cloth, wood, and metal have been used in the example aircraft. Emphasize that the choice of materials depends largely on the desired speed and performance of an aircraft and that each

Some possible aircraft observations

(For more detailed information on each aircraft, refer students to a school or local public library or to the National Air and Space Museum's World Wide Web site, <http://www.nasm.si.edu>.)

Wright Flyer (1903)—two wings (biplane), wooden frame with stretched fabric, small piston engine, pilot lies on wing, no landing gear, two propellers

Vega (circa 1930)—single wing (monoplane), tapering wooden fuselage, fixed landing gear, engine in front, streamlined covering (cowling) over engine, wing over cockpit

Boeing 727—(first produced in 1964 and still in service)—swept-back wings, retractable landing gear, three jet engines attached to tail of aircraft, streamlined metal fuselage, large in size.

X-15 (circa 1960)—fuselage shaped like a rocket, rocket engine at the back of the aircraft, short wings.

plane featured in the activity was designed around the engine power available during the time when it was built.

Stress that the Wright Brothers chose large wings and a lightweight frame for their Flyer to compensate for their relatively weak engine. Alternately, the designers of the Vega concentrated on reducing drag by removing wires and struts and encasing a much more powerful engine within a streamlined cowling.

The high-powered jet engines available by the

1960s allowed the engineering team of the Boeing 727 airliner to use high-strength materials and thin, swept-back wings that reduced drag and increased speed to nearly 600 miles per hour.

Engineers at the National Aeronautics and Space Administration (NASA) who worked on the X-15 project had even more available power in the form of rocket engines. The focus of their experimental work was to develop the highly streamlined fuselage, short wings, and heat-resistant materials necessary for supersonic flight.



TAKE-HOME PAGE TRABAJO PARA HACER EN LA CASA

Observe and Describe Observa y Describe

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Aircraft body (fuselage)
El cuerpo de la aeronave (el fuselage)

Streamlining
La aerodinámica de la nave



The Wright Flyer (1903)

Wing shape
La forma del ala

Engine
El motor

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*Lockheed Vega (circa 1930)
Lockheed Vega (alrededor de 1930)*

Wing shape
La forma del ala

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*Boeing 727 (first produced in 1964 and still in service)
Boeing 727 (Este tipo de avión fue manufacturado por primera vez en 1964. Este tipo de avión aun sigue en servicio.)*

Wing shape
La forma del ala

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X-15 (circa 1960)
X-15 (alrededor de 1960)

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