

# *NASA AT 50*

## *1959: X-15 Aircraft Makes Its First Flight*

### **Teacher's Guide**



**Grade Level:** 6–12    **Curriculum Focus:** Science, Social Studies    **Running Time:** 5 minutes

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### Introduction

*NASA at 50* acquaints students with key innovations and milestones in chemistry, physics, engineering, and space exploration from NASA's fifty-year history. Each clip serves as a gateway for extended lessons in science and history, promoting critical thinking and inquiry as essential components of scientific literacy.

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### Program Description

Explores how NASA developed the X-15 aircraft, the first American plane to reach hypersonic flight. To combat the intense heat faced by planes that reach space altitudes, NASA researchers built the X-15 with a tough titanium skeleton and a skin surface of a chrome-nickel alloy known as Inconel X. The X-15 missions provided important data on hypersonic air flow, aerodynamic heating, control and stability at hypersonic speeds, and piloting techniques needed for reentry. The successful program contributed to all future NASA space projects up to the space shuttle.

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### Learning Objectives

After viewing the program and participating in discussion, students will be able to:

- Explain how NASA accomplished its goal of successful hypersonic flight;
  - Describe how the innovative X-15 aircraft paved the way for space exploration;
  - Identify the characteristics of a plane that can travel to the edge of space.
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### Classroom Connections

What were some of the major concerns about building a plane that could reach such high altitudes? How did the plane's engineers attempt to battle these concerns?

What were some of the metals and materials used to build the X-15?

Describe what is meant by building a “pure research plane.”

What did John V. Becker say was the biggest accomplishment of hypersonic flight?

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## Classroom Activities

Have students visit <http://www.chemicalelements.com> and investigate the interactive Periodic Table of Elements. Titanium and aluminum were alloys used to make the X-15 aircraft. Students should look up these two metals on the chart. What are their symbols, what are they made of, and what are their characteristics? Why would these be good materials to use on a plane traveling five times the speed of sound?

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## Target Vocabulary\*

**aerospace** - space comprising the earth's atmosphere and the space beyond

**altitude** - the vertical elevation of an object above a surface

**hypersonic** - of or relating to speed five or more times that of sound in air

**titanium** - a silvery-gray light strong metallic element obtained from ilmenite and rutile and used especially in alloys and combined in refractory materials

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## Academic Standards

National Science Teachers Association

The National Science Teachers Association (NSTA) has developed national standards to provide guidelines for teaching science. To view the standards online, go to <http://www.nsta.org/publications/nses.aspx>.

This guide addresses the following standards:

- Science and Technology
- Earth and Space Science
- People, Places, and Environments
- Science in Personal and Social Perspectives
- History and Nature of Science

National Council for the Social Studies

The National Council for the Social Studies (NCSS) has developed national standards to provide guidelines for teaching social studies. To view the standards online, go to <http://www.socialstudies.org/standards/strands/>.

This guide addresses the following standards:

- Time, Continuity, and Change
- People, Places, and Environments
- Science, Technology, and Society
- Individuals, Groups, and Institutions