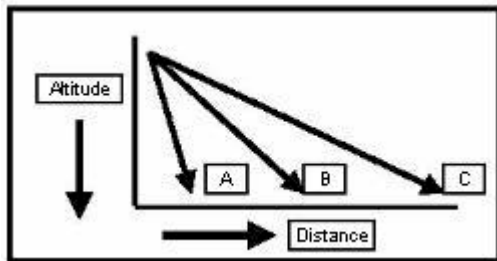


Note: This is the challenge developed by NASA. For our state-wide program, we add one additional stage – the selection of the four teams to present to NASA and the world during our celebration on December 15. Participating teams must post a simple Web page to report the results of their inquiry. The four teams who demonstrate that they have most successfully met the challenge (see our rubric) are invited to present either here from Raleigh or from a videoconferencing center near their school.

### Can a Shoebox Fly Challenge



Audience: Students, Educators: K-12, Informal Educators  
Grade Level: 5-8,9-12

Focus Question: Using your research skills and applying your knowledge of flight dynamics, can you design a shoebox to glide?

#### Description:

Join NASA in this unique design challenge. Learn how to apply theoretical knowledge with design limitations to produce a working glider model. Experience the team planning and design challenges needed to carry through a design concept to a successful demonstration in the world of aeronautical engineering.

#### Instructional Overview:

#### Students will:

- Research the dynamics and forces of flight
- Apply their understanding of flight to the design, construction, and test flight of a shoebox-based glider
- Collect measurements and calculate glide-slope aspect ratios
- Provide a visual and oral summary of their design and test solutions

#### Lesson Plan/Activities:

[http://nasadln.nmsu.edu/dln/admin/media/download.jsp?file\\_id=71](http://nasadln.nmsu.edu/dln/admin/media/download.jsp?file_id=71)

#### Sequence of Events

Pre-Conference **The links below are previews of the activities only. For the Activities: complete module and event information, please see the Activities and Lessons link above.**

**Activity #1:** Students will complete a pre-conference investigation assessment of basic aeronautical terminology and principals to be discussed during the conference.

[http://nasadln.nmsu.edu/dln/admin/media/download.jsp?file\\_id=69](http://nasadln.nmsu.edu/dln/admin/media/download.jsp?file_id=69)

**Activity #2: Design and Fly a Shoebox.** Students will work individually or in teams to design, build and test their own shoebox glider.

[http://nasadln.nmsu.edu/dln/admin/media/download.jsp?file\\_id=70](http://nasadln.nmsu.edu/dln/admin/media/download.jsp?file_id=70)

**Videoconference** During the first video conference, students will interact with a NASA Education Specialist and learn about the past and future efforts of flight and aircraft designs, as well as the principals of lift and how to calculate the glide slope ratio. Students will then be issued a challenge to make a shoebox fly.

During the second video conference, students will do formal presentations back to the NASA Education Specialist to show their end design and calculated glide slope ratios as determined by their test flights. The flight test information should be presented back to NASA using visuals such as PowerPoint or videos to demonstrate their results.

**Post-Conference** After the challenge is issued, students will use the resources provided as well as their own to design and test their shoebox glider. They will calculate their glide slope ratios and prepare a formal presentation for the next conference with NASA.

Students will complete the post conference quiz to assess their knowledge gained from the challenge.

[http://nasadln.nmsu.edu/dln/admin/media/download.jsp?file\\_id=68](http://nasadln.nmsu.edu/dln/admin/media/download.jsp?file_id=68)

## Standards

### **NATIONAL SCIENCE EDUCATION STANDARDS (NSES)**

Science as Inquiry - Content Standard A: As a result of activities in grades 5-8 and 9-12, all students should develop:

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

Science and Technology - Content Standard E: As a result of activities in grades 5-8 and 9-12, all students should develop:

- Abilities of technological design

The Great Shoebox Glider Challenge and Air Show  
Celebrating the 103<sup>rd</sup> Anniversary of the Wright Brothers' Invention of Powered Flight

- Understandings about science and technology

### **NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS (NCTM)**

Standard 4 - Measurement

- In all grades students should apply a variety of techniques, tools, and formulas for determining measurement

Standard 8 - Communication

- In all grades students should organize and consolidate their mathematical thinking to communicate with others
- Express mathematical ideas coherently and clearly to peers, teachers and others

### **INTERNATIONAL TECHNOLOGY EDUCATION ASSOCIATION (ITEA)**

Design - Standard 10

- Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving

The Designed World - Standard 17

- Students will develop an understanding of and be able to select and use information and communication technologies