How To Use This Guide

Rockets are the oldest form of self-contained vehicles in existence. Early rockets were in use more than two thousand years ago. Over a long and exciting history, rockets have evolved from simple tubes filled with black powder into mighty vehicles capable of launching a spacecraft out into the galaxy. Few experiences can compare with the excitement and thrill of watching a rocket-powered vehicle, such as the Space Shuttle, thunder into space. Dreams of rocket flight to distant worlds fire the imagination of both children and adults.

With some simple and inexpensive materials, you can mount an exciting and productive unit about rockets for children that incorporates science, mathematics, and technology education. The many activities contained in this teaching guide emphasize hands-on involvement, prediction, data collection and interpretation, teamwork, and problem solving. Furthermore, the guide contains background information about the history of rockets and basic rocket science to make you and your students "rocket scientists."

The guide begins with background information on the history of rocketry, scientific principles, and practical rocketry. The sections on scientific principles and practical rocketry focus on Sir Isaac Newton's Three Laws of Motion. These laws explain why rockets work and how to make them more efficient.

Following the background sections are a series of activities that demonstrate the basic science of rocketry while offering challenging tasks in design. Each activity employs basic and inexpensive materials. In each activity you will find construction diagrams, material and tools lists, and instructions. A brief background section within the activities elaborates on the concepts covered in the activities and points back to the introductory material in the guide. Also included is information about where the activity applies to science and mathematics standards, assessment ideas, and extensions. Look on page 3 for more details on how the activity pages are constructed.

Because many of the activities and demonstrations apply to more than one subject area, a matrix chart identifies opportunities for extended learning experiences. The chart indicates these subject areas by activity title. In addition, many of the student activities encourage student problem-solving and cooperative learning. For example, students can use problem-solving to come up with ways to improve the performance of rocket cars. Cooperative learning is a necessity in the *Altitude Tracking* and *Balloon Staging* activities.

The length of time involved for each activity varies according to its degree of difficulty and the development level of the students. With the exception of the *Project X-35* activity at the guide's end, students can complete most activities in one or two class periods.

Finally, the guide concludes with a glossary of terms, suggested reading list, NASA educational resources including electronic resources, and an evaluation questionnaire. We would appreciate your assistance in improving this guide in future editions by completing the questionnaire and making suggestions for changes and additions.

A Note on Measurement

In developing this guide, metric units of measurement were employed. In a few exceptions, notably within the "Materials and Tools" lists, English units have been listed. In the United States, metric-sized parts such as screws and wood stock are not as accessible as their English equivalents. Therefore, English units have been used to facilitate obtaining required materials.

Activity Format