

## NGSS Correlations

### Reaction Rocket RKT-625/630

#### Elementary

##### 4-PS3-4

Students can use Reaction Rocket to design, test, and refine a device that converts energy from one form to another.

##### 3-5-ETS1-3

Students can use Reaction Rocket to plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

##### K-PS2-2

Students can use the Reaction Rocket in an investigation to explore flight and analyze data to determine if a design solution works as intended to change the speed and direction of an object with a push or a pull.

##### K-2-ETS1-1

Students can use the Reaction Rocket to plan an investigation to ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

#### Middle School

##### MS-PS3-5

Students can use Reaction Rocket to construct, use and present arguments or experiments to support the claim that when the motion energy of an object changes, energy is transferred to or from the object.

##### MS-ETS1-4

Students can use Reaction Rocket to develop a model or experiment to generate data for iterative testing and modification of a proposed object, tool or process such that an optimal design can be achieved.

##### MS-PS2-2

Students can use the Reaction Rocket to plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

##### MS-ETS1-4

Students can utilize the Reaction Rocket as a prototype to develop a model to generate data for interactive testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

#### High School

##### HS-PS3-4

Students can use Reaction Rocket to design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

##### HS-ETS1-2

Students can use Reaction Rocket in an investigation to design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

##### HS-PS2-1

Students can use the Reaction Rocket to plan a flight investigation to gather scientific evidence. Students can analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

### **K-2-ETS1-2**

Students can use the Reaction Rocket to develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

### **K-2-ETS1-3**

Students can use the Reaction Rocket in an investigation to utilize engineering skills and proper testing methods of materials and design.

### **3-PS2-2**

Students can make observations and/or measurements of the Reaction Rocket flights in an investigation. Students can utilize an object's motion to provide evidence that a pattern can be used to predict future motion.

### **3-5-ETS1-1**

### **3-5-ETS1-2**

### **3-5-ETS1-3**

Students can use the Reaction Rocket in an investigation to plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

### **Suggested Science Idea(s)**

Students will get a blast out of launching rockets with the Reaction Rocket. A classroom/wind free environment is all you need to start flying.

The Reaction Rocket presents a simple and dramatic demonstration of energy transfer.

Students can explore all of Newton's laws of motion, energy transfer, aerodynamics, and more. Students can use the rocket as a prototype, for future engineering investigations.

The Reaction Rocket uses gravity for its initial motion and the transfer of elastic potential energy to propel the rocket. Allow students to design and manipulate variables such as drop height and launch surface to explore many facets of flight, force and motion.

### **HS-ETS1-2**

Students can use the Reaction Rocket as a prototype in an investigation to provide evidence that students will use to modify a rocket. Students can design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

### **HS-ETS1-4**

Students can use the Reaction Rocket to plan a flight investigation that includes the use of computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Encourage students to utilize mathematical equations in their investigations for flight and landing proximity. Set up height measurements and targets for criteria based hands-on learning.

An interesting element to introduce into the lessons and investigations is the use of the slow-motion video option on many phones. The slow action will allow students to look more closely at the forces during an investigation. Students can utilize the stop action on the video to collect precise data/measurements to identify parts of flight.

Private industry is now the guiding force in the United States space program. Challenge students to research current space programs and then come up with their own real-world problems that need engineering solutions. Enable students to break down the flight tasks to embark on their own Reaction Rocket mission.

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