**Phases of a Rocket’s Flight**

**TechShop RDU Founder and UAV Pilot**

**DESCRIPTION**: In this activity, students will be monitoring the height of a model rocket. The students will investigate the flight of a rocket by studying the input and output of a “function machine”. Then visualizing the height vs. time graph in a simplified parabolic shape.

In an Advanced Functions and Modeling, the students can use data from an actual rocket launch. This will allow the students to analyze the 3 phases of rocket flight: the boost phase, the coast phase, and the recovery phase. The 3 phases combine to create piecewise function that begins exponential, becomes quadratic, and finishes as a linear function.

**MATERIALS**:

For the parabolic activity:

Algebra 1 Fathom Book Activity, Student Experiment Handout and Questions

For the AFM Extension:

-SkyTrax rocket data set and Fathom Workspace

-Pre-Launch Calculations page

-Launch Day Calculations page

-Post Launch Modeling Packet

For an actual launch:

-Estes launch starter set that includes a payload rocket

-PerfectFlite Pnut Altimeter and USB data capture cord

**BEFORE YOU BEGIN**:

Grab the students’ attention with a launch video. There are lots to choose from including Apollo missions, and high powered model rockets reaching up to 100,000 feet.

After the introduction, have the student, or groups, sketch a graph of rocket height vs. time. Which is the independent variable/dependent variable? Make sure the students label and scale the x and y axis, allowing them to predict the height of the rocket, and the time of the total flight.

Carefully monitor, select, and sequence various student work. What went into their sketch? How high is their prediction? What is their flight time?

**\*At this point complete the first experiment/activity with the handout Model Rocket Flight with One Function.**

**\*If you choose to, go launch your rocket!!!**

If you choose to extend the lesson, or have students in a higher level course, continue with a discussion of the phases of the rocket’s flight. Based on the level of the class, consider discussing the following questions before starting the students on the activity. What is happening to the rocket when the motor is ignited? After the boost phase, what forces are acting on the rocket? What is the affect of the parachute on the rocket’s descent during the recovery phase?

**\*Please note that there is a modified version of the post launch questions that does not need the students to have a larger function “library”. These questions will compare the 2 data sets, and consider the forces acting on a rocket.**