

## EFA Sorties and New Generation Sunshine State Standards

### Basic Sorties

#### **Sortie Alpha: Parachute Factory**

**SC.5.N.1.1; SC.5.N.1.2; SC.5.N.2.1; SC.5.P.13.1; MA.5.G.3.1; MA.5.G.3.2; MA.5.G.5.1; MA.5.G.5.3**

Teams of students use provided materials and instructions to construct three plastic parachutes. Each parachute shape (circular, hexagonal and octagonal) is measured. Student data calculated and recorded includes circumference, diameter, area and length of parachutes cords. This sortie is the preparatory sortie to conduct Sortie Bravo: Falling Parachutes. The sortie may be conducted at the Museum but is recommended as a pre-visit activity.

#### **Sortie Bravo: Falling Parachutes**

**SC.5.N.1.1; SC.5.N.1.3; SC.5.N.1.6; SC.5.N.2.1; SC.5.N.13.1; SC.5.N.13.2; MA.5.G.5.1; MA.5.G.5.3; MA.5.S.7.2**

The student understands that an object in motion will continue at a *constant speed* and in a straight line until acted upon by a force. An object at rest will remain at rest until acted upon by a force.

Parachutes fall at a constant speed.

#### **Sortie Charlie: Forced Short**

**SC.5.N.1.1; SC.5.N.2.1; SC.5.P.13.1; SC.5.P.13.2; MA.5.G.5.1; MA.5.G.5.3**

Students will toss a balsa aircraft and record flight distance data. Students will then throw the balsa aircraft against the air blown by a fan and measure the flight distance data. A subsequent data analysis will be conducted of the distances and times of flight of each student's aircraft flight.

#### **Sortie Delta: Invisible Forces**

**SC.5.N.1.1; SC.5.N.2.1; SC.5.P.10.1; SC.5.P.10.2; SC.5.P.11.1; MA.5.G.5.1**

The student knows that many forces (e.g., gravitational, electrical, and magnetic) act at a distance (i.e., without contact)

Boxed compasses (magnetism) and electric current / voltage will be used to investigate invisible forces and their effects on each other.

#### **Sortie Echo: How Tall Is That?**

**SC.5.N.1.1; SC.5.N.2.1; MA.5.G.5.1; MA.5.G.5.2; MA.5.G.5.3; MA.5.G.5.4**

Students will construct an astrolabe to determine the height of several objects on the grounds of the USAF Armament Museum.

#### **Sortie Foxtrot: Make it Taller**

**SC.5.N.1.1; SC.5.N.2.1; SC.5.N.2.2; MA.5.G.5.1; MA.5.G.5.2; MA.5.G.5.3**

#### **Closed End Problem (Solving)**

Engineering is a problem solving activity. Students will use only materials provided to solve a problem.

Student teams will be provided a set of building materials. All the building material sets will be identical. The object is to have students build the tallest freestanding structure with only the materials provided.

### **Sortie Golf: Zoom Out**

**SC.5.N.1.1; SC.5.N.2.1; SC.5.E.5.2; SC.5.E.5.3; MA.5.G.5.1; MA.5.G.5.2; MA.5.G.5.3**

The student understands the vast size of our Solar System and the relationship of the planets and their satellites.

The student will name the eight planets and three dwarf planets of our Solar System, learn the name of each planetary body in order from the Sun, construct a scale model of the Solar System, and both learn and apply the definition of an Astronomical Unit (AU).

### **Sortie Hotel: Chopper**

**SC.5.N.1.1; SC.5.N.1.3; SC.5.N.2.1; SC.5.P.13.1; MA.5.G.5.1; MA.5.G.5.3; MA.5.A.1.3; MA.5.A.1.4**

The student knows that a change in one or more variables may alter outcome of an investigation. Students will learn the concepts of independent and dependent variables. Paper helicopters will be dropped and data collected. Helicopters will be modified and data collected. A subsequent data analysis will be conducted.

### **Sortie India: Target Practice**

**SC.5.N.1.1; SC.5.N.1.3; SC.5.N.2.1; SC.5.P.13.1; SC.5.P.13.2; MA.5.G.5.1; MA.5.A.2.3; MA.5.S.7.2**

Students will toss an airplane at a four-grid one-meter square target area target and collect data about where the airplane lands. Students will better understand how fractions, probabilities, percentages, and decimals are related to each other. Students will organize the collected data and see the relationships among fractions, probabilities, and percentages. The final step requires students to make a pie chart to display flight results and use the chart of the displayed collected data to brief their classmates.

### **Sortie Juliet: Mean Flight**

**SC.5.N.1.1; SC.5.N.1.3; SC.5.N.2.1; SC.5.P.13.1; SC.5.P.13.2; MA.5.G.5.1; MA.5.A.1.1; MA.5.A.1.4; MA.5.S.7.2**

Students will make a paper airplane, fly it, generate, use a data collection instrument, collect, record, organize, and interpret data collected during an experiment. Students will organize the collected data and determine the statistical values of **range**, **mean**, **median** and **mode** from the collected data.

### **Sortie Kilo: Air Derby**

**SC.5.N.1.1; SC.5.N.1.3; SC.5.N.2.1; SC.5.P.13.1; SC.5.P.13.2; MA.5.G.5.1; MA.5.G.5.2; MA.5.S.7.2**

The Air Derby is ostensibly a flying contest. Contestants throw paper airplanes or balsa airplanes to determine whose airplane flies the farthest, straightest and the

longest time in the air. However, the learning outcomes include distance and time measurement and the use of mathematics (Pythagorean Theorem) to solve distance problems. The longest time of flight will be measured with a stopwatch.

Teachers may use this activity as the culmination to a lesson on the theory of flight. The activity requires students to demonstrate what they have learned about airplanes and their control surfaces. The lesson, in fact, requires students to use measurement techniques (either English or Metric) to measure the distance the airplanes fly. A time measurement is also included to time the flight time of each airplane flight. The flight distances and times are compared to determine the winners.

### **Sortie Lima: Air Power**

**SC.H.1.3.4, SC.C.2.3.1, SC.6.N.1.1, SC.6.N.1.2, SC.6.P.11.1, SC.P.13.1, SC.7.P.10.3, SC.7.P.11.2, SC.7.11.3, MA.6.S.6.2**

The objective of this sortie is to compare turbine blades to determine which **blade shape** and air (**fan**) **speed** develops the most voltage. Teams measure four sample blade types and calculate the surface area of each blade. Students will test blade sets of the same shape by changing the speed of the fan. Voltage generated by the turbine blades with the different fan speeds will be measured with a visual (LED) display voltmeter and recorded on the data collection instrument. Students will analyze the recorded data and draw conclusions about the area and shape of turbine blades and fan speeds that are most efficient at developing the most voltage.

### **Sortie Mike: Metric Mission**

**SC.5.N.1.1, SC.5.N.2.1, MA.5.G.5.1, MA.5.G.5.2, MA.5.G.5.3,**

Students have difficulty in estimating dimensions and using measurement instruments. This sortie requires students to use several personal measurement tools to measure a collection of items. It also allows students to use a variety of metric measuring devices to measure the same items they measured with their personal measuring tools. The personal measurement followed by the metric measurement will allow students to get an idea of how to estimate the size of everyday (and not-so-everyday) sizes. The comparisons should prove interesting to the students.

### **Sortie November: Pace Counter**

**SC.5.N.1.1, SC.N.1.3, SC.5.N.2.1, MA.5.G.5.1, MA.5.G.5.2, MA.5.G.5.3,**

Students determine their individual 100 meter pace count and construct a pace counter from parachute (550) cord and plastic beads. Instructions for assembly and use of the pace counter are included in Part 4 of this sortie. The pace counter can be used as an aid to determine the distance from one point to another when navigating on foot. The pace counter may be used to complete the sortie entitled *From Here To There* at the USAF Armament Museum or at a teacher substituted location (school) as desired.

### **Sortie Oscar: From Here To There**

**SC.5.N.1.1, SC.5.N.2.1, MA.5.2.3, MA.5.G.5.1, MA.5.G.5.2, MA.5.G.5.3**

Navigation is the process by which we can determine where we are and use that information to get from where we are to where we want to go. This sortie requires

students to use the student constructed pace counter and their individual 100 meter pace count to measure the distance to several pre-selected locations and compare their measurements with the actual distances. Each pre-selected location is a Museum exhibit placard on a stand by the air vehicle it describes.

**Sortie Papa: LEGO® WeDo Robotiks  
NGSSS TDB**

This sortie is under development and will make its premier during the July 2011 EFA STEM Teacher Workshop.

Student teams will be provided laptops, software and task list to perform an elementary robotics project. The project required teams to use the laptops and software to design a robotic apparatus. After the design phase, students will construct the apparatus with LEGO WeDo pieces. The apparatus will perform various programmed instructions while students collect data for later analysis. This is a foundational level robotics activity designed to prepare students for later NXT/Tetrix robotics activities.

**Teacher Requested Activity** Teachers will be encouraged to select a FL DOE Next generation Sunshine State Standard for the EFA team to develop into an activity for use at the Air Force Armament Museum during future class visits.

Teachers may also suggest SSS to be developed into sorties by the EFA Team.

The goal of the EFA Team was to develop a total of 26 sorties. We currently have 27 in operation and two under development. EFA Lead Teachers may use operational sorties either at the Museum or at their respective schools.

## **EFA TTT Vocabulary**

### **Acceleration**

Rate of change in velocity usually expressed in meters per second; involves an increase or decrease in speed and/or a change in direction.

### **Air resistance**

Force of air on moving objects.

### **Circuit**

An interconnection of electrical elements forming a complete path for the flow of current.

### **Conservation of energy**

A fundamental principle stating energy cannot be created nor destroyed but only changed from one form to another.

### **Dependent variable**

Factor being measured or observed in an experiment.

### **Efficiency**

The relative effectiveness of a system or device determined by comparing input and output.

### **Electromagnetic radiation**

The emission and propagation of the entire range of electromagnetic spectrum including: gamma rays, x-rays, ultraviolet radiation, visible light, microwaves, and radio waves.

### **Independent variable**

The factor that is changed in an experiment in order to study changes in the dependent variable.

### **Inertia**

The property of an object, due to its mass, by which it resists change in its position unless overcome by force.

### **Magnetic field**

The region where magnetic force exists around magnets or electric currents.

### **Mass**

The amount of matter an object contains.

### **Potential energy**

Energy stored in an object due to the object's configuration and position.

**Pressure**

The force exerted per unit area.

**Radiation**

Emission form of energy in the form of rays or waves.

**Screw**

A type of simple machine that consists of an inclines plane wrapped around a cylinder.

**Speed**

Amount of distance traveled divided by the time taken; the time-rate at which any physical process takes place.

**Variable**

An event, condition, or factor than can be changed or controlled in order to study or test a hypothesis in a scientific experiment.

**Velocity**

The time-rate at which a body changes its position; defined as displacement divided by the time of travel.

**Wedge**

A type of simple machine that consists of an inclined plane used to separate two objects.