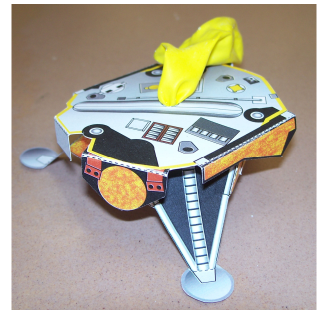
Balloon Powered Phoenix Mars Lander (simplified version) by Steve Widmark



Materials and tools:
1 parts sheet color printed on 110 lb (#110) card stock
1 balloon (lander flies best with a 5” balloon)
glue sick or white glue
scissors
Optional items:
hobby knife

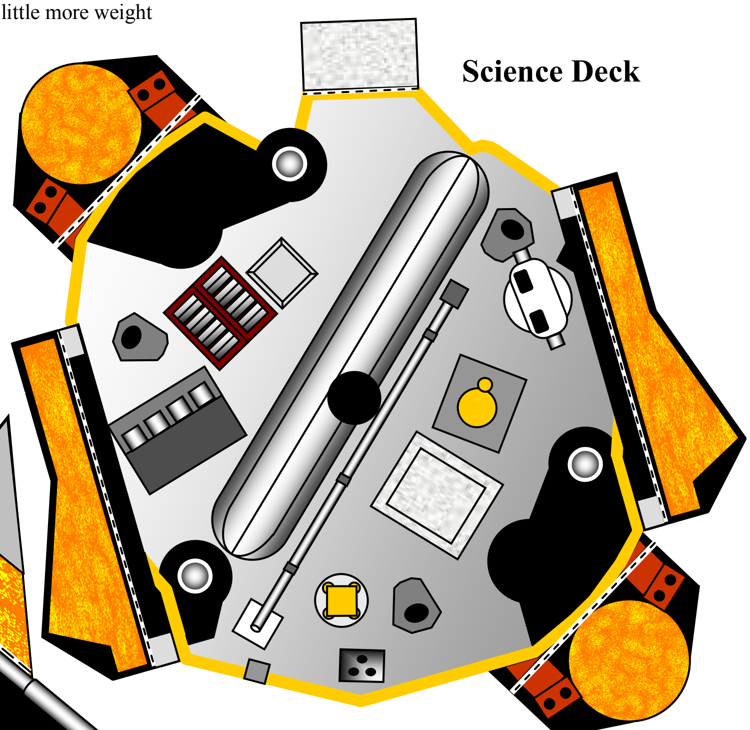
Directions:
Note: If the directions tell you to bend a panel down, this means to bend the panel down along a dotted linne with the printed portion of the part facing up. If the directions tell you to bend a panel up, this means to bend the panel up along a dotted line with the printed portion of the part facing up. The top side of a part is the side with the printing. The back side of a part is the side without any printing.

1. Cut out both parts. Do not cut along any dotted lines. Cut out the black circles in the center of each piece (a hobby knife works best).
2. Bend the five panels (two gpld solar panels, two gold fuel tanks and the white panel) on the outside of the science deck down at a 90º angle. On the base part, bend down along all dotted lines except for the circular landing pads. Bend these up along the dotted lines.
3. Put a dab of glue on each of the three gray triangles on the base. Glue these to the adjacent gold triangles so that the tips of the gold triangles overlap the gray triangles. This should hold the three landing legs downward at the proper angles.
4. Dab some glue on the large gray polygon in the middle of the base. Glue the base to the back of the science deck so that the holes in each piece are aligned.
5. Poke the nozzle of the balloon through the hole on the top of the science deck.

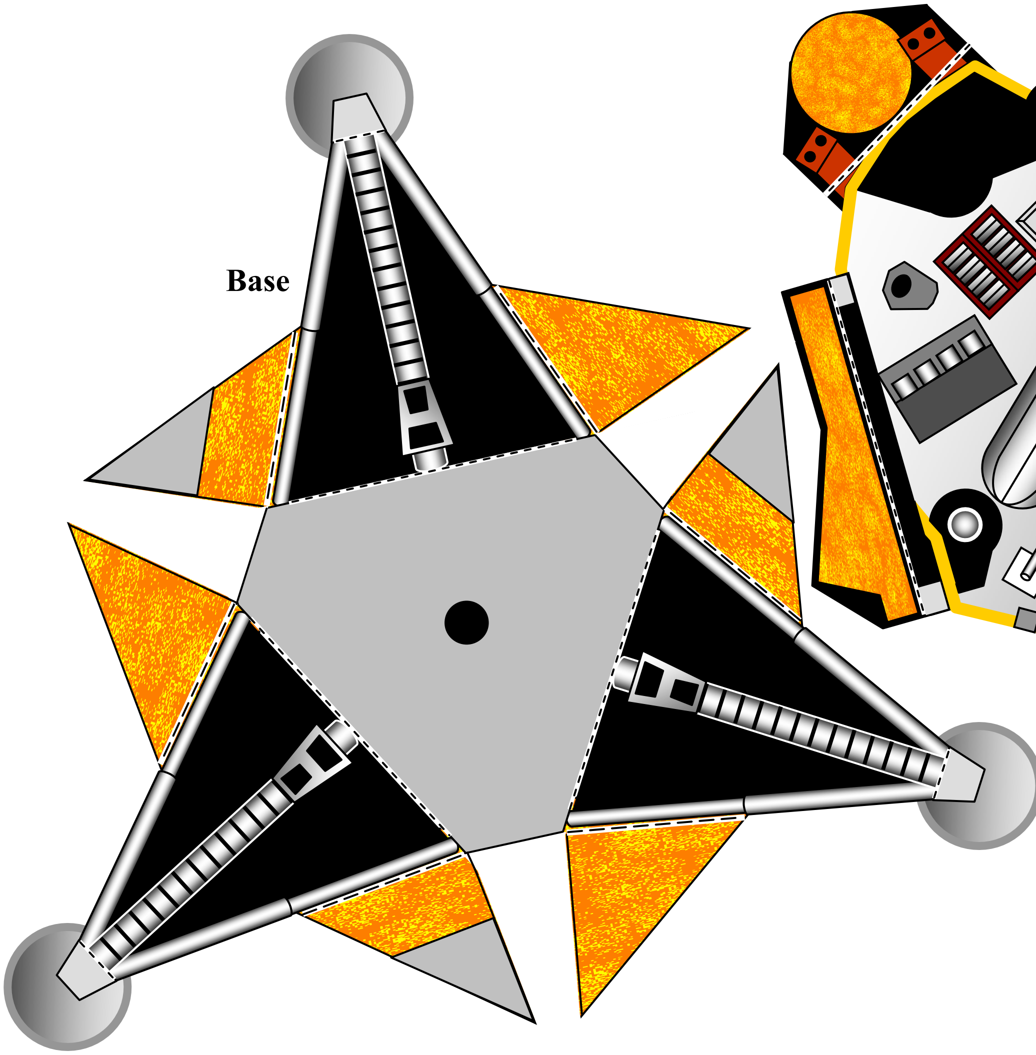
Flying the lander:
Inflate the balloon.   Trial and error will determine how much air to put into the balloon. A well-stretched balloon inflated to maximum size seems to work the best. After inflating, pull the balloon out so the rubber ring on the nozzle of the balloon lies flat against the back of the science deck and then put your thumb over the nozzle to keep the air in. Hold the lander up over your head (or stand on a chair). Release the lander in a level attitude. Ideally, it should make a powered descent all the way to the ground and land upright on its landing gear. If it does not, try the following:

1. Put a different amount of air in the balloon
2. Release it from a different height
3. Enlarge the hole in the bottom of the lander by gently working the tip of a pencil into the nozzle of the balloon.
4. Tape a large paper clip over the hole on the top of the lander to give it a little more weight
5. Try a different sized balloon.

Science Deck



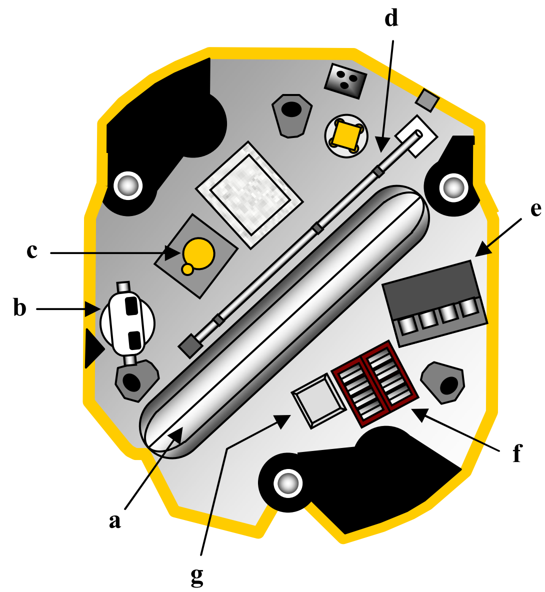
Base



What is Phoenix?

Phoenix is NASA's latest mission to Mars. Launched on a Delta II rocket on August 4th, 2007, the Phoenix lander will touch down in the northern region of Mars on May 25, 2008. Once there, it will dig into the Martian permafrost using a robotic arm and analyze the composition of the soil and ice it removes with a sophisticated automated laboratory. In a nutshell, the goal of the mission is to determine if the Martian surface is (or was) capable of supporting life. Unlike the previous rover missions to Mars that made bounce landings using air bags, Phoenix will make a powered landing employing twelve thrusters positioned around the spacecraft. The model demonstrates this method of landing with a single balloon "thruster." For more information about the Phoenix mission go to http://phoenix.lpl.arizona.edu

Instruments on the Phoenix science deck



a. Robotic Arm (RA) in protective cover
Delivers soil and ice samples from the surface to the TEGA and MECA instruments

b. Surface Stereo Imager (SSI)
Provides stereoscopic, high resolution images of the surface,

c. MET Light Detection and Ranging (LIDAR)
Uses a laser to measure the size and distribution of particles in the atmosphere.

d. Meteorological Station (MET) boom
Measures surface temperatures, wind speeds and pressures.

e. Microscopy, Electrochemistry and Conductivity Analyzer (MECA) Wet chemistry lab with optical and electron-force microscopes.

f. Thermal Evolved Gas Analyzer (TEGA)
Determines the composition of soil and ice samples from the surface by measuring the power needed to vaporize the samples.

g. Mass Spectrometer
Determines the composition of soil and ice samples vaporized in the TEGA.

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Additional copies of this model are available at www.paleoneon.com

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