CONTENTS OF THE PROBE DESIGN CENTER

INSTRUMENTS FOR THE DESIGN AND LAUNCH OF PROBES

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PROBE TYPE

Flyby: A flyby is used to explore many worlds with one probe. It takes a quick look at a world as it flies by. A flyby generally has less than 24 hours to gather information on a world as it zooms past. This means that it may not get a look at all parts of a world's surface.
Cost: $150,000

Orbiter: An orbiter is used to gather information about one world. As it makes many orbits around the world it can gather detailed information about the entire surface and study the world's weather patterns.
Cost: $500,000

Orbiter with Lander: This probe has two parts: an orbiter which remains in orbit around a world, and a lander, which is dropped from the orbiter onto the world below. As the lander descends it can be used to study the atmosphere of a world, if one is present. A lander is protected with thick materials that cushion the instruments inside. This prevents the instruments from being damaged when the lander hits the surface of a world. A lander sends the data it collects to the orbiter. The orbiter then sends this data back to Earth.
Cost: $800,000

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POWER SOURCE

Solar Panels: Solar panels convert sunlight directly into electricity. After launch, the panels unfold and provide power for the probe systems. They can also charge the batteries. Solar panels work only when the sun shines directly on them. The panels are ideal for missions that remain close to the sun, but beyond Jupiter other power sources may be needed if a probe is carrying more than two instruments.
Cost: $90,000

Battery: The batteries act as an energy buffer by storing energy. They can run probe systems in the dark when solar panels are useless. Batteries can be used for approximately one day before they are drained of their energy and need to be recharged.
Cost: $15,000

Thermoelectric Generator: A thermoelectric generator carries plutonium or uranium that it can use to produce electricity. It can operate in complete darkness or when the sun is very far away. It can be used to charge the probe's batteries.
Cost: $200,000

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COMMUNICATION

High Gain Antenna: Antennas act like the ears and voice of a probe, hearing instructions from Earth and sending back information. A high gain antenna sends a great deal of data in a focused beam back to Earth. This antenna must be pointed directly at the Earth in order for us to pick up its signal. Long range missions (beyond Mars) demand the big "ears" of a high gain antenna to send data back to Earth.
Cost: $150,000

Low Gain Antenna: A low gain antenna can send only a small amount of

information at one time, so it takes a long time for it to send all the data it collects. It does not need to be pointed at the Earth in order for us to pick up its signal. If a probe has a low gain antenna, we can communicate with it no matter what direction it is pointing. Low gain antennas can pick up commands sent from Earth even from great distances.
Cost: $30,000

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INSTRUMENTS

Magnetometer: A magnetometer checks for the presence and strength of a magnetic field. A magnetometer can be used in an orbiter or a flyby probe. As the probe flies by or around a world, the magnetometer creates a three dimensional map of the magnetic field surrounding the world.
Cost: $40,000

Wide angle camera: The wide angle camera can take pictures of a wide area. It can be used to take pictures of an entire world from orbiter and flyby probes, and it can be used on landers to take pictures of broad regions of the landscape. Scientists examine these pictures to learn about surface terrain and weather, and check for the presence of features such as craters, volcanoes, ice, or water.
Cost: $10,000

Narrow Angle Camera: A narrow angle camera is used for close examination of objects that are far away. It can take pictures from an orbiter or flyby of specific features on a world, such as craters, mountains, and valleys. This camera offers detailed magnified views that the wide angle cameras do not.
Cost: $10,000

IR camera: Infrared cameras take pictures of light waves that are not visible to the human eye, namely infrared radiation. Infrared pictures show how hot things are. This camera can be used from an orbiter or flyby to determine the temperatures of different areas on the surface of a world. It can also be used to find the location of volcanoes that are still active.
Cost: $140,000

Spectrograph: A spectrograph is an astronomical instrument to get and record spectra. The spectrograph collects samples of substances in the atmosphere or on the surface of a world, then conduct tests to determine their composition. It separates the light from objects into component colors of spectra. The spectra reveal information such as an object's composition, distance, or temperature.
Cost: $200,000

Thermometer: A thermometer can only measure the temperature of its immediate environment, so it is only useful on a lander. It is used to gather information about changes in temperature over a long period of time. It can be used under water.
Cost: $1,000

Barometer: A barometer is used to measure the pressure of the atmosphere pressing down on a world. A high reading on a barometer indicates that a world has a thick or deep atmosphere. In the vacuum of space or on a world without an atmosphere, a barometer will read zero pressure. Like the thermometer, it measures its immediate environment; therefore, it is useful only on a lander.
Cost: $1,000

RADAR: RADAR stands for RAdio Detection And Ranging. Radar on board spacecraft allows us to see below thick atmospheres and map the surface terrain of a world. It does this by bouncing a radio signal off of the surface of a world then "listening" for its echo. Scientists use this to find features on a world, such as mountains, caves, and canyons, that are hidden by a cloudy atmosphere. It would be used only in orbiters and flybys.
Cost: $15,000

Seismograph: Seismographs are instruments used to record and measure earthquakes. They detect and record vibrations caused by the movement of rock along fault zones. They produce a visual record called a seismogram, which shows the strength and location of the epicenter an earthquake. They can be used only in landers.
Cost: $60,000

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