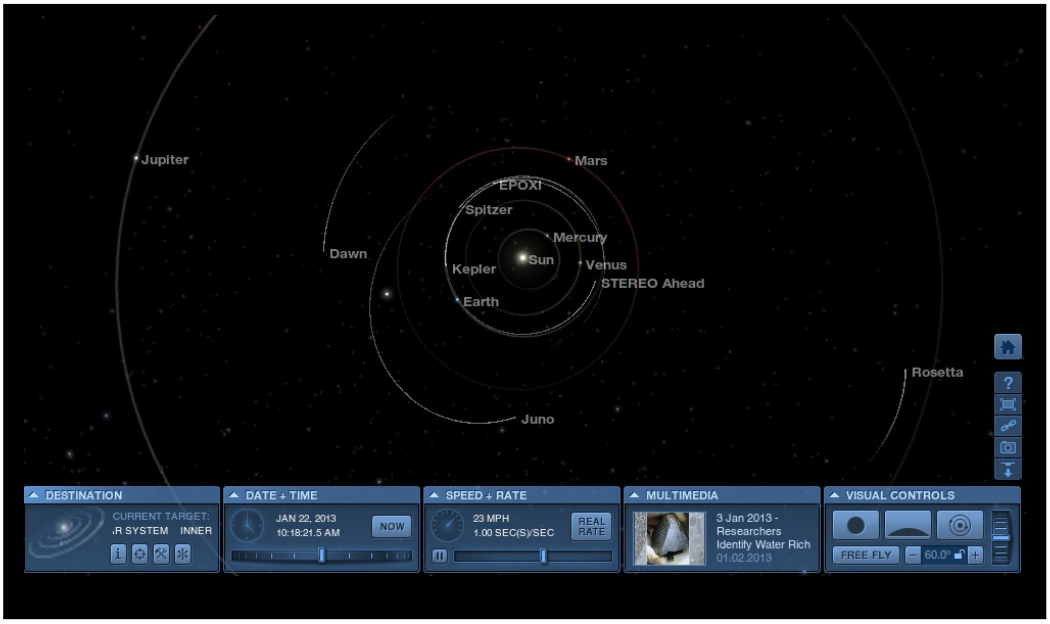
Eye Spy – Exploring Solar Power Systems



Get the Data

Visit EOSS **http://1.usa.gov/McwrUg** to recreate the scene above. Recommended operating system: MS Vista or later; Browser: MS Internet Explorer 8 or later.

Step 1 – Click on the 'Visual Controls' tab and make sure that the following items are selected with a 'white spot': spacecraft, planets, labels, orbit lines, trails and metric.

Step 2- Click on the lower left tab marked 'Destinations'. Select 'spacecraft' to bring up the NASA spacecraft that you can visit.

Answering Questions

Problem 1 - Find and click on 'Rosetta' and EOSS will move to the scene at URL – **http://1.usa.gov/Vg6wDw**. Each of the square panels measures 2.5m on a side. What is the total area for this array and its total power operating near Jupiter if the panels have an efficiency of G=6.5w/m^2?

Problem 2 - Find the Mars Global Surveyor and move to the scene near **URL=http://1.usa.gov/UeQ4Rp**. Each of the 4 panels measures 1.7m x 1.8m. If the panels have an efficiency of G=53 watts/m^2 of power at the distance of Mars, what is the total power generated?

Math Challenge

Challenge Problem: Rosetta is 2.8 times farther from the sun than Mars Global Surveyor. Show that the solar array G values are related by the Inverse-Square Law. Saturn is 1.8 times farther from the sun than Rosetta. What would be the total power generated by a solar panel with an area of 100 m^2 at the distance of Saturn?

Answer Key

Problem 1 - Find and click on 'Rosetta' and EOSS will move to the scene at URL – http://1.usa.gov/Vg6wDw. Each of the square panels measures 2.5m on a side. What is the total area for this array and its total power operating near Jupiter if the panels have an efficiency of G=6.5w/m^2?

Answer: There are 10 of these square panels, so the total area is A=10x2.5x2.5 = **62.5 m^2**. The total power will be P = 62.5 x 6.5 = **406 watts**.

Problem 2 - Find the Mars Global Surveyor and move to the scene near URL=http://1.usa.gov/UeQ4Rp. Each of the 4 panels measures 1.7m x 1.8m. If the panels have an efficiency of G=53 watts/m^2 of power at the distance of Mars, what is the total power generated?

Answer: 4 x 1.7 x 1.8 = **12.2 m^2**. P = 12.2 x 53 = **647 watts.**

Challenge Problem: Rosetta is 2.8 times farther from the sun than Mars Global Surveyor. Show that the solar array G values are related by the Inverse-Square Law. Saturn is 1.8 times farther from the sun than Rosetta. What would be the total power generated by a solar panel with an area of 100 m^2 at the distance of Saturn?

Answer: Rosetta, G=6.5 w/m^2 and Mars, G= 53 watts/m^2. The inverse-square law says that sunlight at Rosetta will be $1/(2.8)^2$ = 0.127 times as intense, so G at Rosetta will be G at Mars x 0.127, which is close to the actual ratio of 53/6.5.

At Saturn, sunlight is $1/(1.8)^2$ = 0.3 at Rosette, so G at Saturn would be 6.5 watts/m^2 x 0.3 = 1.95 watts/m^2. So for 100m^2 a solar panel at this distance would generate 100m2 x 1.95 = **195 watts**.