

Engineer a Satellite

1

PICK YOUR INSTRUMENTS

What would you like your satellite to observe about the Earth system?

Review the different types of instruments used for Earth observation and select up to 3 instruments you want onboard your satellite.

- | | |
|--|--|
| <input type="checkbox"/> Imaging Spectrometer | <input type="checkbox"/> Sounder Spectrometer |
| <input type="checkbox"/> Imaging Spectroradiometer | <input type="checkbox"/> Sounder Spectroradiometer |
| <input type="checkbox"/> Lidar | <input type="checkbox"/> Radar |

CALCULATE POWER REQUIREMENTS

2a

Calculate the total power required for all subsystems and instruments:

Every satellite needs systems to operate and maintain the satellite. Record the power required for each subsystem and instrument you choose. Total the power required.

Attitude Control subsystem Power _____

Communications subsystem Power _____

Data Handling subsystem Power _____

Thermal Control subsystem Power _____

Propulsion subsystem Power _____

Instrument Package: 1: _____ Power _____

Up to 3 instruments
you selected above

2: _____ Power _____

3: _____ Power _____

Total power required for all subsystems and instruments:

2b

Calculate the Electrical Power subsystem:

The solar array must generate twice the total power required to power the satellite and recharge the batteries for half of each orbit when the satellite is exposed to the sun.

Round answers up to the nearest whole number.

Solar Array: 1 solar array = 2400 Watts of power generated

Total power x2 / 2400 = arrays needed.

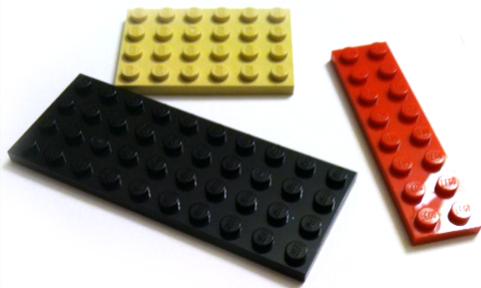
Battery: 1 cube = 300 Watts of power stored

Total power / 300 = batteries needed

MATERIALS

3a

Collect one of each subsystem:



Satellite bus - platform where all subsystems are mounted

Propulsion



Attitude Control



x-band antenna



Data Handling

Thermal Control



s-band antenna

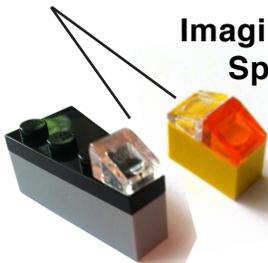


Communications

3b

Select instruments:

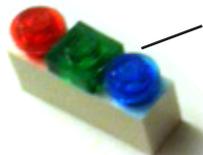
Spectrometers diffract energy similar to how a prism separates white light into a rainbow



Imaging Spectrometer

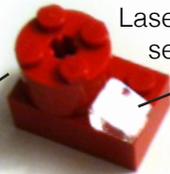
Sounder Spectrometer

Imaging Spectroradiometer



Filters isolate specific wavelengths of energy

Lidar



Optics to measure returned pulses

Laser to actively send pulses

Radar



Antenna to sense microwave pulses

Sounder Spectroradiometer



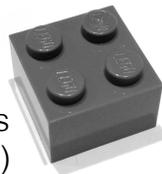
Reflector focuses Earth-emitted microwave radiation

3c

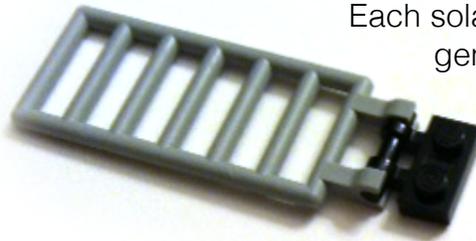
Collect batteries & Solar arrays (use calculation from 2b):



1x1 brick = 1 battery
(300 Watts of power)



2x2 brick = 4 batteries
(1200 Watts of power)



Each solar array can generate up to 2400 Watts of power.

4

BUILD - Assemble all subsystems on to the platform

5

ARE YOU READY FOR LAUNCH?

Weigh your satellite. If it is between 14g and 25g, congratulations, you're ready to launch!