Engineer a Satellite

1 SELECT YOUR INSTRUMENTS

What would you like your satellite to observe about the Earth system?
Check up to 3 instruments and record their power in Step 2.

☐ **Imaging Spectrometer** 100 Watts
Example: observe gases in the atmosphere ozone in the ozone layer.

☐ **Radar** 300 Watts
Example: provide observations about how much water is in a rain cloud.

☐ **Lidar** 250 Watts
Example: observe aerosols in the atmosphere such as ash after a volcanic eruption.

☐ **Imaging Spectroradiometer** 250 Watts
Example: for realistic images of the Earth's surface showing vegetation, oceans, and ice.

☐ **Sounder Spectroradiometer** 550 Watts
Example: observe how gases are layered in the atmosphere.

☐ **Sounder Spectrometer** 250 Watts
Example: shows where water vapor is located in the atmosphere - up high or down low.

2 CALCULATE POWER

To calculate the power requirements for your satellite, add up the wattage for all your instruments and 550 watts needed for the subsystems (Attitude Control, Communications, Data Handling, Thermal Control, Propulsion).

INSTRUMENT 1 _____ Watts

INSTRUMENT 2 _____ Watts

INSTRUMENT 3 _____ Watts

SUBSYSTEMS _____ Watts

TOTAL POWER required: ☐
place number in the "Total power" boxes below

3 CALCULATE ELECTRICAL 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

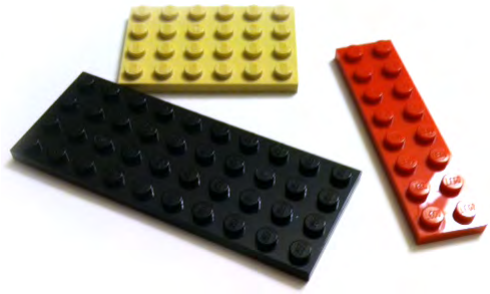
Total power ☐ x2 ☐ / 2400 = ☐ arrays needed

Battery: 1 cube = 300 Watts of power stored

Total power ☐ / 300 = ☐ batteries needed

4 COLLECT YOUR MATERIALS

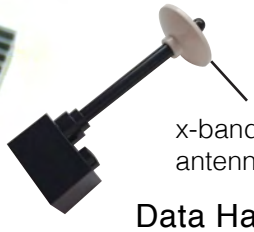
Collect one of each subsystem:



Satellite bus - platform where all subsystems are mounted

Attitude Control

Propulsion



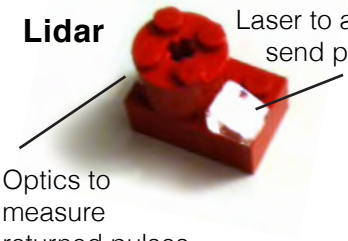
Data Handling

Thermal Control

Communications

Select instruments:

Lidar

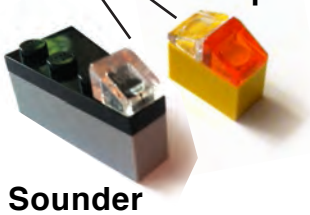


Radar

Antenna to sense microwave pulses

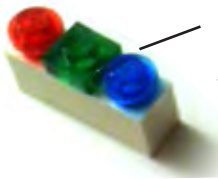
Spectrometers diffract energy similar to how a prism separates white light into a rainbow

Imaging Spectrometer



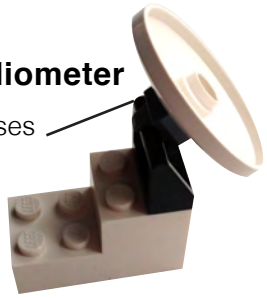
Sounder Spectrometer

Imaging Spectroradiometer



Sounder Spectroradiometer

Reflector focuses Earth-emitted microwave radiation



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.

5 BUILD - Assemble all subsystems on to the satellite bus.

6 ARE YOU READY FOR LAUNCH?

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