Build a Satellite

Team Name: _____

Team Members: _____

Your task is to build a model satellite out of available materials. Your satellite must include as many science instruments as possible to return the greatest science value while staying within size (must fit within an oatmeal canister) and mass constraints (60 kg total for science instruments and power systems). Use the data in the table on the next page to determine which instruments, and how many of those instruments, to include on your satellite in order to achieve the greatest science return. The only required science instrument is a communication antenna.

Our Team's Satellite Instrument Data Table

Instrument	Mass	Number of Solar Cells	Science Value
	kg		
	kg		
	kg		
	kg		
	kg		
	kg		
	kg		
	kg		
	kg		
	kg		
	kg		
Totals	kg		
Total mass of solar cells and science instrument package	kg		

Satellite Instrument Data Table

Detectors or Instruments	Use	Mass (kg)	Number of solar cells needed to power	Science Value
High-Resolution Camera	Capture close-up images	25	2	2
Context Camera	Capture wide-angle images	10	1	1
Gravity Probe	Measure gravity	12	1	1
Magnetometer	Map the magnetic field of the planet	9	0.5	1
Solar Wind Particle Analyzer	Measure the solar wind and its interaction with the planet's atmosphere	8	1	1
Heat Sensor	Measure surface temperature	8	0.5	1
Radar	Return data about material beneath the surface	3	0.5	1
Imaging Spectrometer	Identify surface features by their chemical composition	12	2	2
Laser Altimeter	Map surface features by determining their height	2	2	2
High-gain Communication Antenna	Receive commands from and return data to Earth (high speed, uni-directional)	5	1	n/a
Low-gain Communication Antenna	Receive commands from and return data to Earth (slow speed, multi-directional)	2	0.5	n/a
Solar Cells	Collect energy from the Sun to power an instrument, detector, sensor or probe	1	n/a	n/a

How will the instruments on your design deploy when the satellite is launched?

_____

_____

_____

_____

_____

Brainstorming design sketches

Draw two views of the satellite you intend to build with its instruments:

View 1
View 2

Teacher Approval_____

Pair up with another team to evaluate each other's satellites by completing the Quality Assurance Form (next page). Conduct a shake test by holding the satellite bus and rapidly moving it horizontally back and forth between the 0 cm and 16 cm marks on a ruler. Do this shake test for 30 seconds.

What happened to your satellite during the shake test?

_____

_____

Did any pieces fall off? If yes, which ones?

_____

_____

What kinds of changes are needed to make to your satellite stronger?

_____

_____

Draw your satellite with these new modifications.

What is the total mass of your instruments and solar cells after making these new changes?

_____

Quality Assurance Form

Each team is to review another team's design and model, then answer the following questions.

Name of team reviewed: _____

	YES	NO
Does the satellite fit within the specified size constraint?		
Did the satellite withstand the shake test?		
Will the instruments deploy upon launch?		

Total mass of science instruments and solar cells is: _____ kg

Total science value: _____

List the specific strengths of the design.

List the specific weaknesses of the design.

How would you improve the design?

Inspected by: 1._____ 2. _____

3._____ 4. _____