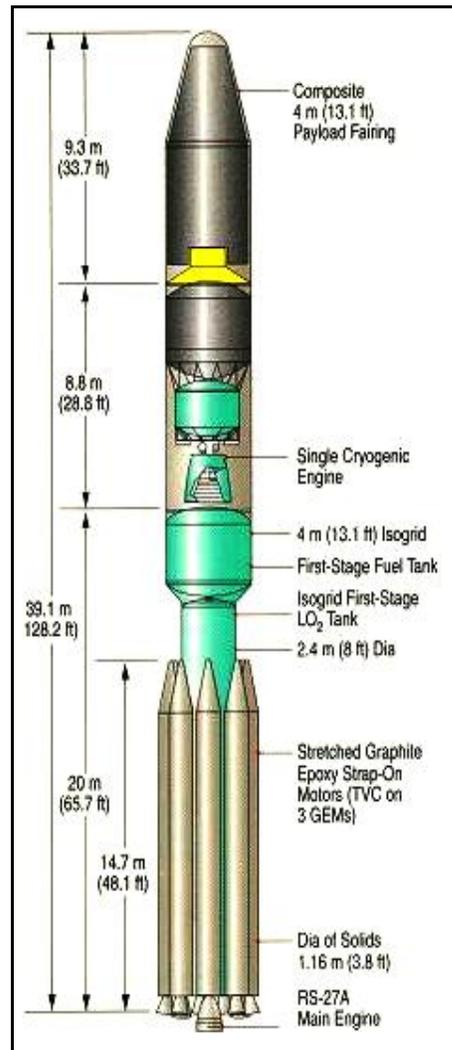
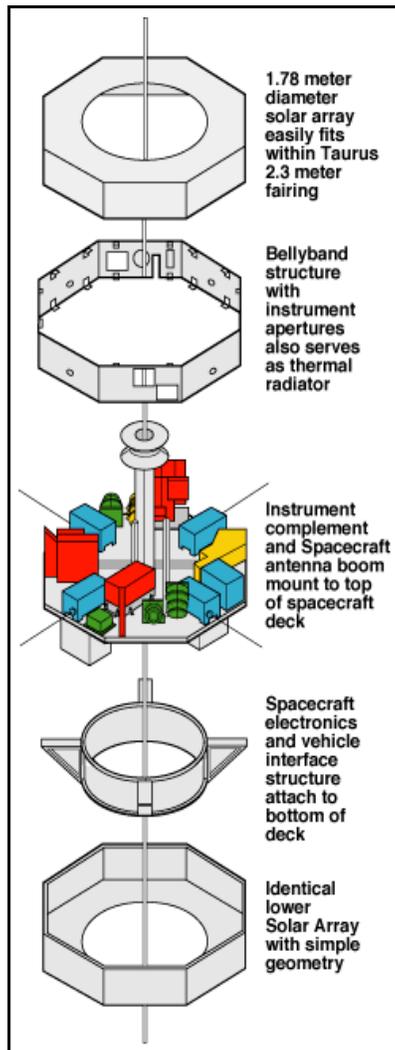


Design Your Own Research Satellite!

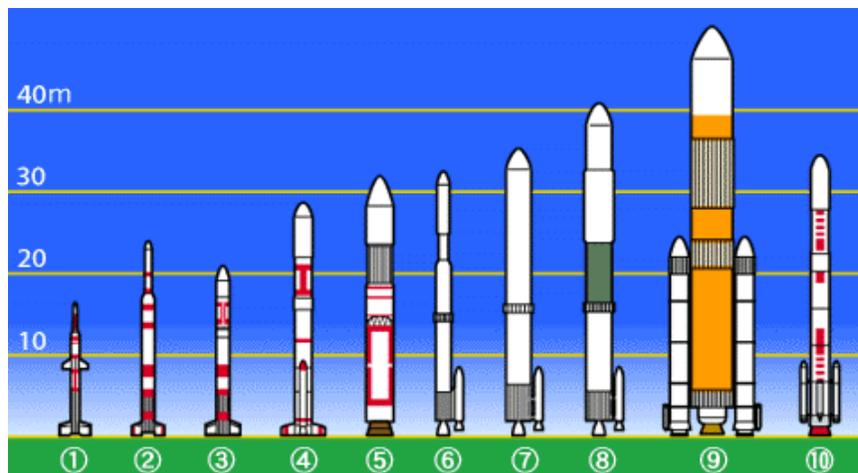
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When scientists and engineers design research satellites, many different things have to be considered to accomplish the research they want to carry-out. In this activity, students will design their own satellite. They will discover how the research goals of a satellite have to be balanced by the cost of the satellite and how much money the scientists have to spend to conduct their research from space. The more you want the satellite to do for you, the heavier it will become, and the more it will cost to launch it!!



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1. Select the experiments that you would like the satellite to accomplish from Chart 1. Write down the mass needed for each of your chosen experiments then find the total mass needed. You will also need to write down the power in watts you will need for all your experiments then find the total watts needed.
2. Select the spacecraft mass from Chart 2 by using the number of experiments you have chosen to complete.
3. By looking at Chart 3 find the watts needed to power your experiment, and the additional mass needed to transport the power.
4. To find the grand total mass needed to launch your satellite, add your total mass from Chart 1, your mass to support experiments from Chart 2, and your mass to power your satellite from Chart 3. Find your grand total mass in Chart 4 to determine the appropriate launch vehicle and its cost.
(Experiments mass + Spacecraft mass + Power mass = Grand total mass)
5. Students can continue to complete this activity as many times as they would like by simply choosing the different experiment or experiments that the satellite could accomplish.



A Collection of Launch Vehicles from Around the World

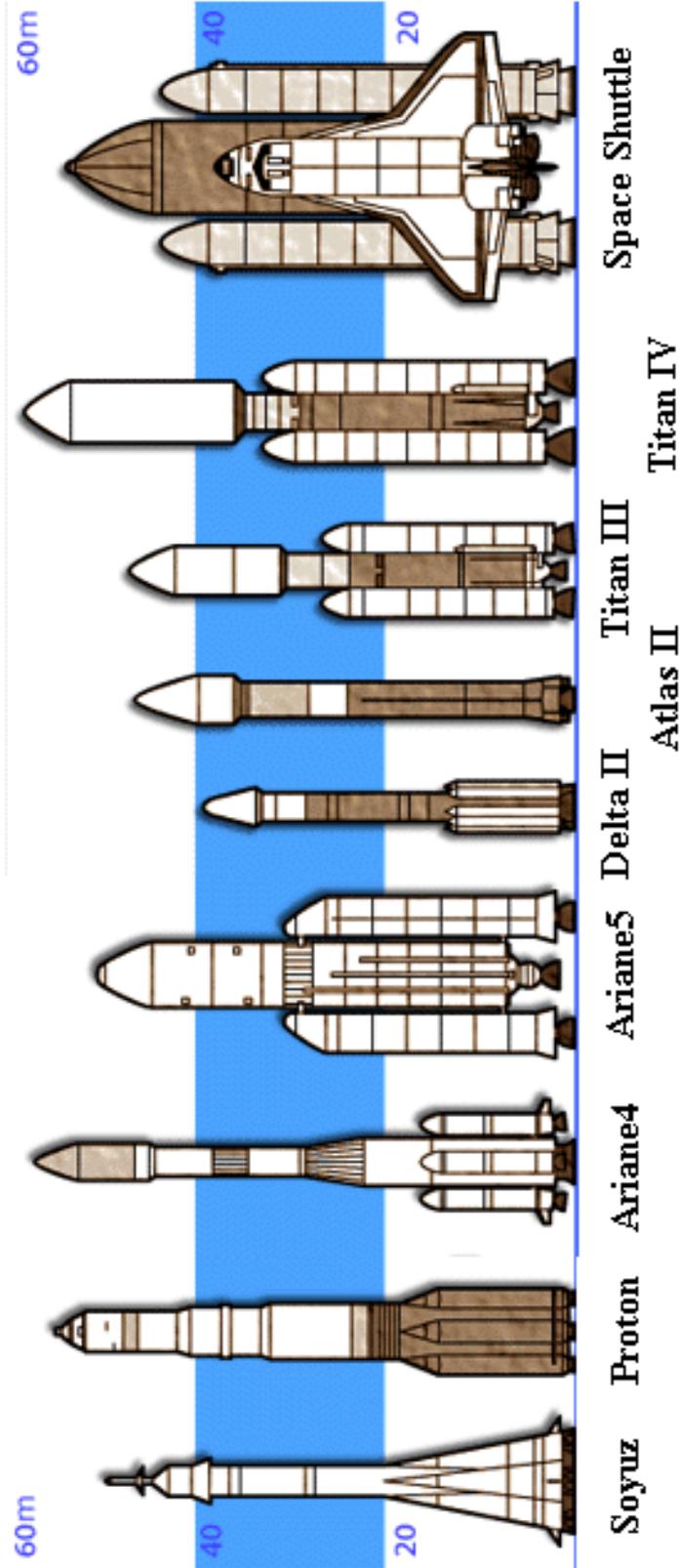


Chart 1: Select the experiments you want to use.

Instrument	Mass (kg)	Power (watts)	Experiment Function
Neutral Atom Imager	7.5	9.5	-detects and maps pictures of atoms in gas clouds around earth
Far Ultraviolet Camera			
SI	8.7	6.0	-detects hydrogen gas around earth
WIC	1.9	3.0	-detects aurora
Radio Plasma Imager	11.0	11.8	-detects plasma clouds around earth
Antenna	14.4	4	
Telemetry Package	5.1	5.0	-transmits/receives data from ground
Spacecraft Electronics	18.0	18.5	-keeps spacecraft working in space
Attitude Torque Rods	15.4	5.3	-part of the spacecraft pointing system
Cosmic Ray Isotope Spectrometer	30.4	12	-detects and classifies particles according to type of atom
Solar Wind Ion Composition Spectrometer	10.5	12	-composition of solar wind and high energy charged particles
Magnetometer	2.5	2.4	-Measures direction strength of local magnetic field near spacecraft
Electrical Field and Wave Sensor	15.5	8	-measures change in local electron fields within the plasma surrounding the spacecraft
Solar Wind Plasma Analyzer	12.2	18	-composition of solar wind charged particles
Large Angle Coronagraph	55	10	-to photograph solar corona

Chart 2: Select the spacecraft mass to support the experiments.

Number of experiments	Mass (kg)
1-5	100
6-10	500
11-13	1000

Chart 3: Select the size of the solar power supply to run the experiments, and the weight of the power system.

Watts needed	Mass
1-10	10 kg
11-20	25 kg
21-35	40 kg
36-55	50 kg
56-80	60 kg
81-100	70 kg
101-200	100 kg

Chart 4: Determine the cost of the launch vehicle

Grand Total Mass	Launch vehicle	Cost
450 kg	Pegasus	\$90 Million
1100 kg	Delta II-8925	\$115 Million
1800 kg	Delta II- 7925	\$105 Million
3000 kg	Atlas II	\$150 Million

