CubeSat Blueprint

Topic	CubeSat Blueprint
Subject	Science
Grade Level	K-3
Recommended Time	1 hour
Curriculum Alignment	Science 1–4/2–4/3–4: Demonstrate positive attitudes for the study of science and for the application of science in responsible ways. Science 1–8: Identify the purpose of different components in a personally constructed object or model, and identify corresponding components in a related object or model. Science 3-3, Focus: Identify the purpose of the object to be constructed: What is to be developed? What is it for?

Hook:	**Notes**
Show Ex-Alta 1 3D Model Video	https://m.youtube.com/watch?v=Ew2N9OqL-F4

Introduction:	**Notes:**
What is AlbertaSat? ● AlbertaSat is a student group at the University of Alberta that designs and builds CubeSats ● CubeSats are small (like a loaf of bread) satellites made up of standardized cubes. These cubes (known as units) are 10cm x 10cm 10cm ● Ex-Alta 1 (Experimental Albertan 1) is a 3U (3 unit/3 cube) CubeSat. It was the first satellite built by AlbertaSat. ● Ex-Alta 1 was built as part of an international project, QB50. This project was lead by the European Space Agency (ESA) to study space weather.	● Ex-Alta 1 has 3 scientific payloads: Multi-Needle Langmuir Probe, dosimeter, and a magnetometer. These allow us to study charged particles, what happens during reentry radiation, magnetic waves, the northern lights, and space weather. We're doing this because space agencies around the world are interested in re-entry, we want to make reusable reentry vehicles, and we want to be able to predict solar storms and know more about the northern lights. Space Weather - esp. solar storms can be really devastating. If one happened today, it could destroy

• Ex-Alta 1 was launched to the International Space Station (ISS) in April of 2017 and into orbit in May of 2017. • Show Map of QB50 Satellites • Ex-Alta 1 includes the following payloads: MNLP (Langmuir Probes), Dosimeter (studies radiation), Athena On-board Computer, Magnetometer • Currently working on Ex. Alta-2, in the planning stages.	power grids and cause trillions of dollars in damage. • Our fourth payload, Athena, is an open source onboard computer. This will be its test flight and if it is successful we will use it on our next CubeSat as the only onboard computer. We want to make a CubeSat as open source as possible to reduce costs and make space more accessible to groups like us.

Background Information:	
CubeSats are made up of 10x10x10 Cubes. Each Cube represents 1U (unit). Ex Alta-1 is a 3U CubeSat and is 30x10x10. • The Langmuir Probes are on the top of the CubeSat, Athena is inside, and the dosimeter is outside. The Magnetometer attached to a boom (arm) which is folded on the CubeSat until the CubeSat is in orbit, then it unfolds. All CubeSats have an antenna, a gps, a computer, and solar panels • Some CubeSats have mini rockets (propulsion systems) • Solar Panels are sometimes attached (like ours), or stick out like wings (like the ISS)	

Explanation of Activity:	**Notes:**
1. Students may work alone or in pairs 2. Hand out Engineering paper (1 sheet to start) and hand out writing utensils 3. Instruct students to draw a blueprint/sketch of a cubesat. Tell them they may be creative or as technical with their design.	1. Students sometimes have trouble thinking up payloads. Encourage them to be creative and offer some suggestions such as: a magnetometer, a plant, a camera, their favourite food, favourite toy etc. Ask them to think about and/or write down what they

4. Draw a quick example on the board (see attached example for reference) 5. Tell students that their designs must include an antenna, a GPS, a radio a payload (an experiment), a computer, and solar panels. Write these requirements on the board or display of a screen. Remind students to label these. a. Remind the students that the GPS and Computer are inside the CubeSat b. Remind them that the GPS and Computer are like the brain c. Tell the students that they may make a 1U to 12U CubeSat 6. Ask students if they have any questions 7. Tell students they may start 8. Presenters should walk around to answer questions and encourage students.	would like to study/learn about if they went to space. 2. Extension Activity: have students create a 3-dimensional drawing. 3. Extension Activity/Possible Assessment: Have students research a CubeSatellite and create a drawing of that CubeSatellite. Students could then compare the similarities and differences between their design and that of a real satellite. This could be done in point-form, full sentences, or using a graphic organizer.

Materials Required
● Pens/Pencils ● Engineering Paper or Graph Paper, 1-2 sheets per student