Activity 1: Do you want to Build a Satellite?

Materials: Toilet paper or paper towel rolls, pipe cleaners, paper plates, tinfoil, stickers, markers, tape, and scissors.

Now that we’ve learned all about satellites, it is time for you to build your own.

Satellite body
Start with the toilet paper/paper towel roll, or another similar household product. The toilet paper roll represents the body of the satellite, which houses all of its main components including the computer, special camera, and all the mechanical and electrical parts needed to make the satellite function. Hold the tube up to your eye and look through it. This what the camera sees when it is pointed at something. The cameras can be pointed up or down, toward Earth or out to space.

Protective Shielding
When most people think about space, they picture it totally empty. That is not the case! While space is very, very big, there is a lot going on out there. It can be a very harsh environment. Since the Earth is so close to our Sun, most of the particles we see this close to Earth are streaming out from the surface of the sun. The Earth is protected because of our magnetosphere, but we fly our satellites higher up than that protective dome. What we call sunlight is actually energetic particles and waves called photons. The photons can be very highly charged, meaning they have a lot of energy. If they slam into certain materials, they can actually rip right through them! To protect the satellites from these charged particles, as well as other forms of radiation, we put all the sensitive instruments and electronic systems inside the satellite shell (toilet paper roll). To add even more protection to the walls of the satellite, we add shielding. The lightest and strongest material we use is Aluminum. To protect your satellite model, wrap the body in aluminum foil (our version of protective shielding). Lay the aluminum foil flat on the table, pinch the ends into the tube and roll, like you are wrapping a burrito. Use tape on the seam of the foil to keep it tight.

Solar Panels:
The same energy discussed earlier that could damage our satellites if we didn’t have that shielding can also be captured and used to charge the batteries of the satellite. That special way we capture sunlight and turn it into energy is by using solar panels. Use the paper plates to represent the satellite’s solar panels. They can be made many different ways, but the best way is to cut straight into the paper plate to the halfway point and then make another cut perpendicular to the first cut. Basically, make a rectangle, with the edge of the
plate being a bit curved. Make two of these rectangles. These rectangles should resemble wings for the satellite. Once the rectangles have been cut, draw a crisscross pattern on them to resemble a solar panel. Next, tape the paper plates to the toilet paper roll. Use tape on both sides of the plates to make sure they are stuck symmetrically like wings. You have now successfully added solar panels to your satellite!

Antennae:
The pipe cleaner is the last step and represents the antennae on the satellite. The antennae allow us on Earth to communicate with the satellite and download the pictures it takes. The antennae can be represented any which way, straight up and down, curled, or wrapped around the satellite. Get creative with it! One good method is to roll the pipe cleaner in a spiral and push down the center just a bit to make it look like a dish, then tape it to the outside. Feel free to use your markers and stickers to decorate your satellite however you want.

Voila! You are now a satellite engineer on top of being a satellite analyst!

Activity 2: iSpy

Materials: Computer

To get our feet wet with satellite image analysis, we are going to play a game of iSpy! You will be shown images of famous landmarks, and you will need to analyze the image and figure out which site you are looking at. Start by clicking the link below:

https://earth.google.com/earth/rpc/cc/drive?state=%7B%22ids%22%3A%5B%221NKWc9v_u2wauCGVCGNLhnywF7JswQg1%22%5D%22action%22%3A%22open%22%2C%22userId%22%3A%22105579686581861036685%22%7D&usp=sharing

Select the “Present” button, shown below.

Move through the presentation and have fun identifying landmarks.
Activity 3: Eye of the Storm

Materials: Computer, pen/pencil, paper

You are now the GEOINTER in Chief of Geo Beach, a coastal city. It is your job to use GEOINT, specifically satellite imagery, to solve problems your city faces. It is hurricane season, and meteorologists have warned that there is a category 4 hurricane barreling toward Geo Beach. Satellite imagery plays a big role in helping cities better prepare for hurricanes and the impact they have on the landscape. Geo Beach has never been hit by a hurricane before, so you are having a hard time preparing a plan to deal with this emergency. Luckily, the geography of your town is almost identical to that of Mexico Beach, Florida, which was hit by Hurricane Michael in 2018. Let’s study that storm to better understand how to prepare for the one approaching your town.

Open the following articles and find the answers to the following questions (please cite which article you found each answer in):

Source 1: https://newsforkids.net/articles/2018/10/12/hurricane-michael-hits-florida-hard/

Source 2: https://www.sciencenewsforstudents.org/article/hurricane-michael-slams-florida-then-speeds-north

1. Hurricanes are ranked using a category system based on their wind speed. What category was Hurricane Michael at its strongest?

2. What was the fastest wind speed recorded in Mexico Beach, Florida?

3. Despite being ordered to evacuate, many Mexico Beach residents decided to stay in their homes. Why did many residents decide not to evacuate? Was this a good or bad decision?

Now let’s look at aerial imagery of Mexico Beach and the impact of Hurricane Michael. Please open the following link:

https://storms.ngs.noaa.gov/storms/michael/index.html#7/30.137/-85.599

This is a map of Florida. On the upper left corner of your screen, please click on the magnifying lens button.
This brings up a search bar. Type in “Mexico Beach pier” and select the first option that appears on the list.

This will zoom you to a close-up view of the city of Mexico Beach. Now, select the layers button, which is found in the upper right corner of the screen.
The pop up box should look like the picture below:

Click the button next to “MapBox Satellite (Pre-MICHAEL)”. Unselect the buttons next to “MapBox Streets”, “October 11 2018”, “October 12 2018”, “October 13 2018”, and “October 14 2018”. Keep the “Mapbox Labels” button selected. It should now look like the picture below:

You should now be looking at an aerial image of Mexico Beach that looks something like this:
Take some time to zoom in and out and investigate what Mexico Beach looked like before Hurricane Michael. Using the satellite image, answer the questions below:

1. How would you describe the landscape of Mexico Beach?

2. What about Mexico Beach makes it vulnerable to hurricane damage?

3. Which structures or buildings can you identify on the map that are particularly vulnerable to hurricane damage? Which areas would be extra prone to flooding during a hurricane?

Now, click again on the layers button in the upper right corner. Click the button next to “October 11 2018” to turn that imagery on. It should look like the picture below:
Your map should now look like this:

The imagery now shows us what Mexico Beach looked like a few days after it was struck by Hurricane Michael. Click the button next to “October 11 2018” on and off to see how the area looked before and after the hurricane. Do this as much as you would like and spend time zooming in and out to study the damage. Answer the following questions:

1. How has the landscape changed since Hurricane Michael hit?

2. What happened to the structures that you identified as vulnerable in the earlier question? Specifically look at the buildings closest to the beach and the pier.
3. Spend time looking at the rivers and canals beyond the beach. What do they look like after the storm? Were these areas that you thought would flood?

Using satellite imagery, we were able to gain a strong understanding of how Hurricane Michael impacted Mexico Beach, Florida. Now, let’s apply that knowledge to prepare for the hurricane approaching Geo Beach.

There are many long-term solutions that can help beachfront communities prepare for hurricanes. You can reinforce existing buildings and build new ones using materials made to withstand hurricanes. Cities can also build levees to deal with flood waters. However, we only have a week before our storm is supposed to hit. We need to come up with some immediate solutions to make sure our residents and their homes are safe. Think back on the articles we read about Hurricane Michael, and answer the following questions:

1. What did the city of Mexico Beach ask residents to do a few days before the storm hit land?

2. Can you think of some reasons why some residents did not evacuate?

Many Mexico Beach residents stayed in their homes because they were only told by the government to evacuate a few days before Hurricane Michael hit. Others stayed because they wanted to protect their homes. Others had no place to evacuate to.

1. How soon should you ask Geo Beach residents to evacuate?

2. How can you persuade residents to evacuate in a timely manner while still protecting their homes?

3. Where would you recommend residents with no place to evacuate to should go?