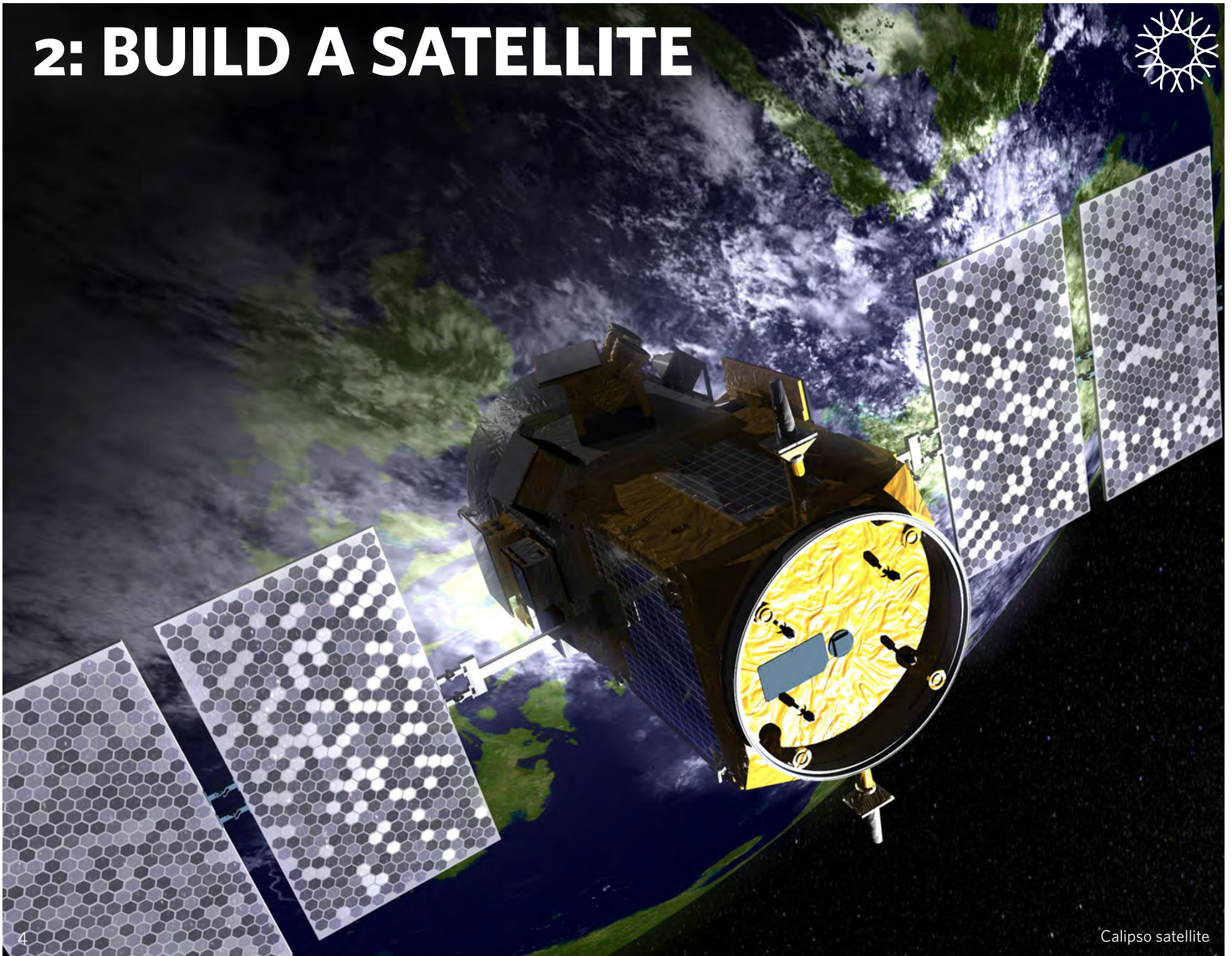


2: BUILD A SATELLITE





NASA has more than a dozen scientific satellites in orbit around Earth. In this activity, youth play a game to learn how satellites send and receive data, then design and build their own satellite models.

Your mission today is to design and build a model satellite.

Preparation

- » Collect recyclable materials.

Satellite Communication (SatCom) Relay 25 min. | inside or outside

What do you think of when you hear the word satellite? What do satellites do? Share some ideas with a friend.

A **satellite** is anything that orbits another object (for example, the Moon is a satellite of Earth). People build satellites to observe Earth and send signals. You most likely use satellites in some way every day, perhaps through television or a map app on your phone.

When a satellite collects data, like photos of objects from space, that information gets translated several times on its way back to Earth—from a photo to computer code to radio signal, and then the same in reverse.

This game simulates that experience, as teams compete to relay information correctly from a satellite's camera to a computer on Earth. This is not a race. The goal is for the final image to match the original *SatCom Relay* photo most closely. The team with the most accurate image at the end wins.

To begin, create five stations at least 20 steps apart from each other. Then, place the four *SatCom Relay* images face down in Station 1 and place markers and paper in Stations 2, 4, and 5. Only players—not materials—can move between stations.

1. Form teams of four players and assign each player a number (1-4).
2. In Station 1—the satellite's camera—Player 1 must look at the *SatCom Relay* image, memorize it, and travel to Station 2 to write a description of it. Make sure no other players see the original image.
3. In Station 2—the satellite's computer encoder—Player 2 must memorize the written description, travel to Station 3, and repeat the description to Player 3. Make sure only Player 3 hears the description.
4. In Station 3—the radio transponder—Player 3 will listen to the description and travel to Station 4 to record it in writing.

- Set up summary:
- Station 1: Four *SatCom Relay* images, face down.
- Station 2: Paper and markers (one set per team).
- Station 3: No materials, but station must be out of earshot.
- Station 4: Paper and markers (one set per team).
- Station 5: Paper and markers (one set per team).

Kit Materials

A

- » construction paper
- » [Design a Satellite cards](#)
- » [Design a Satellite handouts](#)
- » [SatCom Relay images](#)

B

- » markers

C

- » foil
- » pipe cleaners
- » popsicle sticks
- » tape

Loose Items

- » SAC notebooks

Materials Not Included

- » recyclable materials

5. In Station 4—the radio receiver—Player 4 will read the written description and travel to Station 5 to draw the final image.
6. Station 5 is the computer on Earth. Compare the final image to the original *SatCom Relay* image.

Design a Satellite 25 min. | inside

The goal of this activity is to build a model satellite out of a limited set of supplies.

1. Form five or fewer groups and distribute the *Design a Satellite* cards. These are five satellites that collect data about Earth's atmosphere, land, ocean, and energy: Terra, Aqua, Suomi NPP, Calipso, and CloudSat.
2. Look at the cards and talk with your group: What parts do satellites need in order to be able to stay in space for long periods of time? To gather information? To send that information back to Earth?
3. Pass out the *Design a Satellite* handouts, pipe cleaners, popsicle sticks, foil, and recycled materials. Your challenge is to design and build a model satellite that includes the components listed on the handout and at least one moving part.

Label and Share Your Satellites 10 min. | inside

1. Put a piece of paper under your satellite. Draw arrows to label the different components on your satellites and describe what they do.
 - » What is each component? Why did you decide to place it where it is? How does it move?
 - » How will the satellite's camera and communication device stay pointed toward the Earth as it orbits?
2. Share your satellites with the rest of the club.

Explore More: Watch [Wanna Launch a Satellite? You Can!](#) (3 min.) to learn how to launch your own satellite into space!

Call to Action: Human-made satellites can look like stars moving slowly across the sky. With your friends and family, head outside at night and see if you can spot a satellite orbiting overhead. For more information check out [How to Observe Satellites](#) (5 min.).

Attendance & Feedback: How many youth attended? How did it go? Record notes here, then click or scan the link to let us know.

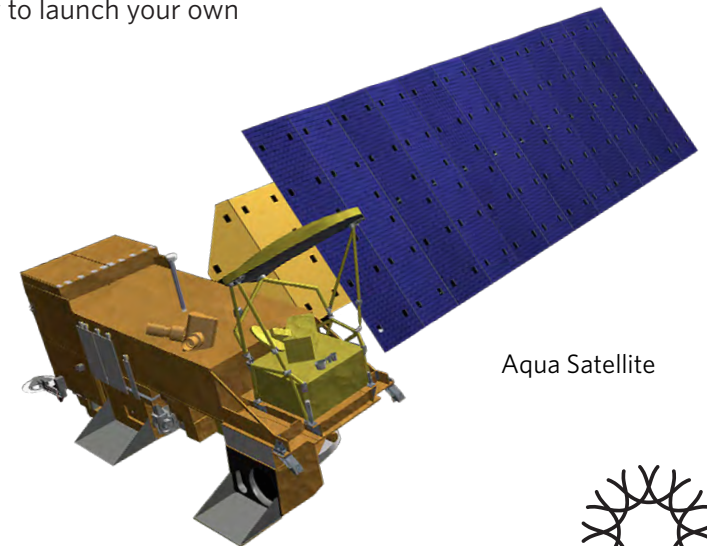
Explore More:
[Wanna Launch a Satellite? You Can!](#)



Call to Action:
[How to Observe Satellites](#)



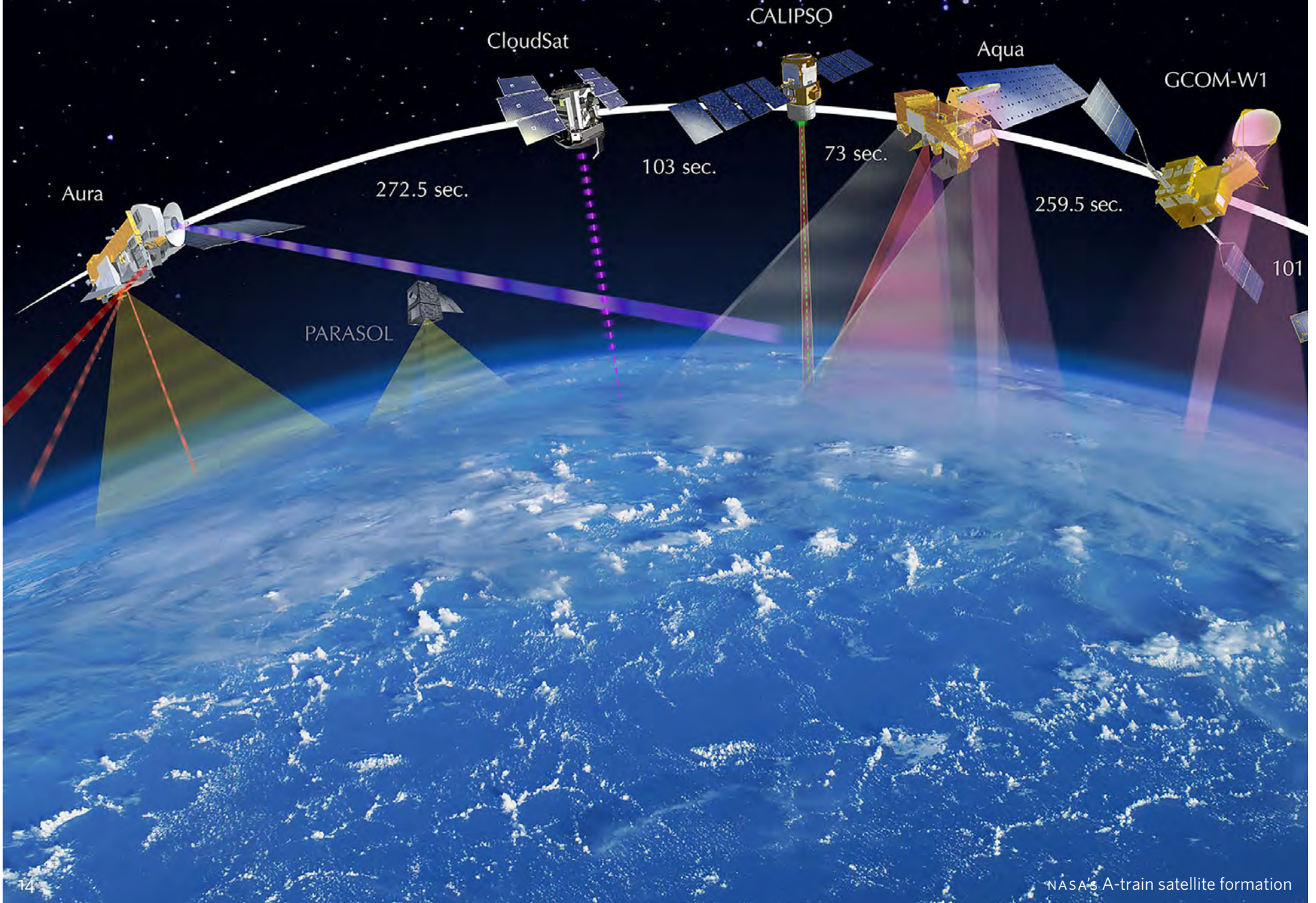
How did it go?
[Let us know!](#)



Aqua Satellite



5: CONNECT TO NASA



Sky Survey observations help NASA researchers study Earth's weather and climate. In this activity, youth practice their cloud identification skills, conduct their first Sky Survey observation, and submit their findings to NASA.



Your mission today is to collect data about clouds to help NASA conduct Earth science research.

Preparation

- » Load videos: [Cloud Names](#) and [How to Do a Sky Survey](#).
- » Download the [GLOBE Observer Data Entry app](#) on your digital device and sign into your club's account.

Cloud Quiz Show 15 min. | inside

Learning cloud names takes practice. Knowing the meaning of those names can offer clues about how clouds look. For example, **cirrus** clouds are wispy and **stratus** clouds form in layers, so when you hear the name **cirrostratus**, you can expect to see a wispy layer of clouds. In this game show, teams will compete to identify cloud names.

Start by watching [Cloud Names](#) (1 min.). As you watch, practice saying the name of each cloud out loud. See the sidebar for a full list of names. Now you are ready to play.

1. Choose one player to be the scorekeeper. Give her or him the *Cloud Quiz Show* scorecard.
2. Divide into teams of four to five players.
3. To begin, say, "Name a cloud that begins with..." and insert one of the starting sounds. See sidebar for the list of five starting sounds.
4. Team members must huddle to choose a cloud name that begins with that sound. The first team to raise their hands and make a buzzer sound gets a chance to respond.
5. Identify that team and say, "And the cloud is..."
6. The team then calls out the name in unison.
7. The scorekeeper checks if the name is correct and keeps score.

Award two points for the first correct answer. If the first answer is incorrect, or if there are additional correct cloud names, the team to the left gets a turn to respond. Each additional correct answer is worth one point.

- » Names of Clouds
 - » **Alto**cumulus
 - » **Alto**stratus
 - » **Cirro**cumulus
 - » **Cirro**stratus
 - » **Cirrus**
- » Starting sounds
 - » **Alto-**
 - » **Cirr-**
 - » **Cumul-**
 - » **Cumulonimbus**
 - » **Cumulus**
 - » **Nimbo**stratus
 - » **Strato**cumulus
 - » **Stratus**
 - » **Nimbo-**
 - » **Strat-**

Kit Materials

- A
 - » [Cloud Cover grids](#)
 - » [Cloud Identification cards](#)
 - » [Cloud Quiz Show scorecard](#)
 - » [Sky Color strips](#)
 - » [Sky Survey charts](#)
 - » [Sky Survey stickers](#)
 - » [Which Cloud Am I? grids](#)

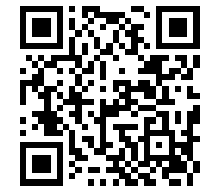
Loose Items

- » SAC notebooks

Materials Not Included

- » 10 folders

[Cloud Names](#)



Teams take turns responding until all valid clouds are named. Repeat steps 3-7 for each of the five starting sounds.

Play for six minutes or complete all five rounds.

Bonus round: Each team has 30 seconds to write down as many cloud names as possible. The team with the most correct cloud names gets five bonus points. Spelling is not important.

Share out: Why do you think scientists have multiple names for clouds? What strategies did you use to help you remember clouds names?

Which Cloud Am I? 20 min. | inside

In this game, one person will use clues to figure out which *Cloud Identification* card their partner is holding.

1. Create teams of two. Determine who will guess and who will respond first. The Guesser needs a *Which Cloud am I?* grid and the Responder needs one *Cloud Identification* card.
2. Responders use a folder to hide the *Cloud Identification* card from the Guesser.
3. All of the clouds are on the grid, so Guessers ask yes or no questions to determine which one their partner has. Focus on characteristics of the cloud itself rather than other parts of the picture.
4. Once a card is guessed, switch roles and pick a new *Cloud Identification* card. Use details when describing color, shape, texture, or position in the sky.

Share out: Which clouds look the most similar to you? How can you tell them apart?

Sky Survey 25 min. | outside

Through GLOBE Observer, citizen and community scientists like you help NASA understand how clouds affect weather and climate. By observing the sky and reporting what you see, you can help confirm or clarify valuable data from NASA satellite photos. Watch [How to Do a Sky Survey](#) to learn how it works.

1. Form teams of four. Each team needs the following *Sky Survey* tools:
 - » *Cloud Cover* grid
 - » *Sky Color* strip
 - » *Sky Survey* chart
 - » *Sky Survey* sticker (this goes in the recorder's notebook)
2. Record the location, time, and date on the *Sky Survey* sticker. Then, head outside to observe the sky.
3. Review the *Sky Survey* sticker together as a club. There are three basic sky conditions:





- » No Clouds: The sky is completely clear.
 - » Some Clouds: Clouds are visible.
 - » Obscured: Clouds can't be seen in more than one-quarter of the sky because of heavy rain, snow, or fog.
4. You will use the *Cloud Cover* grid to estimate cloud cover (few, isolated, scattered, broken, or overcast) for the entire sky.
 5. Observing cloud cover at different altitudes takes practice. While clouds might all seem to be the same distance away, some are closer to Earth's surface and others are high in the sky. The closer ones might block our view of higher ones. Only on a relatively clear day can we estimate cloud cover for low, middle, and high altitudes all at once.
 6. To estimate cloud cover, first, identify clouds at each level of the sky. Then, use the *Cloud Cover* grid to estimate how much of the sky is full of clouds at each level. Each team will be responsible for a different direction—north, south, east, and west—so we can collect more accurate observations of the entire sky.
 7. Now you are ready to do your first *Sky Survey*. You have 10 minutes to observe the sky and record observations in the *Sky Survey* sticker.
 8. Discuss your observations as a club. We will submit only one report for the entire club each time we meet. Ask a youth to hold the mobile device and walk everyone through the [GLOBE Observer data entry](#) process.

[GLOBE Observer Data Entry App](#)



Congratulations! You have completed your first *Sky Survey* as a NASA citizen and community scientist.

Share out: What did you find challenging about observing the sky? What strategies would you recommend for next time?

Explore More: How do clouds affect climate? Watch [Cloudy Forecast](#) (1 min.) to learn how NASA is studying clouds and Earth's climate.

Explore More:
[Cloudy Forecast](#)



Call to Action: Teach your friends the names of different clouds and help them identify clouds in your neighborhood.

Attendance & Feedback: How many youth attended? How did it go? Record notes here, then click or scan the link to let us know.

How did it go?
[Let us know!](#)

