



Student Worksheet

Introduction

This worksheet will allow you and your students to collect and report information about the contrails and clouds that you see. Print out this document and follow the **Measurement Steps** given below to collect information about contrails and clouds. Record the information that you collect on the Contrail Count-a-Thon Data Sheet, which can be downloaded from the project Web site at www.globe.gov/earthsciweek2005/.

Then report the information that you have collected through the Online Data Entry Form located on the project Web site. By participating in this project you and your students will learn about the clouds above you. Please be aware that you do not have to do all the parts of this worksheet, but the more that you do, the more you will learn!

NOTE to GLOBE schools: In addition to reporting your observations for the special Count-a-thon activity, please also report your cloud and contrails measurements through the traditional GLOBE data entry pages.

What You Will Need

- Print-out of this Student Worksheet
- Print-out of the Contrail Count-a-Thon Data Sheet (downloaded from the project Web site at <http://www.globe.gov/earthsciweek2005/>)
- GPS Receiver (optional)
- Watch, clock, or GPS receiver showing local time

Measurement Steps

1. Fill out the *Participant Information* section at the top of your Contrail Count-a-Thon Data Sheet.
2. Pick a site outside your school, home, office, business, etc, where you have a view of the most amount of the sky.
3. Fill out the *Site Information* section of your Contrail Count-a-Thon Data Sheet.

Please try to record the latitude and longitude of your site in decimal degrees, using either a GPS Receiver or a map with coordinates from one of these Web sites:

1. www.Maporama.com
 2. www.Topozone.com
 3. U.S. Census Bureau (in the U.S.) at www.census.gov/cgi-bin/gazetteer
If you are unable to obtain coordinates, record the address of your site.
4. Review the descriptions and pictures of contrails and clouds given on the Contrail Types and Cloud Types pages below.
 5. Go to your site sometime between 11 am and 1 pm local time on October 13th, 2005, and observe as much of the sky as you can.
 6. Record your local time on the Data Sheet.
 7. Count the total number of contrails. If you can, count the number of contrails in each of three categories using the Contrail Types page below for reference:
 - Short-Lived Contrails
 - Persistent Non-Spreading Contrails
 - Persistent Spreading contrails

NOTE: Please record a zero for any contrail types that you do not see.

8. Record the total number of contrails, along with the number of each type of contrail, in the section *Contrail Information* of your Contrail Count-a-Thon Data Sheet. If you cannot observe contrails because clouds, fog, or other obstructions are blocking your view, please check the appropriate box and, in the *Further observations about the contrails that you observed* section, describe what is blocking your view.
9. Identify the types of clouds that you see using the *Cloud Types* page .
10. Check all the types of clouds that you observed in the *Cloud Information* section of your Contrail Count-a-Thon Data Sheet. If you see clouds, but are unable to identify them, check the appropriate box.
11. Report your data through the Online Data Entry Form located on the project web site at www.globe.gov/earthsciweek2005/

Contrail Types

There are three types of contrails that you will be asked to identify in this activity. Please use the pictures and descriptions given below for reference while making identifications.

Short-Lived Contrails:



These contrails look like short white lines following along behind the plane, disappearing almost as fast as the airplane goes across the sky, perhaps lasting only a few minutes or less. The air that the airplane is passing through is somewhat moist, and there is only a small amount of water vapor available to form a contrail. The ice particles that do form quickly evaporate again.

Persistent Non-Spreading Contrails:



These contrails remain long after the airplane that made them has left the area. They form long, generally straight, lines of approximately constant width across the sky. These contrails are no wider than your index finger held at arm's length.

Persistent Spreading Contrails:



These contrails also remain long after the airplane that made them has left the area. They form long streaks that have widened with time since the plane passed. These contrails are wider than your index finger held at arm's length. This type is the only type that can currently be seen in satellite imagery; and only when they are wider than four fingers held at arm's length. Therefore, noting the equivalent finger width of these contrails in the *further observations about contrails* area of the Data Sheet will be very useful for the scientists.

*NOTE: you can find a chart for identifying contrails at:
<http://asd-www.larc.nasa.gov/GLOBE/contrails/>*

Observing Cloud Type

There are five descriptive terms for the various types of clouds:

CIRRO or high clouds

ALTO or middle clouds

CUMULUS or white puffy clouds

STRATUS or layered clouds

NIMBUS or clouds from which precipitation is falling

The following ten types of clouds, named using the above terms, are to be used when reporting the cloud type for your area:

High Clouds

	<p>Cirrus</p> <p>These clouds look like white delicate feathers. They are generally white wispy forms. They contain ice crystals.</p>
	<p>Cirrocumulus</p> <p>These clouds are thin white layers with a texture giving them the look of patches of cotton or ripples without shadows. They contain primarily ice crystals and perhaps some very cold water droplets.</p>
	<p>Cirrostratus</p> <p>These clouds are a thin, almost transparent, whitish layer made up of ice crystals. They may totally or partly cover the sky and can create a halo appearance around the sun.</p>



Middle Clouds

Altostratus

These clouds form a bluish or grayish veil that totally or partially covers the sky. The light of the sun can be seen through them but there is no halo effect.



Altocumulus

These clouds look like waves of the sea with white and gray coloring and shadows. They contain mostly water droplets and perhaps some ice crystals.



Low Clouds

Stratus

These clouds are gray and lie very close to the surface of the Earth. They usually look like a sheet layer but sometimes are found in patches. They rarely produce precipitation.



Stratocumulus

These clouds are a gray or whitish color. The bases of these clouds tend to be more round than flat. They can be formed from old stratus clouds or from cumulus clouds that are spreading out. Their tops also tend to be mostly flat.



Nimbostratus

This is a very dark and gray-colored cloud layer that blots out the light of the sun. It is massive and has a continuous fall of precipitation.



Cumulus

These clouds have a flat base and a dense, mound shaped top that resembles a large cauliflower. Where the sun hits these clouds they are a brilliant white. The base tends to be a darker gray. They generally do not produce precipitation.



Cumulonimbus

These are large, heavy, and dense clouds. They have a generally flat, dark surface with very tall and large tops like the shape of a massive mountain or anvil. These clouds are often associated with lightning, thunder and sometimes hail. They may also produce tornados.