

## Contrails

Contrails are "human-induced" condensation trails that are left behind by passing aircraft, including rockets. They are formed when invisible water vapor freezes onto tiny combustion particles emitted from aircraft exhaust, producing white icy clouds that are visible from the ground. Contrails require a certain amount of humidity and are created at high altitudes (usually above 5 miles) where the air is extremely cold (−40 degrees F or less). Depending on wind speed and direction, contrails will sometimes drift far away from where they were formed, and consequently, when we look up in the sky, it is at times possible to see old persistent contrails but no airplane. Also, because FAA-regulated airplane flight paths may cross, change altitude, or change direction, so too can contrails, thereby producing beautiful criss-cross patterns in the sky.

All contrails are made of ice crystals and are formed in the same way, but they exist for different lengths of time. Short-lived contrails look like short white plumes trailing the airplane. They evaporate almost as quickly as the airplane moves across the sky because the atmosphere is quite dry.

Persistent (non-spreading) contrails are the much longer white plumes formed when the atmosphere is more humid. They can remain visible well after the airplane has disappeared from sight, but they do not spread because the winds are not turbulent.

Persistent (spreading) contrails look like long, broad, white plumes that spread horizontally due to winds. Sometimes they spread so much that they cannot be distinguished from cirrus clouds.

Contrails are seen from the equator to the poles; over continents and oceans; over populated and deserted areas. All that is required is an aircraft to be flying at high altitude under the right conditions of temperature, humidity, and winds. There is no need to invoke the existence of mysterious "chemtrails" to explain them.

Indeed, contrails were observed as early as 1919 when airplanes were first able to reach sufficiently high altitudes to form them.

During World War II contrails were studied intensively when it became important to detect airplanes. Pilots used contrails to track the enemy; while thick contrails caused by a large number of airplanes flying in formation sometimes made flying difficult and dangerous, even leading to midair collisions on occasion.

Ultimately, research in the 1950s led to a method for predicting contrail formation which was the basis for present-day contrail-forecasting by the United States Air Force.

Contrails are man-made clouds which can block out sunlight from above and trap in Earth's heat from below, possibly affecting surface temperatures, so scientists continue to study them to this day. Atmospheric scientists sometimes even deliberately fly their research airplanes in unusual patterns, such as circles, to create contrails that can be more easily distinguished from the often linear commercial airplane contrails.

In summary, we know what contrails are composed of, we know how to predict them, we know how to make them, and we know their history. So the “chemtrail” theory, which has been thoroughly discredited by the scientific community, is entirely unnecessary when describing these fascinating white clouds of ice that so often decorate our skies, especially in the spring when conditions are optimum for their formation.

## **Online Resources**

[National Weather Service](#)

[NASA](#)

[EPA Factsheet](#)

[Worldwide Civil Air Traffic Video](#)