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# Contrails - and Clouds

**Contrails and Cirrus clouds**

This beautiful display was captured at sunset by Ed Donovan of Berry Shoals Intermediate School, on January 28th, 2002 in South Carolina. Note the delicate structure in the middle contrail, which results from local air motions induced by the airplane. These contrails are clearly persistent (no airplane in sight), but except for the one at top left, they have not spread very much. They are accompanied by some beautiful, wispy cirrus clouds.

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**Many Persistent Contrails**

This photo was taken by Lin Chambers in 1997, right outside her office at NASA Langley Research Center in Hampton, Virginia. It shows the extensive build-up of persistent contrails resulting from our location along the East Coast flyway. Some of these contrails are showing signs of spreading, but the spreading is not particularly pronounced. There are also some natural cirrus clouds visible in the mix.

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**Complex Sky**

This striking photo was taken by Carol Clark in Oregon in 2003. It shows a persistent contrail being laid down in a sky that already includes some low level cumulus clouds, as well as some higher level stratus clouds. In addition, there is an optical phenomenon: a rainbow.

**Clouds and contrails in Central Europe**

This photo was taken the main town square in Prague, Czech Republic, in July 2005 during the GLOBE Annual Meeting. It shows both persistent and spreading contrails along with some definite cumulus clouds (behind Cathedral) and some probable thin cirrus.

Photo by Dr. Debra Krumm, Colorado State University.

**Turning contrail**

This photo shows a contrail that makes a definite turn, against a backdrop of cirrus clouds. While this might seem unusual, contrails like this are regularly observed in the same part of the sky in the early evening, suggesting that this is actually a regular flight pattern for a scheduled flight.

Photo by Lin Chambers in southeastern Virginia, November 2003.

**Short-Lived Contrail and Cirrus**

This is a very common combination: a short-lived contrail with some isolated and wispy cirrus cloud covers. Note the completely different character of the contrail compared to the natural cirrus. Photo by Lin Chambers, Virginia, USA.

**Short-Lived Contrail and Cirrus**

Here is another example of a short-lived contrail with some very thin cirrus cloud. Photo by Doug Stoddard?

**Persistent Spreading Contrail under Cirrostratus Veil**

A persistent spreading contrail fragment under a thin veil of cirrostratus clouds. Note the wiggles along the edge of the contrail. This is very typical of contrails, because of the trailing vortices from the airplane. It is a great clue to help identify older contrails. This contrail is definitely persistent - the airplane is nowhere in sight, and the contrail has had some time to widen. Also note that the contrail ends on the left in an area where the cirrostratus clouds also stops. This is a good indication of a region of low humidity air. Photo taken by Lin Chambers in August 2003 in southeastern Virginia.

**Very wide contrails**

The two contrails going across this photo are decidedly persistent spreading contrails as can be determinedfrom their width. Notice that the somewhat linear clouds that cross these contrails are not obviously contrails.They do not maintain the characteristic structure normally seen in a contrail. While these clouds might indeedhave started life as contrails, they now must be classified as cirrus.

Photo by Lin Chambers, August 2003, southeastern Virginia.

**Contrails and cirrus at sunset**

These beautifully illuminated contrails (two spreading and one fainter persistent one) with natural cirrus were photographed at sunset. Note the distinct color change betwenn the upper contrailand the natural cirrus. This could denote either that the two are at a different altitude, or that they

havedistinctly different ice particles in them (resulting in different optical effects with the setting Sun).

Photo by Lin Chambers, southeastern Virginia, November 2003.

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