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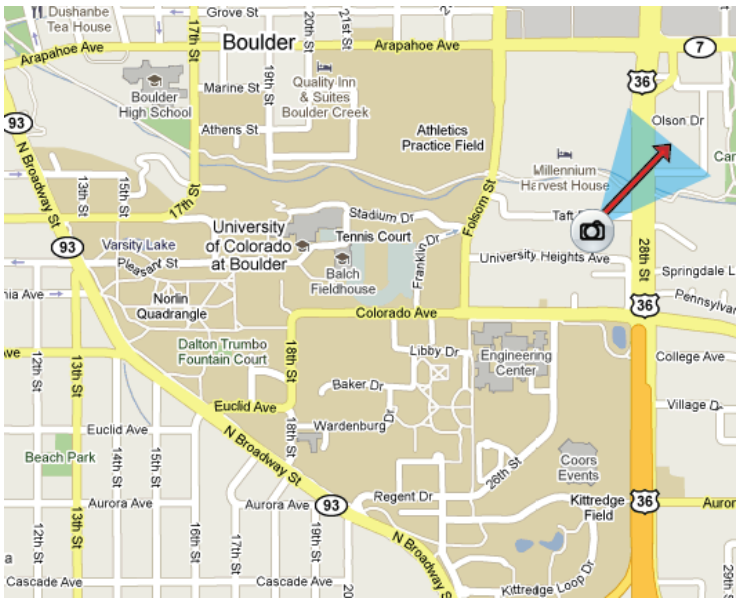
Flow Visualization
April 19th 2010

f/5.8 : f-stop
1/320 sec :exposure
ISO-80 : iso speed
17 mm : focal length
Canon SD870 IS: camera
12500 ft.: FOV
1469 x 169 : dimensions
no : flash

Clouds 2: Airplane Conrail

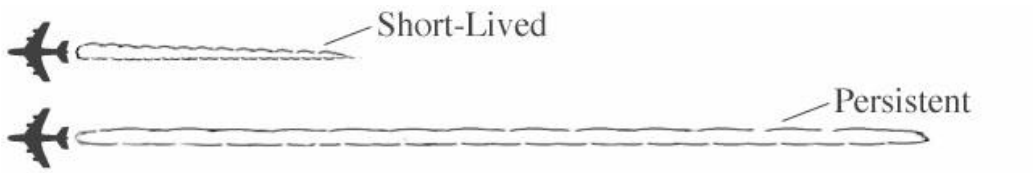
This image was taken early in the morning in an effort to capture a good airplane contrail. I have seen many airplane contrails before, but normally the sky is cluttered with other various clouds. This image was interesting to me because it shows the scope of the sky and how a single plane can affect our huge perspective of the sky.

This image was taken from the 4th floor balcony of my apartment complex in Boulder. The sun is located behind me and to the right as the plane is moving from the west to the east. The contrail is being viewed from the ground looking up as the early morning sunrise is piercing through the vapor. The picture was taken looking up at about 60° elevation at 8:12am on January 30th, 2010. Below is a map of where the picture was taken from in relation to the city.



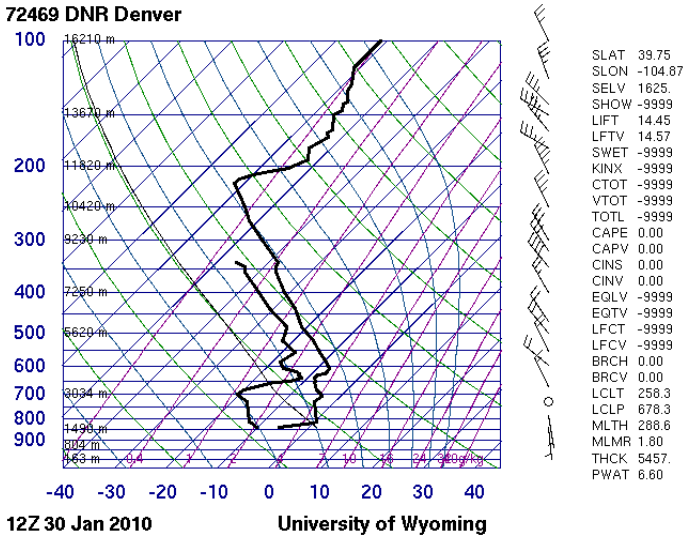
This image shows the trail of a single contrail of an airplane as it flies over the city of Boulder in the early morning. Contrails, which are short for condensation trails, form out of the exhaust of airplanes due to the jet's water vapor condenses around its own exhaust particles. When this occurs, a visible cloud is apparent in this part of the atmosphere. If the contrail is visible

for quite a long time after the plane, it means that the atmosphere is already saturated with as much water vapor as it can hold[1]. On the other hand, if the contrail is short, the atmosphere is dry and is able to reabsorb the water vapor as soon as it condenses[2]. Below is a representation of the difference between short and long contrails.



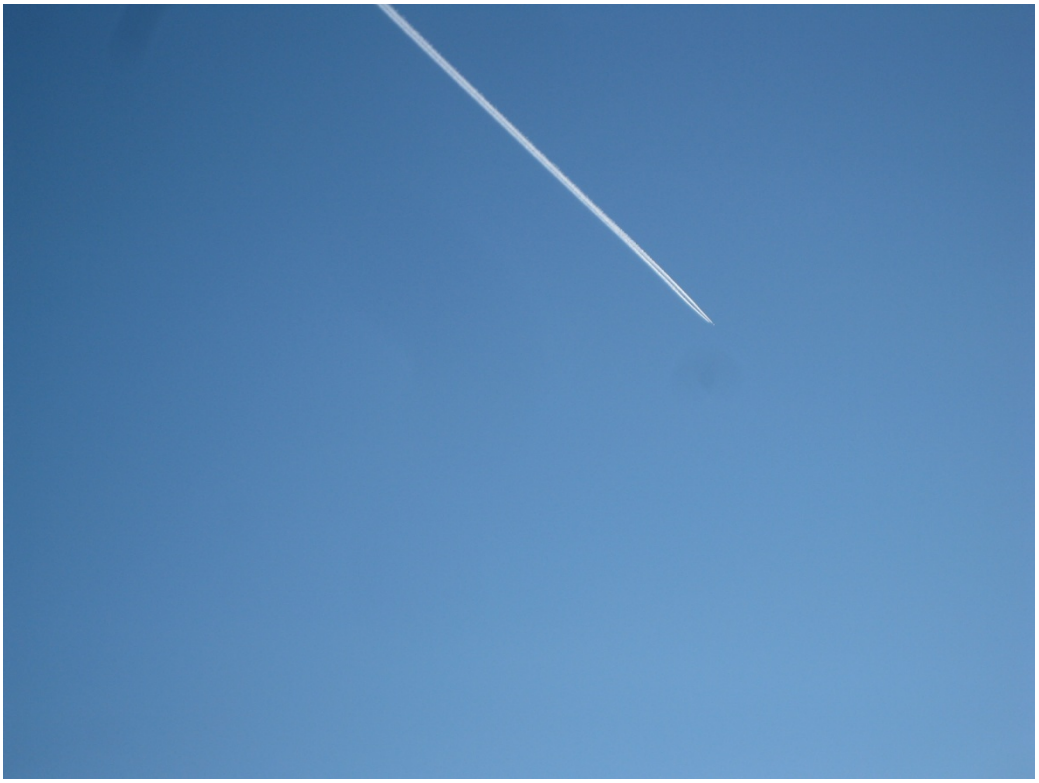
Contrail evolution and History[2]

The formation of contrails from planes can drastically affect the atmospheric conditions[3]. This was most studied in depth in the days following September 11, 2001 when all airline traffic was halted. This gave atmospheric researchers a chance to study the effects of an atmosphere with no planes and no contrails. Their findings found that without the contrails from the planes, the temperature rose about 1 degree Celsius than immediately before[3]. In the skew-T plot below, you can see that cape=0.00 showing a relatively stable atmosphere. This could be confirmed with the relatively no other clouds in the sky. My best guess is that the plane was traveling between 26,000-35,000 feet above sea level.



For the image, I tried to capture the piercing contrail in the seemingly flat sky. I rotated the image to create a strong upward diagonal with the plane making its way ¾ through the square crop of the image. The image was taken with an f/stop of 5.8, and a shutter speed of 1/320, and an ISO of 80. The camera used to take this picture was a Canon PowerShot SD870 taken at 3264x2448. The image was imported into my computer and cropped in a square to emphasize the strong diagonal. After some post processing in Photoshop to rotate, crop and get rid of some dirt on the lens, the final image was 1469x1469px. The original image can be seen below.

1. http://indianapublicmedia.org/amomentofscience/airplane-contrails/
2. http://asd-www.larc.nasa.gov/SCOOL/contrails.html
3. http://facstaff.uww.edu/travisd/pdf/climatepapermar04.pdf



I hope that the image reveals a sharp contrast in the in how a plane can affect a seemingly plain sky. The picture does a good job of showing the distinct contrails left behind from an airplane. I wish I had zoomed in more to grab a little more of the detail on the contrail, and might have even received some interaction between the two separate contrails from the jets.