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Flow Visualization  
Cloud Assignment #1  
2/28/2013

The intent of this image was to take an ordinary and natural scene and turn it into an uncommon and unnatural one. In this case, an image was taken of a cloud in close proximity to the sun and was edited to repurpose the image as that of a rocket during liftoff. This effect was achieved first by capturing an image of clouds that could be portrayed as rocket contrails and by having a concentration of bright light, in this instance the sun, to represent the initial engine ignition. To increase its effectiveness the image was later processed in Adobe Photoshop, the methods of which will be discussed further along in this report.

This photograph was taken on February 17<sup>th</sup> at 2:39PM. The image was captured in Boulder, Colorado at an approximate photographer elevation of 5,440 feet. From the horizontal, the angle of the camera was approximately 50 degrees with the sun being at an estimated elevation of 29,000 feet above sea level. Simple trigonometric calculations<sup>1</sup> were performed to estimate the distance between the object and the lens as can be seen below in figure 1:

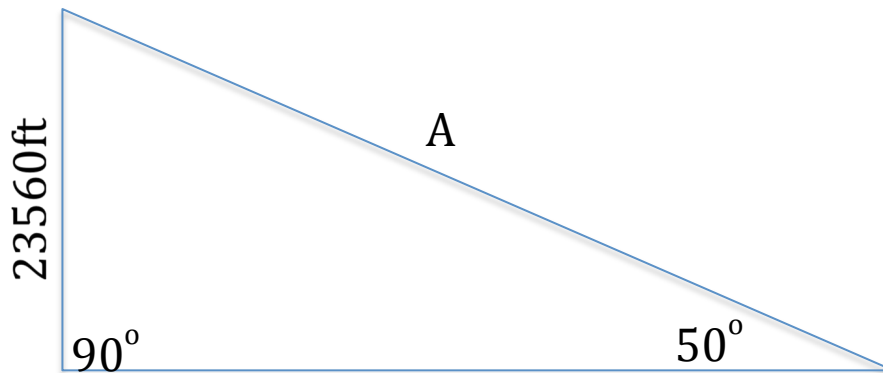


Figure 1: Experimental Set-Up

$$\text{Law of Sines: } \frac{A}{\sin a} = \frac{B}{\sin b}$$

where  $A = \text{unknown}$ ,  $a = 90^\circ$ ,  $B = 23560 \text{ft}$ ,  $b = 50^\circ$

$$\frac{A}{\sin 90^\circ} = \frac{23560}{\sin 50^\circ}$$
$$A \approx 30,755 \text{ ft}$$

Through analysis of the skew-T plot<sub>2</sub> – seen in figure 2 – for the day the original image was captured – 2/17/2013 – it can be determined that the cloud in the image occurred in a stable atmosphere and was most likely of the cirrostratus variety. Cirrostratus clouds normally occur<sub>3</sub> in a altitude range from 22,000 to 30,000 feet which is consistent with the statement made earlier of the captured cloud being at an altitude of 29,000 feet above sea level. By observing the CAPE value of the appropriate skew-T plot, the stability of the atmosphere can be determined; in this case the CAPE value was 0.0 indicating a stable atmosphere. As cirrostratus clouds form in stable atmospheres<sub>3</sub> it can be determined that the assumed variety of cloud is warranted and supported. Finally, there was no weather immediately preceding or following the time this image was captured, however there was a large winter storm that descended on the area a few days later.

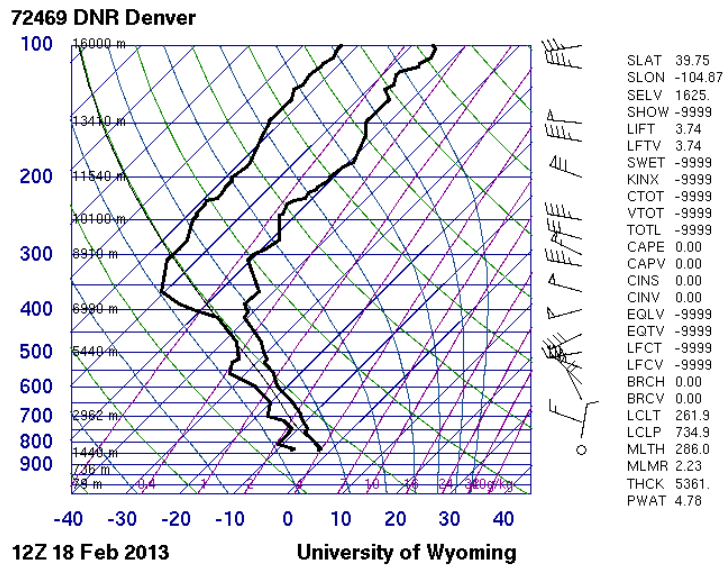


Figure 2: Skew-T for 2/17/2013

The image was captured using a Canon EOS Digital Rebel XS with a 55mm focal length and ultraviolet filter installed. The image was shot at a shutter speed of 1/400s with an aperture of f/14 at an ISO of 200 with no flash utilized. The original image dimension was 3888 x 2592 with the final image being cropped to 800 x 2984. The original image was processed in Photoshop by creating multiple image layers and adjusting the contrast curve of each individual layer in order to achieve the desired artistic effect. During editing, the original image was also rotated 90-degrees CCW. The camera used saves image files with a .jpg extension and the edited image was saved as a .tif to avoid further compression. The before and after images can be see below in figures 3 and 4 respectively.



Figure 3: Original Image

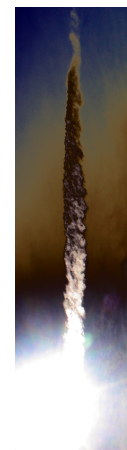


Figure 4: Edited Image

It is felt that the image achieves its original goal of capturing a natural scene and transforming it to appear as something completely different. In terms of areas of improvement it would be nice to find a way to even the brightness/darkness of the “rocket contrail” so that the color and detail is uniform and balanced throughout. Additionally it would be aesthetically advantageous to make the image more symmetrical by centering the sun in both the image itself and the “contrail.” It is believed that the concept of this image could be taken further by doing a series of pictures with the theme of ordinary objects or occurrences repurposed in unexpected ways.

## References

1. "Law of Sines." *Wolfram Math World*. N.p., n.d. Web. 26 Feb. 2013. <<http://mathworld.wolfram.com/LawofSines.html>>.
2. "Atmospheric Soundings." *Atmospheric Soundings*. N.p., n.d. Web. 26 Feb. 2013. <<http://weather.uwyo.edu/upperair/sounding.html>>.
3. Hertzberg, Jean. "More Clouds." *Flow Visualization*. J. Hertzberg, 5 Feb. 2011. Web. 26 Feb. 2013. <<http://www.colorado.edu/MCEN/flowvis/course/Lecture2013/08.Clouds2.pdf>>.