

July 5, 2004

Dear lmayo@pop600.gsfc.nasa.gov,

I just completed all the calculations and would like to receive the NASA/Astronomical League's Transit of Venus Certificate Observing Program and pin. I found two different versions of the requirements for this program one on the Astronomical League's web site and one on the sunearthday.nasa.gov web site, so I finished all the calculations on both versions of the requirements.

The Astronomical League's requirements.

1) Derive the distance to Venus.

I used the pictures from Howard University and from Australia to superimpose the two images of Venus and get a distance between them by measuring the distance between the two paths on the photographs made as Venus moved across the Sun. By taking into account the latitudes yielding an angular separation of the two observing sites of 71.326 degrees, and a distance between the two paths of .381 inches, I calculated the distance to Venus as  $4.955 \times 10^8$  km. This is off by a factor of 10 and I cannot figure out where my error is. But if you take the actual value of  $.414 \times 10^8$  km, my magnitude difference has a 17% error. Very close.

2) Derive Venus's orbital velocity at the time of transit.

From using the Howard University photographs, I calculated an angular velocity of  $1.16 \times 10^{-5}$  degrees/second. Then I used the equation to calculate the orbital velocity and got a value of 30.374 km/sec. The actual value is 35.0 km/sec, which is an error of 13.2% in my value.

3) Detect the Venusian Atmosphere

I thought I saw this between the 1<sup>st</sup> and 2<sup>nd</sup> contact. It was obvious near the limb of the Sun where the silhouette of Venus was eating into the disc of the Sun. Once, I saw a hint of a ring around part of the planet. Thereafter, I only saw a sliver of it on the bottom (top) of where the planet was part way onto the disc of the Sun. On 3<sup>rd</sup> contact, using a H-alpha filter, I might have seen the black-drop effect, but clouds were obscuring the Sun and it was difficult to see.

Since then transit event, I have seen photographs on the internet clearly showing the Venusian atmosphere (the halo effect) and the black drop effect.

4) Time the Transit

I watched the transit event live on NASA TV from Athens, Greece and timed the transit using my WWV radio. Here are my contact times:

- 1<sup>st</sup> contact = 11:19:54 MDT - June 7<sup>th</sup>, 2004
- 2<sup>nd</sup> contact = 11:38:04 MDT - June 7<sup>th</sup> 2004
- 3<sup>rd</sup> contact = 5:04:07 MDT - June 8<sup>th</sup>, 2004
- 4<sup>th</sup> contact = 5:22:59 MDT - June 8<sup>th</sup>, 2004

From the certificate requirements on the web site <http://sunearthday.nasa.gov>,

- 1) Is the same as #1 from the certificate requirements found on the Astronomical Leagues' web site.
- 2) Calculate the A.U.

Using the value you supplied for Venus's greatest elongation of 46 degrees, I was able to calculate the value of the AU to be  $92.857 \times 10^6$  miles.

- 3) Calculate Venus's Orbital Period

Using the equation provided, I calculated a value of  $P = .6147626$  yrs or 224.39 days. The actual value is 224.7 days or less than a 1% error in my value.

- 4) Calculate the Mass of the Sun

Using values from my astronomy books and the equations provided, I calculated the mass of the Sun to be  $1.9892 \times 10^{30}$  kg. Converting a Newton to  $(\text{km})(\text{m})/\text{sec}^2$  allowed me to cancel units nicely to be left with only kg.

- 5) Detect the Venusian atmosphere and black drop effect

Done in previous Astronomical League section #3.

- 6) Time of Transit

Done in previous Astronomical League section #4.

I have all my sketches I did during the transit, along with the actual calculations I did. I can FAX them to you if you need to see my work. Just send me a FAX number and I will send them to you.

As for Part 2 of the requirements,

- 1) I registered with the Sun-Earth Day event on April 12, 2004.
- 2) I gave a Friday night seminar (April 16, 2004) at the Little Thompson Observatory ([www.starkids.org](http://www.starkids.org)) to the people who attended this event about the upcoming Venus Transit event. There were 30 people in attendance, 18 of which were girls. I am also a JPL Solar System Ambassador, so I gave a discussion of the telecom we received about this event and also discussed how people might incorporate an early June vacation to the east coast to watch this event. I also identified several locations along the eastern seaboard that were hosting events on the morning of June 8<sup>th</sup>. I discussed my plans to see the Venus Transit event from Iowa City, IA (which was cloudy the entire transit). I can email you my power point presentation I gave the folks if you would like to see what I discussed. I also discussed safe sun observing techniques. The entire presentation took almost an hour.

I am a member of the Longmont Astronomical Society, a member society of the Astronomical League. Please print my name on the certificate as Michael Hotka. You can mail my certificate and pin to:

Michael Hotka  
1425 Snowberry Lane  
Broomfield, CO 80020

Thank you for providing a program to recognize my participation in the Venus Transit event. I enjoyed doing the calculation as those astronomers did back in the 1800's. I am anxiously awaiting the 2012 event, for I will be able to see this from my backyard, here in Colorado.

Sincerely,

Michael Hotka