International Space Station Transits the Moon

Captured At Last by Club Members

By Alex McConahay

After months of hunting, several club members finally caught the International Space Station crossing the disk of the moon late last month.

Burton Briggs has been a long time leader of this effort. Some time ago he discovered a website that calculated time and earth surface

The six-frame sequence below captures the ISS transit of the moon. At fifteen frames per second, the transit took less than half a second. Alex McConahay used an Imaging Source DMK 41, on a William Optics 66 SD, and a Meade LXD 55 mount. Although it looks like the space station is flying above the moon, it is actually very close to the earth. The background moon is a composite of 450 frames taken that night in the minute or so before the transit.

David Morris used a modified Canon 350 DSLR on SkyWatcher ED120 and a Skyview Pro Mount to capture this and the exposure on the next page of the ISS in front of the moon. His exposure was Large/ Fine jpg, 1/2500, 800 ISO. He shot in Continuous Mode, which gave him five frames per second.

centerline positions for transits and conjunctions of many satellites, and particularly the Space Shuttle and International Space Station.

One clicks into Calsky.com and inputs the observing position and how far one is willing to travel. Calsky calculates where one needs to be, and when, to observe a satellite crossing the disk of the moon or sun. They include an interactive Google Map of the "centerline." One must be within a few kilometers of the centerline to see a transit. Being on the line increases the chance of witnessing the event and also increases the length of the transit.

From that point on, it is simply a case of driving there, and taking a picture of the moon (or sun) at the right time.

Oh, were it in fact that easy! Among the things one must deal with are:

- the rarity of the event (although the ISS goes around about once every 90 minutes, these transits of the moon or sun take place only about once a month in any locale),
- moon phases (you cannot see anything silhouetted against a New Moon or slight sliver),
- clouds (three of our trips were killed off by weather, one while we sat cameras ready),
- off beat locations (Cabazon seems to have more than its share of those nearby),
- middle of the night timing (who needs to catch a transit at 2:00 am?),
- work schedules,
- and equipment snafus.

Just after Christmas, Calsky's email alert system said there would be a transit in Moreno Valley, at 8:30 pm on December 29. So, Alex McConahay contacted the others in the transit chasing crew (Burton, David Morris, and Jim Redfield).

Burton had moved up to Idaho. But the others managed to get together beside a dirt road in northeast Moreno Valley. The night of the big show, Alex had forgotten his computer, and so had to run home quickly. Jim's camera had performed beautifully during practice, but timed out and went to sleep as it sat idly awaiting show time. But, all in all, the trio were successful in capturing the shot.

For those who want to take their own shots, the procedure goes something like this:

Go to Calsky, http://www.calsky.com/ and follow along their screen prompts.

When you finally get a hit, use the interactive map to find an ideal observing location. Light pollution does not matter much, but it helps to be off main streets and such.

Equipment is flexible. Alex and David both opted for full coverage of the disk, about half a degree. If you want more magnification of the spacecraft, you would have to sacrifice full coverage of the disk. More magnification also means a narrow field, and needs better camera aiming. If the target crosses on one side of the disk, and you are aimed at the other, you will miss it entirely. So, it is important to choose a good combination of sensor chip and focal length to grab your shot.

Use whatever camera and scope you have. Video captures many frames. Therefore, you have more frames with images of the space-

Top: David Morris grabbed this frame of the ISS.

Middle: A Shuttle-based shot of the ISS. Compare it to the detail in David's shot to identify the various part of the spacecraft.

Below: The imagers (l to r, David Morris, Alex McConahay, and Jim Redfield) on the night of December 29, 2009, just after the 8:30:43 pm transit.

craft, and enough frames to stack for greater resolution on the disk. Furthermore, one can start a video based system early and let it run, and later isolate the frames that catch the spacecraft. Alex chose a video system, and started a minute and a half early. DSLR's however, like David chose, have much larger chips, a wider field, and potentially higher magnification and resolution. However, they can capture only about 5 frames per second, and that for only a few seconds. So, the timing must be better. And no matter what, if you can get only 5 frames per second, you would be lucky to get more than two spacecraft exposures during the half second long event.

Both David and Alex re-calibrated their watches and computers using an internet time service immediately before going out. David read off the seconds loud and clear. It should be noted that the centerline locations and timings from Calsky are not necessarily precise. They depend on orbital and other maneuvering burns and are calculated for sea level. At other elevations, timing and location are different.
If you master the timing and location, the imaging is relatively simple. Point the camera at the moon or filtered sun. Use a tracking mount if possible, but a fixed tripod will do. Focus and take test exposures. And then, just before transit, use a remote control (via cable or computer) to fire away with video or continuous mode DSLR. Practice all this before the big event to avoid surprises (like a camera that times-out after sitting idle waiting for the precise second, or whose buffer fills after only a few seconds of continuous mode).

The passage of the ISS is exceptionally quick, less than half a second. It makes for an interesting movie (which is available at http://alexastro.com/Alex%20Home%20Page/SolarS/solarsindex.html)

We plan to go on hunting these transits, catch a few against the sun, and maybe with the sun shining on the spacecraft. Perhaps we will be lucky enough to capture the Shuttle on its last flight to the station next month!!! It is challenging and fun. If you would like to join, just contact alexmcconahay@roadrunner.com and get on the list. We hope to see some of your successful shots in the Prime Focus.

Alex McConahay's composite (right) of the ISS passing the crater Tycho. The ISS was about 50 arc seconds across from this distance. The critical part of this adventure is being in the right place at the right time. The Google map from Calsky (below) helps this happen.