```
----------------CHECK CLOCK----------------
           Does this time seem correct?
             2019-09-09 15:24:03  CDT
             Press: [y]es or [n]o....
```

When the moontracker program is first opened, the user will be asked to verify the time provided by the system clock. If the time is correct, press [y] to proceed to the manual moon finding phase. If it is incorrect, press [n].

If the time was incorrect, the program will ask for the year, month, date, hour, month, and seconds to be provided. Supply these as two-digit values, followed by Enter. Finally, the program will ask which timezone you are in. There are limited options for timezone at this time.

```
-----------MANUAL  CONTROL-----------
Use arrow keys to move view.
   [SPACEBAR] - stop motors
   [ENTER] or [r] - track & record
   [v] - Check Computer Vision
   [i] - Cycle camera ISO mode
   [g] - Increase exposure
   [b] - Decrease exposure
   [h] - Fine increase exposure
   [n] - Fine decrease exposure
   [p] - Clear Night threshold
-------------------------------------
ISO: N/A
Exp: 1405
```
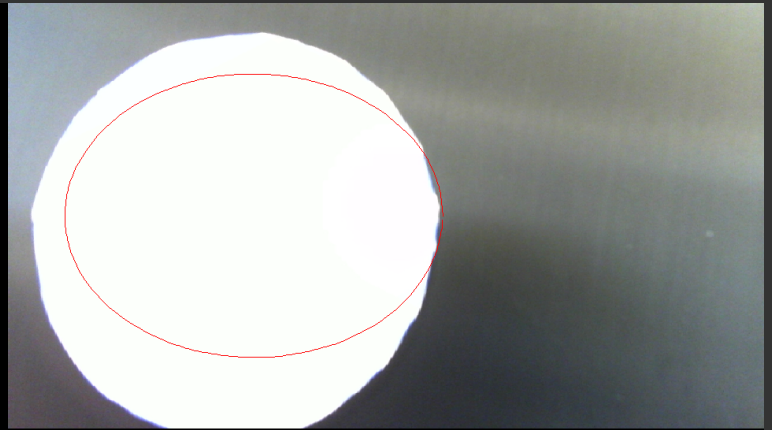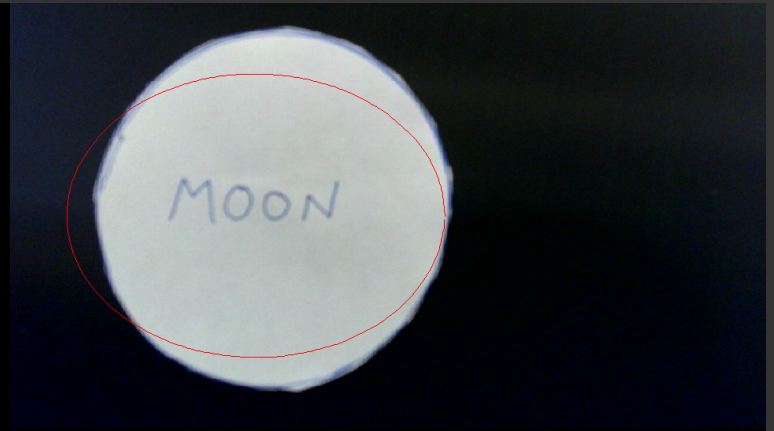
Once the program reaches the Manual Control screen, the moon must be brought into view of the screen. Use the arrow keys to manually adjust the position of the turret altitude and azimuth until the moon is visible on the screen. A red oval or circle serves as a targeting reticle for optimum position.

Once the moon is visible on the screen, confirm that the entire moon fits in the visible window. Adjust the zoom and focus of your spotting scope to achieve sharp edges.

When the moon is first found by the program, the exposure settings of the camera will be set such that the moon appears "washed-out" or overly bright. This is intentional. Finding the moon through the scope can be challenging, and the glow of the over-exposed haze around the moon can aid in the initial positioning.

Once the moon is properly positioned in the frame, adjust the ISO and exposure settings of the camera such that the edges of the craters of the moon are visible and detailed. In the high-quality demo image above, adjusting the settings make the word "MOON" visible.

The ISO of the camera is cycled with [i]. This option will not be available with all cameras.

The exposure setting of the camera has coarse and fine adjustments. The keys to increase and decrease the exposure value are [g] and [b] for coarse adjustments and [h] and [n] for fine adjustments, respectively.

An optimized setting activated with [p] can be performed. This auto-matically sets the exposure value to what has been empirically deter-mined by the authors to be "good". This can make for a nice starting point before making fine adjustments.

Press [v] to bring up a black and white image in the bottom right. This is what the computer vision "sees".

When everything is ready, press Enter or [r] to proceed to auto tracking mode.

```
----------------TRACKING MOON-------------
*Buttons only work when window is selected!*
  [q] - quit
(Or just close this window to to quit)
(it might take a few seconds)
  [i] - Cycle camera ISO mode
  [z] - Decrease thresholding Value
  [x] - Increase thresholding Value
-----------------------------------
ISO: N/A
Thresh: 125
```
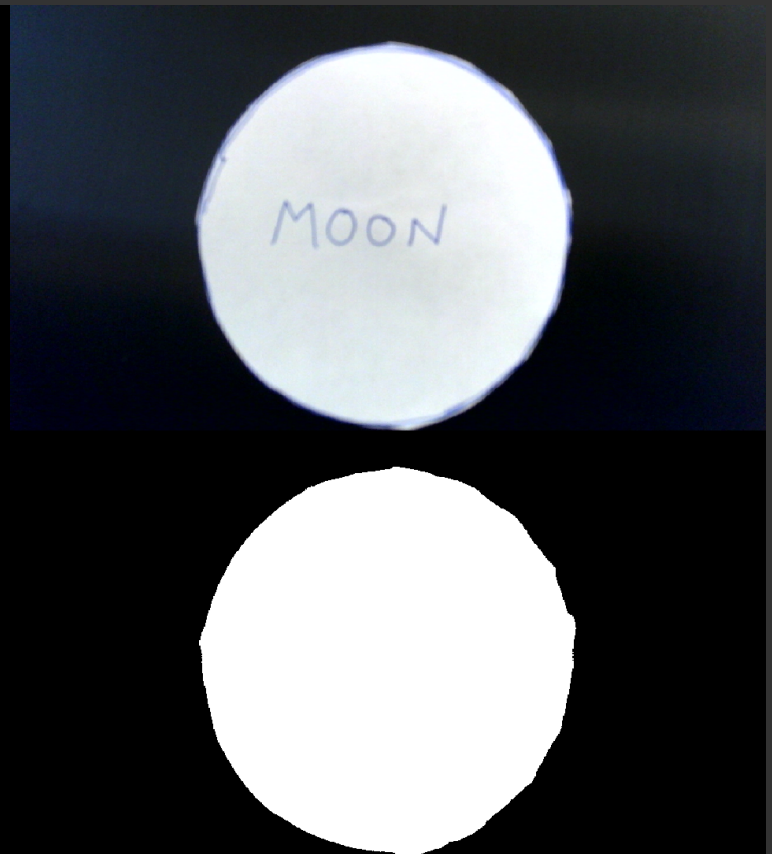
In the automated tracking mode, LunAero will operate independently of the user. Few settings can be changed once in auto mode. If ISO is enabled by the camera hardware, that can be cycled here. However, exposure values cannot change.

When the moon is centered during proper function, threshold images will pop up on the screen for debugging purposes in the lower-right quadrant of the screen. As before, the image here represents what the tracking software "sees" when determining how to center the moon in frame.

If a change in site conditions causes the moon to be dim or overly-bright on the screen, the black and white threshold can be adjusted by pressing [z] or [x]. Adjusting this threshold value is only able to change how LunAero "sees" the moon when centering. It will not effect recorded video. If you temporarily lose the moon due to haze, changing the BW threshold can allow you to continue tracking the moon.

When the moon is lost, the program will shut down automatically. To manually quit, press [q].