**Steps for Taking “LOP” Celestial Navigation Sights**

1. Plan the sights.
   1. Determine when and where the sights will be taken (twilight, noon, etc. and the closest approximation possible of where you will be.)
   2. Use an almanac, star finder, program, etc. to find the altitude(s)/azimuth(s) of the bodies you plan to shoot at the given time and location.
   3. Write these down to make it easier to locate the bodies when taking sights. (Note: it may be helpful to organize the bodies by azimuth or magnitude – dimmest to brightest for morning sights, vice versa for evening.)
2. Before time to take the sights, check your instruments for errors.
   1. Check your timepiece for errors.
      1. Compare the time on your timepiece to a reference source, such as a radio signal, rated chronometer, lunar, etc.
      2. Write down the difference as your “watch error” (do not forget to include whether it is “fast” or “slow”. (E.g. Watch 1 min. 15 sec. fast”)
   2. About 15 to 30 minutes before sight time, move your sextant, octant, etc. to the area in which you will be working to acclimate it to the temperature/humidity.
   3. Check your sextant, octant, etc. for errors.
      1. Check index mirror for perpendicularity.
         1. Lay the sextant on its legs with the index arm set to around 60°.
         2. Look at the index mirror from “above” the sextant (looking past the index mirror towards the arc) so that you can see the arc and the reflection of the arc in the mirror at the same time.
         3. If the arc and its reflection do not line up, adjust the index mirror until they do.
      2. Check for side error.
         1. Sight a distant object (like a star) and see if the direct and reflected images line up vertically when the index arm and micrometer/vernier are set to zero.
         2. If they do not, you *can* adjust the horizon mirror until there is no error – but this is not absolutely necessary as the error itself will not affect the accuracy of the measurements.
      3. Check for index error.
         1. Sight a distant object (like the horizon) and see if the direct and reflected images line up horizontally when the index arm and micrometer/vernier are set to zero.
         2. If they do not, you have two choices:
            1. Leave the error and write down its magnitude and direction to be corrected for during sight reduction. (E.g. “I.E. = +1.2’”)
            2. Adjust the horizon mirror until there is no error.
         3. If you choose to eliminate both side and index error, repeat steps 2.b.ii and iii until neither error is detected.
3. Take the sights.
   1. Align each body with the horizon, bubble, etc. and immediately note the time. (You should note the seconds first, then minutes and hour. You may also try mentally counting the seconds between taking the measurement and looking at your timepiece and subtracting those from the time.)
   2. After writing down the time, write down the measured “sextant altitude” [“Hs”]. (Unlike a watch, the reading on a sextant will not change on its own, so it is more important to get the time first.)
   3. Make sure you have noted which body you were shooting and - for the Sun and Moon – whether it was an upper or lower limb sight. (Optionally, you can list how confident you are that each sight was accurate. This will help later in identifying outliers.)
4. Begin the sight reduction process.
   1. Correct your measurements for index error and/or any other known, systematic error. (E.g. you may always shoot bodies 0.2’ too high.)
   2. Use a table, calculator, program, etc. to find the “dip of the horizon” (based on your “height of eye”) and correct for that to get the “apparent altitudes” [“Ha”].
   3. Find the refraction and – if necessary – the parallax in altitude and semi-diameter values and correct for those to get the “observed altitudes” [“Ho”].
5. Select a sight reduction method: tables, calculator, program, etc. and “reduce” each sight.
   1. Use an almanac [electronic or paper] to find the “Greenwich hour angle” [“GHA”] and “declination” [“Dec.”] of each body at the time of each sight.
   2. Based on the chosen sight reduction method, select an “assumed position” [“AP”] as close to your actual position as possible. Some methods require the use of an assumed longitude such that the “local hour angle” [“LHA”] of the body will be a whole degree. Each “line of position” [“LOP”] must be plotted from the assumed position used for each sight.
   3. Find the “calculated altitude” [“Hc”] and azimuth [“Zn”].
   4. Subtract Ho from Hc to get the “intercept” [“p”].
      1. If the computed altitude is greater (i.e. the result is negative), the intercept is marked as “away” [from the azimuth], otherwise it is marked as “towards”.
6. Plot the lines of position or calculate the new fix directly.
   1. On a plotting sheet, measure out the distance of the intercept from each AP towards or away from each azimuth.
   2. Draw a perpendicular line (the LOP) at the measured distance.
   3. The position of the new fix is where all of the LOPs intersect (or, more commonly, a point among all of the various intersections).