

STAR SIGHTS PRACTICE EXERCISE

On a ship somewhere near Lat 8-50N and 109-40E.

The following round of evening stars was shot:

Jupiter at 18:51:58 Hs 50 deg 27.6'
Rigel at 18:55:33 Hs 35-35.1'
Capella at 18:58:42 Hs 32-26.9'
LL of the moon at 19:09:54 Hs 13 deg 12.9'
Fomalhaut at 19:12:24 Hs 31-19.9

Condition Data:

Date: 13 January 2013
Height of eye is 83 feet
Index error is 0.9' on the arc
Temp 80 deg F
Press 1013 mB
Course 037
Speed 11.6 knots
ZD-8

Find you 1900 Local time Fix by celestial observation.

ANSWER:

We have five sights, I can only do the sight reduction by hand calculation not having an electronic aid; to spare some time I decided to investigate which three of the five sights would give me the best cut.

Using 2102-D I have identified the approximate azimuth as follows:

Body	Zn°T (2102-D)	Zn°T (SR)
Jupiter	75	70
Rigel	105	107
Cappella	40	40
Moon	250	256
Fomalhaut	230	228

I plotted the azimuth on a copy of UPS to determine the best cut.

I have noticed that Cappella and Fomalhaut are roughly 180° in azimuth from each other, so there is no point to consider them together. The same applies for the Moon and Jupiter. I selected the following combination of three:

CAPPELLA (35°) JUPITER (30°) RIGEL

*(Number in parenthesis are the rough relative bearings between the selected bodies).

In addition the Moon is a waxing crescent of only 2 days age (4%), considering my own ability in taking sights, this would be the less reliable sight of all.

First, I'll reduce and plot the selected combination and if the fix doesn't satisfy me, I'll investigate if is worth throwing in maybe Fomalhaut in lieu of Cappella, keeping Jupiter and Rigel.

Here are the results:

Body	a	Zn(°T)	a-Lat	a-Lon
Cappella	4.2'A	40	09°N	109° 39.7'E
Jupiter	34.1'T	70	same	109° 01.5'E
Rigel	1.6'A	107	same	109° 49.5'E

Barometric pressure (1013Hp or Mb) is standard atm. pressure, 80F (~25C) of temperature requires a negligible correction which has been disregarded in the SR process.

I have enclosed, in the azimuth table above, the comparison between 2102-D calculated azimuth values and the SR reduction azimuths' values for reference and comparison.

Enclose is the resulting plot of the 3 LOP's.

Fix coordinates are: **08°48.8'N; 109°44.2'E**

Range and bearing from DR position can be calculated (DR position is marked).

If a more precise job is required (not at this stage given the good results of the LOP intersection), all the three LOP's could be advance to 19:00 WT(LT) considering the time lapsed between each of the selected bodies' sights (and 19:00:00WT), the distance run at 11.6 Kts on course 037°M (assumed to be magnetic) for the DR coordinates the Variation is: 0.14W (NOAA website).

However the advancement is better be done numerically due to the small distances involved and the inherent plotting difficulties; using the computed new altitude intercept (a'), distance (D), course(C) and the same Zn value computed, using the formula:

$$da = D \times \cos (Zn-C)$$

New altitude intercept for the advance LOP: $a' = a + da$

Where a (-) if originally Away or (+) if originally, Toward. For exercise purpose I have calculated the three (a') as follow:

Body	a'	Orig. a
Jupiter	35.4'T	34.1T
Rigel	1.32'A	1.6'A
Cappella	3.4A	4.2'A

This is splitting the hair in four, however on the enclosed UPS I have marker in red the new position of the LOP's advance to 19:00 WT.

The advance LOP's(19:00:00WT)resulting fix is: **08°48.2'N;109°45.0'E**

Against the original fix of: **08°48.8'N; 109°44.2'E**

Not worth the time spent on advancing for such a small distance and time frame.

PB.