REANALYSIS OF THE KRZYSTEN-RAIRDON ARC OF LIGHTS VIDEOTAPED MARCH 13, 1997

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INTRODUCTION

During the summer of 1998 this author analyzed the March 13, 1997 ("M13") videos of Lynne Kitei (LK), Mike Krzysten (MK) and Chuck Rairdon (CR) in order to determine whether or not the anomalous lights in these videos were over southwestern Phoenix or near Phoenix, as initially claimed by the witnesses. In order to confirm (or deny) this claim it was necessary to determine exactly where the lights were before claiming, as some did, that either they were unknown lighted objects or were attached to an unknown (huge!) object.

The method of determining the locations of the lights was straightforward triangulation based on the assumption that the witnesses all filmed the same lights at the same time (within a couple of minutes). This assumption was quite reasonable when appled to the MK and CR light arrays (the "Krzyston-Rairdon Arc," the KRA) because they are nearly identical with the exception that the lights at the far right of the array in the MK video disappear within tens of seconds of their appearance whereas the same lights in the CR video are visible for much longer. The assumption also seemed reasonable for the lights in the LK video because she was looking south-southwestward so that her sighting line crossed the sighting lines of MK and LK and therefore the lights could have been at the convergence point. However, as was pointed out in the previous work, the order of disappearance of the lights in the LK video does not match the order of disappearance of any three adjacent lights in the MK video. This difference in order of lights going out was attributed to the fact (as determined from the video analysis) that the lights in both the MK and LK videos were moving slowly downward and thus could have dropped, at different times, below the rugged ridgeline of the Estrella range southwest of Phoenix. However, there is another possibility to explain the difference in order of disappearance: it could be that LK videoed completely different lights. This possibility is based on her claim that her video was taken before 10 PM whereas MK said his video was taken after 10 PM. The following analysis is based on the assumption that the LK lights were not part of the KRA.

NEW TRIANGULATION OF THE "KRZYSTEN-RAIRDON ARC" OF LIGHTS

Accurate triangulation requires a large baseline and accurate viewing angles (sighting directions) as measured relative to the baseline. In the 1998 analysis the baseline of the triangle, that is, the distance from CR to MK, was found to be 32 miles, so it was expected that the CR-MK triangulation would be quite accurate. However, the analysis of the CR video with the video equipment then available did not produce sufficiently accurate sighting angles from the CR location (there was low confidence in the values of the angles). Therefore the CR sighting directions were based on a triangulation that used the reasonably accurately determined (angles to within a degree and a 7.5 mile baseline) LK and MK sighting lines. The CR sighting directions, obtained in this way, combined with the MK directions, yielded triangulated locations that, unsurprisingly, agreed with the LK-MK locations (as shown in the "Report on Phoenix Lights Arrays," Sept. 1998).

Now it is assumed that the LK lights play no role in the MK-CR triangulation so another way must be used to determine the sighting lines from the CR location. An analysis of the "raw data," that is, the CR video and a comparison/reference video was undertaken using modern equipment. This analysis resulted in the determination, with reasonable confidence, of the sighting line directions from the CR location and for a new triangulation of the light array. The results of the new analysis are described below.

ANALYSIS OF THE REFERENCE VIDEO

The reference video was made by this author at the CR sighting location (CR's back porch) during 1998, about a year and a quarter after the M13 sighting. The reference videotape, taken at various magnifications, shows the daytime scenery to the south and west of CR and in the general direction of the lights as indicated by CR. Of particular importance is the fact that Santan Peak, which is nearly due south of CR, appears in the video at maximum zoom. Santan Peak is used as a geographical reference point to establish the sighting line directions (azimuths of the sighting lines). The camera at full zoom was rotated clockwise from the Santan Mountains to beyond the direction which CR indicated was the direction to the lights. Figure 1 below indicates the location of CR, the Santan Peak and the general direction of sighting lines.

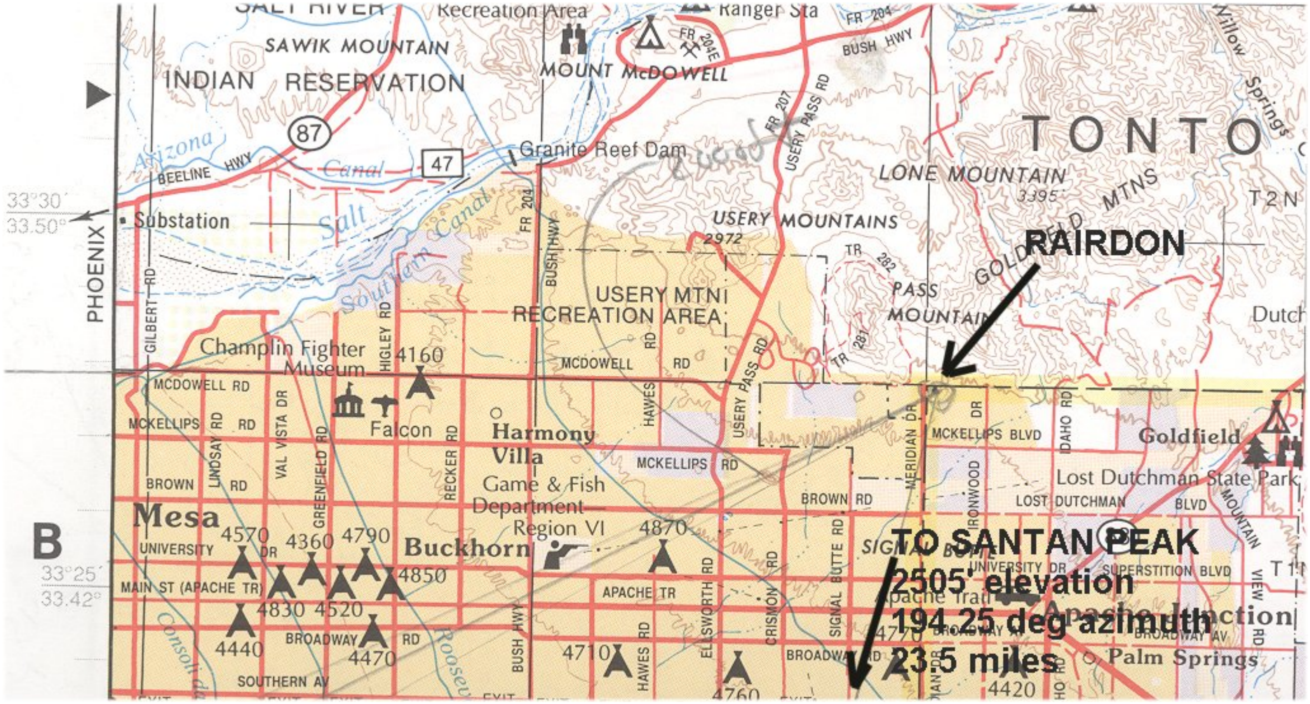

FIGURE 1: LOCATION OF CHUCK RAIRDON AN0044
DIRECTION TO SANTAN PEAK

Santan Peak, azimuth 194.25^0, provides a reference direction but the sighting lines of interest are farther to the west, so a series of frames from the comparison video were used to “transfer” the reference direction to the direction of the lights. To do this it was first necessary to calibrate the camera to determine the angle scale factor equal to the number of degrees per pixel when the camera is at full zoom. This was done (with the help of my daughter) by videotaping a yardstick at 50 ft as shown below. The angle subtended by the yardstick at 50 ft is 3/50 radians or 3.44^0 which corresponds to 451 pixels of the digitized picture. This yields the scale factor used below, 0.00763 degrees per pixel.

FIGURE 2: CALIBRATION OF THE CAMERA FOR
DEGREES PER PIXEL AT FULL ZOOM

The following are frames of the comparison video that were used to transfer the Santan Peak sighting direction to another feature in the scenery, a telephone pole that is close to the location of the left hand light of the array, referred to as "light 1."

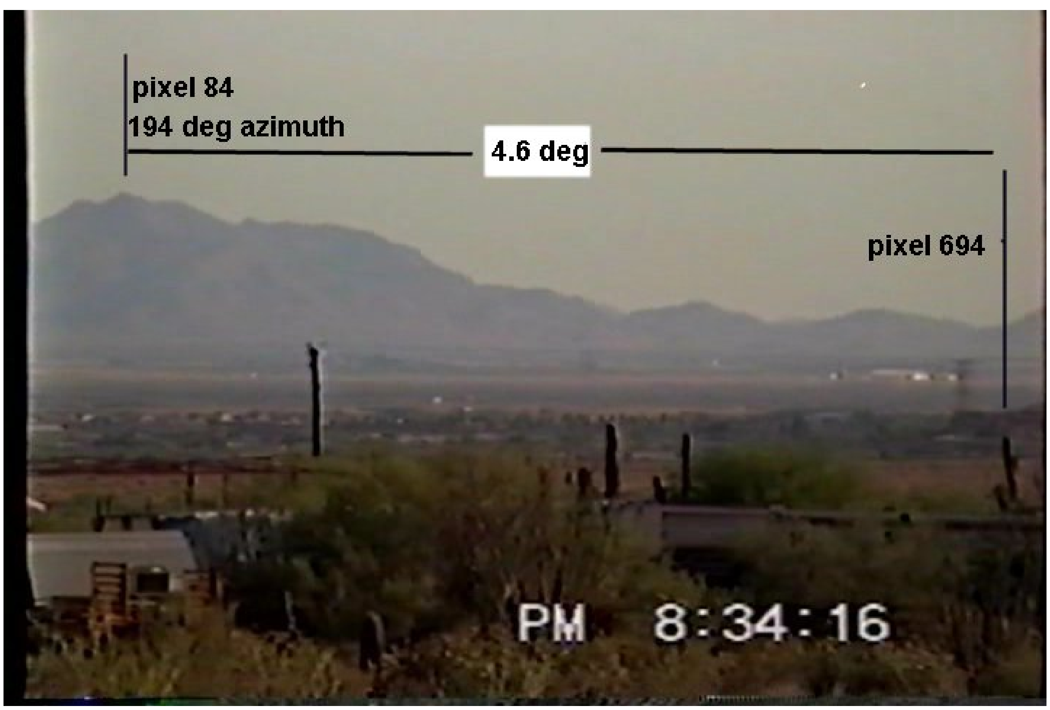

FIGURE 3: SANTAN PEAK AND THE ANGLE TO
A "REFERENCE CACTUS" (FROM REFERENCE VIDEO, 1998)

In the above and following scenes the vertical dark lines indicate the direction reference transfer points and the numbers of pixels are used to calculate the difference in directions. For example in Figure 3 the pixel width of the direction difference is 694-84 = 610 pixels. This is converted to the angular difference by multiplying by the scale factor: $0.00763 \times 610 = 4.6^0$.

FIGURE 4: SIGHTING DIRECTION TRANSFER FROM "REFERENCE CACTUS" TO "REFERENCE POLE"

FIGURE 5: SIGHTING DIRECTION TRANSFER

FIGURE 6: SIGHTING DIRECTION TRANSFER

FIGURE 7: SIGHTING DIRECTION TRANSFER

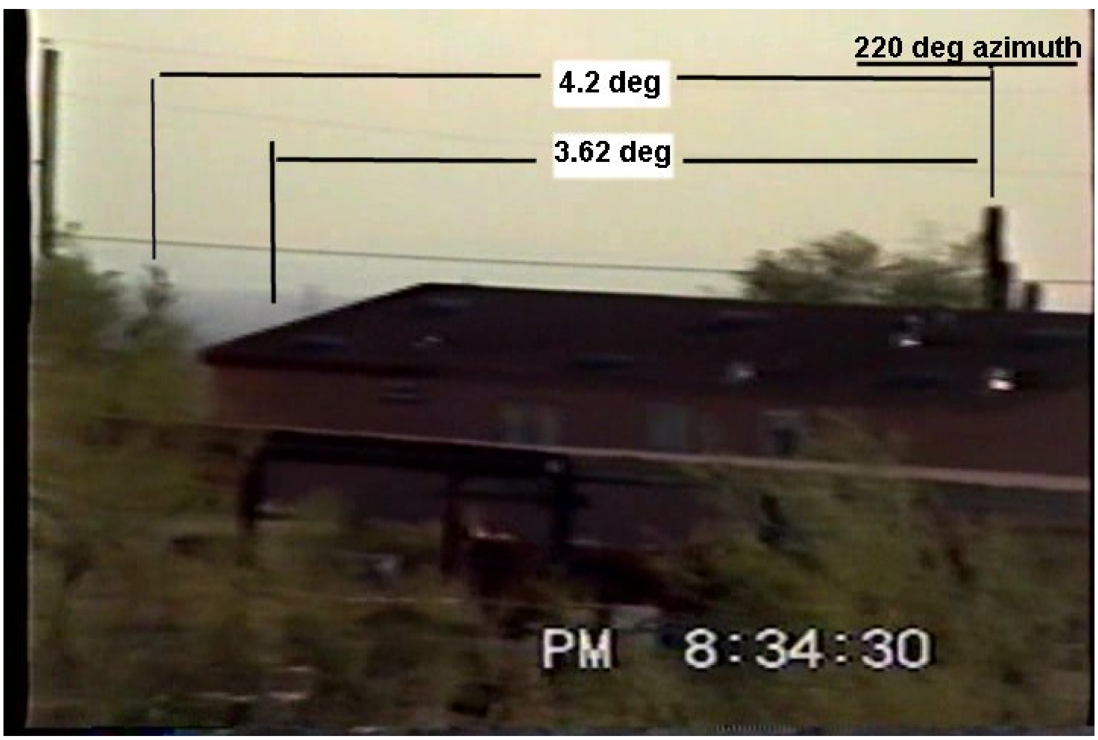

FIGURE 8: SIGHTING DIRECTION TO REFERENCE POLE
AND HOUSE ROOF

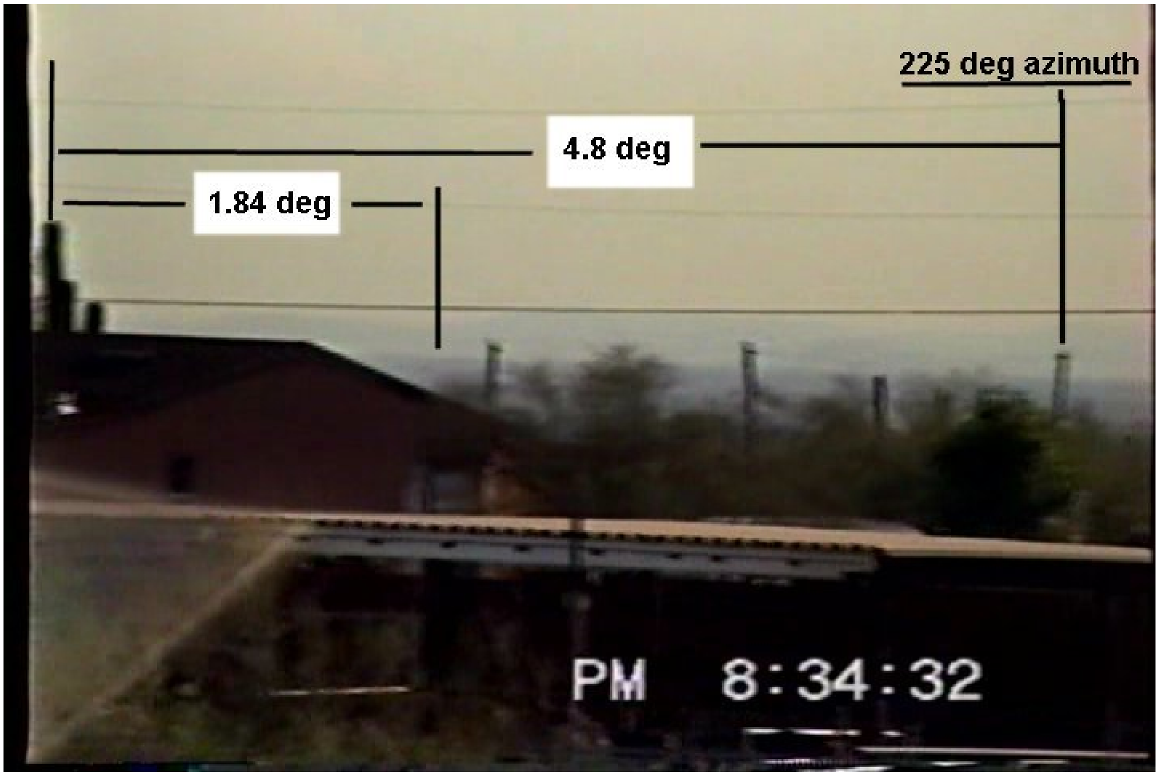

FIGURE 9: HOUSE ROOF AND REFERENCE POLE

By adding the sighting line differences in the above scenes to the 194^0 azimuth of Santan Peak one finds that the direction to the "reference pole" in Figure 8 is 220^0 which should be accurate to within a degree or so. Figure 9 extends the azimuth reference to about 225^0.

THE CHUCK RAIRDON VIDEO

Figure 10 shows a frame about 5 seconds into the CR video. The frame has been brightened and converted to black and white. The array of anomalous lights in the sky is obvious. Not as obvious is a dark image at the lower left as designated by dark arrows. This is the image of the house roof shown in Figures 8 and 9. The length of the roof as it appears in silhouette (between the arrows) is about 3.6 +1.8 = 5.4 degrees. Figure 11 is a negative image of a similar frame.

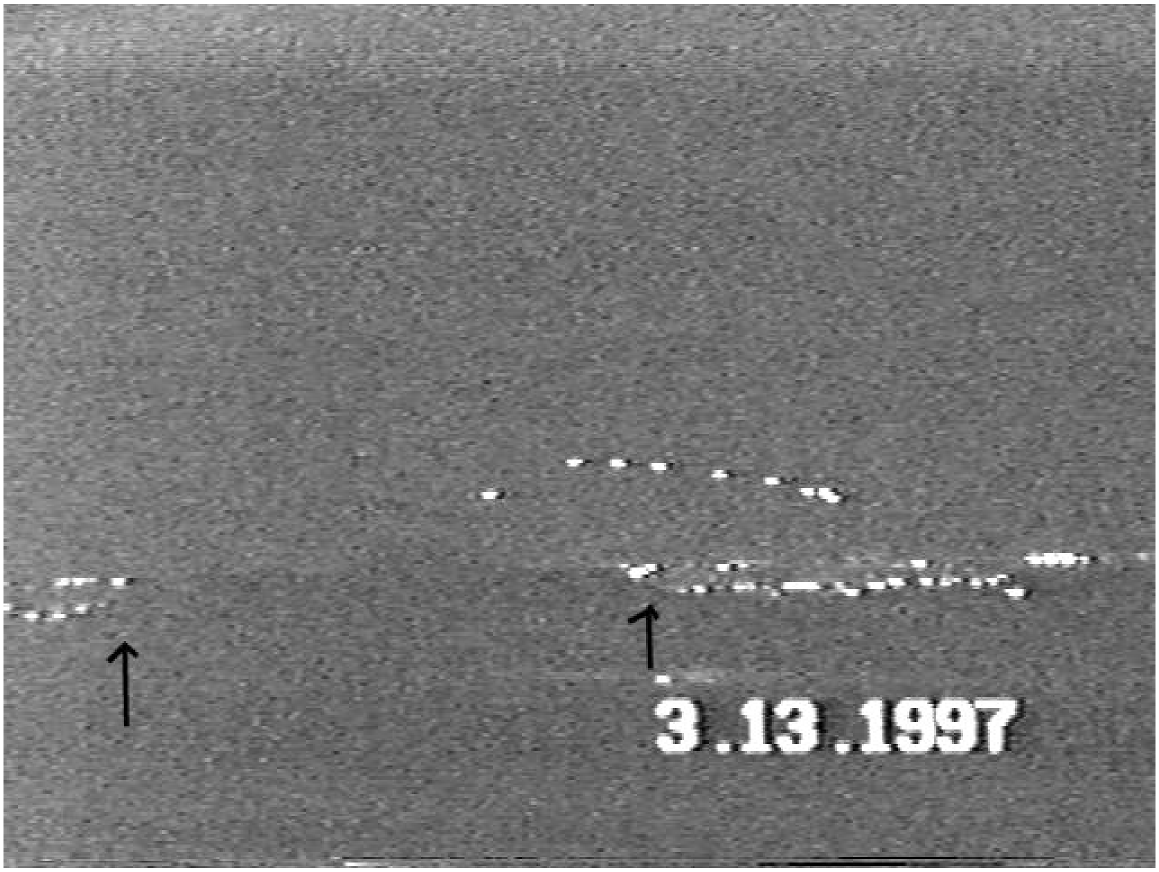

FIGURE 10: A FRAME OF THE CR VIDEO AT ABOUT 5 SECONDS
(This has been brightened to make visible the silhouette of the house roof.)

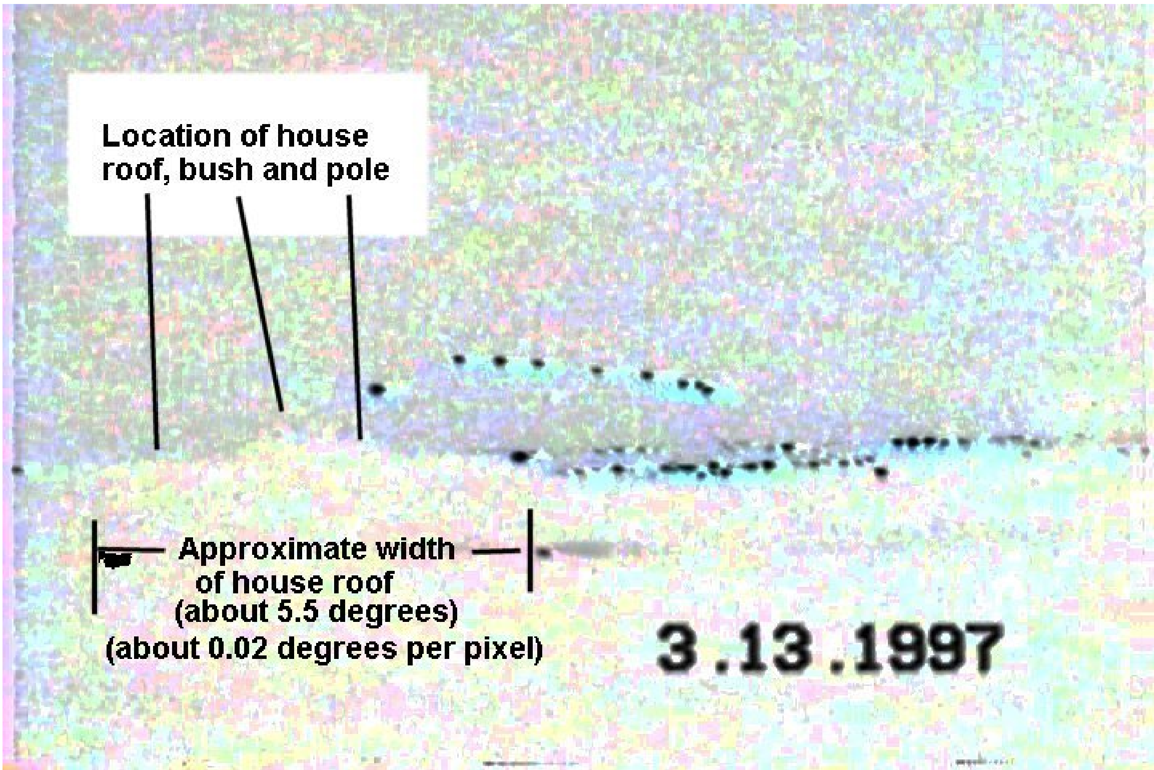

FIGURE 11: A FRAME OF THE CR VIDEO
(This is a negative image.)

It should be noted that the outline of the house roof is visible because it is silhouetted against distant city lights. There is, unfortunately, very little contrast in a single frame between the brightness level of image of the house roof, essentially zero (plus noise), and the brightness of the background (a low level plus noise). However, when the video is run (at 30 frames/second) the natural tendency of the eye to average rapidly changing scenes (the noise level fluctuates) tends to "average out" the noise and thereby make the contrast appear greater. Thus when watching the video play it is easier to see the outline of the roof. In particular, it is possible to identify the location of the large bush or tree that rises above the house roof and thereby to estimate the location, in a video frame, of the reference pole. To see this, compare the bush image location in Figure 12 with the location indicated in Figure 11.

FIGURE 12: HOUSE ROOF, BUSH AND POLE

SIGHTING DIRECTION TO THE LIGHTS

It should be apparent from Figure 11 that the leftmost light (light 1) is almost exactly at the azimuth of the pole. Using the scale factor 0.02 degrees per pixel (see Figure 11) and a measurement of the pixel distance from light 1 to light 2 (at the extreme right of the array), 206 pixels, one finds that the length of the array is about 4^0. That means that the array stretches from an azimuth of about 220^0 to about azimuth 224^0. The CR sighting directions can be plotted on a map, starting from the location of CR along with the location of MK and the sighting lines of MK, to locate the lights in the array. O"f particular interest are the distances of the lights from the witnesses. The distances can be determined by direct calculation using the law of sines.

Imagine drawing a triangle with a baseline and sighting lines from each end of the baseline that converge to a point at some distance from the baseline. At the left end of the baseline is the location of MK. The baseline runs 32 miles along an azimuth of 110^0 to the location of CR. The sighting line from MK to light 1 (the leftmost or eastmost light) is at azimuth 202^0. Thus the angle between the baseline (110^0) and the sighting line is an interior angle of the triangle: $202 – 110 = 92^0$. From the CR location the sighting line azimuth is 220^0. The interior angle at the CR location is the angle between the baseline and the 220^0 azimuth: 360 – (180-110)-220 = 70. The angle between the sighting lines, as measured at their intersection point far from the baseline, is 180 – 92 – 70 = 18^0. The law of sines uses the ratios between the various sides of a triangle and the angles opposite those sides:

$$A/SIN(a) = B/SIN(b) = C/SIN(c) \qquad (1)$$

where A, B and C are the sides and a, b and c are the angles opposite those sides. In this case the baseline (A = 32 miles) and the angle opposite (18^0) are known. Also known are the angles b (92^0) and c (70^0), so the calculation, rounded off to the nearest mile, is as follows:

$$32/SIN(18) = 103 = B/SIN(92) = C/SIN(70) \qquad (2)$$

$$B = 103 \times SIN(92) = 103 \text{ miles} \qquad \text{(CR distance)} \qquad (3)$$

$$C = 103 \times SIN(70) = 97 \text{ miles} \qquad \text{(MK distance)} \qquad (4)$$

where B is the distance from CR to the location of light 1 and C is the distance from MK to light 1. These distances are roughly 25 miles farther from the witnesses than the distances previously reported (79 miles from CR and 71 miles from MK).

A similar calculation can be carried out for the light at the right end of the array (light 2). In this case angle b = 97^0, c = 66^0 and therefore a = 180-(97+66) = 17^0.

$$32/SIN(17) = 109 = B/SIN(97) = C/SIN(66) \qquad (5)$$

$$B = 109 \times SIN(97) = 109 \text{ miles} \qquad \text{(CR distance)} \qquad (6)$$

$$C = 109 \times SIN(66) = 100 \text{ miles} \qquad \text{(MK distance)} \qquad (7)$$

Again, these distance are about 25 miles larger than calculated before. Using the law of cosines it is possible to calculate the distance between light 1 and light 2. In this case one uses the angle between the two sighting lines from MK (or CR) along with the calculated distances from the MK (or CR) to the lights. Using the MK values one has:

$$S^2 = 97^2 + 100^2 - 2 \times 97 \times 100 \times \cos(97-92) \qquad (8)$$

$$= 56$$

$$S = (56)^{0.5} = 7.5 \text{ miles.}$$

This is the same distance as presented in the previous report.

CONCLUSION

In the previous analysis the intersection of the MK and LK sighting lines was used to "calibrate" the sighting directions from CR's location. This was because, as described above, the ground reference images that were obvious in the daytime reference video were very indistinct in the CR video and so this author did not feel confident in using the indistinct images, such as that of the house roof, to establish sighting directions. However, there is now a new consideration, namely, that it is possible that the LK video does not show lights in the MK-CR array. In that case the intersection of LK and MK sighting lines is irrelevant and cannot be used to calibrate the CR sighting directions. Instead, the MK-CR triangulation must then be based on sighting line directions determined from the CR and reference videos alone. Fortunately better equipment now available has made this possible, as demonstrated above.

Even though the new analysis shows that the sighting directions in the old analysis were wrong by about 5-6 degrees (e.g., sighting line 1 was 226^0 in the previous analysis, 220^0 in the new analysis), it is important to realize that the general conclusion of the first analysis is supported and even strengthened by the new results. The general conclusion is that the "Krzysten-Rairdon Arc" was far southwest of Phoenix rather then over or close to Phoenix. As pointed out in the previous analysis, this places the lights in the vicinity of the Goldwater Training Range where, it is said, at about 10 PM, the Maryland Snowbirds Air National Guard unit finished a training exercise that used very bright LUU-2 flares and then ejected the remaining flares so they would not have to land with flares in the loading bay. According to the spokesman for the Air Guard these flares were dropped at high altitude and therefore could be seen by people, such as MK, who were at the higher altitudes in the Phoenix area. As has been pointed out in the previous analysis, the lights move slowly downward and to the left, as would parachute flares falling in an air mass that is moving eastward, which was the general wind direction at the time. Also, the durations of the lights are less than the maximum burn time of these flares (about 5 minutes). Therefore this investigator concludes that the lights were flares dropped by the Maryland National Guard.

END NOTE: The previous analysis also discussed the January 14, 1998 (J14) light arrays which were described by the witnesses as appearing just like the M13 lights discussed here. This new analysis would also impact the triangulations carried out for the J14 lights: it would move the lights 20 - 25 miles farther from the witnesses than calculated previously.