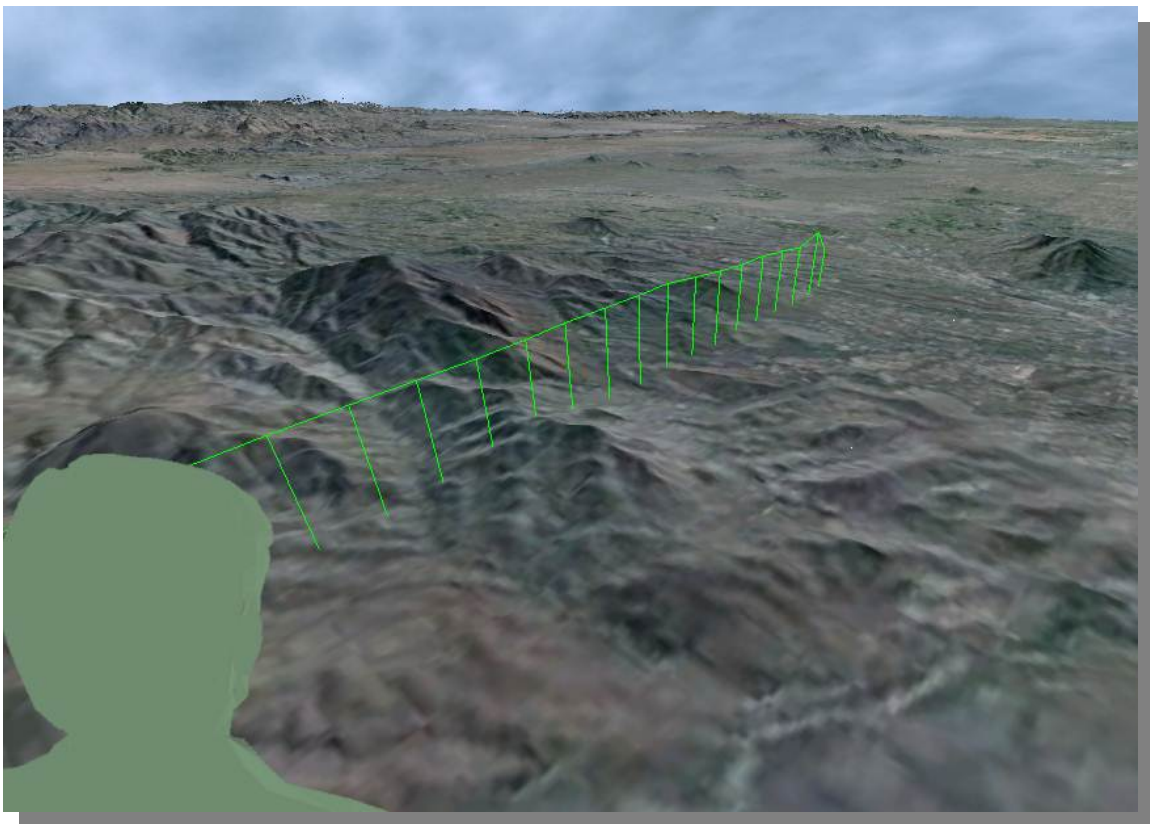


Immersive Witness Interview (IWI) - Reconstruction, Cave Creek, AZ USA

Immersive Witness Interview (IWI[®])
Accident: EC135 T2, S/N: 0094; N127TS; Services Group of America;
Cave Creek, AZ; 02-14-2010; NTSB Ref: WPR10FA133



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In the frame of the Cave Creek accident investigation, five witnesses were interviewed on April 19-20, 2011 with the Immersive Witness Interview (IWI®) method. These interviews were conducted by Dr. Bauer and the NTSB investigation team more than a year after the accident. The main objective of the study was to demonstrate the IWI technology to the NTSB.

| Witness | Latitude (deg) | Longitude (deg) |
|---------|----------------|-----------------|
| #1 | 33.850517 | -111.926580 |
| #2 | 33.846851 | -111.921270 |
| #3 | 33.851836 | -111.924960 |
| #4 | 33.854574 | -111.925909 |
| #5 | 33.850431 | -111.929580 |

Table 1: Position in Latitude and Longitude of the interviewed witnesses.

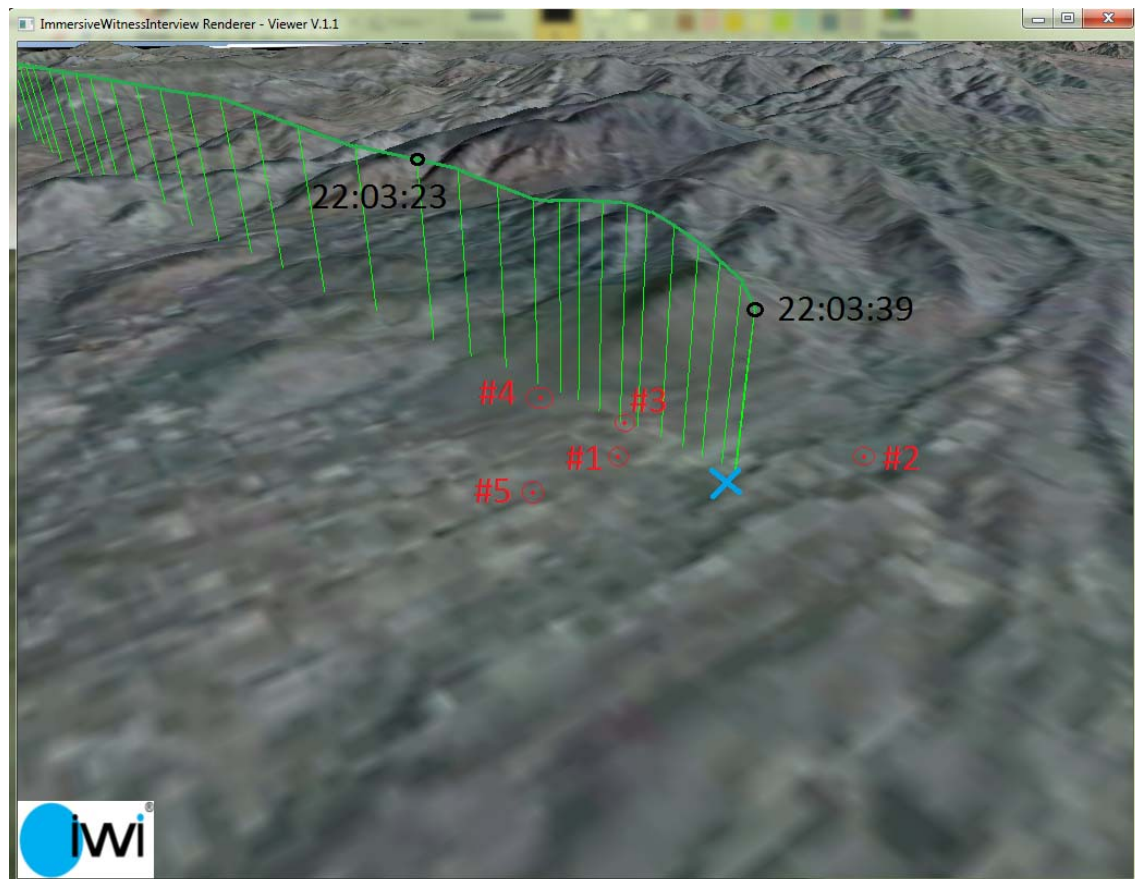


Figure 1: Complete radar plot as provided by the Phoenix Terminal Radar Approach Control (TRACON, green track with vertical lines); the witness positions (red); and the position of helicopter wreckage (blue)

Figure 1 shows the helicopter radar plot (green line with vertical lines), the positions of the five witnesses in red, and the helicopter wreckage position marked with a blue cross. The radar plot shows the helicopter’s flight path traveling at a height of approximately 2,000 feet above ground. The radar data between 22:03:23 and 22:03:39 GMT has been interpolated as shown in annex A.

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The investigation revealed that the “pop pop” sound described by witnesses was the main rotor blade impacts with the tail section. A review of the wreckage debris path, witness statements, and radar data revealed the “pop pop” sound would have occurred shortly after 22:03:23, around which time the accident maneuver initiated.

With regards to witness observations and the accident sequence, in most cases, the “pop pop” sound is what drew the witnesses’ attention to the helicopter. Therefore, it is only reasonable to expect that most witnesses saw the helicopter’s flight path after 22:03:23

Witness #1:

The witness #1 was inside his house when he heard the helicopter over his house. He heard a “pop pop” sound and went to the window. Figure 2 shows the witness’s South view out of the window, when he first saw the helicopter, with the nose down and falling from the approximate positions indicated by points T0 to T2 (red line). The green line at the top of the image is the radar plot, which depicts the helicopter’s flight path coming from the north flying over the witness.



Figure 2: Radar plot (green) and photo of witness #1’s view with his observed flight path (red line between points T0 and T2)

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Witness #2:

The witness #2 was inside his house when he first heard the helicopter. He heard a strange sound and went outside to his terrace to see. As shown in figure 3, he saw the helicopter falling down (red line) from the approximate positions indicated by points T0 to T2. The green line at the top of the image is the radar plot, which depicts the helicopter's flight path traveling from the right to left.

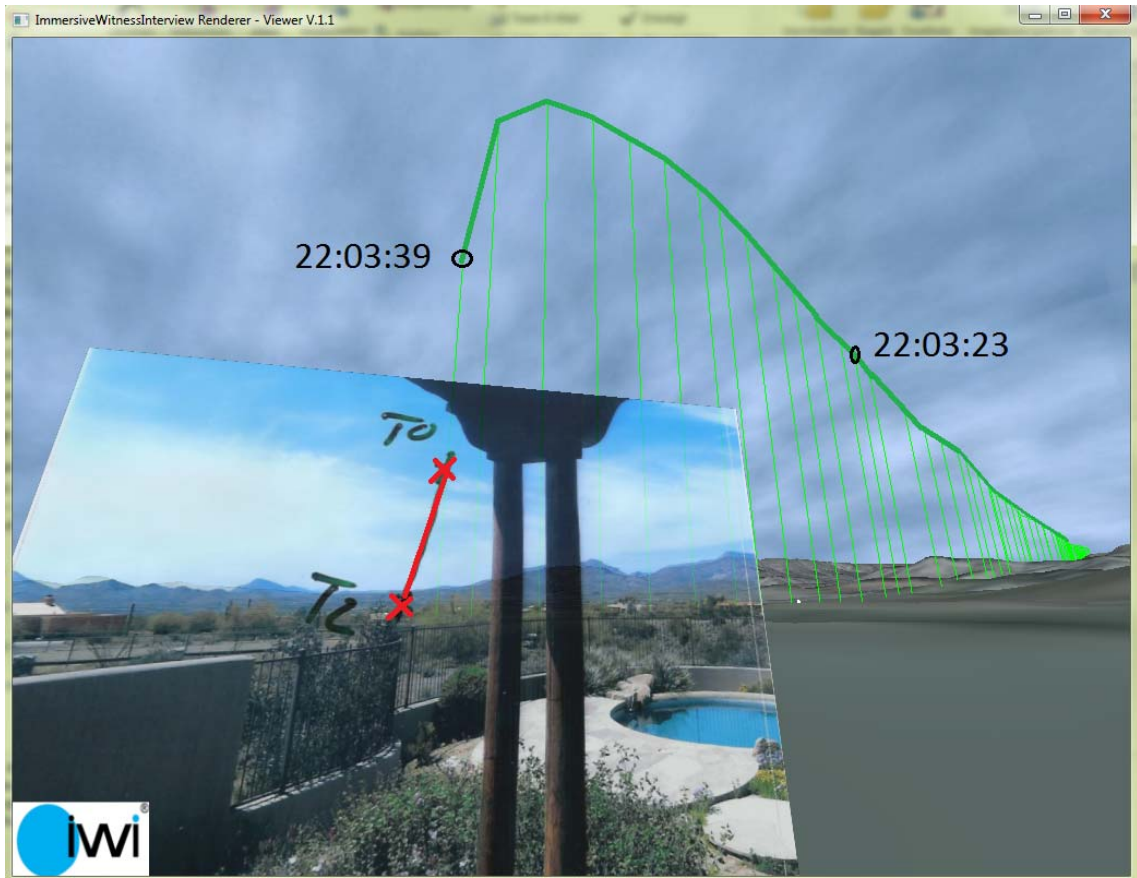


Figure 3: Radar plot (green line with vertical lines) and photo displaying the view from witness #2 with his observed flight path (red line between points T0 and T2)

Witness #3:

Witness #3 was in the front of his house when he first heard the helicopter flying overhead. He then heard an unusual “pop pop” sound and then looked up and first saw the helicopter at the position approximately depicted by point T0 as shown in figure 4. The red line shows what the witness believes he observed the helicopter’s flight path to have been between the points T0 to T1 and then going down to T2. The green line at the top of the image is the radar plot, which depicts the helicopter’s flight path flying over the witness towards the south.

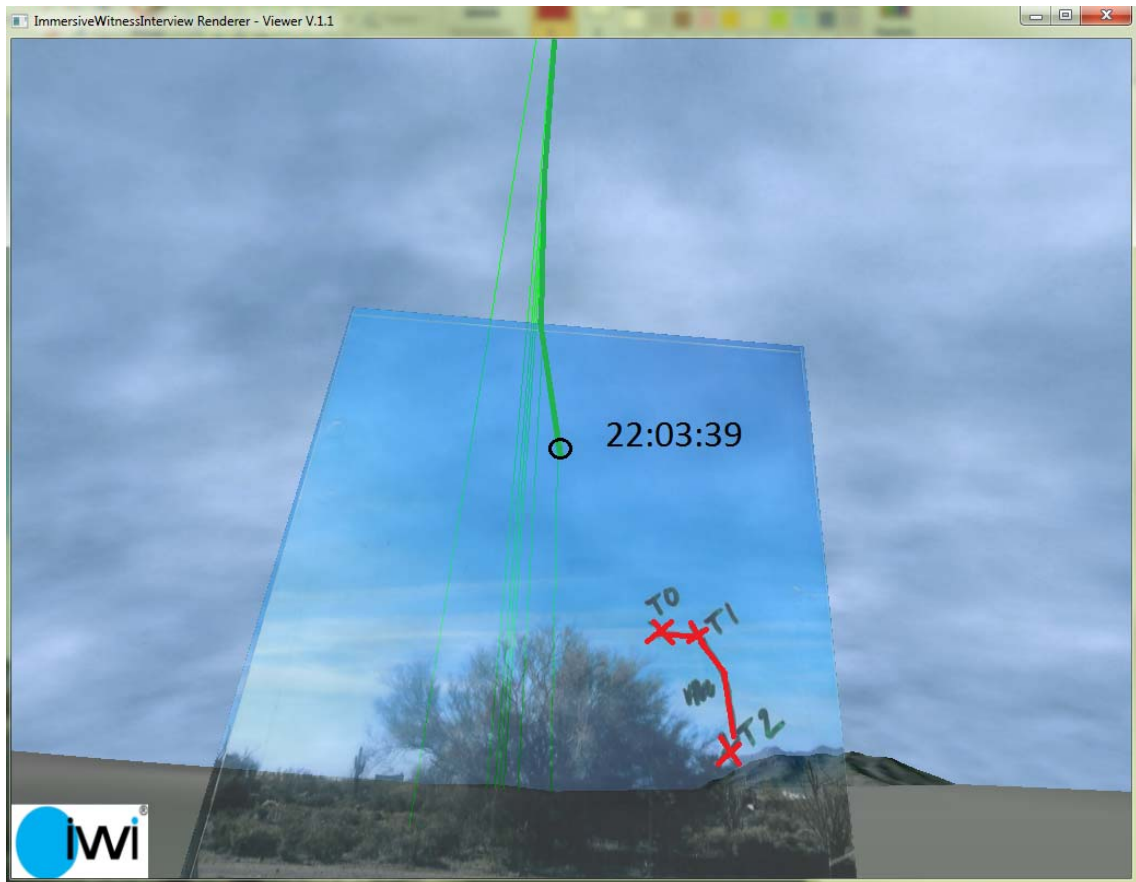


Figure 4: Radar plot (green line) and photo depicting witness #3's view and observed helicopter flight path (red line) from T0 to T1 to T2

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Witness #4:

Witness #4 was walking his dog in a lower terrain area of a creek bed when he first heard the sound of the helicopter. Figure 5 depicts the location at which he first saw the helicopter at T0 traveling towards him from over the hills north of his position. At T1 he described hearing a “pop pop” sound and saw pieces falling off the helicopter. He stated that the helicopter then started to descend to the location depicted at point T2.

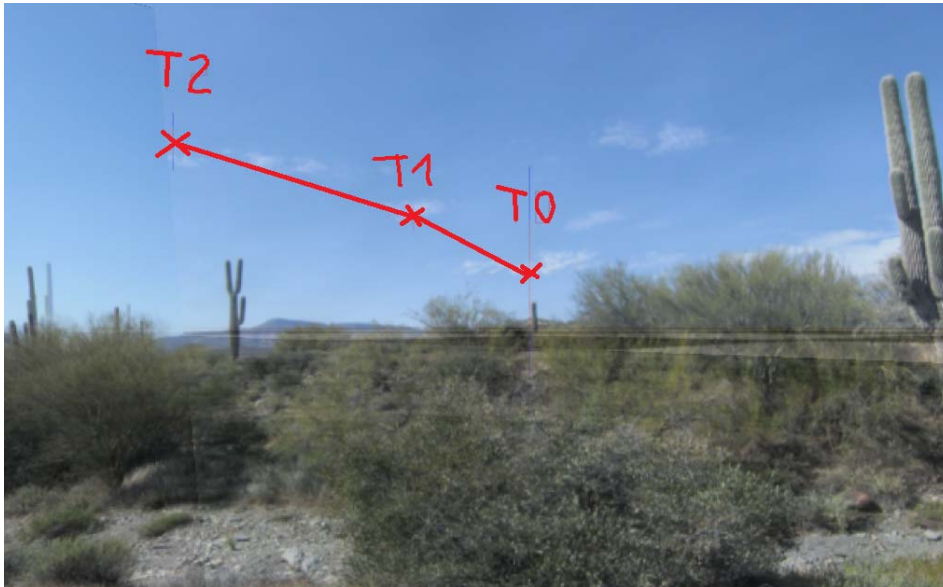


Figure 5: Witness #4's view (from the creek bed) with his observed helicopter flight path (red line) from T0 to T1 to T2, flight path as depicted by radar is out of view to the right.

Witness #4 then moved out of the low creek area to a higher position approximately 70 feet from his initial location (figure 6), where he saw the helicopter again, and this time beginning at a point marked by T0. At this point the witness stated that the helicopter was “going down, and rotating twice, then going up a bit and falling over”. This is depicted in the moments of traveling between points T0 and T1; he then described it going down to the point marked by T2.

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Figure 6: View of witness #4 (above the creek bed) with his observed helicopter flight path (red line) from T0 to T1 to T2

Witness #5:

It should be noted that witness #5 was the only one among the five IWI witnesses who had not been previously interviewed by the NTSB investigation team during the onsite phase of the investigation just after the accident.

During the IWI interview, more than a year after the accident, the witness explained that he was in his backyard when he initially heard the helicopter. After hearing a strange sound which he described as a “big bang” he went next to the pool and looked over the fence (see the photo in the lower right of figure 7). The witness stated he saw the helicopter for the first time at the approximate point depicted by T0 (coming from the left out of the trees in his view). Then at T1, he noted that the helicopter began to go down to T2. Figure 7 also shows the radar flight path data depicted by the green line, showing the helicopter traveling from the left within about 1,800 feet above ground level. The witness described the flight path of the helicopter much lower.



Figure 7: Radar plot (green line) and photo of witness #5's view (lower right) with his observed helicopter path (red line) from T0 to T1 to T2

Summary:

It should be noted that this study and the associated witness interviews were conducted by Dr. Bauer and the NTSB investigation team more than a year after the accident. The main objective of the study was to demonstrate the IWI technology to the NTSB.

With regards to the longitudinal and lateral position of the helicopter, the witness observations were generally consistent with the radar data.

Witness #4 was generally below the helicopter and began to move to a higher elevation, looking up to observe the helicopter. This is a challenging perspective for a witness from the standpoint that the witness had limited reference objects which changed over time as he moved.

Witness #5 reported the altitude of the helicopter's flight prior to the accident sequence to be generally lower than what was recorded by radar. As it would have taken the witness several seconds after the "pop pop" sound to move to his vantage point, it is unclear at which point during the flight path he observed the helicopter.

The radar data did not include the end of the helicopter's flight path to the accident site. Figure 8 shows the lines of sight for Witnesses #1 and #2. If the intersections of both lines of sight are considered, then an almost vertical flight path can be expected (shown in figure 8 with a purple dashed line). Based on the observations of witnesses #1 and #2, the helicopter's flight path just before impact was almost straight down.

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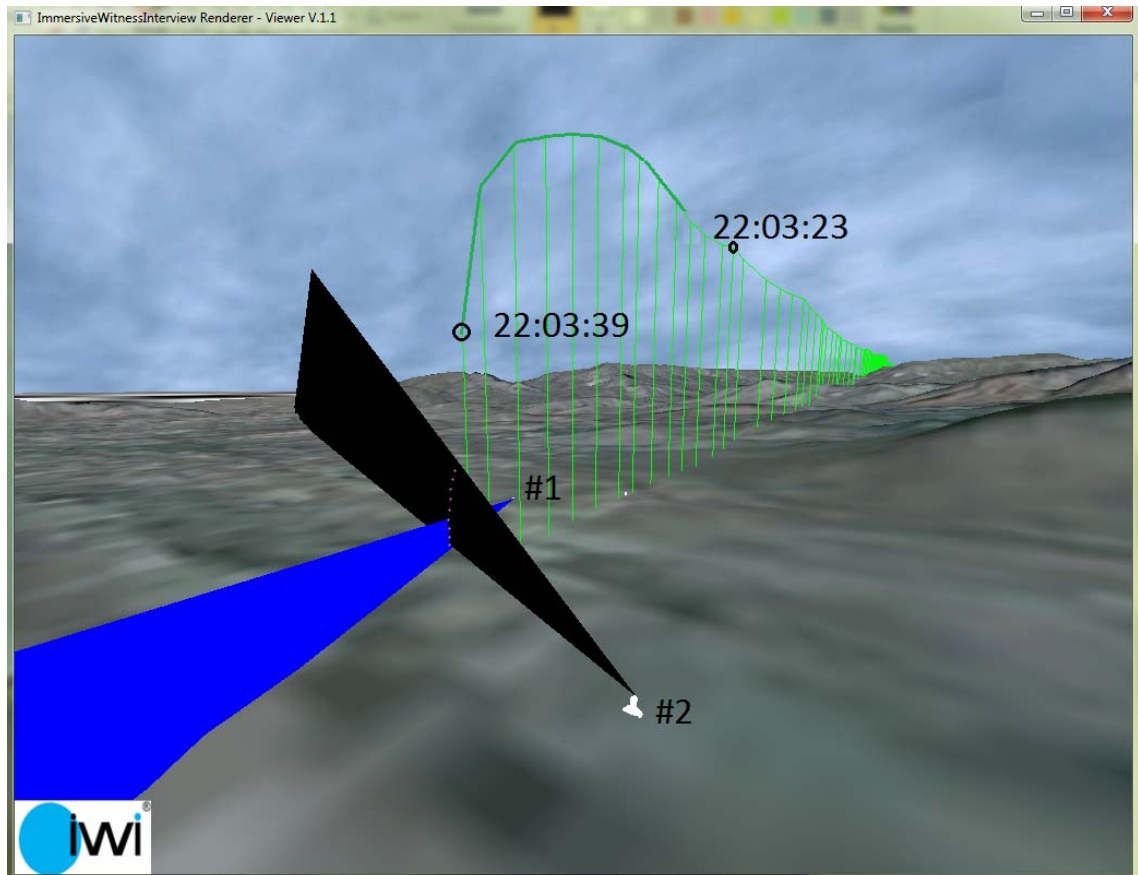


Figure 8: Lines of sight of witnesses #1 (blue shading) and #2 (black shading), the assumed final flight path (purple line), and the flight path based on radar data (Green)

Based on witnesses #1 and #2, the ground impact position of the helicopter was calculated to be at: Latitude: 33.84811215° and Longitude: -111.92505423° . This reconstructed point is quite accurate, as it is only about 75 feet away from the actual position of the helicopter wreckage.

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Annex A:

Radar Data Interpolation:

The following tables show the provided radar data. Radar data points 3-16 have been interpolated as shown in figure 9.

Point 17 shows the crash site and the altitude values for points 11, 13 and 14 were interpolated due to radar only (RO) and beacon only (BO) returns for these points (no altitude info available).

| Radar Point | Time | Lat_deg | Lon_deg | BaroAlt_feet | |
|-------------|-------------|-------------|---------------|--------------|------|
| 1 | 22:03:13 | 33,86381944 | -111,92656667 | 4600 | |
| 2 | 22:03:18 | 33,86029722 | -111,92617778 | 4600 | |
| 3 | 22:03:23 | 33,85750000 | -111,92638900 | 4500 | |
| 4 | 22:03:24 | 33,85694400 | -111,92611100 | 4500 | |
| 5 | 22:03:24 | 33,85611100 | -111,92333300 | 4500 | |
| 6 | 22:03:27 | 33,85555600 | -111,92583300 | 4500 | |
| 7 | 22:03:28 | 33,85277800 | -111,92500000 | 4400 | |
| 8 | 22:03:29 | 33,85305600 | -111,92555600 | 4400 | |
| 9 | 22:03:29 | 33,85277800 | -111,92388900 | 4400 | |
| 10 | 22:03:33 | 33,85083300 | -111,92611100 | 4700 | |
| 11 | 22:03:34 RO | 33,85055600 | -111,92555600 | 4550 | 2400 |
| 12 | 22:03:34 | 33,84944400 | -111,92250000 | 4400 | |
| 13 | 22:03:37 BO | 33,84972200 | -111,92500000 | 4200 | 2400 |
| 14 | 22:03:38 RO | 33,84888900 | -111,92583300 | 4000 | 2400 |
| 15 | 22:03:38 | 33,84833300 | -111,92333300 | 3800 | |
| 16 | 22:03:39 | 33,84888900 | -111,92500000 | 3700 | |
| 17 | - | 33,84802220 | -111,92526000 | 2340 | |

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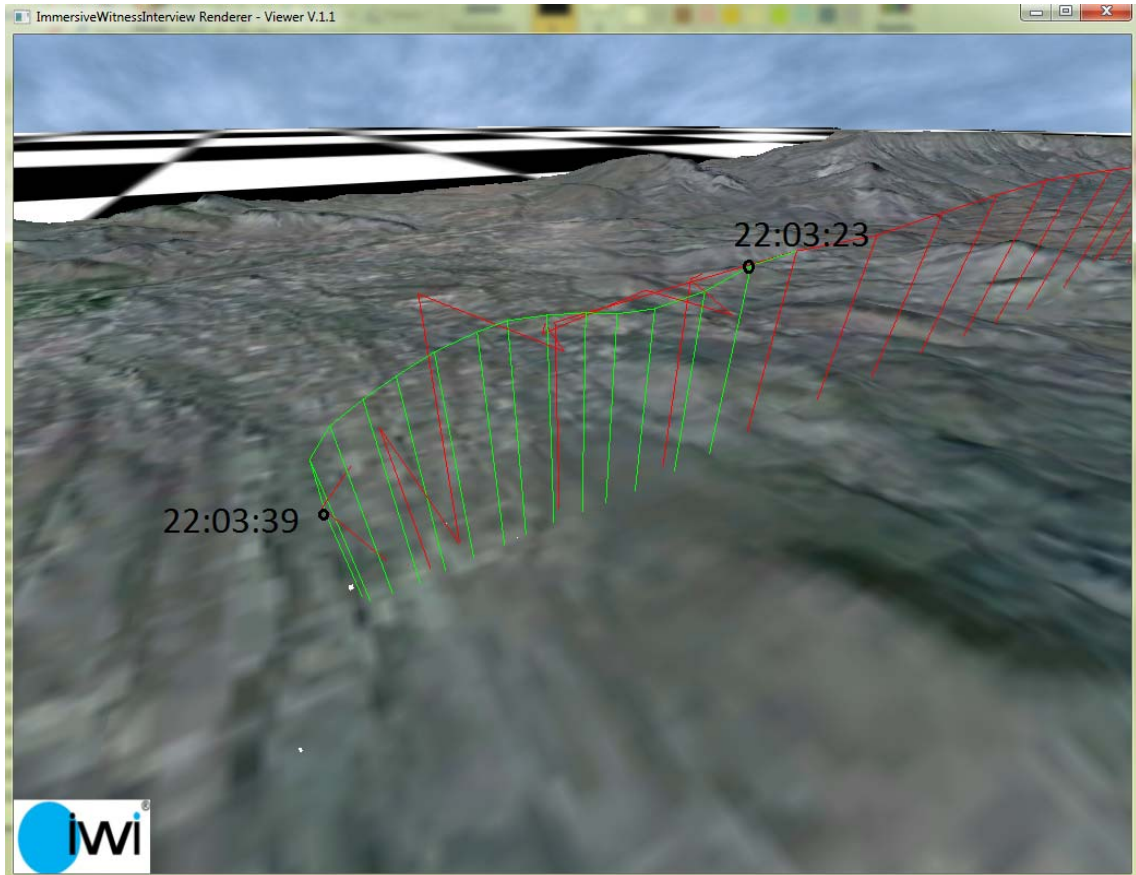
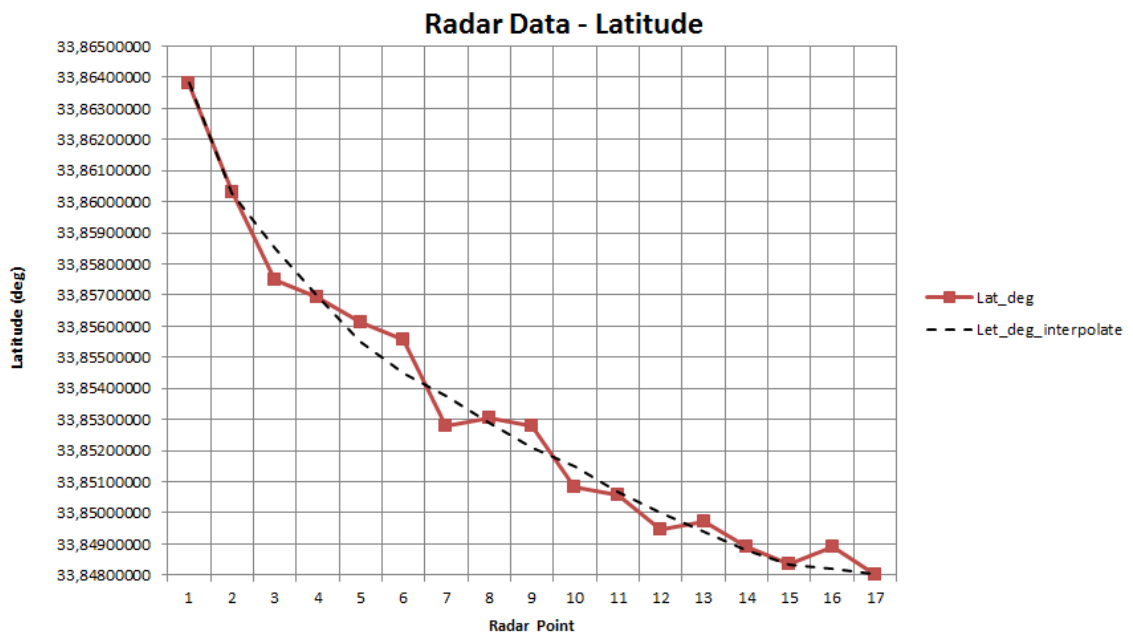
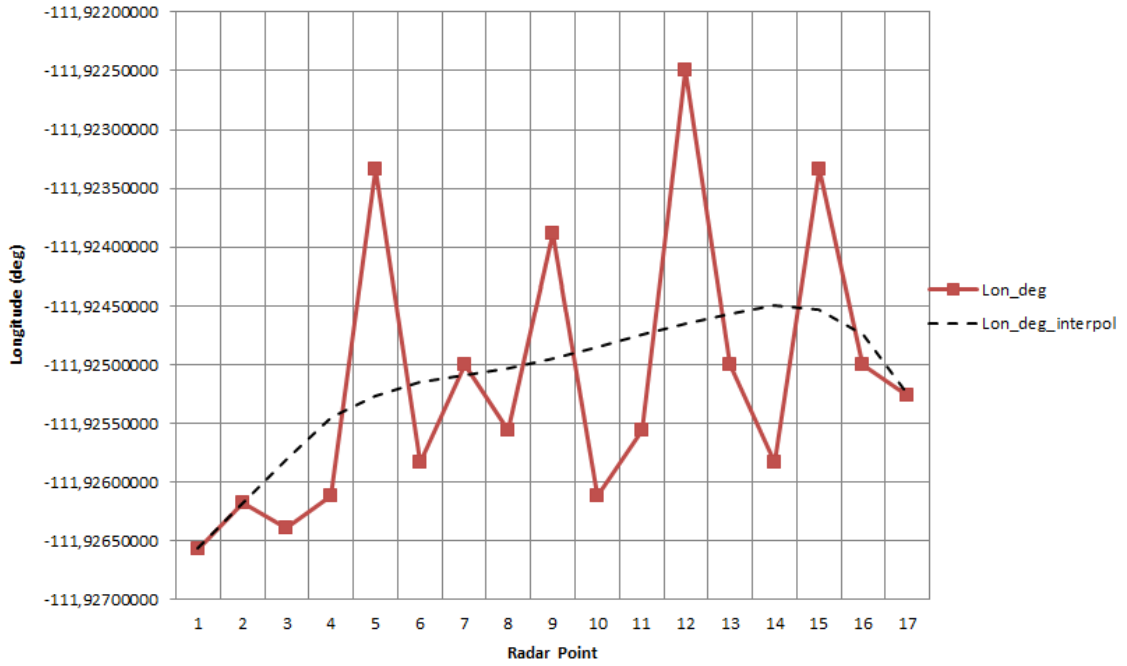


Figure 9: Radar data (red) with interpolated data at the end (green)



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Radar Data - Longitude



Radar Data - Altitude

