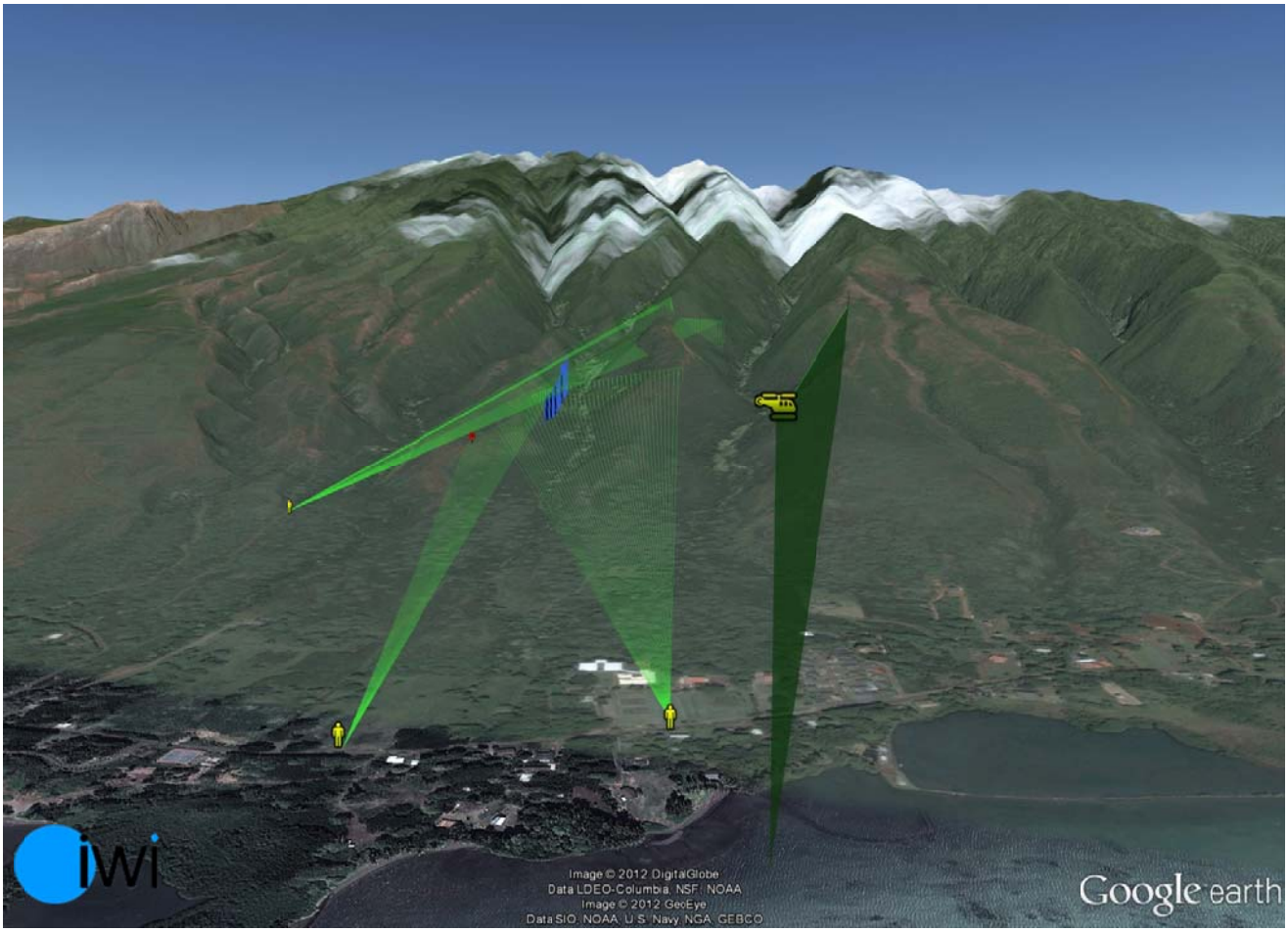
Operations/Witness Group Chairman's Factual Report

Attachment 5 – Immersive Witness Interview (IWI) Report

WPR12MA034

Immersive Witness Interview (IWI ®)

Accident: EC130 B4, S/N: 4909; N11QV; Blue Hawaiian Helicopters; Molokai, Hawaii; 10-10-2011; NTSB Ref: WPR12MA034



Report Outline

SECTION: **PAGE:**

Background about IWI

The Immersive Witness Interview (IWI ®) technique and the iPad app tool used in this report were developed by Dr. Bauer (© 2009-2012) to provide a qualitative and simple-to-understand analysis of accident flight path investigations. The IWI methodology principally reconstructs a flight path based on eyewitness observation information where there is no flight data recorder or radar data available. The IWI® methodology and the IWI-Analyzer software use basic physiological and psychological information from the interviewing of multiple eyewitnesses of an event to reconstruct and define a vehicle's flight path in a 3-D world.

During the interview of individual eyewitnesses, each witness is asked to provide a 2-D account of their statement-based observed flight path, established from their lines of sight and the distance to known fixed reference objects. The individual accounts are then recorded and transferred into a 3-D environment to interact with other witness accounts for a consolidated path profile that can be viewed in a 3-D environment.

A visual verification of the dependencies in the witness statements can quickly be identified in the *Immersive Witness Interview Analyzer* software to qualify the level of witness error or accuracy (showing the witnesses who articulate accurate/inaccurate observations).

IWI® can approximate a flight path or moving path with a minimum of two different positioned eyewitness statements. The result can be visualized with the expected errors using the developed IWI® application called: *Immersive Witness Interview Analyzer* software for 3-D visualization.

In this report you will see the points referenced on the path created by the witness with the nomenclature:

IC = Initial contact
FC = Final contact; and all other special observations that the witness noted as
O1 = First special observation and
O2 = Second special observation and so on

Case Overview

On November 10, 2011, at approximately 1214 Hawaiian Standard Time (HST), the subject aircraft collided with mountainous terrain near Pukoo, Hawaii (Island of Molokai). The commercial pilot and four passengers were fatally injured. The aircraft was being operated by Blue Hawaiian Helicopters, based in Maui, Hawaii, as a local air tour flight. Visual meteorological conditions prevailed. The flight originated from the Kahului Airport (PHOG), Kahului, Hawaii, at approximately 1144.

The accident site was approximately 5 miles west of Pukoo, Hawaii, in mountainous terrain at N21° 04.050' by W156° 50.578'. The area was surrounded by heavy wild vegetation. The measured elevation at the main wreckage was approximately 640 feet mean sea level (MSL) and the terrain angle varied between 25-30°.

The wreckage debris field encompassed an area approximately 400 feet in length (from southeast to the northwest). The main wreckage came to rest on a heading of about 270°and was located in the confines of a large burn area. A majority of the wreckage was located in the immediate area of the main wreckage and was mostly consumed by post-impact fire.

There was no air traffic radar surveillance coverage in the area of the island of Molokai, HI where the accident occurred at the time of the accident. The weather included; visual meteorological conditions with some light rain, fog, and a quickly moving rain storm into the area from the east at the time of the accident. (NTSB Ref: WPR12MA034).

Case Map

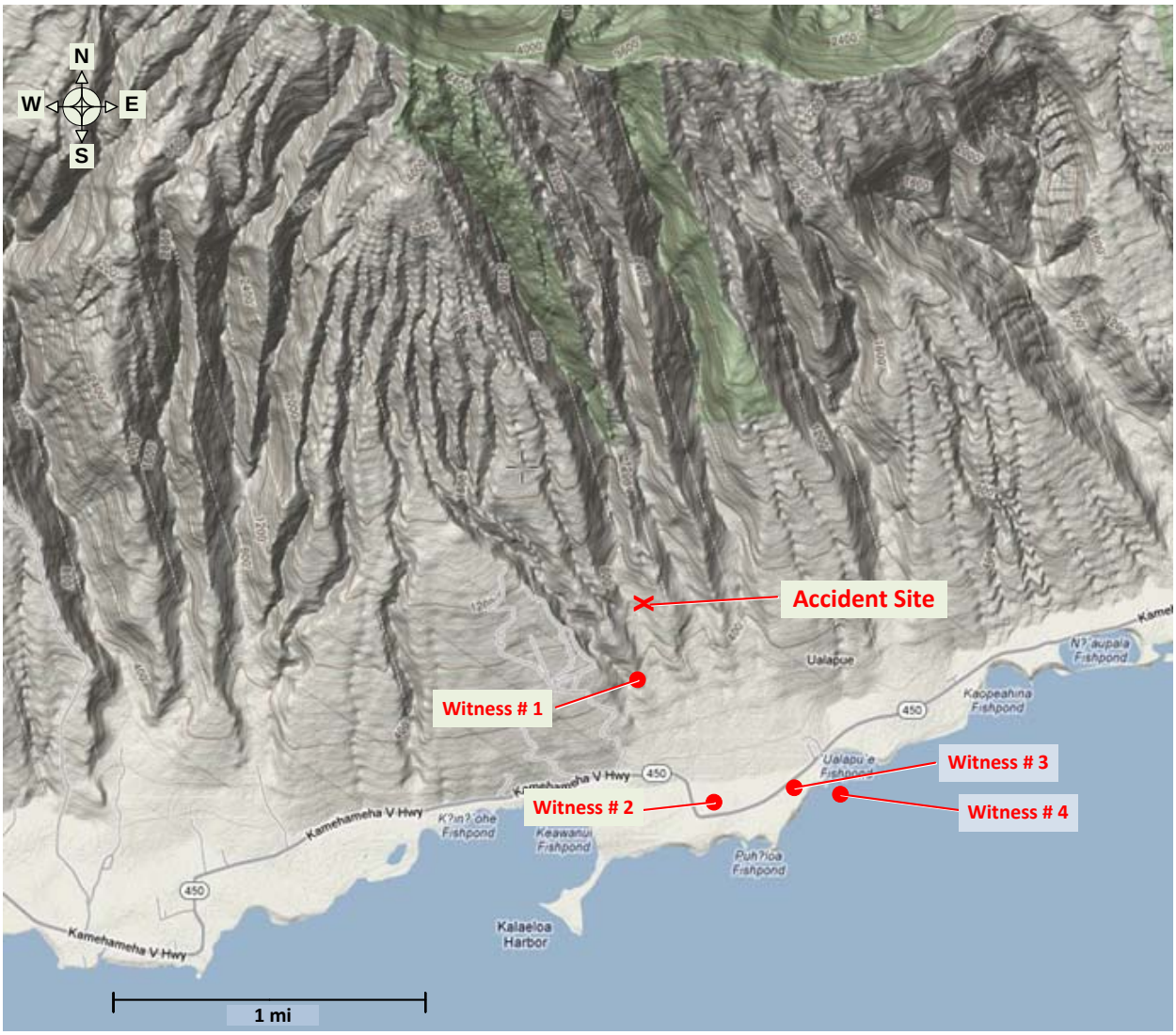


Figure 1: Map with approximate locations of witness #1, #2, #3 and #4 in relation to the accident site. Map data©2012 Google

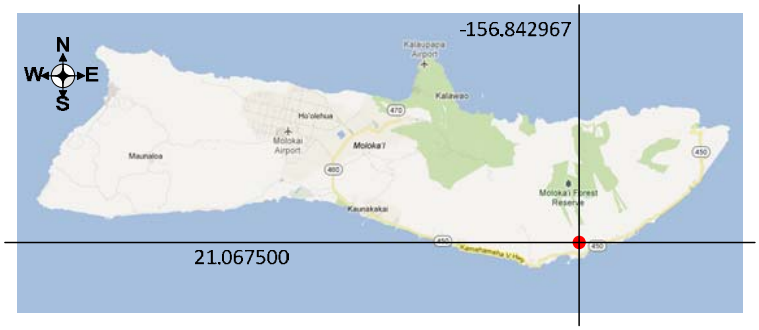


Figure 2: Depiction of the Molokai Island and the approximately latitude and longitude of the accident site area. Map data©2012 Google

Terrain Background

The accident site is in the southeastern quadrant of the island of Molokai, located on the south face of volcanic mountainous terrain at N 21.067500° W -156.842967°, at 535 feet MSL. This is approximately 0.75 NM up-hill and north of the shoreline, and approximately 2.00 NM downhill and south of the island's mountain ridgeline that generally runs east-west. The general slope of the south face is approximately 20 degrees. The elevation of the ridgeline due north of the accident site is approximately 4,000 feet; and the ridgeline generally increases in altitude as the ridge runs to the west, reaching a peak of 4,960 feet; and generally decreases to the east. The topography of the mountainous terrain in the area spanning the 2 NM north of the accident site includes; wooded valleys and ridges with ravines leading up to the ridgeline. Two notable waterfalls can be observed in this area during periods of rain similar to the time of the accident date. The mountaintops are frequently obscured by clouds during the time of year.

Two of the three witnesses were located near the seashore level, south of the accident site approximately 0.70 NM; and one witness was closer to the accident site at just 0.25 NM south of the site. The fourth witness was located in an aircraft near the south shoreline.

The witnesses mentioned that waterfalls can become visible in times of heavy rain (as they were at the time of the accident) at the top of both the Ohia and/or Kahanaui Gulch which extend down the mountain on either side of the terrain where the accident site is located. Other regularly flowing waterfalls that are frequented by tourist are located on the north side of the island or further west on the south side of the island.

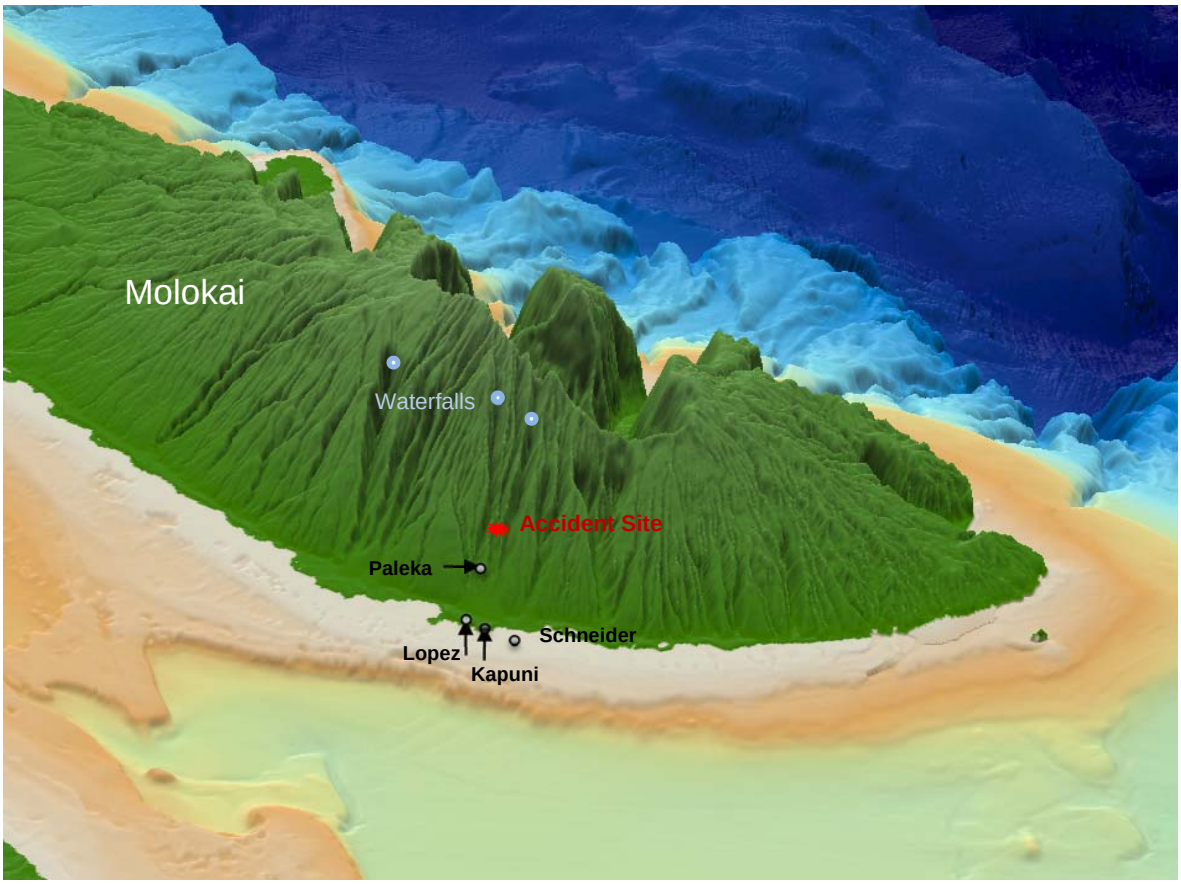


Figure 3: Topography Synthesis map of Molokai, from University of Hawaii at Manoa, May 13, 2011

Witnesses

In the frame of this subject accident investigation three witnesses were interviewed on 04-24-2012 with the *Immersive Witness Interview (IWI®)* method, using the new *IWI* iPad app and photographs. Three of the ground witnesses, identified by the NTSB, with a visual reference perspective to the final moments of flight, and one visual witness who was airborne at the time of the accident, were re-interviewed. These interviews were conducted by the American Eurocopter Investigator, Mr. Buttner and other members of the NTSB investigation team 197 days after the accident. The main objective of applying the *IWI* interview method was to capture additional information about the flight path and attitude of the helicopter shortly before the impact. Each witness was located approximately 0.25 to 0.75 Nautical Miles (NM) south-southeast from the accident site.

The photographs of the witness' perspective and witness' flight path description will be inserted into the virtual earth view of the Immersive Witness Interview Analyzer software for analyses.

Witness (Name)	Latitude (deg)	Longitude (deg)	Elevation (feet)	Face Direction (deg)	IC Initial contact	FC Final contact	01 Spc Observation	02 Spe Observation	Attitude
#1 [Walter Paleka]	21.0631861	-156.84375	269	005	X	X	X	X	X
#2 [Shannon Lopez]	21.0568917	-156.837494	23	340	X	X	X		
#3 [Floyd Kapuni]	21.05835	-156.834933	62	326	X	X	X		
#4 [David Schneider]	~21.056333	~-156.833333	~1,100	~360	X	X			

Table 1: Position information of the interviewed witnesses

Witness #1: (Walter Paleka)

The following depiction illustrates the photographed perspective of the ground witness Mr. Walter Paleka from the (second) position where he ran to when he noticed the aircraft. The photo has been inserted into the *IWI-Analyzer* software. The red line on the digital photo was illustrated by Mr. Paleka to describe the flight path that he remembers observing.

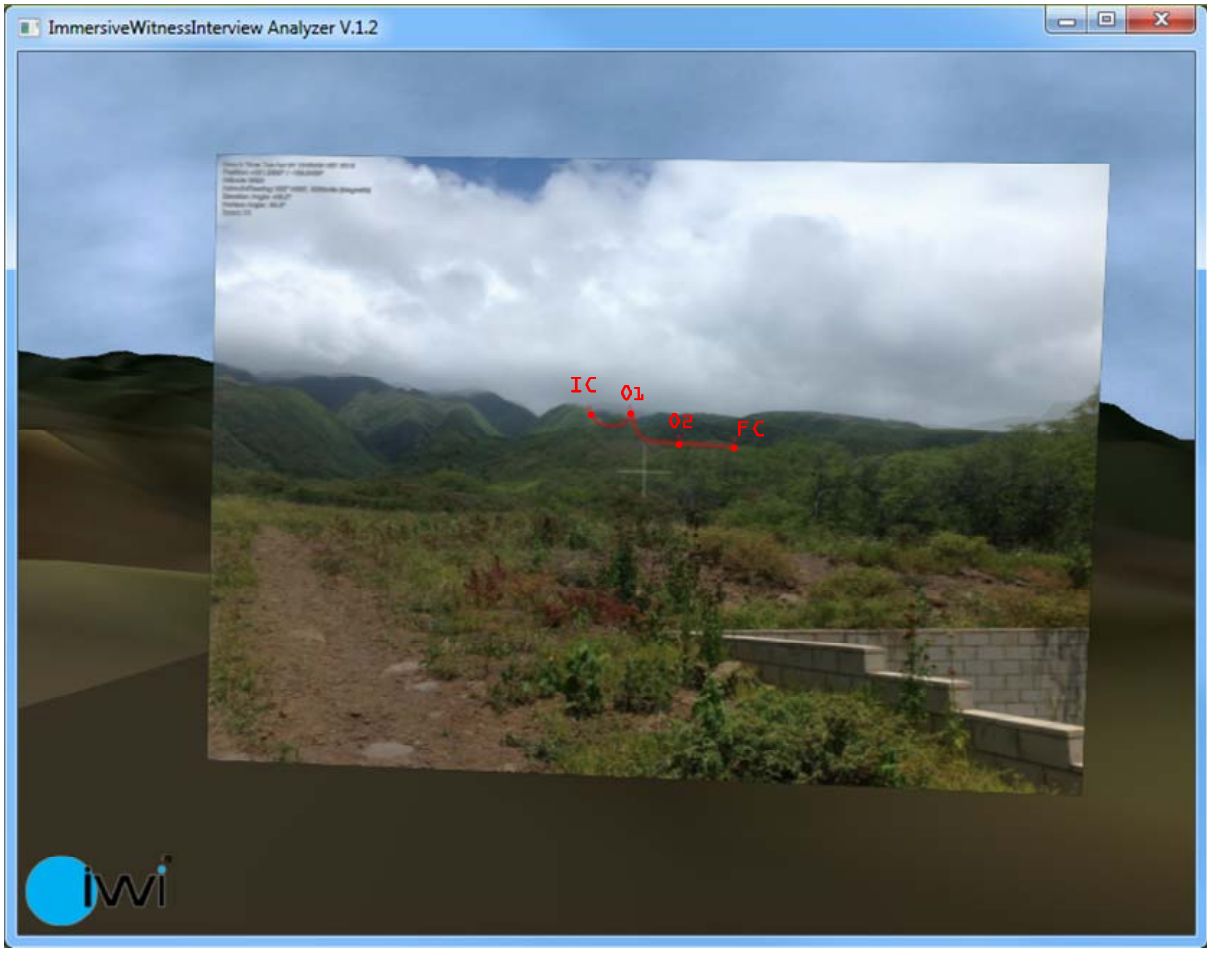


Figure 4: Witness #1 (Paleka) viewpoint with described flight path (red line)

At Mr. Paleka's initial observation of the aircraft (noted on the red line at IC), he described it as generally traveling at him, in his direction and hearing a "Whoop whoop whoop" sound. He further remembers seeing the cabin of the helicopter and then described it as going "belly up" (noted on the red line at O1). At this time he heard a "Pop" sound as the helicopter was moving up and before it began to "fall away". He said he noticed "something black fall off". He wasn't sure what it was but he also used words stating that the "tail fell." The last point he saw the aircraft was as it was travelling along the red line and ending at the location of FC, near the actual impact site. He stated that he saw the fire in the aircraft before the impact, as he moved and ran northwest approximately 50 feet to a 2nd location. This 2nd location "Position #2" is located at: N21° 3' 47.60" W156° 50' 38.04".

Witness #2: (Shannon Lopez)

The following depiction illustrates the photographed perspective of Mr. Shannon Lopez when he noticed the aircraft. The photo has been inserted into the *IWI-Analyzer* software. The red line on the digital photo was illustrated by Mr. Lopez to describe the flight path that he remembers observing.

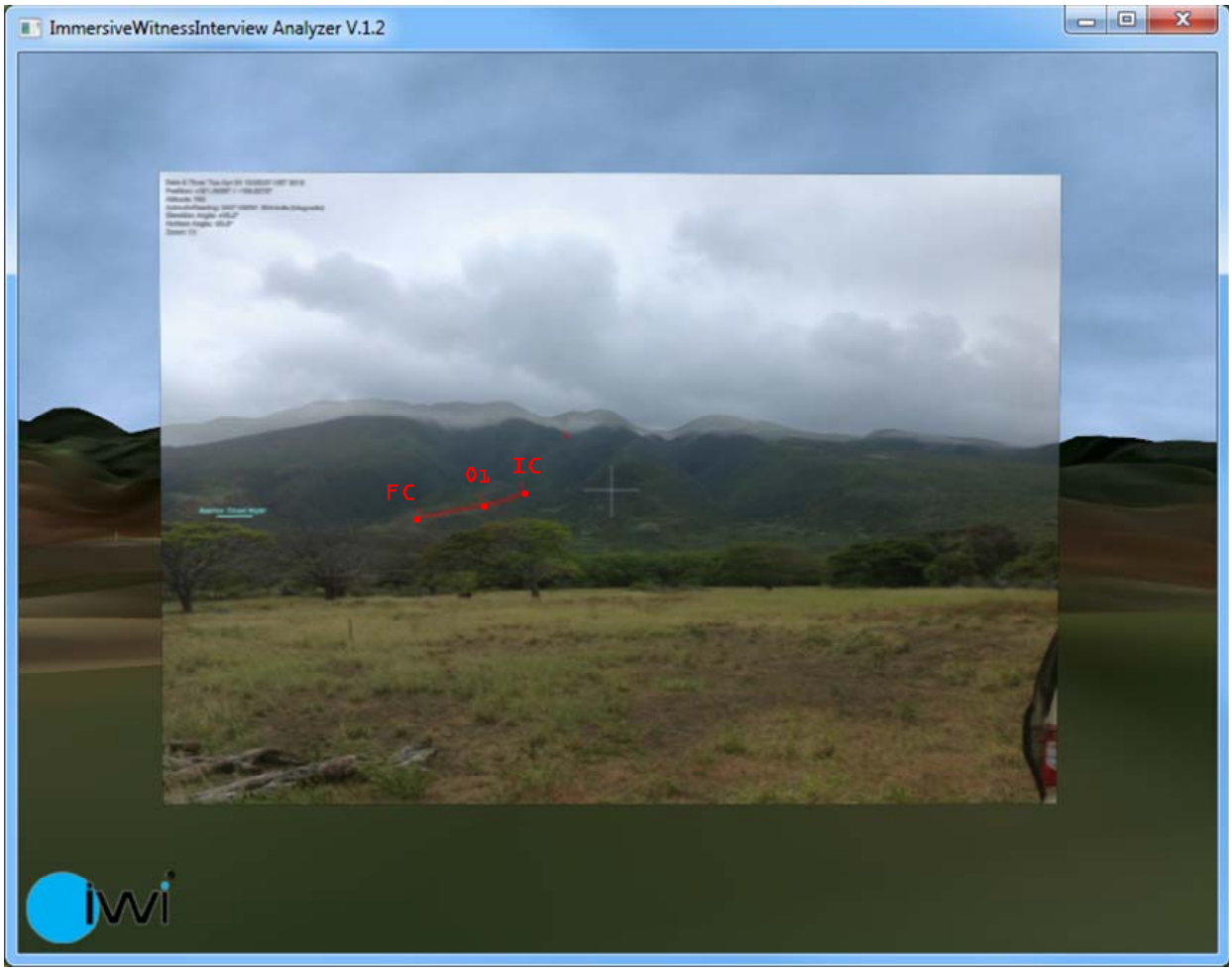


Figure 5: Witness #2 (Lopez), viewpoint with described flight path (red line) and cloud base in blue.

At Mr. Lopez's first observation of the aircraft (noted on the red line at IC), he described it as traveling generally from right to left in his field of view. He first noticed the aircraft's sound as he was driving in his pickup truck eastbound on Highway 450. He heard a sound that he said was similar to what he thought a 'Huey' helicopter would sound like, "Whoop whoop whoop". He said, he remembers hearing the sound and seeing the aircraft travel from approximately the point identified by IC to O1. At O1, he stated he could see it [helicopter] with the color blue moving down and to the southwest. Between, approximately O1 and FC, Mr. Lopez pulled off the road to get a better view. He stated that at the final contact (FC) of the flight path he saw the impact fire.

He identified the cloud base as being just above where the helicopter impacted the ground. He drew the cloud base on the photo identified by the blue line, next to "Approx. Cloud Height". Mr. Lopez additionally stated it "was foggy, and was very windy"; He said "it was rainy then shortly after it cleared up about ¾ way up the mountain."

Witness #3 (Floyd Kapuni)

The following depiction illustrates the photographed perspective of Mr. Floyd Kapuni when he noticed the aircraft. The photo has been inserted into the virtual earth view of the IWI-Analyzer software. The red line on the digital photo was illustrated by Mr. Kapuni to describe the path of what Mr. Kapuni remembers observing.

Figure 6: Witness #3 (Kapuni), viewpoint with described flight path (red line)

Mr. Kapuni's stated that his initial observation of the aircraft (noted on the red line at IC), was with a gray mist/smoke spiraling path, but that he wasn't sure what it was at first because of the rain front that had quickly moved into the area from the east. He said he was unable to make out the color of the object [aircraft] because of the dark clouds and rain. However, by the time it had reached the point that he depicted by O1, he saw a red type of light that he described as "like the back of jet engine" and it was here that he also heard the sound of engine power. He described the line of travel as relatively level, but drew a line that was on a slight decline from point IC to O1. During the interview he drew two slightly different line paths that changed the (O1) position slightly lower. At the point depicted by (FC) near the end of the path, he said he said he saw it nose over, followed by a large impact fire. He stated that from point O1 to FC it went slightly down, then up, then straight down to the ground.

Mr. Kapuni's lives at this location, and was in his backyard grilling when he first noticed the rainstorm "squall" that suddenly moved in, which made him move to the front of house to take a better look, which subsequently drew his attention to the flight path.

Witness #4 (David Schneider)

The following depiction illustrates the approximate photographed perspective of Mr. David when he noticed the subject aircraft. The photo has been inserted into the witness view of the IWI-Analyzer software. The blue mark between the two points on the digital photo is the location that Mr. Schneider described as being both the Initial (IC), and final contact (FC), location that he observed the subject aircraft flying at while he was near this part of the island. The altitude of the mountain terrain under the IC and FC positions is approximately 2,000 feet MSL. *Note: The cloud coverage in the photograph was happenstantial of the cloud coverage on the day the IWI interview was conducted and is not representative of the mishap date.*

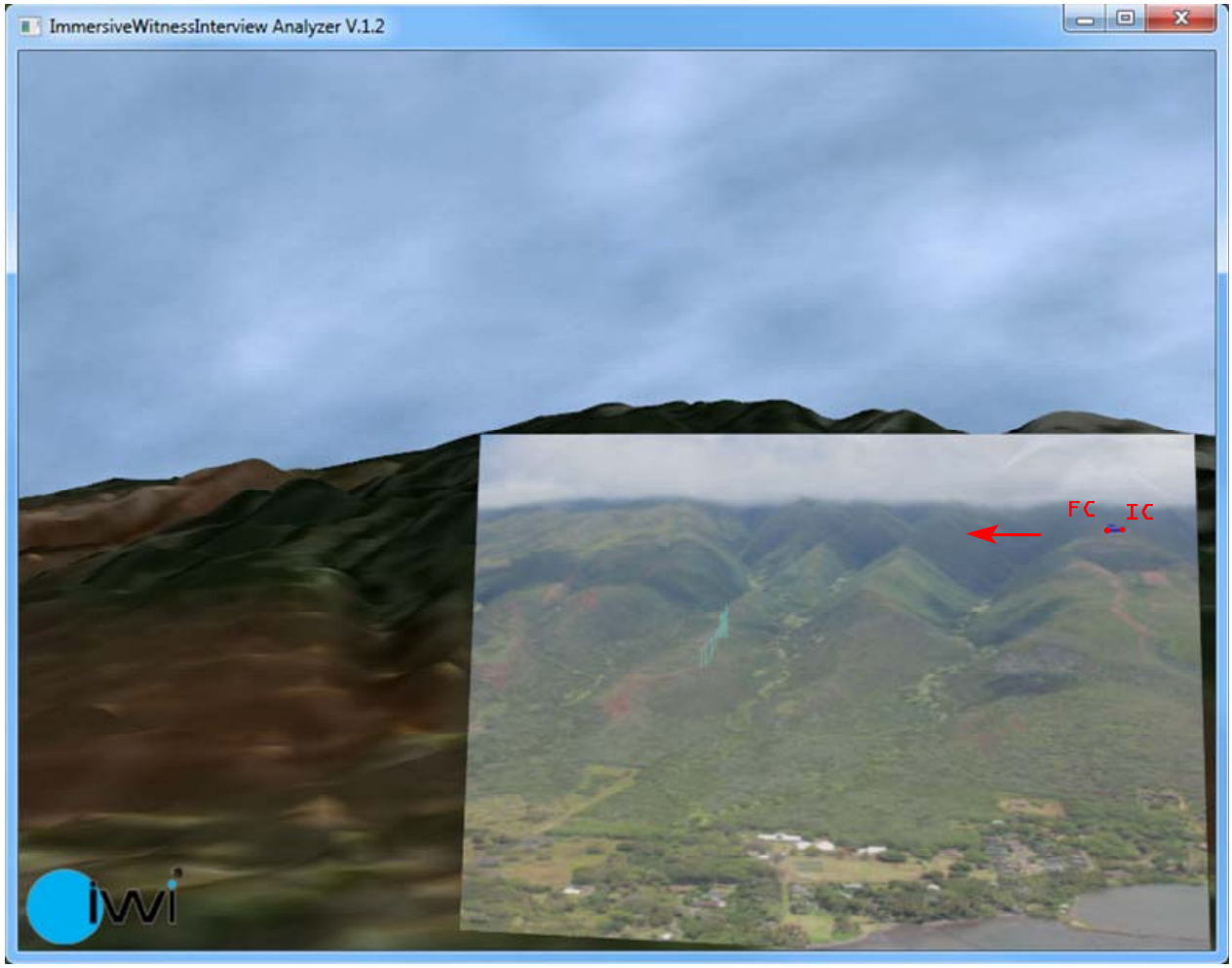


Figure 7: Witness #4 (Schneider), approximate viewpoint with observed point of helicopter (blue circle)

Mr. Schneider was flying a helicopter (an MD500 with the doors off) on a southwest heading over, or approximately just past Highway 450, heading out over the water when he looked up and briefly saw the subject aircraft heading westbound just below the cloud deck at approximately his 3 to 4 O'clock position. He mentioned that it was difficult to make out the company/color of aircraft due to dark clouds, as it was a dark colored aircraft against a dark background, but he was quite certain of the location at which he spotted the aircraft. He said he saw the subject aircraft just below the clouds, and he estimated them to be approximately 2,200 – 2,400 feet MSL. He additionally mentioned that he remembers it was windy that flight and that the winds were out of NE, and that it was a "little bumpy".

Meteorological Information

The meteorological conditions described by witnesses Schneider and Lopez suggest that the top of the mountain was obscured by the clouds at the time of the event. These witnesses also depicted the approximate base of the clouds as being just above the aircraft, as seen from their viewpoints and at the time they each made their initial contact (IC) of the aircraft. According to Mr. Schneider, he estimated the cloud base to begin at approximately 2,200 to 2,400 feet MSL (see figure 8). Mr. Lopez estimated the cloud base beginning at a level which was later estimated to be approximately 700 to 800 feet MSL. The difference in the cloud base altitudes reported by these two witnesses could be accounted for by the time and distance from which these two witnesses observed the event. Still, the metrological phenomena in the areas of this event are reportedly capable to change both quickly and differently depending on the time and terrain. A full metrological examination performed by the NTSB, of the weather in this area has not been completed at the time of this report.

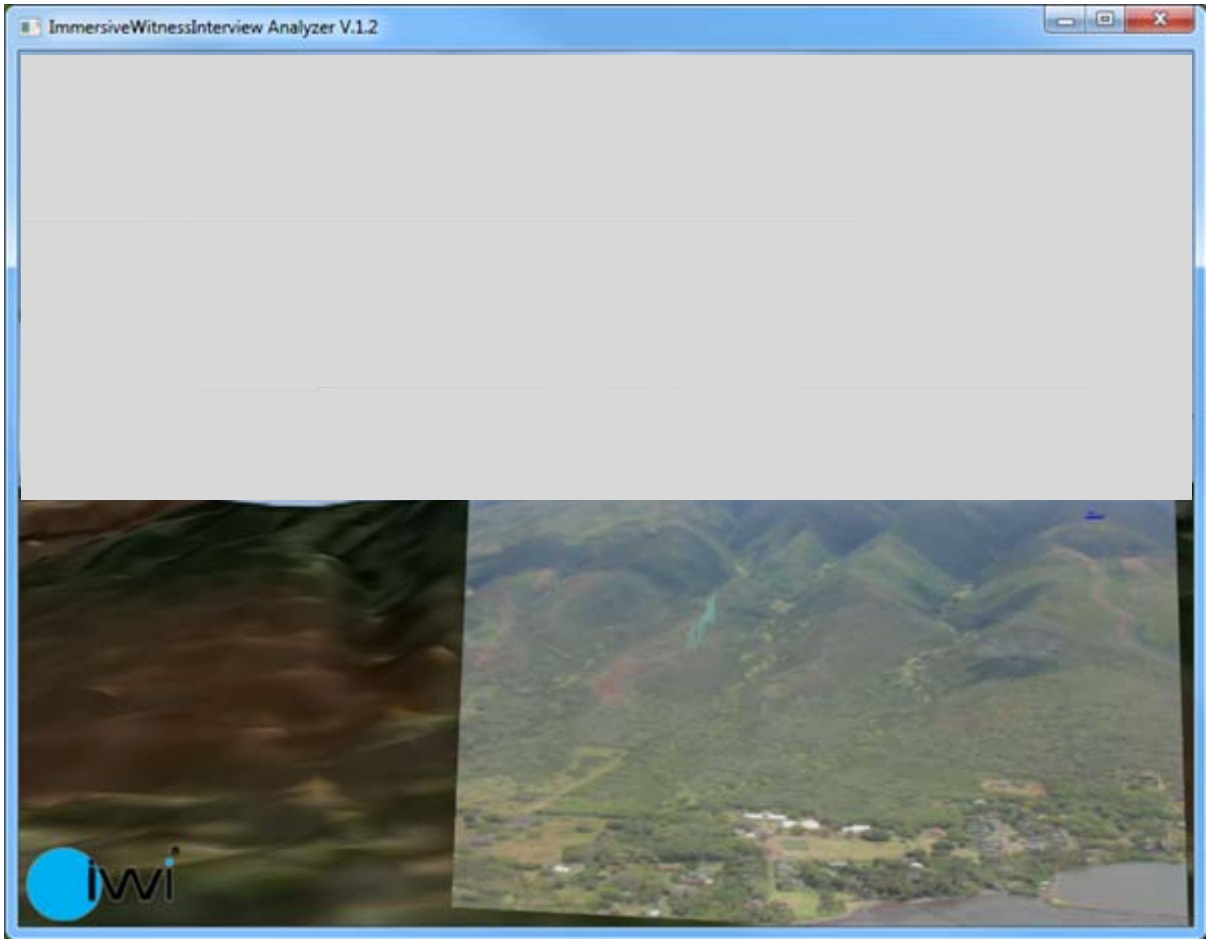


Figure 8: Witness #4 (Schneider) IWI viewpoint, with a cloud base line showing cloud layer at approximately 2,200 feet

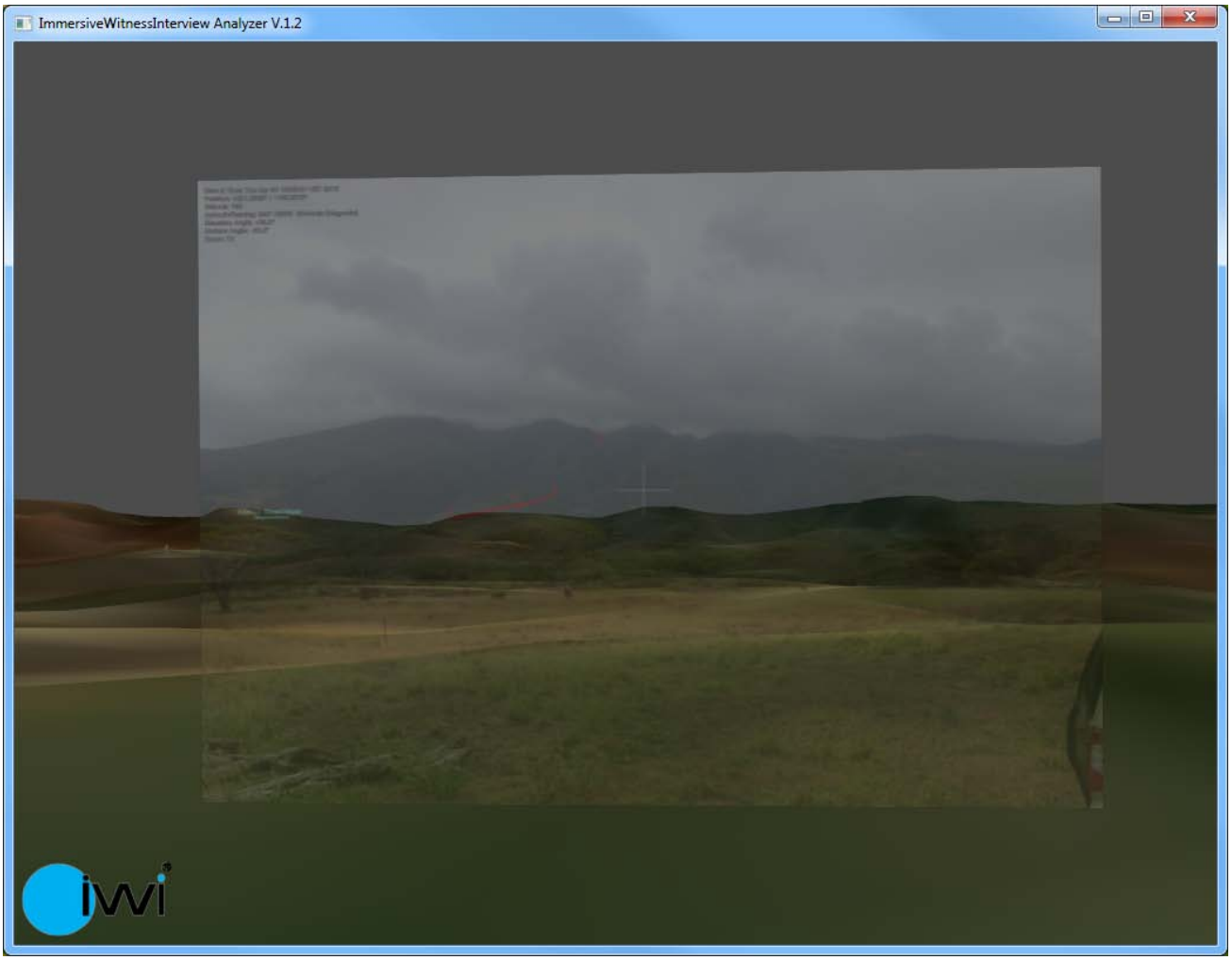


Figure 9: Witness #2 (Lopez), with IWI viewpoint showing a progressive cloud coverage with altitude that begins at approximately 800 feet, where he identified it began with the blue mark on the left of the IWI app rendering.

IWI Reconstruction Paleka

The following images are from the perspective of the witness Paleka and shows his 2D statement and the IWI reconstructed flight path made from this witnesses statement and one of the other 2 reported ground witnesses;

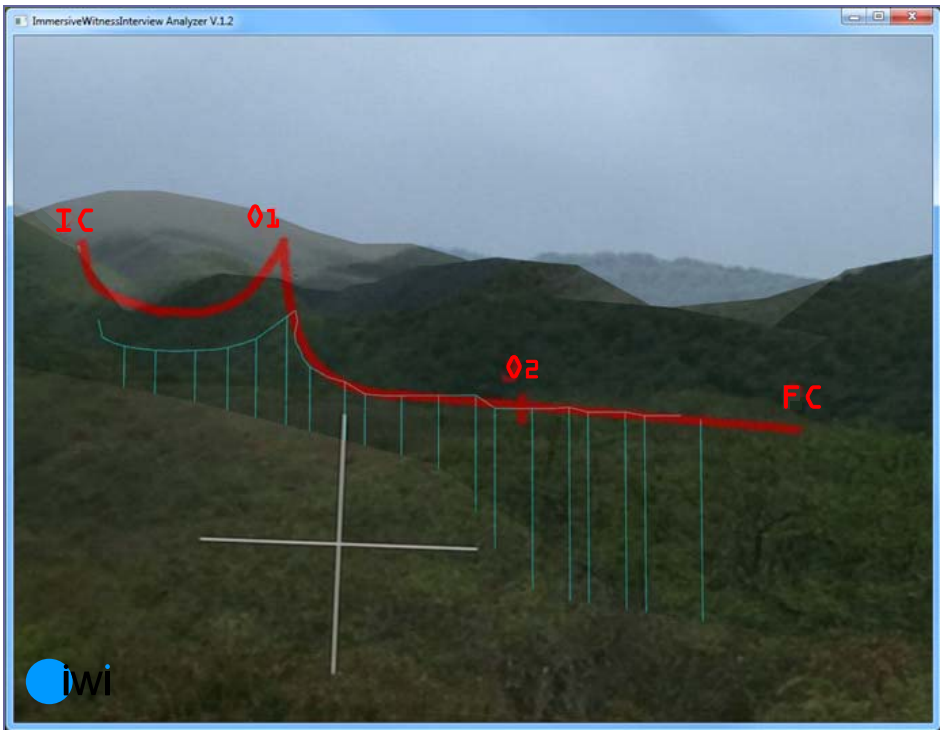


Figure 10 (Paleka – Lopez): Paleka's 2D description (Red) combined with the IWI reconstructed flight path (blue) of Lopez

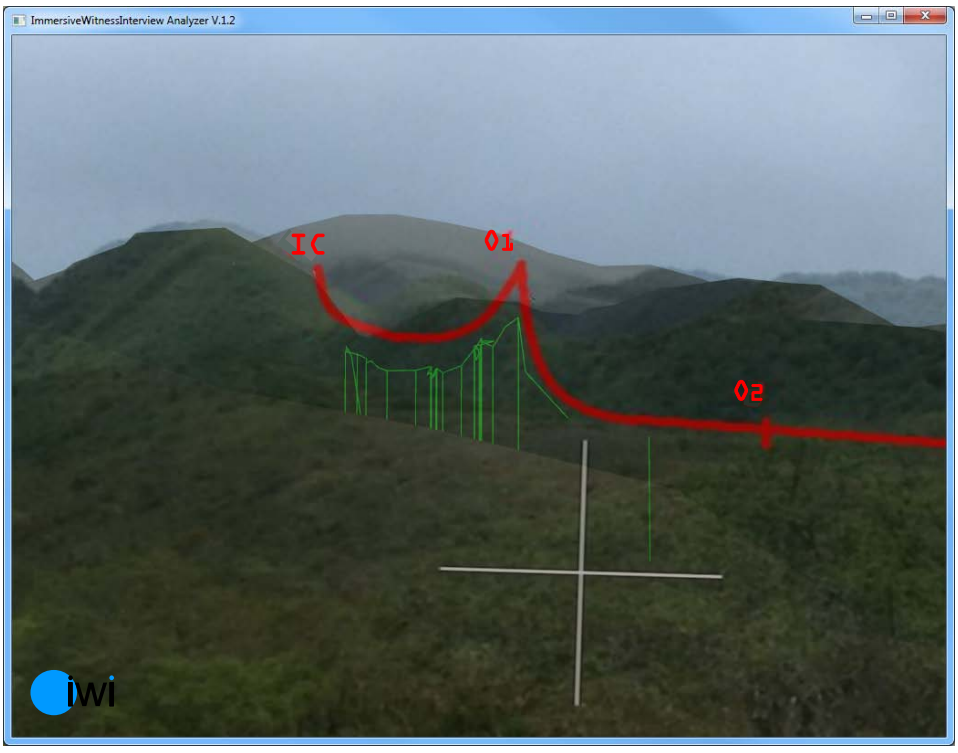


Figure 11 (Paleka – Kapuni): Paleka's 2D description (Red) combined with the IWI reconstructed flight path (green) of Kapuni

IWI Reconstruction Lopez

The following images are from the perspective of the witness Lopez and shows his 2D statement and the IWI reconstructed flight path made from this witnesses statement and one of the other 2 reported ground witnesses;

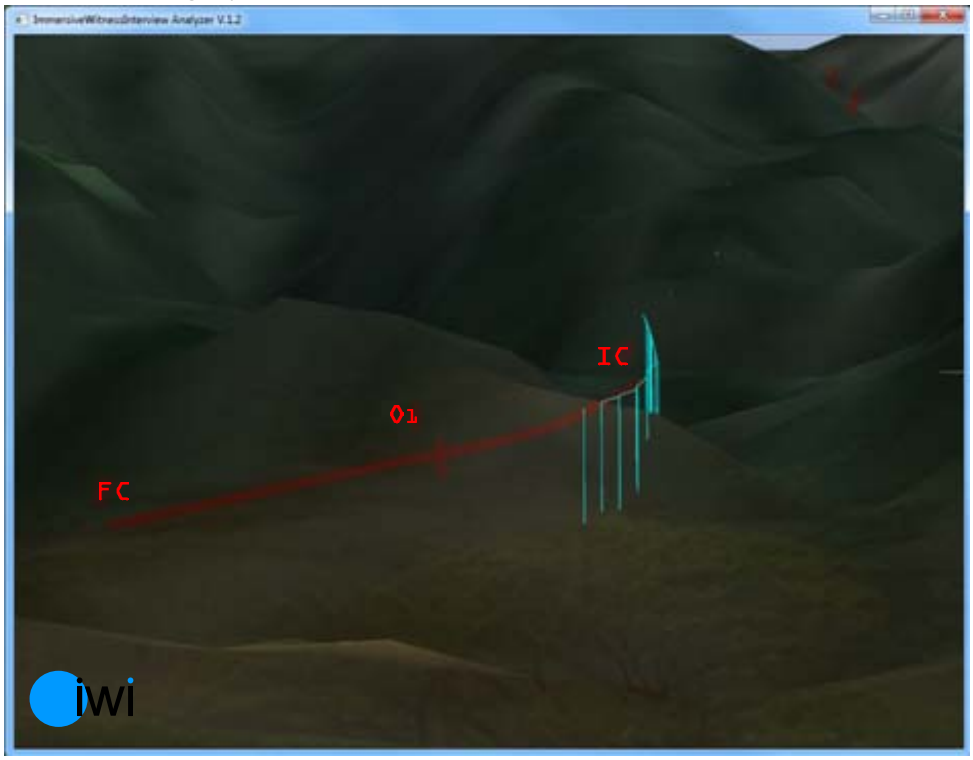


Figure 14 (Lopez - Paleka): Lopez's 2D description (red) combined with the IWI reconstructed flight path (Blue) of Paleka

Figure 15 (Lopez - Kapuni): Lopez's 2D description (red) combined with the IWI reconstructed flight path (red) of Kapuni

IWI Reconstruction Kapuni

The following images are from the perspective of the witness Kapuni and shows his 2D statement and the IWI reconstructed flight path made from this witnesses statement and one of the other 2 reported ground witnesses;;

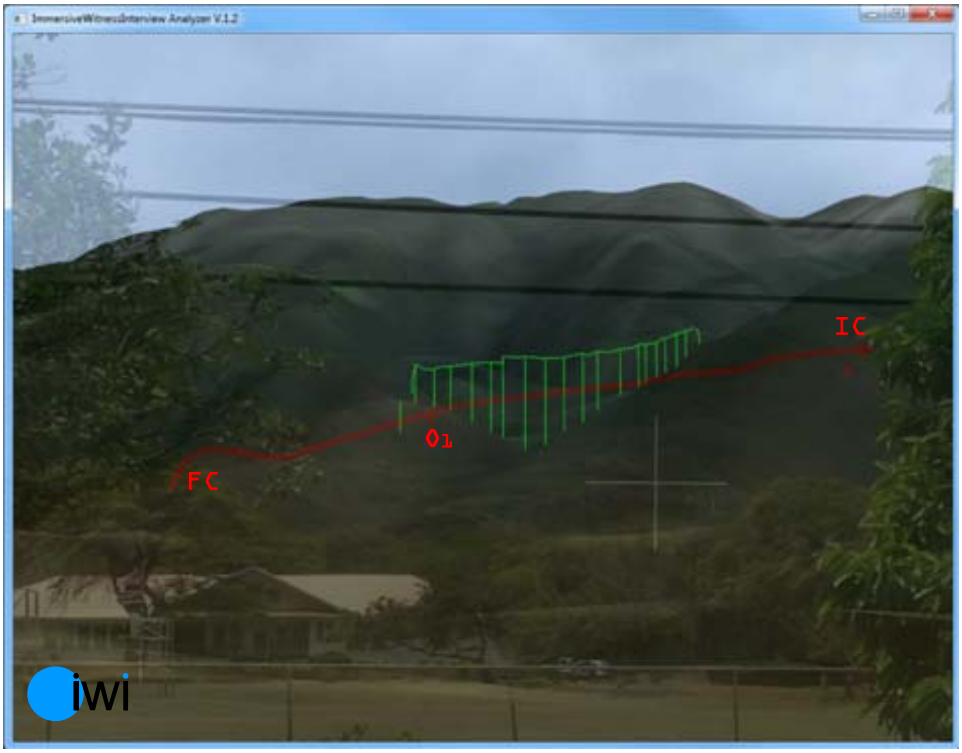


Figure 12: (Kapuni - Paleka): Kapuni's 2D description (red) combined with the IWI reconstructed flight path (green) of Paleka

Figure 13 (Kapuni - Lopez): Kapuni's 2D description (red) combined with the IWI reconstructed flight path (red) of Lopez

IWI-Analyzer Results

The three flight paths illustrated by witnesses Mr. Paleka, Mr. Lopez, and Mr. Kapuni are plotted for consideration from the IWI-*Analyzer* software, which depicts the following reconstructed flight paths as calculated (see Figures 16, 17, 18 and 19). The light red points shown in the figure below depict the location of the accident site and the debris. Based on the *IWI* witness statements and the reconstructed flight paths (Red, Blue and Green lines), the subject helicopter came down the mountain range on a heading of approximately 170 degrees.

If the three flight paths illustrated by the three witnesses of Mr. Paleka, Mr. Lopez, and Mr. Kapuni, and the location of Mr. Schneider's last observation is considered, the IWI-Analyzer software would suggest the helicopter was on a westerly heading at 2,200 feet MSL, approximately 1 NM downhill of the top of the mountain range (approximately ¾ of the way up from the shore).

Reconstruction	Witness 1	Witness 2	Witness 3	Witness 4
[Blue Line Path]	X	X		
[Green Line Path]	X		X	
[Red Line Path]		X	X	
[Blue *Marker Pt*.]				X

Table 2: IWI Reconstruction flight path color codes for witnesses

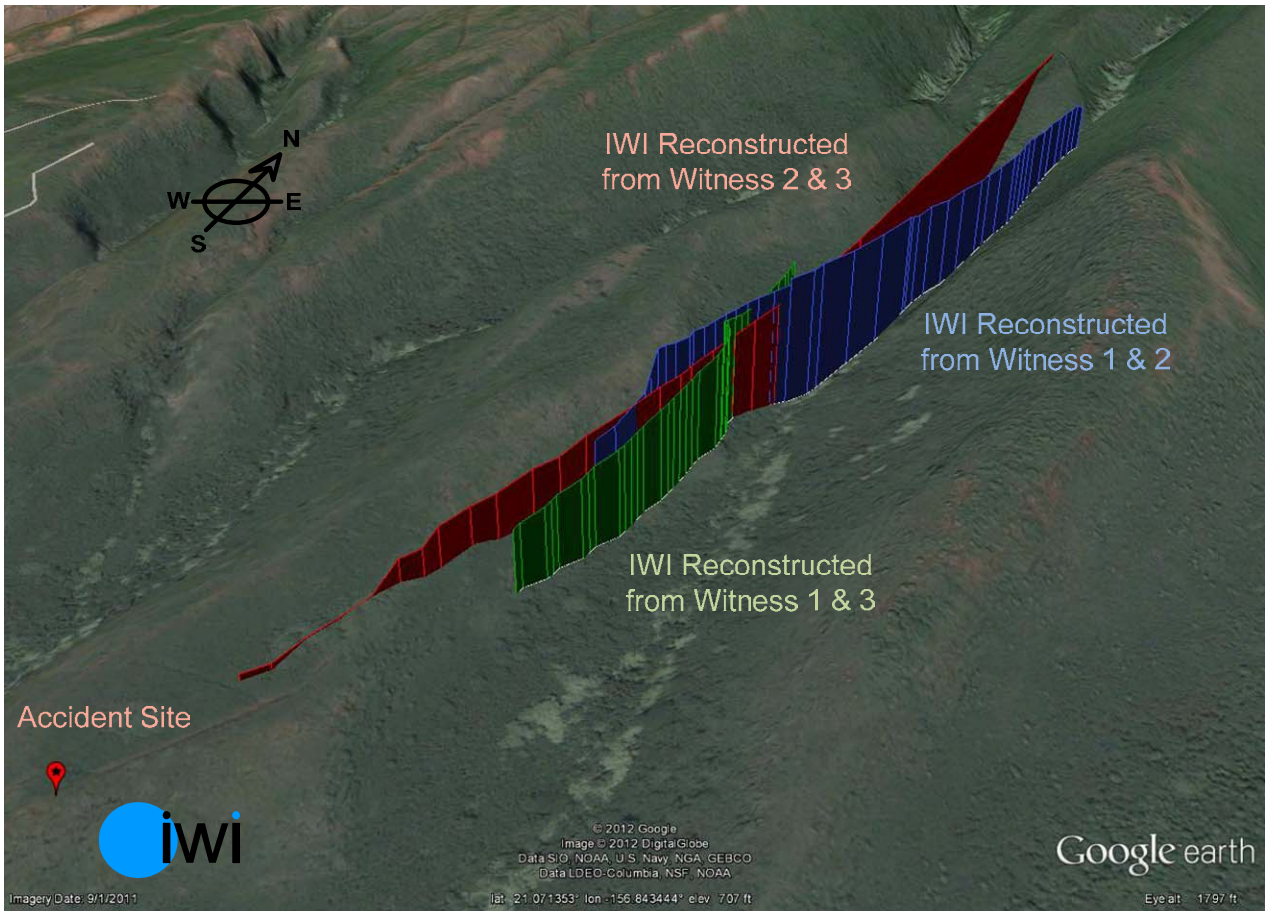


Figure 16: Overview - Looking northwest at the three reconstructed flight paths from the IWI-Analyzer Constructed from the following witness combinations (Blue = 1 & 2, Green = 1 & 3, Red = 2 & 3).

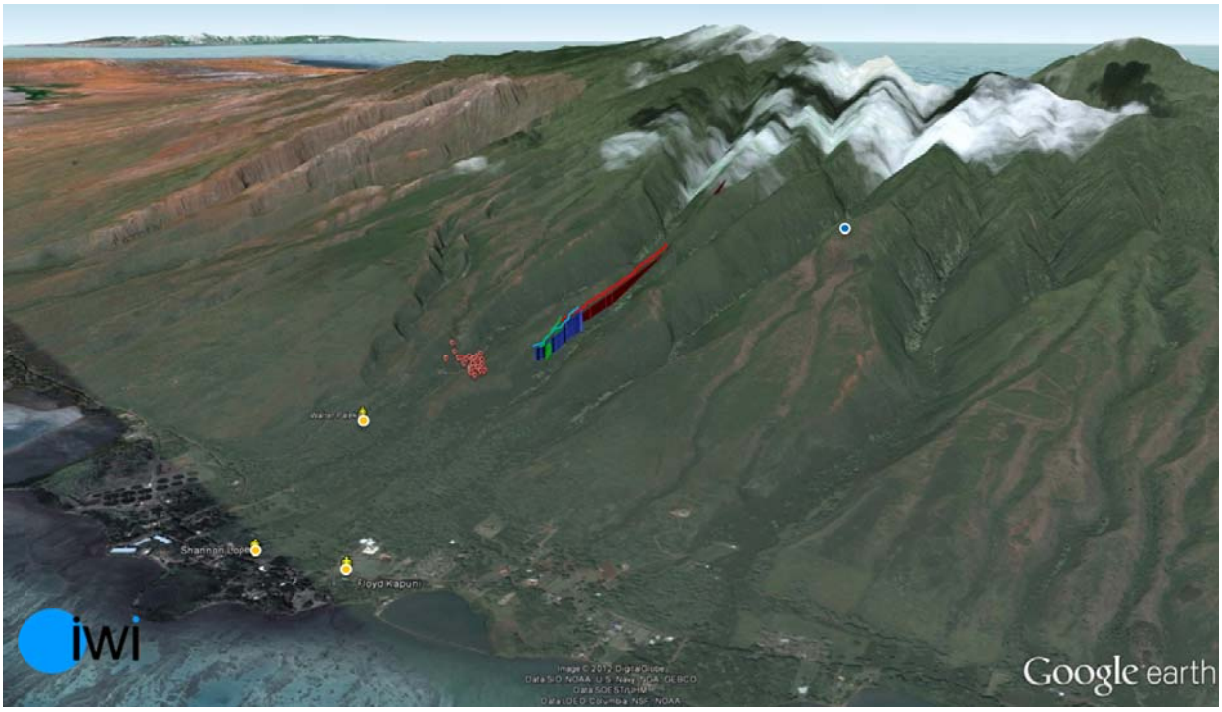


Figure 17: Overview looking northwest at three land witness locations (Yellow) and Reconstructed Flight Paths the main wreckage site (Red dots). Last observed position by witness David Schneider (Blue dot)

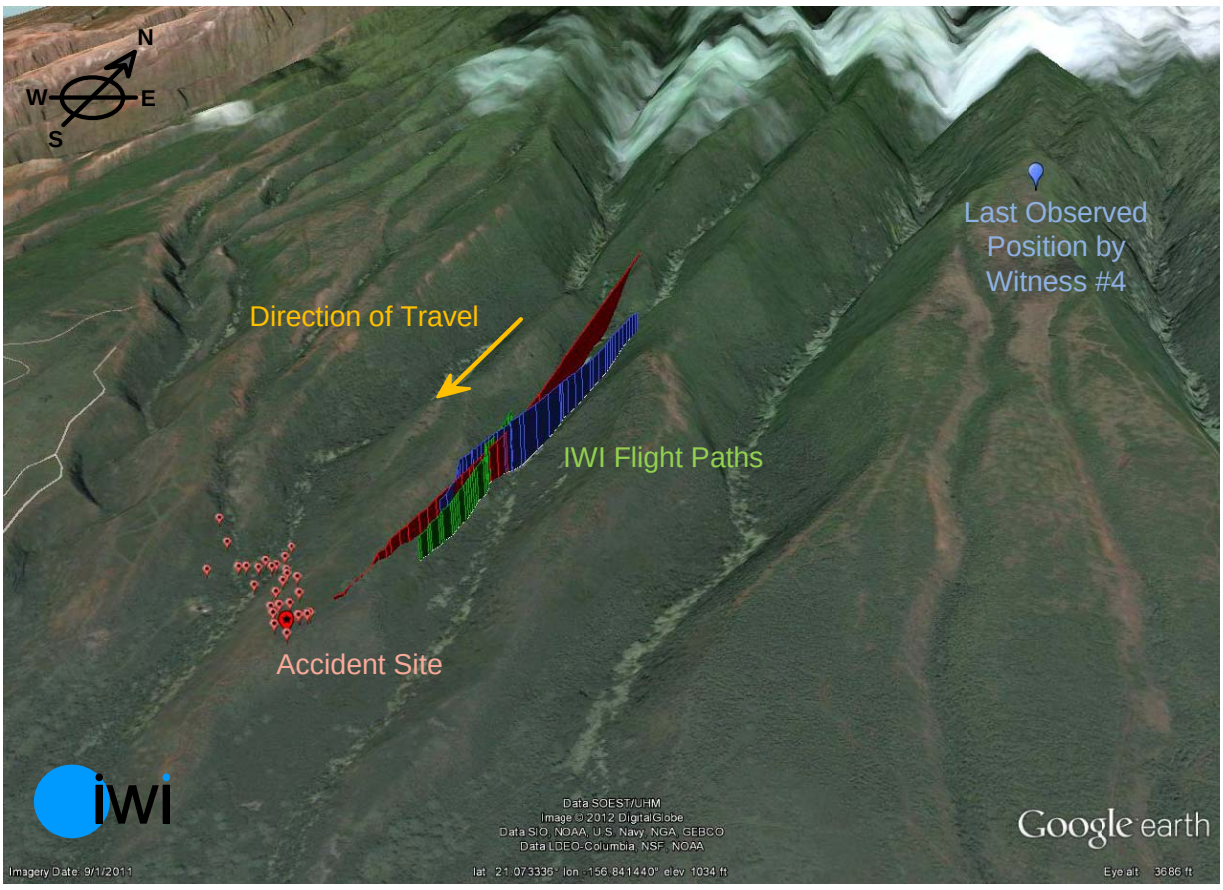


Figure 18: IWI reconstructed flight paths with direction of travel, accident site, and last observed site. Reconstructed flight paths (Blue = witness 1 & 2, Green =1 & 3, Red = 2 & 3),

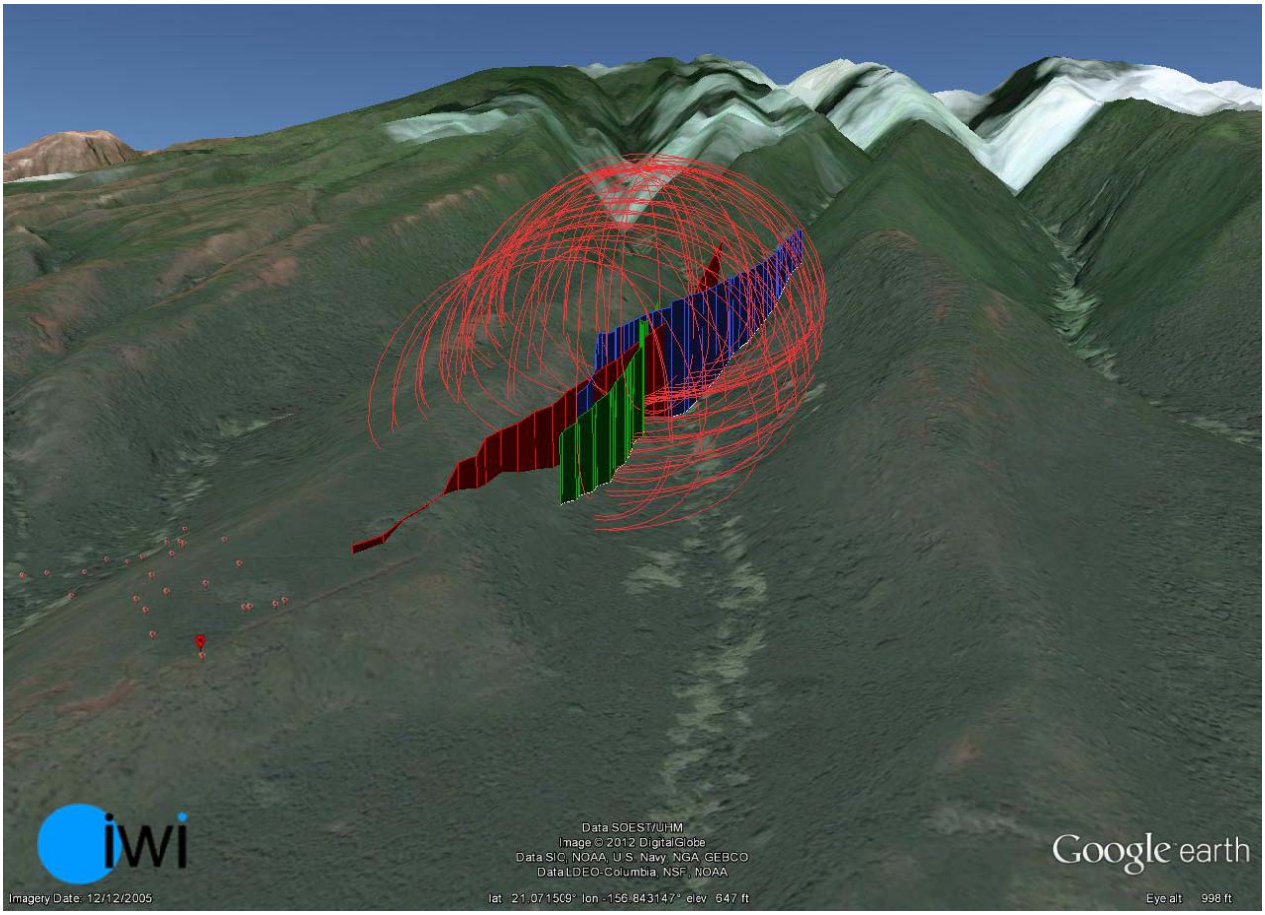


Figure 19: Calculated error tunnel around three reconstructed flight paths (red) looking north from accident site.

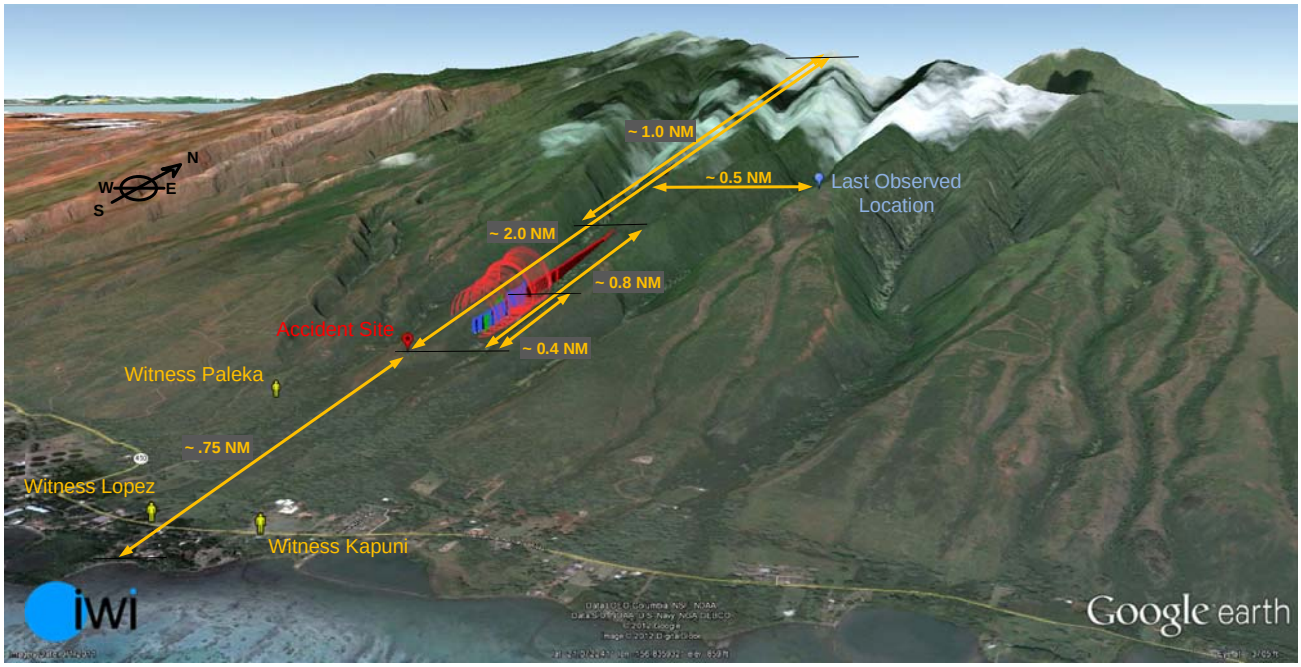


Figure 20: Three Reconstructed Flight Paths with Error Tunnel and descriptive dimensions.

Witness #1 (Paleka) was able to explain to the interviewer the positions and attitude of helicopter at two locations on his observed flight path. The attitudes were illustrated on the *IWI* iPad app. With the Heading, Pitch, and Roll information of these two positions as illustrated in the *IWI* app depiction (below), the helicopter's attitude was inserted into the IWI-Analyzer software at the two positions identified as IC and O1.

Figure 21: Screenshot of IWI app with Paleka's attitude description of the helicopter at position IC

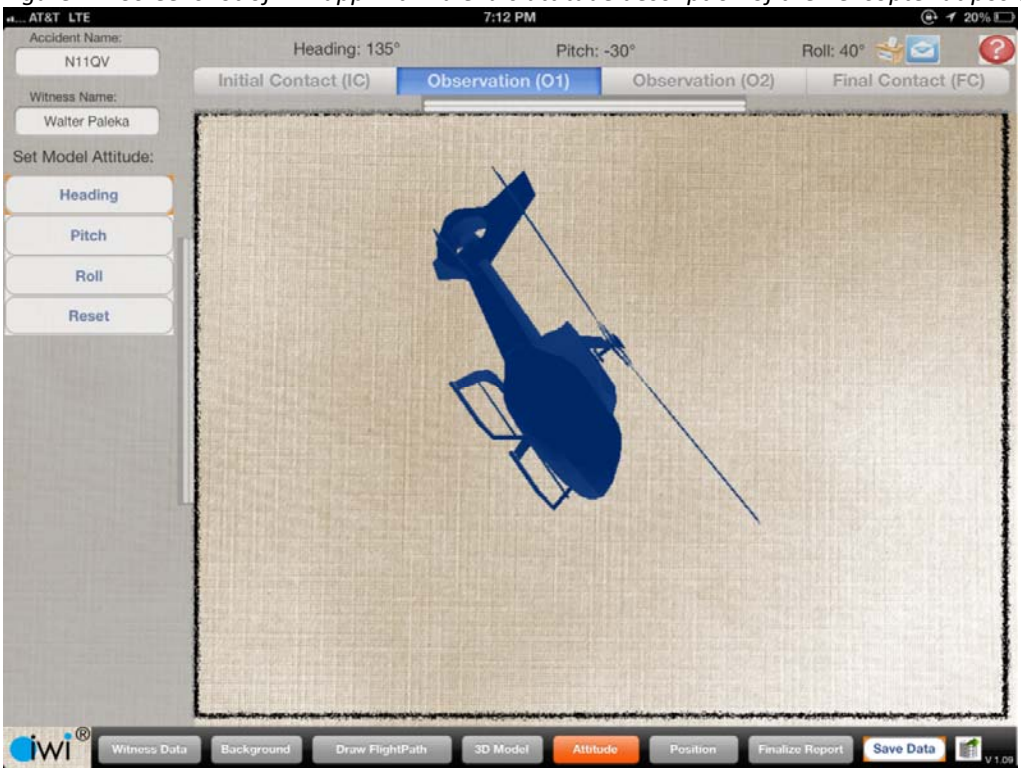


Figure 22: Screenshot of IWI app with Paleka's attitude description of the helicopter at position O1

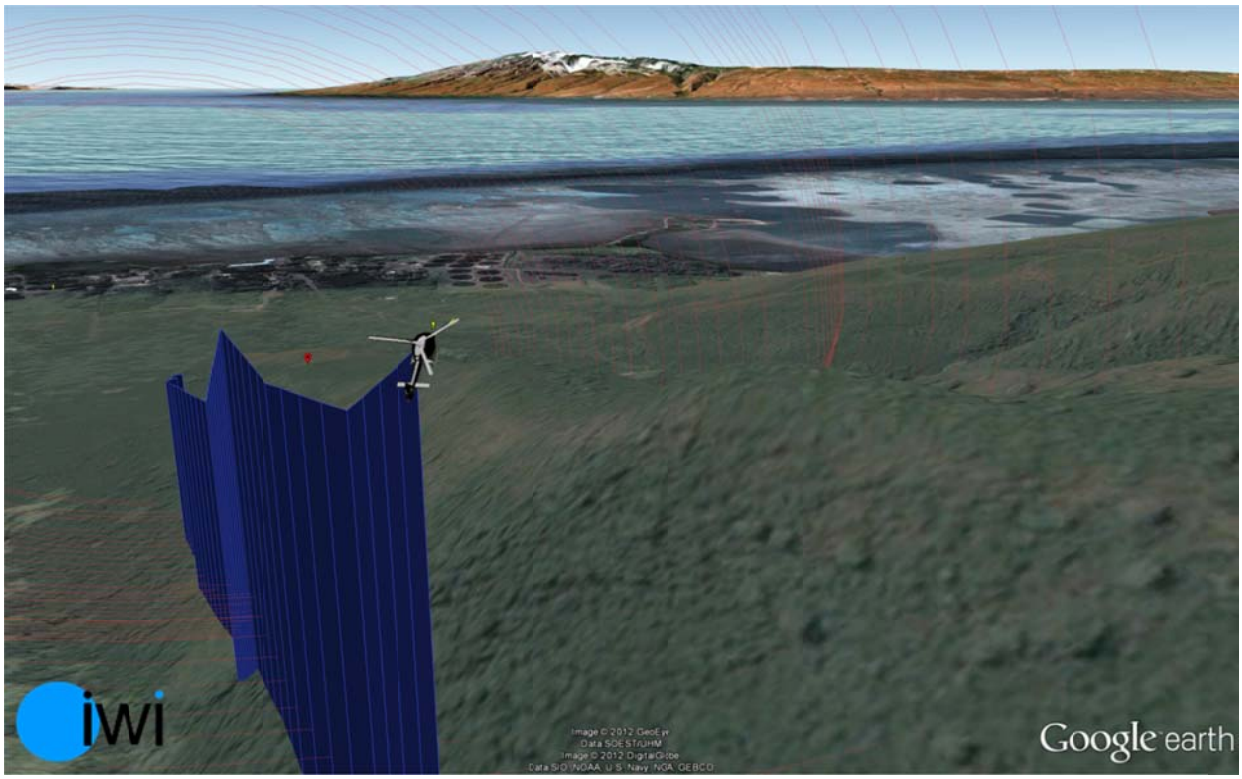


Figure 23: Witness #1 of helicopter's attitude at observed point IC on the IWI reconstructed flight path looking south.

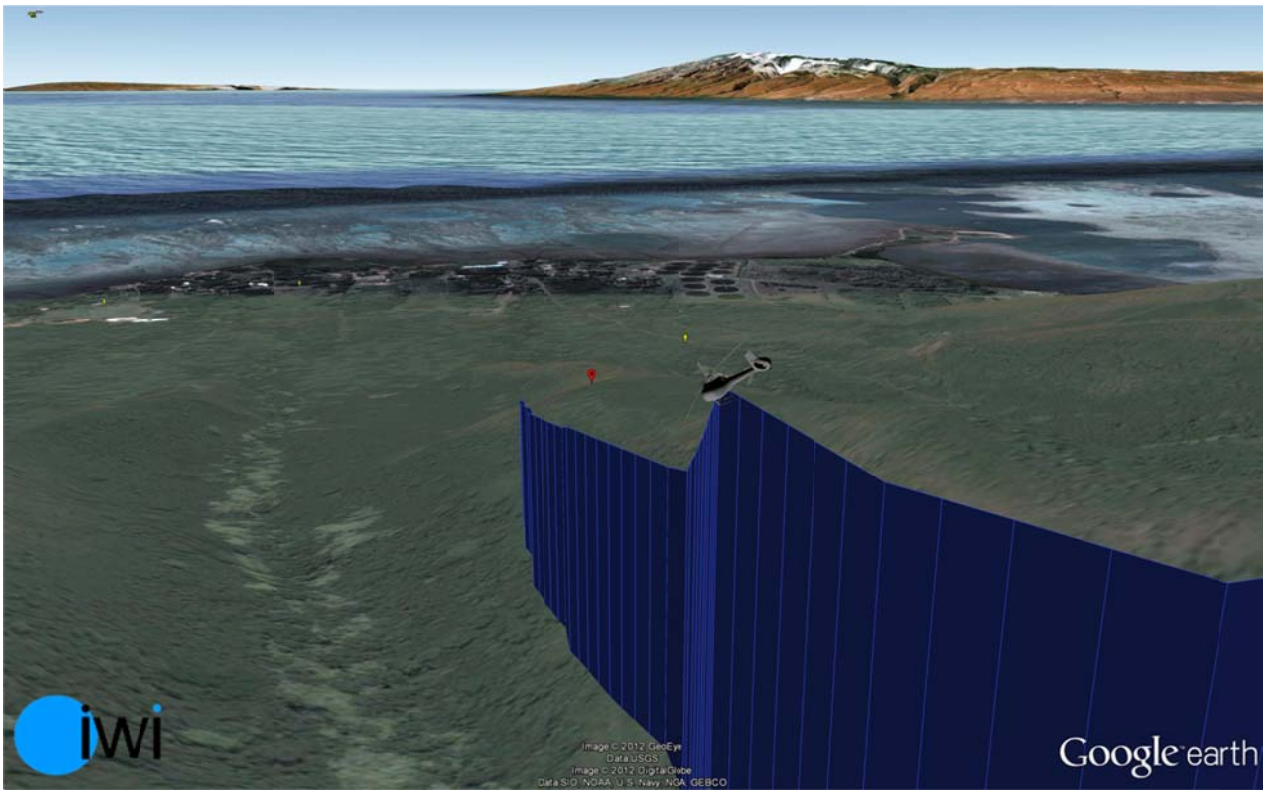


Figure 24: Witness #1 of helicopter's attitude at observed point O1 on the IWI reconstructed flight path looking south.

Conclusion

It is conclusive that the witness flight paths indicate that the subject helicopter traveled, somewhere between .4 to .8 NM on a southerly heading in its last observed flight path. From the crash site to the furthest calculation (.8 NM north), it began approximately 1 NM down from the ridge line of the mountain. If the three flight paths illustrated by the three witnesses Mr. Paleka, Mr. Lopez, and Mr. Kapuni are considered; all reconstructed flight paths are located within the error tunnel show with a high degree of validity that the helicopter flew down the mountain on a southerly heading. Additionally considering the location of Mr. Schneider's last observation of the subject helicopter (approximately .5 NM east) adds to the conclusion that the subject helicopter was approximately ¾'s the distance up the mountain side from the shore and on a westerly heading, at approximately 2,200 feet MSL, (~200 feet AGL) before its observed southerly flight path to the accident site.

Of the witnesses, Mr. Paleka, who was the closest to the accident site, was the only one who could recall the attitude of the helicopter when he observed the aircraft. The description by Mr. Paleka shows a coherent reconstructed flight path with the helicopter attitude for the position IC and O1 as shown in figures 21, 22, 23, and 24.

The meteorological conditions described by both witnesses Schneider and Lopez suggest that the top of the mountain was obscured by the clouds at the time of the event. These witnesses also depicted the approximate base of the clouds as being just above the aircraft, as seen from their viewpoints and at the time they each made their initial contact (IC) of the aircraft.

The IWI interview took place 197 days after the accident. It has been shown within other investigations before in which IWI has been applied, that even after one year, the accuracy of witness statements were still very valid, as the reconstructed flight paths could be compared to existing radar data.