

HAWAII ZIPLINE INCIDENT OPINION PAPER

March 29, 2012

To: Zipline Enthusiasts
From: Experience Based Learning, Inc (EBL)
Re: Hawaii September 2011 Zipline Incident and Opinions

To Whom It May Concern,

Over the past months, EBL has been called upon by officials in the State of Hawaii, general public, clients, and tourist visiting the Great State of Hawaii, regarding the Zipline incident of September 2011 on the Big Island.

Further, having been part of five (5) projects in Hawaii since 2002 and being a leader in the industry, we have been asked our opinion on the merits of the incident that claimed a workers life and injured another, the Great State of Hawai'i efforts to regulate the industry, EBL courses in the islands, our recommendations for regulation, and addressing uneasy tourists. We will do our best to respond to each question.

First, EBL, like our fellow professionals, extended our continued thoughts and prayers to the effected family and friends of the worker who passed in this incident and hope for a speedy recovery of the injured worker. EBL didn't know these workers personally, but many of the shareholders are friends via interconnected relationships in this small and growing industry.

Hawaii September 2011 Zipline Incident:

We must point out that our direct information on this incident comes from newspaper articles and mostly hearsay information from conversations within the industry. Therefore, any information we provide here is based on opinion and the accuracy of the newspaper articles representation of the facts. Therefore, EBL can only provide additional questions and responses based on speculation. This may provide for an increase in clarity to the situation or allow for officials in the reviewing the case some insights as to what should be examined next.

This incident on September 2011 was not part of an EBL installation or operation, nor was it at any of our Licensed operators locations. Therefore we do not see any conflict of interest in providing our opinions. However, it was located between Hilo and our course located at the World Botanical Gardens, Zip Isle. The accident claimed the life of a worker for Experiential Resources, Inc (ERi). We have no idea if this worker was an employee or a subcontractor for ERi. We only hear that he was conducting business on their behalf, for an ERi client, as represented in the media.

If the facts presented by the media are true in the representation of items from the police report and investigation, such as the utility poles were set at only 5 feet deep and ground anchors unearthed, then this would raise some serious questions in our minds. For example, per the ANSI Accredited Professional Ropes Course Association (PRCA) standards, utility poles set for tower structures or zipline anchor posts, must be set to a depth of 10% of the overall length, plus an additional 2 feet. Therefore, a 50 foot pole would need to be set 10% or 5 feet plus an additional 2 foot deep, for a total of 7 feet. The only way this could be altered to a lesser depth or to be reviewed to see if a greater depth is required, would be via the approval of a licensed engineer familiar with the region in which the utility pole is installed, soil type, and proposed forces on the pole; compression and lateral forces, and other consideration. In this case, Hawaii, specific to the Big Island, to the actual property the poles were installed. For the lay person, the depth of the pole matters for compression (downward) forces and the skin friction of earth to the sides of the buried utility pole. However, not all soil types are equal and a soil chart or a geotechnical report should be reviewed and factored into the equations, if not already.

To better understand this issue, let us use our latest Hawaii property for example. We consulted a local Professional and Structural Engineer, licensed and insured in the Great State of Hawaii, to review and wet stamp approve the EBL plans for that installation. During the process and the engineers due diligence, he referenced a soil chart for the region where our poles were installed and found that the ash loam of the region only provided for a very low pounds per square inch (psi) factor. In our case, only 1,000 psi. Therefore, any poles installed on our tour that would be in a position to support a tower, had to be placed on a poured concrete footer pad reinforced with rebar, sized to the engineered approved calculations. This would prevent the compression (downward) forces on the poles from actually sinking the pole into the soft soil type. Now, other factors play out here such as the diameter of the butt of the pole, the resistance along the sides of the poles, and the soil type of each location for each pole. At the EBL tour just North of Hilo, we found it cost prohibitive to do a soil evaluation at each specific pole on our tour, some 20 different locations, so we utilized the base line assumption that all the soil, regardless of location, would only serve to support the lowest psi possible, or 1,000 psi. For contrast, many other locations may have a psi rating of 2,000, 6,000, 10,000 psi or greater, depending on sand, ash, sand and gravel, loam thickness, strata, or bedrock contact and type of bedrock such as lava or granite.

Ground anchors also rate their strength based on the local soil type and psi rating. In our case again, when using the 1,000 psi rating for ash, we found that we needed to utilize a larger bottom plate anchor for a greater pull out surface that would offset the softer soil, yet afford us the proper strength rating, reflective to our anticipated combined load forces for the zipline. To aid in that strength rating, we doubled all anchors to split the load over two ground anchor points, per pole. Then to insure ground anchor stability, backfilled each anchor with 300 pounds of concrete before topping off the backfill on each ground anchor with native soil and tamping. This step is may be critical in such poor soil types and the psi factor may increase and/or decrease with the addition of moisture, rain fall, or water ground table fluctuations. In short, when you ride a zipline, vibrating forces and sign waves generated by the participants' motion down the line, create changing dynamic forces on the anchor system, thus being transmitted into the surrounding soil. By adding an increase of water to the anchor area, in conjunction with these vibrations, you may have a situation whereas the soil begins liquefaction. This refers to the process where saturated, unconsolidated [sediments](#) are transformed into a substance that behaves like a liquid. This allows for the anchor to creep upward and become unearthed over time, or suddenly. Lastly, for inspection purposes, you should paint the head of each anchor so you could witness through the inspection process, if any of the ground anchor heads reflect creeping or unearthing. To date, EBL courses, including the World Botanical Gardens, Zip Isle, on the Big Island, have been without incident since installation in 2009.

Questions that the authorities and investigation should be asking may include, "Was a local and properly licensed engineer brought on to the project and approved the installation materials and methods?" "Was a soil chart for the area or a geotechnical report consulted for the area to determine the soil type and psi rating?" "Did the location have proper local building permits and conduct the ongoing building inspector site reviews to ensure proper compliance with engineered plans and material recommendations?"

The answer to these questions may prove insightful in the determination of the actual cause for the tower and zipline failure in September 2011 on the ERI zipline installation. In a most recent media report it was suggested that the tower had failed once before, but was reinstalled, according to witnesses, in much the same location and construction method. The first failure should have been a strong warning that miscalculations may have been made and should have been addressed. Given that the islands of Hawaii are all formed via volcanic processes, it may be prudent for state officials to cause review of other ERI installed ziplines and towers throughout the state to insure proper compliance during those installation processes and to protect the well being of tourists. Whiule this will most certainly cause economic misfortune for local operators, in the spirit of safety for the enduser, it may be a necessary requirement to protect the industry as a whole. It is a reasonable speculation that the zipline death of the ERI worker has had an impact to the overall zipline industry and therefore a second possible incident could prove detrimental to all ziplines across all the islands and the mainland.

Background; Past EBL projects in Hawaii:

Since the zipline incident of September 2011, we have received inquiries as to which ziplines in the islands EBL has installed and would recommend for safety. Many factors go into a safer course, so for the sake of this report, we only recommend courses that carry the EBL Licensed Location logo, located on the promotional materials of a particular tour; e.g. website.

Regarding EBL's experience in the State of Hawaii, EBL was part of the first installed tour in the State of Hawaii in Maui in 2002. EBL installed the cable systems, provided the safety and certification training, and ongoing inspections for three years. In roughly 2004, EBL traveled back to this tour and installed what we believed to have been the second, yet longest suspension bridge as part of a canopy tour, in the State of Hawaii at 150 feet in length. Since that time, that location has gone into business as zipline installers and operators at other locations. We wish them well and are proud of the fact that EBL most likely had played a key role to their learning curve and success. That tour operates today under another inspectors' review and therefore we have no further comment regarding that tour due to lack of involvement.

EBL's second project was on the island of Kauai, for a program along the North shore region, in 2003. That course included seven ziplines and we believe Hawaii's first suspension bridge as part of a zipline tour. EBL installed the ziplines and bridge while the client installed take off and landing platforms. That tour operates today under another inspectors' review and therefore we have no further comment regarding that tour due to lack of involvement.

EBL's third project was also on Kauai for a program along the South West area which took people more to the interior of the island for the ziplines. This tour consisted of seven ziplines and our first project that required poles and cable placement with the aid of helicopters. That tour operates today under another inspectors' review and therefore we have no further comment regarding that tour due to lack of involvement.

EBL's fourth Hawaii project, again on Kauai for a company that EBL had previous experience with since 2003, to conduct youth teambuilding programs, high and low ropes challenge courses, and EBL's first free hanging style climbing wall. In 2005, EBL installed the first EBL owned canopy zipline tour in Hawaii. EBL installed, maintained, trained, certified, and safety inspected this course until the Fall of 2008. This was the only tour on Kauai that was a true canopy tour whereas the entire tour was located in the tree canopy from start to finish. It consisted of 6 ziplines, a suspension bridge, postman's walk, gap step, swinging platforms, and other elements that comprised, what we believe to have been, the first US canopy tour and some today may define as an aerial adventure park. The location operates today under another inspector's review and therefore we have no further comment regarding the tour due to a lack of involvement.

EBL's fifth project in Hawaii is located on the Big Island, just North of Hilo, named The World Botanical Gardens, Zip Isle. This tour consists of 7 ziplines ranging up to 1,000 feet in length. The last zipline also includes EBL's patent pending signature dual, side by side racing ziplines. This is a great tour. This tour is currently in good standing with the EBL Licensed Location program and receives bi-annual inspections from a qualified builder and inspector of EBL, familiar with the course installation per the engineered plans and building department recommendations. We highly recommend this course to the general public.

Hawaii Regulation:

Since the September 2011 incident that claimed an ERi worker, and injured a second, the State of Hawaii has been reevaluating the need for regulation of ziplines in the state. While many states do not regulate ziplines and appear to be incident free, other states do have some sort of regulation. As a lay person on the side lines of the Hawaii situation, yet having been in contact with state representatives, it appears to EBL that the proposed regulation would not have prevented this accident from occurring. As this incident affected workers, it should fall under OSHA to investigate the incident and according to the media reports, that is what is happening. OSHA currently has regulation regarding fall protection for workers and other regulations for worker safety. If the media reports are true that the utility poles were set too shallow, or anchors where not rated properly per soil conditions, or permit requirements where not adhered to, then these issue should be addressed in the findings of the investigation, with any other contributing factors.

Mandates for operational insurance, operational plans, emergency procedures, ongoing safety inspections from Qualified Persons, and other regulations will serve to assist closing any gaps that may be present hazards to the public. However, regulation in itself cannot remove all hazards. Human error verses materials failure, appear to be the cause in this September 2011 incident. Whereas, the ground anchor didn't fail, rather human error under estimated the expected loads and perhaps, per soil conditions, failed to install the proper anchor for the application, or method of installation. The same could be said about the collapsing tower structure.

Regulation as presented by the State of Hawaii representatives may be a positive step forward, as it is designed to protect the public. Of the measures presented, these regulations are already present in the industry via the Professional Ropes Course Association (PRCA). Yet not being the oldest association in the industry of Ropes Challenge Courses, it was the first to address the new up and coming industry of Canopy Zipline Tours since 2003. In 2005, the PRCA became the first ropes course and canopy zipline tour industry American National Standards Institute (ANSI) accredited association to be a standards developer in this specific area. For the past six years, the PRCA has reached out to the industry for contributions as it set forth to develop the first and governing ANSI American National Standard (ANS). This process has been supported by some, yet opposed by others due to the spirit of freedom and not wanting to be controlled. However, zipline incidents like that of September 2011 call for the need to have such ANSI ANS standards in place and serves to validate the PRCA efforts. More information may be viewed at <http://www.PRCAinfo.org>