

Incident Summary #II-1581017-2023 (#37073) (FINAL)

SUPPORTING INFORMATION	Incident Date	June 24, 2023	
	Location	Radium Hot springs.	
	Regulated industry sector	Amusement Devices - Zip line	
	Impact	Qty injuries	0
		Injury description	NA
		Injury rating	None
	Damage	Damage description	A guest traveled across the zipline while their harness was unattached to the smart belay lanyard.
		Damage rating	Major
	Incident rating	Major	
Incident overview	A guest became unattached from their lanyard while travelling at height across a zipline. The guest's grip on the belay handle was the only thing that prevented them from falling. They managed to hang on to the lanyard handle while travelling across the main cable to the landing platform where the zip guide assisted the guest onto the landing platform.		
INVESTIGATION CONCLUSIONS	Site, system and components	<p>Zipline details:</p> <p>The zipline tour consists of 7 individual lines that weave back and forth across a dry gulch. Ziplines range in length from approximately 65' to 750'. Zip lines 1-6 are single lines accommodating 1 rider at a time. The final zip is a double zipline that uses a braking system to stop the rider. The zipline tour consists of a training area that provides guides with the ability to train the guests in the use of the Edelrid Smart Belay and the operational procedures for the zipline tour. Prior to participation in the course, guests receive an orientation including a verbal description of the experience and physical practice on the training course. After completing the training course, guests access the tour via a ground/walking entrance to zipline #1 and are led through the tour by guides.</p> <p>Equipment details:</p> <p>Guests wear a full body harness with a single D-ring attachment point in the front which is coupled to a Edelrid double smart belay trolley. The smart belay consists of two carabiners, a pilot handle used for holding on, and a swivel connection point. The smart belay carabiners can only be released one at a time and the second one isn't able to be released until the first one is connected. They are used for transferring across connection points while never being fully detached. The smart belay is connected to the D-ring on the front of the harness using a threaded quick link connector (Image 3). The threaded quick link connector is attached to the harness and closed figure tight by the guests then tightened by a guide using a wrench to lock the coupling in place and prevent unintended loosening.</p>	

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Guides:

The zipline tours are accompanied by guides who are the main source of information and assistance for the guests. The tours can either be staff-guided with 2 guides and a maximum of 8 guests or self-guided using 5-6 guides placed within course for supervision.

Training:

The guides are trained for the zipline tour including operational procedures, guest assistance and evacuation procedures, personal fall protection skills, and guest training and orientation. Guides must be trained, assessed, and signed off by supervisors before they are able to participate in the operation of the zipline tour.

Operating procedures – Guided tour:

The zipline tour has an approved operations manual that outlines requirements for subjects including:

- Equipment inspection
- Guest ratios and supervision requirements
- Harnessing and equipment
- Guest safety orientations
- The role of the guides
- Operating and rescue procedures

Guides must sign off that they have read and understand the operations manual and agree to follow all of the policies and procedures must be signed off for each technical skill before performing it.

Failure scenario(s)

Seven guests were part of a group participating in a zipline adventure tour. The tour was staff guided, being overseen by two guides. The guests went through orientation and were given the harness and helmets needed for the tour. The guests put on the harnesses and helmets and adjusted the straps for proper fit. The guides then gave the guests the belay lanyards and instructed them to attach them to their harnesses with the treaded coupling and tighten the coupling by hand. They were told that a guide would come around and tighten the couplings with a wrench. Two of the guests were having issues from helmet making them feel claustrophobic to feeling like the harness wasn't fitting right. One guide was helping the guests with the gear issues. The other guide tightened the threaded couplings with a wrench but missed two of the guests.

The guides then took the guests through a small training area where they practiced using the smart belay system and transferring the clips between lines.

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	<p>When the group arrived at the first zipline of the day, the guides instructed the guests how they could either step off the platform or sit down and take their weight on the line and harness first then slide off the platform however they preferred. The lead guide went across the zipline and prepared for receiving the guests.</p> <p>After four of the guests traveled down the zipline to the landing platform, the sweep guide informed the guests he was going across and they could come across on their own when they were ready, and it was clear. After the sweep guide made it to the other side and the line was clear, a fifth guest clipped in and traveled across without their threaded coupling closed and tightened to the d-ring on their harness. The coupling remained attached to the harness and the guest made it to the other side. The sixth guest also did not have the threaded coupling closed and tightened to the D-ring on their harness. The guest launched off the platform and when the weight of the guest was applied to the line, the line reacted with a bounce that unloaded the weight of the guest allowing the open threaded coupling to detach from their harness. The guest traveled across the zipline for approximately 12-14 seconds while only hanging on to the lanyard handle with their grip strength stopping them from falling into the ravine below.</p>
Facts and evidence	<p>Interview Statements (Guests):</p> <ul style="list-style-type: none">• There was a total of seven guests and two guides on the tour.• The guests were given the belay lanyards by the guides and told to connect them to their harnesses and tighten the connector by hand and the other guide would be around to tighten them up with a wrench.• Not everyone in the group heard the instruction.• Two of the guests did not have their threaded couplings tightened by the guide with the wrench.• They felt the instructions from the guides were “rushed” and “a little chaotic”.• When they went across the training area zipline they sat down first to take their weight and they traveled across without the threaded connector coming off.• They walked off the first zipline after the training area and that caused the line to bounce.• The threaded connector had come off the harness and they had to hold on to the smart belay bar with their grip strength being the only thing preventing them from falling into the ravine.• After the incident they did not continue the tour. <p>Documents:</p> <ul style="list-style-type: none">• The design and installation of the zipline course along with the selected equipment to be used and the operations and risk management manual were compliant with applicable codes and standards and were signed off by a professional engineer.

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	<p>Zipline operations manual:</p> <ul style="list-style-type: none">• After completing the client orientation, the group is led to the start of the zip tour where guides perform a final inspection of harnesses and helmets.• The lead guide will ride zip #1. Once the lead guide has connected to an appropriate fall protection point on platform #2 and cleared the zip line, the sweep guide can start moving guests onto the course. The sweep guide will supervise guest's transfers from the main platform transfer loop to zip #1.• The lead guide will clear and receive the first four guests/riders. After the first four guests/riders have arrived at the zip platform #2, the lead guide will send those four guests/riders onto zip #2. Then the next four guest/riders will be received at zip platform #2.• The lead guide will then move to platform #3 and the sweep guide will ride the first zip to join up with the group. This process is repeated until the group arrives at zip #7.• The sweep guide will follow the group through the course ensuring that they are following the operating procedures and assisting as necessary.
Causes and contributing factors	<p>The failure to follow the operating procedure of tightening all the guest's threaded couplers with a wrench allowed the guest to become detached from their smart belay lanyard during the travel across the zipline.</p> <p>Contributing factors to the incident include:</p> <ul style="list-style-type: none">• Operating procedures:<ul style="list-style-type: none">○ The procedures in the operations manual did not contain specific instructions or procedures detailing a method for connecting the smart belays to the guest's harnesses and ensuring all connections had been tightened with a wrench prior to proceeding.○ The operating procedure not being followed when a final inspection of the guest's harnesses was not conducted prior to the start of the zip tour.○ The operating procedure not being followed when the sweep guide traveled across the zipline leaving 3 guests to travel across on their own removing the possibility of the guide identifying the open connector on the guest's harness.• System design:<ul style="list-style-type: none">○ The compliant design of a single connection point between the smart belay lanyards to the harness require procedures and human actions to ensure proper connection without any redundant safety if the procedure is done incorrectly.



Image 1 - Zipline #1 view from the launching platform. [A] The zipline cable. [B] The landing platform.

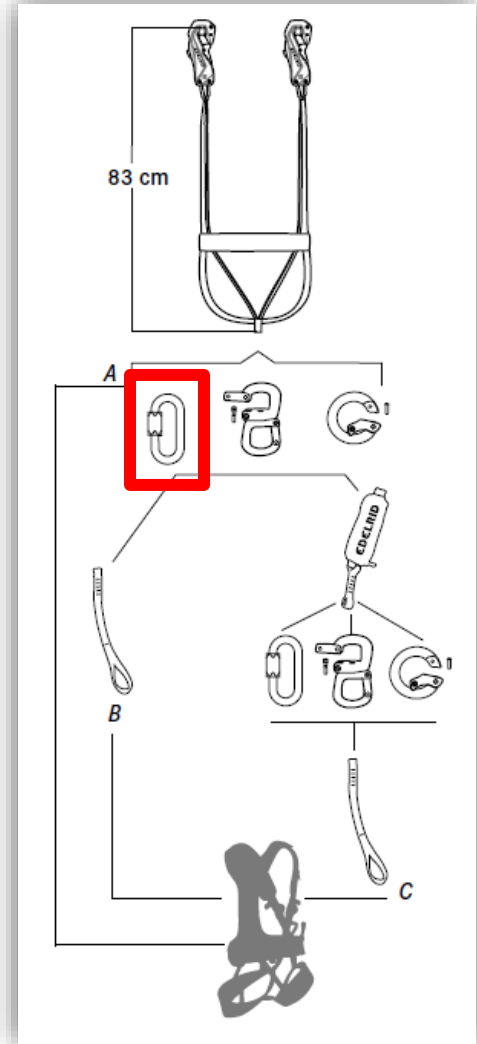
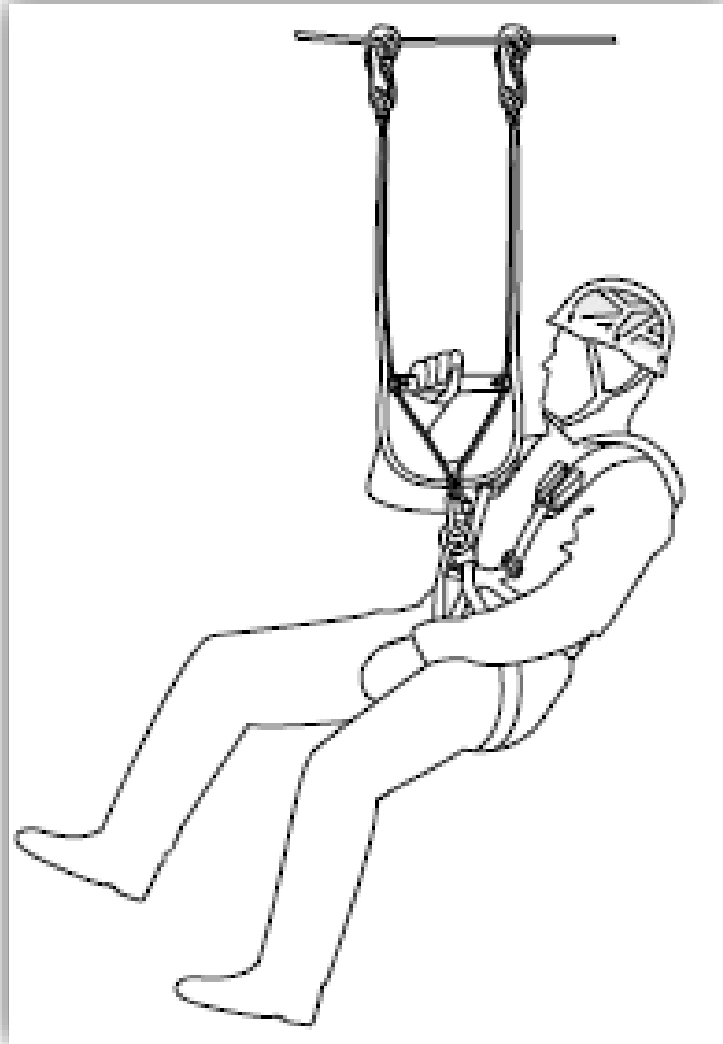


Image 2 - Manufacture's manual showing use of the smart belay system and connection to harness. Red box showing threaded coupler style used for connection.

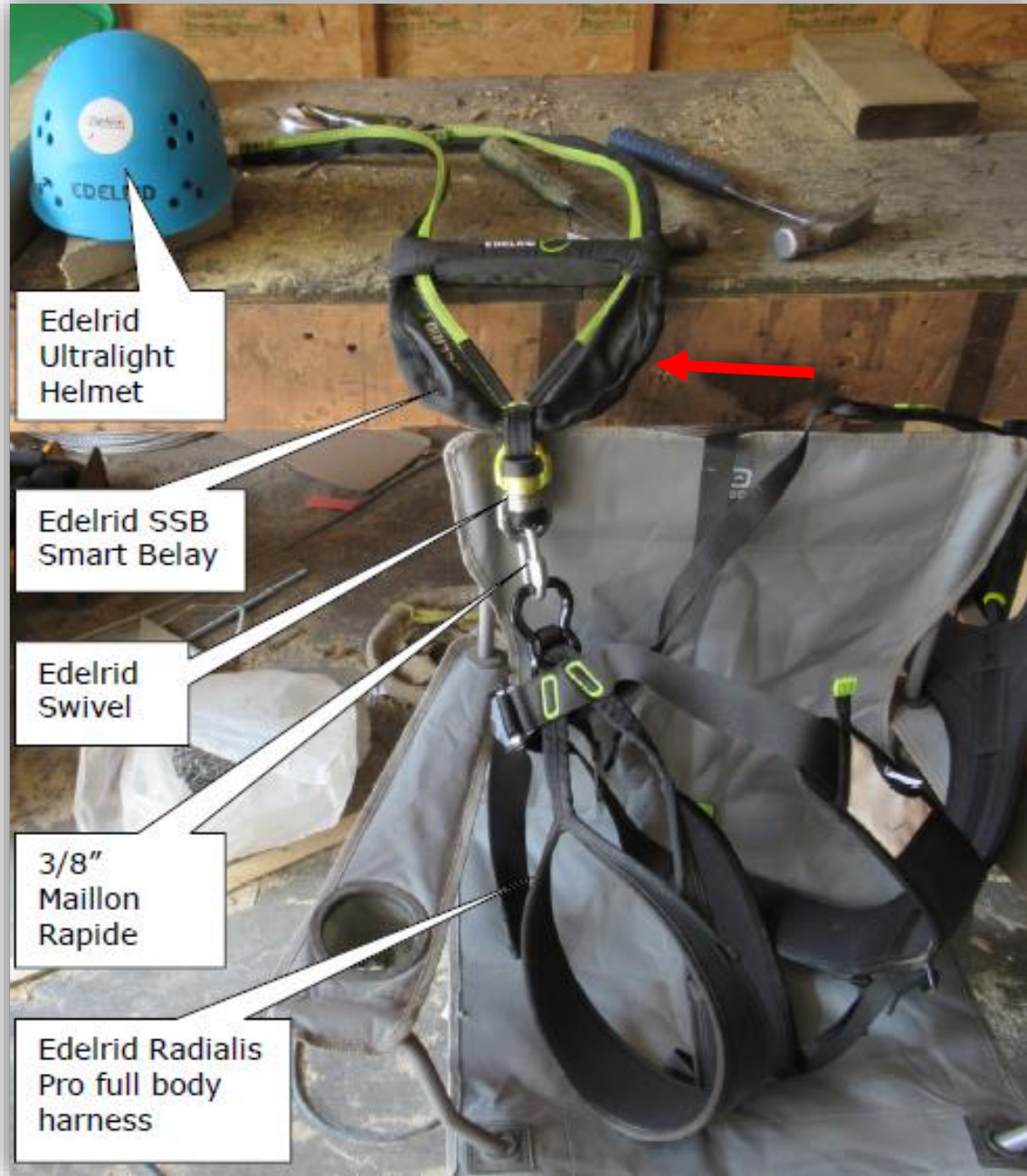


Image 3 - Zipline rider gear with [ARROW] smart belay connected to the full body harness using the 3/8" Maillon Rapide threaded coupler.



Image 4 – The guest traveling across the zipline unattached to the smart belay lanyard.

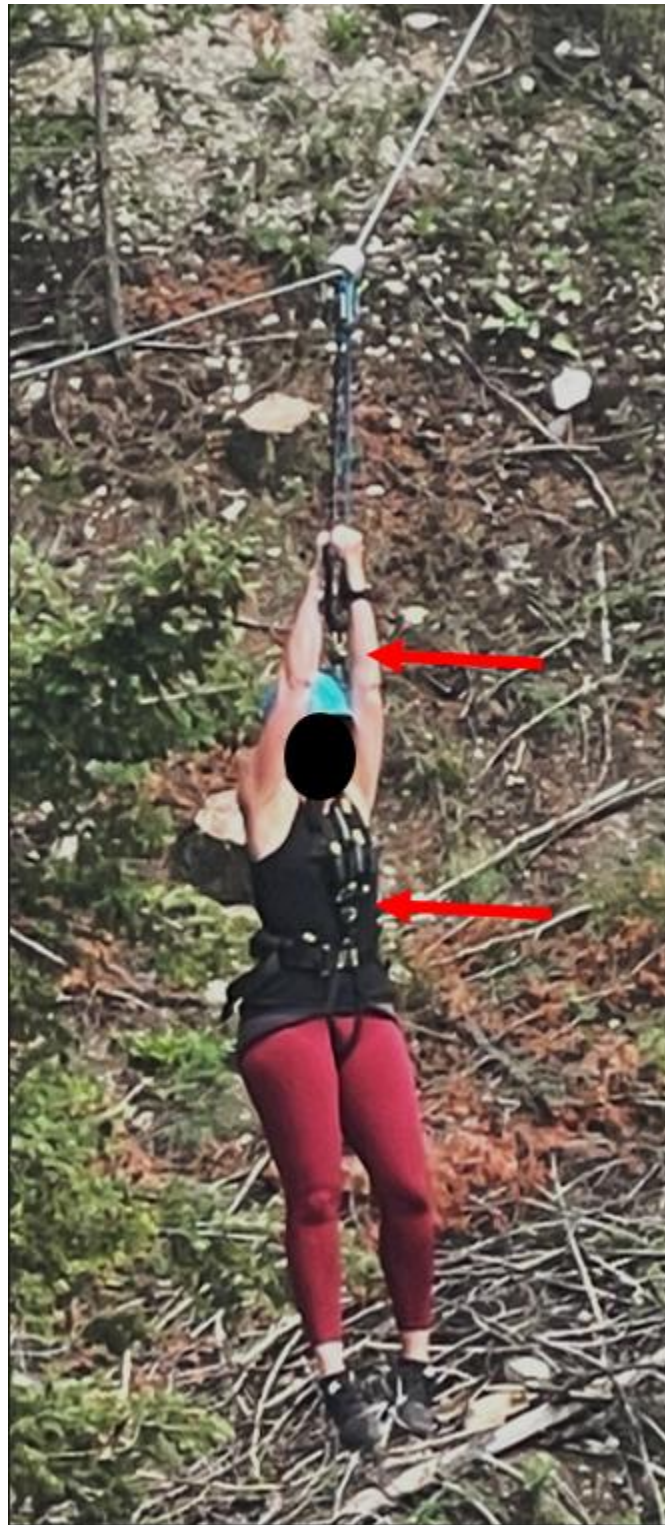


Image 5 – The guest traveling across zipline. [ARROW] The Smart belay lanyard coupling (Top) and the location of the D-ring on the harness that the coupler is supposed to be attached to.