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Rescue work by one lifeguard on a cable car - a new method of rescuing victims

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Abstract. In an environment where tourism is developing rapidly, and in connection with which new tourist complexes appear, the number of cable cars increases. Moreover, the safety of vacationers in these complexes depends on the quality and the normal functioning of these roads. Despite the fact that the load-bearing elements of the ropeways are very reliable, in addition, the principle of redundancy of the main elements (main and backup drives, as well as two mutually redundant power sources, etc.) is used in the design, sometimes accidents occur in the form of a sudden stop movement. This circumstance requires the immediate organization of rescue operations to rescue (evacuate) passengers from the cable car.

Keywords. ropeway transport, evacuation of passengers, requirements to personnel during evacuation, reduction of personnel injury risk, critical failure.

Introduction.

According to the international standards established today, rescue work should not exceed 3 hours, during which the rescuers must have time to save the last victim and deliver him to the designated place. In addition, rescue and evacuation operations are associated with a certain risk, both for the victim and for persons in the area danger. This circumstance requires a search for new methods of rescue [6].

Today, there are 3 main methods of rescuing victims of cable car accidents, and all of these methods have their drawbacks. Chief among them is a waste of time. Often rescue all victims of cable car accidents roads is impossible within the established standard time (3 hours). This article describes the available methods for rescuing victims in an accident. on the cable car, as well as a new method that has been tested several times in accidents on cable cars available in tourist complexes of the Republic Uzbekistan. With the help of the new method, within the set time (3 hours), it is possible to save much more victims. In an environment where the process is proceeding at a high rate urbanization and

tourism is developing, in all countries there is a need to improve the flow of passengers in big cities and the creation of new tourist complexes. In this regard, in large cities, in mountainous areas, as well as in tourist chairlifts, gondola and funicular cableways are being built in the complexes. At the same time, cable cars, widely used around the world, like other types transport, is the main means of delivering tourists in tourist complexes. The safety of holidaymakers in these complexes depends on the quality and normal functioning, cable cars. A feature of cable cars from other vehicles is that the means of transportation are located at some distance from the surface of the earth. Considering this feature, special ones are imposed on the load-bearing elements of ropeways. requirements related to the strength and reliability of these roads. In addition, for design, the principle of redundancy of basic elements is applied (the main and redundant drives, as well as two mutually redundant power supplies, etc.) [1].

Despite this, sometimes accidents do occur in the form of a sudden stop movement, which is associated with technical and emergency circumstances. Concerning immediate rescue operations are required to evacuate passengers. According to

international standards, rescue operations in case of accidents on cable cars roads should be carried out within 3 hours. During this period, the rescuers must have time to save the last victim and deliver him to a safe place. Rescue and evacuation operations are associated with a certain risk not only for passengers hovering at a height, but also for serving personnel and for all persons in the area of potential danger. It circumstance requires rescuers to comply with safety requirements and performing the necessary methods of rescue. In this regard, in case of accidents on cable cars more time is spent to rescue victims standard. Especially under these circumstances, when on the cable car hundreds of people are left in a "suspended state" in an emergency and exposed to a long motionless hovering.

Main part. Today there are 3 main methods of salvation injured in accidents on cable cars: First method. Evacuation from the cable car with access by cable (Pic. 1). In this method, the rescuer on the support located higher from the hovering victim, goes up and along the cable gets a special roller block with self-insurance to the chair. Having reached the victim (to the chair, trailer), the rescuer puts on a hovering lifeguard (or other harness), and using a climbing equipment lowers the victim down using the braking device. Wherein the braking device is attached to the roller or to the parts of the chair. By releasing one victim down, the rescuer will move to the next hovering victim and repeats an element of this method [5]. The disadvantage of this method is the loss of time. When carrying out rescue work, it is necessary to approach the intermediate support located above the suspended armchairs (gondola, cabins). Although sometimes the lower intermediate support is closer to the victim. In addition, with this method for moving the rescuer along the rope to the hovering, the help of a second rescuer is needed, who regulates the speed of his moving with a rescue rope and your own braking device. In the case of lifting the

rescuer from the lower intermediate support along the rope upward require a lot of physical strength and time.



Picture: 1 Chairlift rescue

algorithm.

Second method. Evacuation of the victim using the "Petzl" method (Pic. 2). This method is used to rescue an injured person trapped in a cable car (trailer), using a set of additional mine rescue equipment of the company Petzl, which consists of the following components:

- "Vertexbest": a comfortable helmet with a strong chin buckle to reduce the risk of losing a helmet in the event of a fall;
- "Navahobodfast": harness for work positioning and fall arrest, designed to work in a hanging position;
- "Rollcab": rescue block for hoist ropes;
- "ID S": universal self-locking belay device with anti-panic function;
- "Grillon": adjustable self belay with a handle for easier descent;
- "Bermude": the rescue gusset is installed quickly and easily.

With this technique, one rescuer is on the rope, and the other on the ground and adjusts the speed of movement of the first rescuer, guiding him actions. Despite taking into account all the elements of the rescue equipment, this method also has its drawbacks, which, like the first method, include the loss of time and the need to create rescue teams of at least two rescuers [3].



Picture: 2 Descent of the victim through the "Petzl" system

Third method. Rescue operations using a hinged ladder (Figure 3.4). This method is carried out by two rescuers. Rescuers climb up with equipment along the support upward to the supporting rope. Having reached the rope, they will organize a local station on a support and organize a safety rope for the rescuer. Safety the rope ensures the safety of the rescuer when moving along the rope. Rescuer moves down the cable to the chair using a hinged ladder and itself belaying with a large safety hook, the lifeguard below with the help of a safety rope, adjusts the speed of its movement (Pic.5.6). The rescuer, having descended on the cable car (chair), puts on rescue triangle (or other harness) on the victim, and through its the braking device lowers the hung (victim), the braking device fixed on a ladder, or on the details of the chair (Pic. 7). Next, the rescuer goes down, or by reversing the hinged ladder and the hook on the rope behind the chair suspension moves to the next one and repeats the operation. There are such moments that there are elderly people or people with a large complexion in the chair, who do not feel very comfortable at altitude. For such cases it is better use a harness or a homemade harness connected in place from a piece of main rope. Disadvantage of the method: the rescue ladder creates inconvenience when going up into the mountainous area and along the support of the cable car. As in the first method, two, three are involved rescuer to the appropriate investment of time. Given the shortcomings of the above rescue methods injured on the cable car, we propose a new, more effective method, helping to save time and the number of rescuers. This method has been repeatedly

tested in accidents on chairlifts that exist in tourist complexes of the Republic of Uzbekistan.



Picture: 3. Rescue using a hinged

Picture: 4. Climbing the supports stepladders



Picture: 5. Installation hinged ladders to the carrying rope.

Picture: 6. Rescuer movement on carrier rope.



Picture 7. Evacuation of the victim. Rescue work by one lifesaver on a cable car - new method. (Pic. 8).

To use this method from the rescuer requires the ability to communicate with people, and also a little knowledge of psychology, which are needed to calm people in hungry feeling stressed and other unfavorable factors. In cases where the distance between chairlift chairs and ground small, and the distance to the support is significant or is on difficult terrain, lifeguard can throw the main rope to the chair with people and after fixing it, make climbing the rope (Pic. 8)

The rope is fastened behind the seat by passengers, provided that they know how to do it, the rope is passed through a metal ring in the structure armchairs. The other end drops to the ground, where the lifeguard secures it to the organized local station, and in its absence, fix one end of the rope into yourself. Along the fixed rope (Pic. 9), the rescuer makes an ascent, using clamps (zhumaras, crolls, grasping prusiks, etc.), in the "hand - foot" method or in any other way using climbing equipment for lifting the top along the fixed rope (fig. 10). The most important thing ia that everything happens as much as possible quickly and professionally while observing safety measures [8].

The lifeguard climbs the chair of the cable car, stands with his feet between passengers and insures itself with seat insurance. Then he puts a rescue triangle or other harness on the hovering one, and lowers the hovering (victim) through its braking device, which is attached to the parts of the chair (Pic. 11). After finishing the evacuation, the rescuer begins to descend (rappelling) with the help of a descender, independently applying the insurance itself grasping knot (auto block, classic prusik) (Pic. 12).



Picture: 8. Rescue of the victim

Picture: 9. Ascent by rope

Pic.10. Climbing scheme one lifeguard. using the Zhumar rope method "hand leg".



Picture: 11. Descent of the victim

Picture. 12. The insurance itself. A) Auto block. B) Classic Prusik.

Benefits of the new method. Using this method of rescue a passenger from a seat by one lifeguard has the following advantages:

- no need to lift through a higher support and approach to the victim along the rope. As a result, time is saved;
- rescue work can be carried out by one rescuer without involving a partner, i.e. unlike other methods, if available, for example, 10 lifeguards can be organized 10 teams, i.e. work can be organized in 10 points at once;
- there is no need to purchase new means of rescue;
- easily mastered by every rescuer.

Lack of method. The method cannot be applied when the distance between the chair and the ground are very large. An example for the practical application of the method: 2019 in the month of April, on the cable car of the tourist complex "Beldersay" located in the mountainous area of the Tashkent region, due to adverse weather conditions, the main electrical panel was damaged by lightning cable car. At that moment, there were 42 passengers on the cable car, and well trained rescue team of 12 ropeway workers, this new evacuated all

passengers using the method in 40 minutes.

Conclusion. Thus, our proposed new method for organizing rescue work by one lifeguard on a cable car, has some advantages over other methods. The main one, of which is, savings time and number of rescuers to carry out rescue operations.

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