

Redundancy for Lowering or Raising People with Fiber Ropes

20171021-TER-REC0005 Terrestrial Rescue Recommendation

1. Introduction

When lowering or raising people with fiber ropes there is always a risk of a rope failing, by it being cut or breaking over an edge. This problem increases with increased tension on fiber ropes. ICAR recommended in 1999 that fully redundant rope systems are used when lowering or raising people with fiber ropes.

Other material or technologies have not yet replaced the use of fiber ropes in mountain rescue operations, so there is continuing need to manage the risk of rope failures.

Recent testing (Mauthner Kirk 2014-16) demonstrated higher risk of sharp edge failure with a dedicated load rope and an un-tensioned back-up rope than techniques which share the load between two ropes. Consequently, ICAR has revised this recommendation in 2017.

2. Recommendation

The ICAR Terrestrial Rescue Commission recommends Two-Tensioned Rope Systems for, high consequence terrain, when lowering or raising with fiber ropes that provide a mutual backup in the event of a failure of one of the rope systems.

Redundant anchor systems should be used for Two Tensioned Rope Systems, preferably with some separation between ropes.

Whether using fiber rope winches or pulley systems, sharing the tension between rope systems is recommended, including when switching between lowering and raising.

If all tension is to be placed on one rope, then an additional risk assessment must be made.

3. Explanatory notes

Redundancy should be provided when lowering or raising people with a fiber rope system whenever possible. A Two Tensioned Rope System is more resistant to failures from sharp edges than a Two Rope System using a Single Load Rope with and a slack or low-tensioned back-up rope (Mauthner Kirk, 2016).

This research demonstrates that each rope system in a Two-Tensioned Rope System must be capable and competent as both a load rope and a back-up rope at the same time.

- Benefits of Dual Capability Two Tensioned Rope Systems include:
 - Reduced risk of fiber rope cutting from sharp edges
 - Reduced fall arrest forces and shorter stopping distances if one rope does fail
 - Smoother movement of loads

Testing showed no noticeable difference in risk of failure from rock fall between tensioned and un-tensioned rope systems; results were similar in all test scenarios (Mauthner Kirk, 2016).

4. Glossary

Single Loaded Two Rope System	Full load is on one rope, no load on the second rope
Two Tensioned Rope System	Full load is shared between two ropes
Dual Capability Two Tensioned Rope System (DCTTRS)	Each rope system is capable and competent as both a load rope and a back-up rope to the other rope, at the same time
High Consequence Terrain	Conditions which can lead to serious injuries or death
Fiber Ropes	No natural fiber ropes!

5. References

Mauthner Kirk (2016), *EMBC Rope Rescue NIF Equipment Testing Summary Report*, Basecamp Innovations.

History of Revisions	
issued	1999 Cingov (SK)
revised	2000 Chamonix (F)
revised	2005 Cortina (I)
revised	2017 Soldeu (AND)