Basket Hitch Anchors

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What’s the best anchor?

• In 2017, helped by a Mountain Rescue Association grant he obtained, Joe Ray, with help from others in AMRG, did some tests on basket hitches
4. Basket hitches break, on average, at a higher strength and with less variability (smaller standard deviation) than W3P2 anchors.

5. Basket hitches appear to be between 705 to 775 lbs stronger than W3P2 anchors in the configuration tested.
The Hypothesis

- A basket hitch anchor tied with a high internal angle and using a single carabiner will cause off-axial loading to such an extent that the carabiner could be damaged or fail:
  - Before the webbing fails
  - At loads within our standard 10:1 static safety factor
Methods

- Testing was done using standard rope rescue equipment
- All equipment was purchased new for the purposes of this testing
- MRA provided a grant for the test equipment and Rock Exotica Enforcer load cells for the testing
- Anchors used were those typically used in rope rescue systems (trees, telephone poles)
- Cribbing was used in some tests to maximize the angle of the webbing
Methods

• Force was slow-pull using several different methods in various tests:
  • mechanical advantage rope systems
  • A 3 ton come-a-long
  • 6 ton winch on Harmony Fire Districts Rescue 22 truck
• Measurements of the internal angle of the anchor were taken at the following intervals:
  • 50 lbs, 1000 lbs, 2000 lbs, 3000 lbs, 4000 lbs, 5000 lbs
Results

- Initial internal anchor angle: 86-124°
- Under load, webbing stretched, and angles decreased 10%-29%
- 3,000 lbs,: 74-94°
- Larger initial angle = larger stretch (3-4”)

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Results

- Steel carabiners: no damage or failures
- Aluminum locking carabiners: failures within our 10:1 safety margin, as low as 4,144 lbs/18.42 kN
- Aluminum non-locking climbing carabiners, as low as 2,200 lbs/9.78 kN
- The more exotic the shape of the carabiner, the more likely to sustain damage or fail
- On asymmetrical carabiners, the wide side experienced more issues than the narrow side
Other issues and failures

- 9 Prusiks melted/destroyed
- One tree pulled out of ground at <4000lbs
- 1 load releasing hitch melted at ~3000lbs
- Anchor strap damaged by abrasion on the anchor
- 1 screw link was damaged under normal usage
Conclusion and Recommendations

• The basket hitch is as strong or stronger than the W3P2 when tied with an internal angle less than 45 degrees: avoid extreme angles!

• Use a rigging plate and/or multiple carabiners to avoid triaxial loading on a single carabiner

• If using an asymmetrical carabiner, position the smaller end of the carabiner on the anchor side and the wider end on the load side
Questions?

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