

## **The Study of Knot Performance and Knot Failure**

Exploring the Secrets of Knotted Cordage to Understand How Knots Work

# **Distinguishing Knot Security from Knot Stability**

## **A Questionnaire to Check Your Understanding of Concepts**

Few people, including many knotting specialists, distinguish knot security from knot stability. But to think carefully about knot performance, it is essential to keep these concepts distinct.

The questionnaire on the next page helps you make the distinction between security and stability more clearly. Real-life scenarios put you into situations where it would be useful to know the difference.

Check your understanding of these concepts by taking this questionnaire. Note that both security and stability are relative: a knot is more or less secure, more or less stable. Note also how the security of a knot is related to its stability, and that a knot can be secure but unstable. These matters will be dealt with fully in the study of knot stability.

You are again urged to perform the task yourself and arrive at your own conclusions before reading my answers. And if your analysis is different from mine, or if you have found a better way of stating things, let me hear from you on the knotblog or via email. [Click here to open the blog](#) or to send an email message.

### **On Taking this Questionnaire**

This questionnaire will be more useful to you if you have read the previous study titled "Knot Security."

The concepts presented in these two studies are further developed in the following study titled "Knot Stability."

Other studies of knot performance are

The Breaking Point of Natural-Fiber Knots

Knot Strength

See also these studies of knot performance:

Influences on Knot Performance

Terminology of Knot Performance

Introduction to the Study of Knot Performance

[Click to view any of these studies.](#)

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## Questionnaire on Distinguishing Knot Security from Knot Stability

**DIRECTIONS:** Assume that all knots are well tied and that they do not include backup knots. To check your understanding of the concepts of knot security and knot stability, mark whether each statement pertains to

**Security** When loaded normally, a *secure* knot stays tied and does not come loose. (A normal load is moderate and steady, and it comes from directions the knot was designed to withstand.)

**Stability** A *stable* knot does not deform easily when subjected to an abnormal load. (An abnormal load comes from a direction the knot was not designed to withstand, or the load may be intermittent or reversed, or a segment such as the tail may be pulled out of line.)

**Both** Circle both *security* and *stability*.

**Neither** Circle neither word.

- 1) Security Stability I tied two ropes together, but the knot snagged, deformed, and slipped apart.
- 2) Security Stability A heavy load fell on a fixed loop tied at the end of a rope. The rope broke just outside the knot.
- 3) Security Stability Some knots are easy to untie even after they have been loaded.
- 4) Security Stability In the 1940s, mountain climbers discovered that some knots tied in nylon rope slipped apart when loaded heavily.
- 5) Security Stability It is generally agreed that any knot reduces the strength of a rope.
- 6) Security Stability On Siula Grande, Joe Simpson's partner cut the climbing rope, causing him to fall into a crevasse.
- 7) Security Stability A Square Knot can tumble if the tail is yanked out of line.
- 8) Security Stability While climbing a steep pitch, a novice joined two pieces of rope with a certain knot. One of the tails slipped out. No more novice.
- 9) Security Stability A knot that holds well in cotton cord may not hold as well in nylon rope.
- 10) Security Stability If you tie a Granny Knot around a post or rail and pull it in a certain way, it will tumble into Two Half Hitches.
- 11) Security Stability If a loosely-knotted rope flaps in the wind, the knot may lose its form.
- 12) Security Stability In 1936, while roping down the North Face of the Eiger, Toni Kurz could not untie a knot at the end of the rope. He died while suspended there because the knot was too thick to pass through a karabiner.
- 13) Security Stability If I tie my shoes with a standard Double Bow Knot, it keeps them tied all day long. But I can easily untie it by pulling one or both tabs. The bows come right out and the knot comes untied immediately.
- 14) Security Stability If one of the tails of my Double Bowknot finds its way through a loop, and I pull hard on that tail, I can't undo it, especially in the dark.

Check your answers against mine: 1) both. 2) neither. 3) neither. 4) security (they slipped until they came untied). 5) neither. 6) neither. 7) stability (it deforms). 8) security (they slipped and come apart). 9) security (same as 8). 10) stability (it deforms when subjected to a non-standard load). 11) stability (same as 10). 12) neither. 13) stability. 14) Tomfoolery.

To further check your understanding, try to explain why you made your selections. Then think of particular knots in other brief scenarios that help you distinguish knot security, stability, strength, ease of untying, and other characteristics. Finally, consider whether the knot comes undone in one stage or two, whether the untying is hazardous or beneficial, and how you could prevent deformation and failure.