

VA Tech Study Findings: Alternating Tread Stair vs Ship Ladder

Overview

The Department of Industrial Engineering at Virginia Polytechnic Institute conducted a study comparing alternating tread stairs to conventional ships ladders and the findings were published in the proceedings of the Human Factors Society's 32nd Annual Meeting.

Subjects

- 80 ROTC students
- Identical clothing and shoes
- Most subjects had years of experience using a ships ladder versus only 15 minutes with the alternating tread stair

Conclusion

- **Missteps were significantly fewer on the alternating tread stair and about 80% of the subjects preferred it for descent.**
- **The users' subjective data and the objectively measured frequency of missteps consistently and clearly demonstrate the comfort and safety advantage of the alternating tread over the ships ladders.**

Specific Findings

Subjects were observed and recorded using both devices. Statistical analysis was employed to test for any significant differences and include the probability that the observed difference is due to chance. The observers state a confidence of 1.00-p (or, 95%) that observed difference is real not random.

Objective Measure: Actual missteps recorded over the duration of the study

	Alternating tread stair	Conventional ship's ladder
Ascending with load	4	5
Ascending without load	3	9
Descending with load	7	16
Descending without load	8	8
Total missteps	22	38

A binomial test was used for items on the comparison questionnaire. Of the 39 comparison questions, 25 yielded a significant difference ($p < 0.05$). 24 of the 25 differences were favorable to the alternating tread stair.

- 80% preferred the alternating tread stair for safety and comfort during descent ($p < 0.00006$)
- 68% preferred the alternating tread stair for overall safety and comfort ($p < 0.0022$)
- For descent, the alternating tread stair was preferred for balance, foot support, and lower likelihood of slippage and tripping

VA Tech Study Findings: Alternating Tread Stair vs Ship Ladder

- For ascent, the alternating tread stair was preferred for safety, foot support, and lower likelihood of slippage and tripping
- The one preference for the ships ladder was step width, which was anticipated because the design of the alternating tread stair reduces the tread width in order to provide greater usable tread depth

Subjective Measure: Questionnaire completed by participants at the end of the study

	Chose alternating tread stair	Chose conventional ship's ladder
Overall preference	67.9%	32.1%
Overall safer ascent	66.3%	33.7%
Overall safer descent	81.3%	18.7%
Safer tread depth	88.8%	11.3%
More comfortable tread depth	85.0%	15.0%
Safer ascent	71.8%	28.2%
Safer descent	82.1%	17.9%
More comfortable ascent	62.5%	37.5%
More comfortable descent	85.0%	15.0%
More likely to slip/trip on ascent	35.6%	64.4%
More likely to slip/trip on descent	15.0%	85.0%