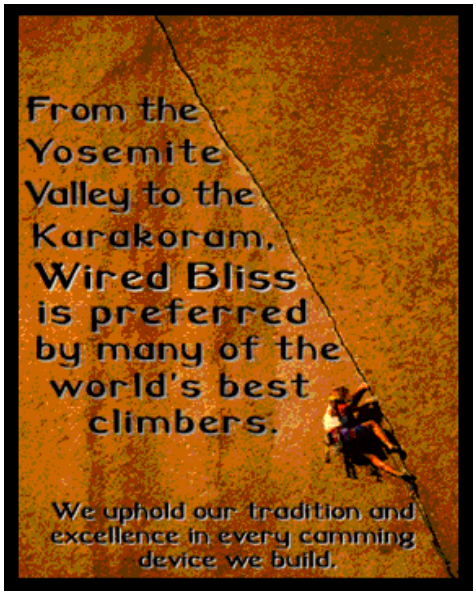
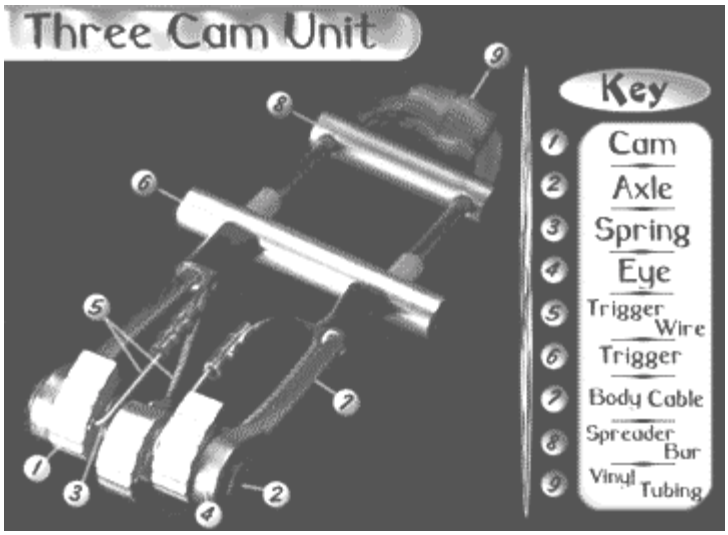
Material Selection for a Camming Device



What is climbing? [from ORCA web Site]

Simply, it is ascending for the sheer pleasure of the ascent. Most climbers start out on simple rock scrambles or, increasingly, at indoor climbing gyms. As they gain experience, they find they've entered a sport with many varieties and a 125-year history. The skills and specialized equipment required for technical climbing are what differentiate it from hiking or mountain climbing by trails. Technical climbers pursue their sport in many places, from small boulders in Central Park to the 3,000-foot granite face of El Capitan, and from short frozen waterfalls to Mount Everest.

For most climbers, the sport means trying to solve a problem-a rock face, a frozen waterfall, a high mountain-using the minimum aids of equipment. The pursuit of difficulty for difficulty's sake is the challenge that unites climbers of all types.



The Assignment

Camming devices Protection devices with spring-loaded cams which, inserted in a crack, resist outward pull from a falling climber. Two popular brands of cams are Friends and Camalots.

The assignment is to consider the materials shown for the camming device in the figure and shown in the accompanying table [from Bliss]. For each component determine a function, objective and constraints. Based on a reasonable assumption of loading determine what material should be chosen as an alternative to that shown. Critique the selections and explain a possible justification. The report should conform to the report format used in previous assignments.

Materials	
Cams	6061 T6 Aluminum
Eyes	1018 Cold Rolled Steel
Axles	4340 Heat Treated Cr Mo Steel
Trigger Mechanisms	6061 T6 Aluminum with Stainless Steel Cable and Wire
Body Cable	1 x 19 Stainless Steel Cable, Silver Brazed with 56% Silver to Eyes
Spreader bars	Color Anodized 6061 T6 Aluminum

Additional References:

http://www.umeme.maine.edu/mick/Classes/MEE320/spring_2002.htm
Metals Handbook ASM International, TA459.A5