his diabetes. He probably should not go on an extended physically demanding trip because of the difficulties of regulating his medication in the face of extreme physical activity.

Any person with a physical disability or medical condition that could endanger himself or other members of his party should inform the leader of his condition. He should also have obtained a medical opinion concerning the advisability of his engaging in mountaineering or any other comparable sport or activity. The purpose of this is not to eliminate such individuals from mountaineering, but rather to educate them concerning the possible hazard to ensure that they operate within limits that are safe for them and others.

Responsibility, of course, also lies with leaders of climbs or trips and may even involve clubs that sponsor such climbs. A recent review of some of the legal implications has appeared in the American Bar Association Journal by Joyce Blalock (Am. Bar. Assoc. J. *53*, 58-62, 1967). This points out many possible areas for legal contention and includes the requirement by individuals who have a disability or illness to make this fact known at least to the leader.

EQUIPMENT TESTING

Due to poor conditions of weather the Oregon chapter was not able to complete its series of tests last year. It is anticipated that there will be a report in next year's report.

Mr. John Armitage, an AAC member presently studying in England, has passed on some worthwhile comments concerning ropes. He quotes the results of abrasion tests on manilla and nylon rope – presumably of the same size; the manilla rope retained 84% strength and nylon only 24%, under dry conditions, under wet conditions figures were, respectively, 64% and 53% (Ropes from man-made fibres No. 555 89 pages; $3.00 from British Ropes Ltd., Austin & Hope Lane, Charlton, London S.E. 7, England).

Armitage also points out that some of the European Kernmantle ropes (11mm) will pass 2 U.I.A.A. falls but never 3 falls, and after the 2 severe falls it will not appear to be damaged by ordinary inspection. So we repeat again that a rope that has caught a severe fall should be retired. It has done its duty.

A further point was made by Armitage that 7/16 inch ropes should be the minimum diameter. He points out that a worn 7/16 inch rope is still as strong as a new 3/8 inch rope. He further states that it is becoming a universal practice in Britain and on the Continent to discourage the use of the single 3/8 inch rope for climbing. In fact such ropes (3/8 inch) are being referred to as half-ropes to discourage their use.

The following are reports of rope and carabiner tests done by Serena Bousman.* The rope tests were performed at the Plymouth Cordage Company under the supervision of Mr. A. Wirtzburger. A standard rope testing machine was used and the tests were conducted according to the methods outlined in the Cordage Institute Standard Test Methods for Synthetic Fiber Ropes (Nov. 10, 1960).

("Tensile strength shall be determined by using eye spliced specimens 3-5 feet in the clear between the last tucks of the splices. In all cases a tapered splice shall be used. Experience has shown that for nylon and poly-

ethylene ropes a minimum of 4 full and 2 split tucks should be used. The inside diameter of each eye shall not be less than 7 inches and not more than 15 inches.

"The spliced specimens shall be broken on any suitable testing machine with the speed of the moving head controlled to 3" ± 1" per minute, under no load.

"Conditioning of test specimens: For ropes made from nylon test specimens shall be thoroughly conditioned prior to tensile testing in an atmosphere of 65% RH and 70°F.")

New 7/16 inch diameter diameter Mountain Goldline was used for all tests unless otherwise stated.

*(Sponsored by Boston University College of Engineering.)

TABLE 1
Tensile Strength—dry

Failure lbs.	elongation %	Comments
6050	49.2	Broke at splice
5420	42.0	Broke at splice
5660	45.6	Broke at splice; this specimen had previously been used in an attempt to break rope over a carabiner which broke at 5375 lbs. The elongation readings taken did not differ significantly from those of unstretched rope.
6200	47.0	Broke at splice; this sample was loaded to 1000 lbs. and released 10 consecutive times. The elongation at 1000 lbs. was the same each time.
		Tensile Strength—wet
5830	50.0	Broke at splice; soaked in fresh water 24 hours.
5420	48.0	Broke at splice; soaked in fresh water 24 hours.

TABLE 2
Knot Tests

Knot	Test # 1	Value # 2	(lbs.) # 3	Ave. (lbs.)	% unknotted dry strength
Butterfly	4040	3700	4150	3963	69.5
Bowline on a Coil	3907	3220	3580	3569	63.0
Bowline	3795	3620	3705	3707	65.0
Fisherman's	3250	2900	3260	3136	55.0
Sheet bend	2690	2860	2860	2803	49.0
Prussik	2100	2200	(comments)		1/4" on 7/16" new mountain lay Goldline some slipping approximately at 1500 as knot tightened; 1/4" broke at knot in both cases.
Prussik	2775	2400**	2100		5/16" on 7/16" new mountain lay Goldline some slipping between 1000 and 2000. **One strand of 7/16" and one strand of 5/16" broke at 2400 at the knot. The 5/16" broke at the knot in the other two tests.

The percentage reductions caused by the knot in the 7/16 inch Goldline are similar to those reported by Leonard and Wexler for 5/16 inch manila and 1/4 inch nylon (Sierra Club Bulletin *31,* 68-100, 1946). Knots do reduce the tensile strength of the rope probably as a result of the angulation of the rope.

A number of carabiners of different types were obtained in the open market from suppliers. The carabiners were tested on a Tinius Olsen Tensile Tester. The range selected for the test was 1-30,000 lbs. Breaking time varied between 10 and 90 seconds. No correlation was noted between time and strength.

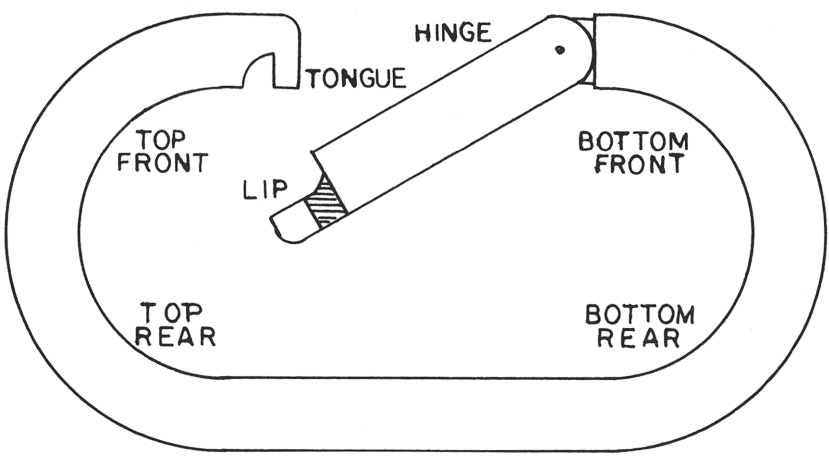

Figure 1. Nomenclature for carabiner.

TABLE 3
Carabiner Tests

Stubai steel

2700	hinge pin sheared, stretched at approximately 1300
3000	–do–
3150	–do–
3200	–do–
3250	–do–

Cassin aluminum

4450	Tongue broke, hinge deformed, stretched at approximately 1500, broke top rear
5100	Closing pin pulled out of lip, hinge deformed, stretched approximately at 1500
5100	Tongue broke, hinge deformed, stretched approximately 1500, broke top rear
5450	Tongue broke, hinge deformed, stretched approximately 1500

Note: Those which did not fail due to fracture were not tested to their upper limit due to danger from flying pieces. It is assumed that they would have fractured if stretched further.

Bedayan aluminum

2250	Tongue broke, stretched at approximately 1500, no break.
2500	–do–
2500	–do–
2750	–do–
2800	Tongue broke, broke top rear when stretched less than above.

Kamet aluminum locking—Tested in locked position.

3300	Began stretching, broke top rear
3450	–do–
3600	–do–
3700	–do–
3750	–do–

Chouinard aluminum

3450	Tongue broke, stretched at approximately 2500, broke top rear
4250	–do–
4400	–do–
4400	–do–
4500	–do–

Army aluminum—No identifying marks.

1850	Tongue broke, stretched at approximately 1100, broke bottom rear	
2000	–do–	(see note for Cassin Al.)
2250	–do–	(")

Cassin steel locking—Tested in locked position.

6300	Tongue and lip deformed, bearing failure one side of tongue fractured, stretched at approximately 2500
6450	–do–
6700	–do–

6750	Hinge pin pulled through bottom front, stretched at approximately 2500
7350	Tongue and lip deformed, bearing failure one side of tongue fractured, stretched at approximately 2500

Cassin steel

3550	Tongue and lips deformed, bearing failure, stretched at approximately 2200
3600	—do—

Marwa steel

6450	Tongue and lip bearing failure, stretched at approximately 3000
6450	—do—
6550	—do—
7050	—do—
7350	—do—

The results of the carabiner tests are similar to those reports (in last year's report) from Everett Lasher. Lasher reported that the Army aluminum carabiner failed at about 2000 lbs. There was one instance in this series above in which an Army aluminum carabiner failed at less than 2000 lbs. This study also points out that a number of these carabiners will show signs of deformation before failure. If such deformities are noted in carabiners in use they should be discarded. It is usually the aluminum (Army and Cassin, and Bedayan) types that tend tó be deformed below 2000 lbs. although the Stubai (steel) also showed deformity at 1300 lbs.

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