

A. Foot Travel.

1. Nonsnow

a. Horse. Logistics for pack trips should be worked out with the packer in charge.

b. Foot. Foot travel will be subject to the normal limitations of any hiking as far as weight of load and speed of travel is concerned. Proper foot gear and foot protection is imperative. A safe route should be traveled to avoid injury. Detailed planning will be needed to select clothing, survival, and job equipment which can be carried. Terrain and elevation must be considered.

2. Oversnow

a. Foot. During the snow season, foot travel may be necessary.

(1) Terrain

(a) Over glacier or other ice.

(b) Over terrain where extreme care is needed due to hazards of travel.

(c) Over areas of intermittent snow cover.

(2) Equipment

(a) Hiking or climbing boots, cross-country boots, mountaineering boots.

(b) Crampons.

(c) Ice ax.

b. Snowshoes

(1) Models. Snowshoes come in many models and sizes. The model and size used depends on: (See Attachment 1.)

(a) Size of person and load to be carried.

(b) Steepness of terrain.

(c) Softness and depth of snow.

(d) Open terrain vs. timber or brush.

(e) Distance to be traveled.

(f) Individual preference.

(2) Materials. Snowshoes are constructed from a variety of materials.

(a) Frames

(i) Wood, usually ash

(ii) Metal alloy

(iii) Plastic

(b) Webbing

(i) Rawhide

(ii) Neoprene

(iii) Plastic

(3) Bindings (See Attachment 2.)

(a) Types

(i) "A" type

(ii) "H" type

(iii) 3-pin cross-country type

(iv) Cable type

(b) Materials

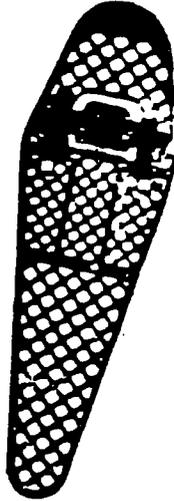
(i) Leather

(ii) Neoprene

(iii) Metal alloy

## Snowtread All-Plastic Snowshoes

Made entirely of polypropylene plastic, these snowshoes resist snow and ice build-up and are unaffected by extreme cold. Provide lightweight, sure-footed support. Built-in hinge allows unrestricted heel movement. Maintenance free - just hang them up after use.



## Sherpa Snowshoes

Anodized aluminum frames; tear resistant face, neoprene cloth. Special claw binding provides excellent traction on crusty inclines and ice. Features a built-in hinge rod that holds the claw binding in place while allowing unrestricted heel lift.

Two models: Featherweight and Lightfoot.

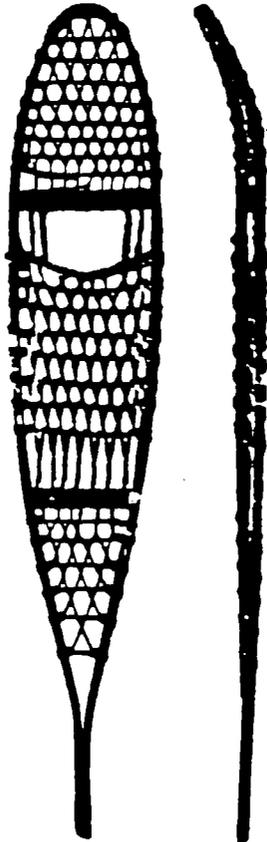
CLAW BINDINGS



NOTE: Sherpa snowshoes sold w/o bindings. Order bindings separately.

Model suggested for your load on	FEATHERWEIGHT	LIGHTFOOT
Mountains or in dense brush	100 to 275 lbs.	200 to 300 lbs.
Flat or hilly terrain	50 to 200 lbs.	150 to 225 lbs.

## Trail Model



A long, narrow snowshoe that's perfect for deep powder snow conditions. The tipped-up toe design makes this an easy shoe to walk with, and it's often used for racing. This is a good shoe for beginning snowshoers but not well suited to dense timber or brush. Each shoe is 10" wide and 58" long. Weight - 6 lbs. per pair. White ash frames.

## Michigan Model



An all-purpose snowshoe for the experienced user. It performs well in all snow conditions and in most terrain conditions. Not good in heavy timber and brush. Each shoe is 12" wide and 48" long. Weight - 5 1/2 lbs. per pair. White ash frames.

## Cross Country

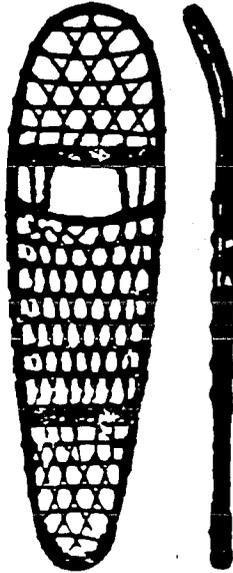


Popular with professional and recreational snowshoers. The tail reduces drag and increases stability. Suited to most snow conditions and almost all terrain. Not good for dense underbrush. Each shoe is 10" wide and 46" long. Weight 4 lbs. per pair. White ash frames.

# -Bear Paw Model- Green Mountain- Bear Paw



The ideal snowshoe when maneuverability counts. It works well in heavy timber and brush. The short design allows for tight kick turns. Not for beginners. Each shoe is 13" wide and 28" long. Weight - 4 lbs. per pair. White ash frames.



A most versatile shoe, with a unique design well-suited to beginners, very maneuverable in brush. Each shoe is 10" wide and 36" long. Weight - 4 1/2 lbs. per pair. White ash frames.

## Bindings

ATTACHMENT 2

### Type "A"

A general-use binding of moderate control. The instep strap and sandal-type ice piece provide excellent support.



83741 Neoprene, per pair.  
83748 Leather, per pair.

### Type "H"

Same as Type A, except that Type H (also known as the Army binding) has a solid ice piece.



(4) Accessories

- (a) Climbers to grip on slopes or hard snow.
- (b) Tapping pad for use with federal snow sampler.
- (c) Ski poles for stability.
- (d) Boots. Type used mainly personal preference-- rubber/leather, pac, leather hiking boot, cross-country or light mountaineering boot.

(5) Maintenance

- (a) The best maintenance is preventive maintenance.

- (i) Inspect snowshoes and accessory items for damage well in advance of using to allow time for repairs, if needed.

- (ii) Make repairs with the same or similar materials used in original construction.

- (iii) Replace any items which cannot be made serviceable through repair.

- (iv) Keep wooden frames and rawhide webbing well varnished to prevent absorption of water.

- (b) Field maintenance

- (i) Use care to prevent equipment damage in the field.

- (ii) Carry basic repair items on the trip with you, i.e., rawhide, wire, screws, tape, small tools, etc.

c. Skis

- (1) Types

- (a) Downhill
  - (b) Mountaineering
  - (c) Cross-country

- (2) Factors in selecting type and size.

- (a) Size of person and load to be carried.
  - (b) Softness and depth of snow.

- (c) Steepness of terrain.
  - (d) Open terrain vs. timber or brush.
  - (e) Distance to be traveled.
  - (f) Individual preference and skill.
- (3) Materials: Most skis today are laminations of these materials.
- (a) Wood
  - (b) Metal
  - (c) Plastic
  - (d) Fiberglass
- (4) Characteristics (general)
- (a) Downhill. Wide ski; metal edges; flat bottom waxed; boot in solid, full release-type binding.
  - (b) Mountaineering. Medium width; usually metal edges; flat oil textured bottom, waxed or unwaxed; heel release binding with or without clamp-down capabilities.
  - (c) Cross-country. Narrow width; usually nonmetal edges; flat or textured bottom; waxed or nonwaxed; heel release binding.
- (5) Bindings
- (a) Solid downhill type
  - (b) Modified downhill-release type
  - (c) Mountaineering heel release type
  - (d) Cable cross-country type
  - (e) 3-pin cross-country type
- (6) Accessories
- (a) Climbers. Seal skin, mohair, rope
  - (b) Tapping pad for use with federal snow sampler.
  - (c) Poles

(d) Boots. Style depends on type of ski and binding.

(7) Wax vs. nonwax: The choice of waxing vs. nonwaxing mountaineering or cross-country skis, usually, is determined by personal choice and/or ease of operation. Techniques of waxing can be easily learned, but are time-consuming. Skis with climbers or specially textured bottoms will allow uphill and general cross-country travel without waxing.

(8) Maintenance

(a) Preventive maintenance

(i) Inspect skis, bindings, poles, etc. for damage before the field trip.

(ii) Tighten screws, adjust bindings, add base wax, etc. at the office.

(iii) Have specialized repairs made at a competent ski repair shop.

(iv) Replace any items which are too badly worn or damaged for repair.

(b) Field maintenance

(i) Use care to prevent equipment from being damaged in the field.

(ii) Carry basic repair items, i.e., screws, extra cable, extra 3-pin baal, replacement ski tip, ski splintering material, tape, wire, etc.

B. Mechanized Travel

1. Road type vehicles. Since a great amount of time is spent on summer maintenance, consideration must be given to the use of vehicles on back country roads.

a. Drive carefully to prevent vehicle damage.

b. Use four-wheel drive to get you out of trouble, not into trouble.

c. Carry emergency repair items, i.e., tools, tape, water or coolant, spare belts, spare radiator hose, spare electronic ignition module, jack, spare tire, etc.

2. Large oversnow type vehicles. Machines capable of carrying several people and large loads.
  - a. Use care in operating to prevent damage.
  - b. Carry emergency repair items similar to those carried in road type vehicles.
3. Snowmobiles. One to two person, light load.
  - a. Twin track, single ski
    - (1) Larger track bearing surface, thus greater flotation on deep, soft snow.
    - (2) More area to carry larger loads.
    - (3) Less maneuverable
    - (4) Generally, best adapted on flat to moderate slopes with few obstacles.
  - b. Single track, double ski
    - (1) Generally faster, more maneuverable.
    - (2) Load space and capacity limited.
    - (3) Climbs steeper slopes if snow is firm.
    - (4) Less stable than twin track machines.
4. Operation. Instructions from the manufacturer or dealer, usually in the form of an owner's manual, should be followed.
  - a. Experimentation to get correct carburetor jets or adjustment for your elevation will be necessary.
  - b. Practice to develop operating skill will be necessary.
  - c. Experimentation in packing equipment properly will be necessary.
  - d. Auxiliary racks can be built for equipment hauling.
5. Maintenance.
  - a. Preventive maintenance
    - (1) Follow procedures outlined in the owner's manual.

(2) Inspect spark plugs, track tension, control cables, fuel tanks (leaks), drive belts, gauges, check oil, perform lubrication, check coolant, check battery, etc.

(3) Follow owner's manual instructions for summer storage.

(4) Set up some schedule for dealer inspection and service if there is no one else to do detailed maintenance.

b. Field maintenance

(1) Operate with care.

(2) Carry basic repair items, i.e., tools, belts, spark plugs, control cables, extra fuel, come-along winch, tape, wire, etc.

C. THE CROSS-COUNTRY TRIP

Many factors contribute to a successful cross-country trip. Already mentioned were:

1. Conditioning
2. Planning
3. Training and skill development
4. Proper equipment and maintenance

Another factor of paramount importance is ATTITUDE. A cross-country trip for snow survey work is intended to get the job done safely. The attitude of the personnel involved should reflect this.

1. BASIC ATTITUDE ITEMS

- a. Do not assume invincibility.
- b. Do not travel alone.
- c. Select the safest routes possible—avoid avalanche terrain, steep or rocky slopes, unsafe snow bridges over streams.
- d. Do not take chances to impress someone or to attempt to save time.
- e. Anticipate what to do in case of equipment failure or need for an overnight bivouac.

f. Do not ignore or short-cut the safety and survival rules you have learned.

g. Stop and think. USE COMMON SENSE.

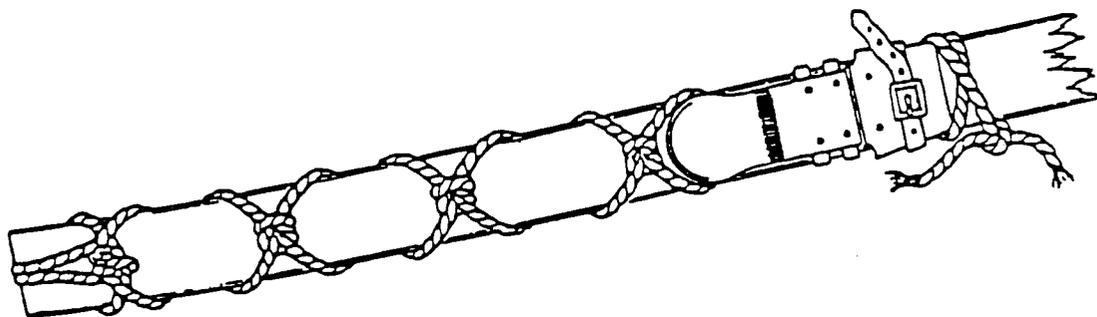
Every trip will have its own peculiarities. This must be recognized and handled accordingly by the individuals involved. The basic rules apply to all cross-country travel and should not be ignored. Conditions may be encountered where combinations of motorized, ski/snowshoe, and foot travel may be necessary. Plan accordingly.

## HOW TO CONSTRUCT ROPE SKI CLIMBERS

After measuring snow for 32 years and traveling countless miles on skis this was the first year and the first time I have had an opportunity of using a pair of Seal Skin climbers on my skis for an uphill trip that lasted the better part of all day. After a couple of hours, I had the feeling that I was carrying a couple of six-inch logs on each foot. The snow was NOT sticking to the skins, it was just the added weight which made the skis clumsy to handle. Fortunately, I had thrown my rope climbers in my pack before leaving home. I stopped; lit the old pipe and pulled off the skins; dug out the rope climbers and slipped them onto the skis; tied them up and mounted the trusty steeds. WHAT A RELIEF, and light as a feather. I soon overtook my companion and we traveled on up the trail. Soon I was breaking trail and my companion stated that he had never seen a set of rope climbers tied like mine and did not believe that they would hold so well; and I mean we were going up, and how. That night in the cabin we found some 1/4 inch hemp rope and I tied a pair for him. The next day on up to the snow course (Reference: 1948 Snow Surveyors Forum illustration on Page 15) my companion stated that he was through with skin climbers and was going to use the rope climbers from then on.

Advantages: Good Traction; Light weight; easy to dry and easy to carry; useful for other uses besides climbers; cheap and easy to replace.

Disadvantages: Not too good on icy side hills. But what is?



PICTURE OF ROPE SKI CLIMBERS

## HOW TO TIE ROPE CLIMBERS

1. Two lengths of 1/4 inch Hemp rope 13 feet long (each)
2. Double one rope and tie the rope together with a SQUARE knot 8 inches from the mid-point fold. Pull knot very tight.
3. Bind this loop together with several wraps of twine or string just behind the knot and towards the folded end. Make a second bind about 3 1/2 or 4 inches from the first and towards the folded end. This makes a loop that will come over the tail of the ski.
4. Place the first square knot under the ski near the tail and bring the ends of the rope up around on top, one on each side, and tie another square knot on top of the ski, and pull up very tight. (If the rope is now slid off, this knot should be about 5 inches down from the first knot. Slip back on ski in place.)
5. Now with the rope tied around the tail of the ski and Knot No. 2, on top of the ski, bring the wrapped loop over the end and pass the loose ends of the rope around and down through the loop and pull up tight against knot No. 2.
6. From here on all is easy. Part of the ends of the rope around the ski tying square knots under and over, under and over about 6 to 8 inches apart. Do not pull these knots up too tight until you have them well spaced with the next to the last knot just behind the heel plate and the last knot under the ball of the foot. The ends of the rope are brought up from under the foot in front of the toe irons of the ski binding, and tied in another square knot. This knot should be placed on the outside of the ski and the ends tucked in so you don't tramp on them. If there is excess rope it should be cut off and the ends neatly wrapped or tied with a rosebud or something to keep the ends from fraying.
7. To remove the climber, untie the knot in front of the toe irons (ONLY) and slide the ropes off the ski. Do not untie all the knots.
8. To replace the climber on the ski put the last solid knot under the ski over the tail end. Then thread on, one under, one over, until the tail of the ski slips into the wrapped double loop. Take up all the slack and tightly tie around in front of the toe irons. It may be necessary to file a small notch in the tail of the ski to assist in keeping the rope loop on the back end. However, if the climbers are kept tight and if loop behind knot No. 2 is not too close, this is not necessary.

Like a sailor, any good Niphometrologist can tie one of these in a few minutes provided he does not get his fingers all bound up in the knotty problem. And he certainly will not have fifteen dollars tied up in a pair of skins either. I know we don't use them very often, but when you need a pair of climbers they are needed very badly.

Note: A rope that is slightly used and limber is better than a new stiff rope because the knots can be pulled up tighter and the knots will not work loose, they will stay put.

A V-shaped rescue sled Model No. 1 is easily built. It is suitable for hauling short distances and downhill across steep slopes.

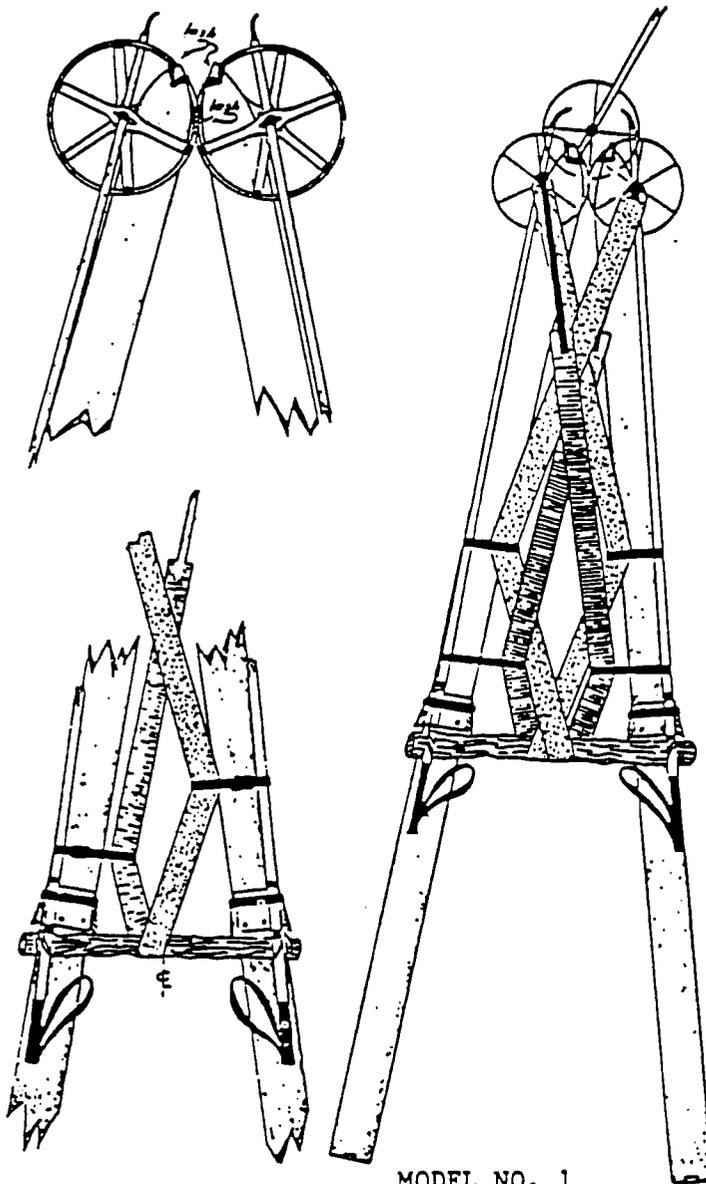
For a long haul, particularly on flatter slopes, make sled Model No. 2.

Model No. 3 is the most satisfactory rescue sled. It requires an extra pair of skis to make it, however.

Remember, all sleds must be built strong and knots made tight.

#### Model No. 1

Place a ski pole snow ring over the tip of a ski with the pole to one side of the ski and with the ring lying on the ski and under the pole. Thread



MODEL NO. 1

the hole in the ski tip with 3 feet of copper wire and lash the snow ring firmly to the ski. Do same with other ski. Place ski tips side-by-side, poles on the outside, and last overlapping snow rings with wire or nylon cord 10 or 12 inches long (A).

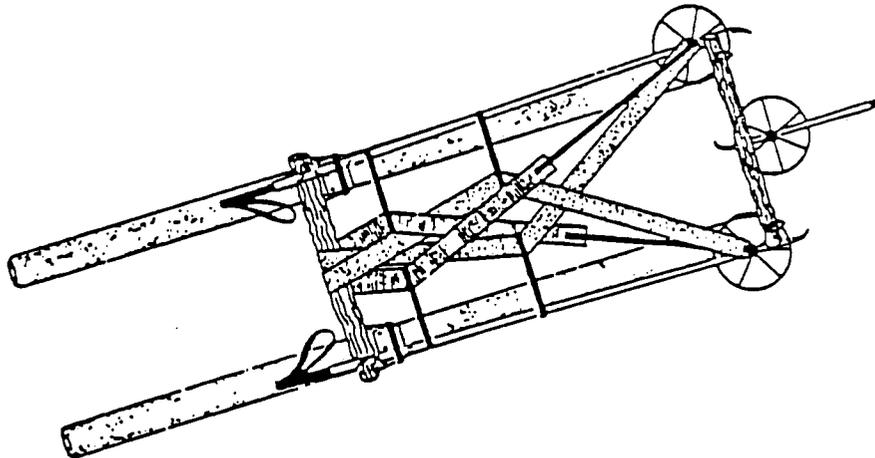
Spread heels of skis to inside width of about 2 feet. Cut tree limb about 2 inches in diameter and 20 inches long. Place limb behind toe irons and under ski poles. Lash poles and bough to toe irons of each ski with a piece of wire 3 feet long. Place ski loop of a climber over left ice prong. Pull climber back firmly, wrap once around bough spacer, slightly left of midpoint, extend to right ski tip, pull firmly, and tie tail-end strap to right ice prong. Buckle climber to ski poles (B).

Attach other climber in the same way, starting with right ice prong and working to the left. If available, fasten boughs, blankets, or other material on this cross webbing. Lash one of your own ski poles to snow rings at ski tips (C).

If necessary, lash the injured man to rescue sled. Wrapping nylon cord completely around the sled will not rough lock excessively. If the injured man can sit up and ride forward, a pack-sack can be fastened to the sled as a backrest. If he must be laid down, he will fit on the sled best with his head forward, although this may make going down steep slopes more difficult. Person towing sled should have climbers on skis for braking and pulling.

#### Model No. 2

Make this sled similar to sled Model No. 1, but spread ski tips until skis are parallel. Cut a second tree limb about 1 1/2 inches in diameter and



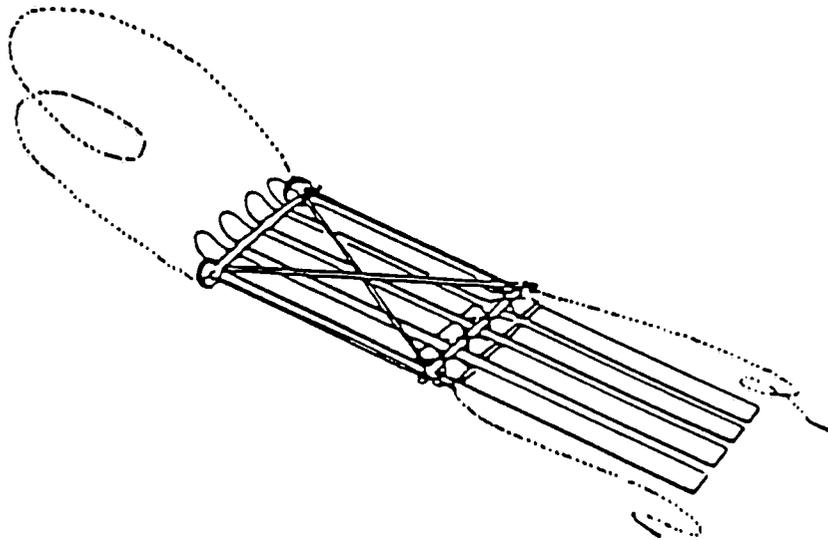
MODEL NO. 2

20 inches long and lash ends securely to ski tips. Lash the snow ring of one of your ski poles to the center of the front bough, with the snow ring over the bough and the ice prong under it.

### Model No. 3

This sled requires four skis and a long piece of stout rope. It takes several men to pull the sled and guide it with side ropes.

Make two cross sticks from poles or from brush branches cut to fit across the four skis. Place one cross stick at the tip end of the ski and the other at the center lashed to the bindings. Lash each stick to the cross sticks. Make the forward cross stick fast to the tips where they begin to curve upward. Here again, holes in the tips of the skis are handy. Diagonal cross lashing helps keep the riggings in shape. Cover the sled frame with boughs or clothing, especially at the metal bindings. Tie the injured man onto the sled to keep him from rolling off and suffering more injury. Take particular care in braking on downhill slopes.

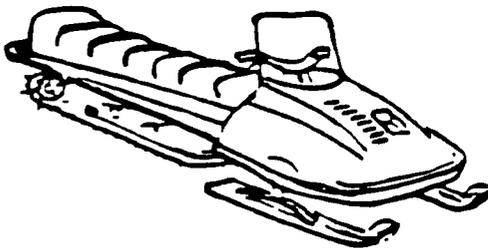


## OVERSNOW MACHINES

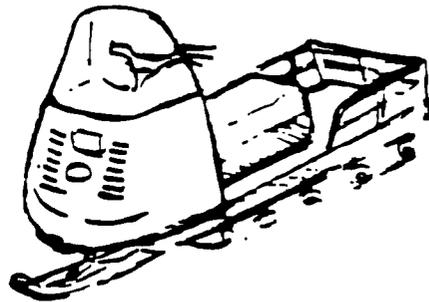
### A. INTRODUCTION

The inaccessible snowbound countryside has been opened up to man by power-driven, high-flotation, oversnow vehicles. Oversnow machines now provide transportation for work and recreation access to locales once not regularly visited by man in winter.

Snow vehicles are complex machines--the result of years of design, experience, and development.



Single tracked - double ski  
type snowmobile (recreational)



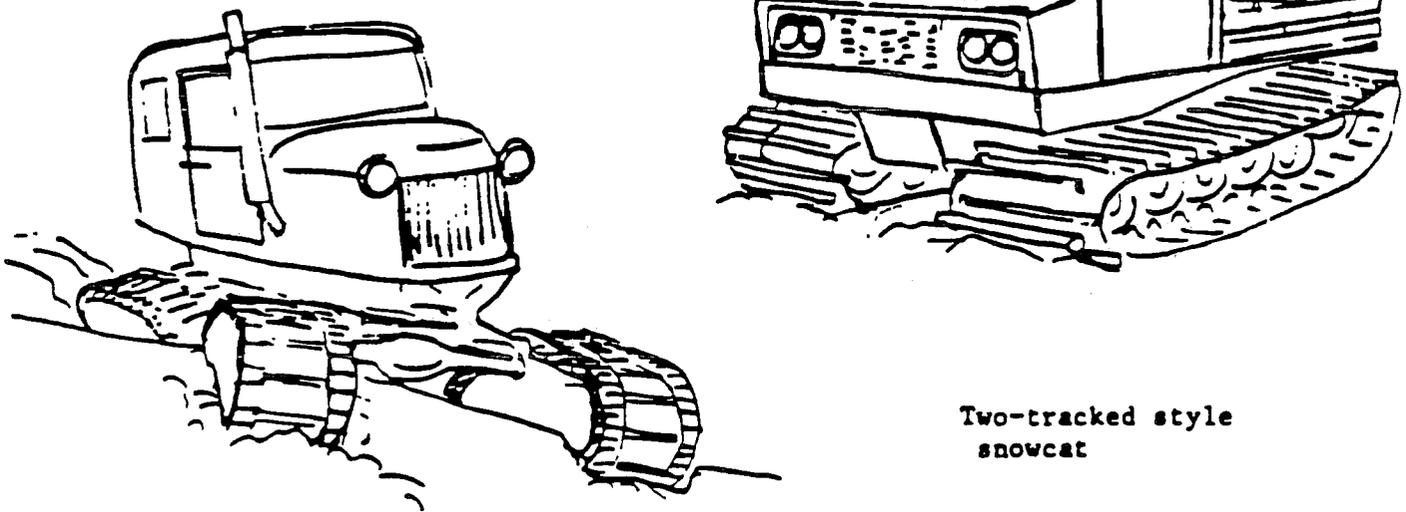
double tracked - single  
ski type snowmobile  
(utility)

Today's oversnow machines are closely engineered with efficiency in mind; most snowmobiles are powered by lightweight, air-cooled, two-cycle engines. Structural body, drive trains, and tracks and skis are all of sufficient, but not excessive, capacity to meet the design loadings and intended uses. The keys to successful operations are your knowledge of the vehicle, accepting it as a machine with limitations, and your personal good judgment, experience, and driving abilities.

You will be responsible for the snow vehicles and associated transport equipment; i.e., flatbed trucks or trailers. These special purpose vehicles are generally expensive and will require extra and specialized maintenance. Your personal attention to these special operational and service and repair matters is essential.

Thirty minutes of travel in a good snowmachine can place you nearly a day's return walk from your beginning point. Therefore, we must stress

becoming familiar with and learning proper driving habits and other behavior that will ensure your personal safety, successful mission accomplishment, and continued good service from the oversnow vehicle.



Four-tracked style  
snowcat

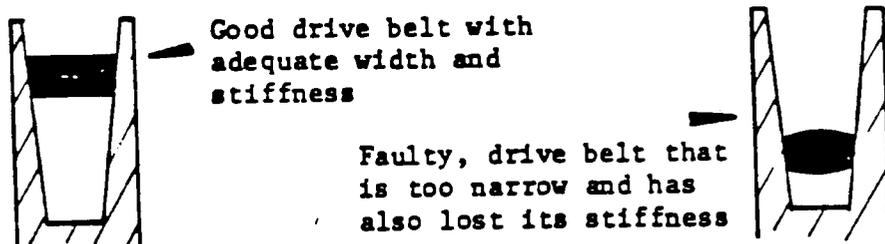
Two-tracked style  
snowcat

#### B. OPERATION OF OVERSNOW TRANSPORT VEHICLES

This section will be largely a listing of important do's and don'ts of snowmachine operation with accompanying discussion or visual aids as needed. Matters of importance to single passenger, open snowmobiles will be covered first with additional discussion at the end of this section on large snowcats, (multiple passenger, enclosed cab vehicles).

1. Review operators manual before operating first time. Unique features and operational instructions are already explained here for your benefit.
2. Develop your own checklist to use before you start up each day. These items should be included:

- a. Are fuel and/or oil tanks full?
- b. Do you need extra fuel for the day?
- c. Check throttle. Depress and release several times to ensure smooth operation. It should return to the idle position.
- d. Check brake operation. Note: On double-track machines with shifting transmissions, check both brake adjustments--it is imperative that the brake that controls movement of the transmission shafts be a little tighter than the other. You must be able to stop all movement in the transmission before you attempt to shift the gears.
- e. Check steering operation.
- f. Check skis and ski legs (are carbide runner bars in good shape)?
- g. Check ski alignment (steers best with 3/8" - 3/4" toe-in at front).
- h. Are tracks free rolling, centered on sprockets, and not stretched too tight?
- i. Do all lights work?
- j. Are safety kill switches operable?
- k. Is drive belt in good condition? It is free of cracks and breaks, or is it too narrow from wear? After a belt has been used a while, it will become soft and light pulls will cause lateral compression, making it impossible for the clutch to work properly. A belt whose cross section has been "burned" away by excessive clutch slipping will also not do.



Cross sectional view of drive sheave

- l. Are all emergency and work items loaded and fastened securely?

m. Does any of your load pose potential hazard to you or the machine?

3. Match operating speed to the conditions.

a. Machine will not steer or break normally on icy surfaces.

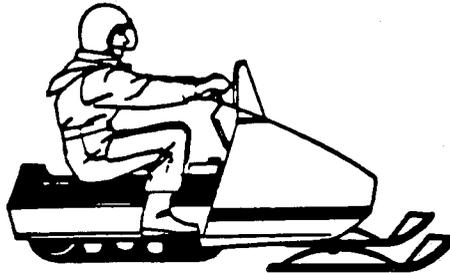
b. Drifting snow may cause very choppy, hard, and irregular surfaces.

c. Do not outdrive your range of visibility.

d. Maintain machine speed sufficient to get through soft unpacked snow without bogging down and becoming stuck.

4. Riding your snowmobile is relatively simple, but let's review three important fundamentals: Riding position, balance, and momentum are the basic principles of making your snowmachine go where you want it to go. The balance principle is quite simple as you can shift your body weight to stabilize your machine on a hillside or lean into a turn to improve your machine's turning ability. Experience will tell you how much to use. The riding position for best balance and control depends upon certain conditions:

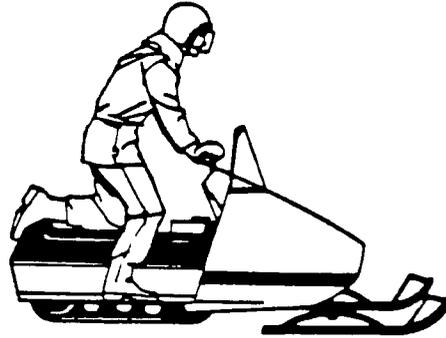
a. Sitting. Feet on running boards, body midway back on seat; the best position when operating the snowmobile over familiar, smooth terrain or groomed trails. In this position, the legs should not be fully extended under the hood. Knees and hips should remain flexible to absorb shocks.



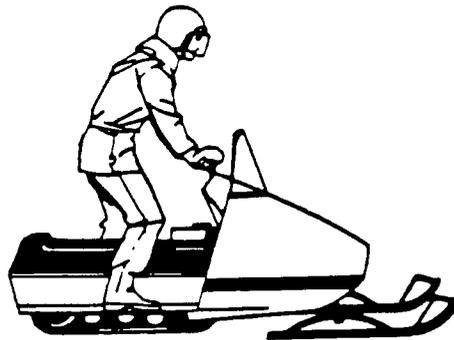
b. Posting. A semi-sitting position with the body off the seat and the feet under the body in a sort of squatting posture, thus the legs can absorb shocks when traveling over uneven terrain. Quick stops can be dangerous.



c. Kneeling. This position involves placing one foot firmly on the running board and the opposite knee on the seat. Quick stops must be avoided.



d. Standing. Place both feet on the running boards. Keep knees flexed to absorb the shock from the surface bumps. This is an effective position to see better and to shift weight as conditions dictate.



The third principle, momentum, is critical to successful climbing, turning, and generally moving through unpacked snow.

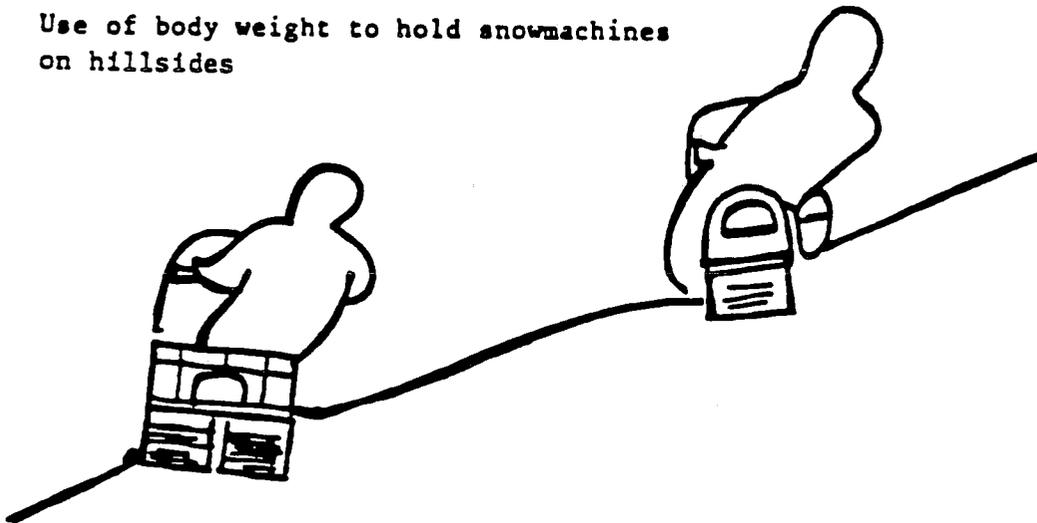
The flotation of the front skis and weight shifting of your body are all much more effective at the operating speed. As the driver hesitates out of uncertainty, these effects diminish rapidly.

Do not maintain momentum that is hazardous to you or your vehicle. However, only miles of experience will prepare you to judge momentum that will not be hazardous in some circumstances.



Likewise, you will soon realize from experience that the full capacity of your snowmobile will not be realized until you can smoothly coordinate and apply proper balance, body position, and momentum.

Use of body weight to hold snowmachines on hillsides



5. For soft powder snow, single track machines will perform best with the front track suspension adjustment set to cause the track to go deep into the snow. On double tracked machines, use the lower forward gear. Always take turns breaking the trail to avoid overheating or drive belt abuse.
6. Ascend steep hills diagonally across the slope if space permits.
7. If the hill requires a direct straight-up ascent:

- a. Select an open, smooth part of the hillside.
  - b. Approach with maximum safe speed.
  - c. Before you lose momentum and traction, make a turn across the slope returning down the slope for a repeat attempt, which will be greatly enhanced as you return on your packed track.
  - d. Double tracked machines, of course, can be shifted to reverse, backing down the hill for another attempt.
8. Reduce speed on ungroomed trails.
  9. Avoid frozen lakes and streams.
  10. Be continually cautious in uppacked snow for obstacles just under the surface of snow; i.e, rocks, logs, wires.
  11. Be extremely careful loading and unloading machines from the trailer or truck.
  12. Observe all winter survival rules applying to clothing with emphasis on water and wind resistant outer layers. Severe chill factors may be encountered at cruising speeds even on moderately cold days.

U.S. CUSTOMARY WIND CHILL CHART												
Combined Speed of Wind and Snowmobile in MPH	Actual Thermometer Reading (°F)											
	80	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Temperature (°F)											
0	80	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-4	-15	-26	-36	-47	-57	-68
10	40	28	18	4	-9	-21	-33	-46	-58	-70	-83	-95
15	35	22	9	-5	-18	-30	-43	-56	-72	-85	-99	-112
20	32	16	4	-10	-25	-38	-53	-67	-82	-98	-110	-124
25	30	14	0	-15	-29	-44	-59	-74	-89	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-50	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(wind speeds greater than 48 mph have little additional effect!)	<b>LITTLE DANGER*</b>			<b>INCREASING DANGER*</b>				<b>GREAT DANGER*</b>				
	*DANGER FROM FREEZING OF EXPOSED FLESH											

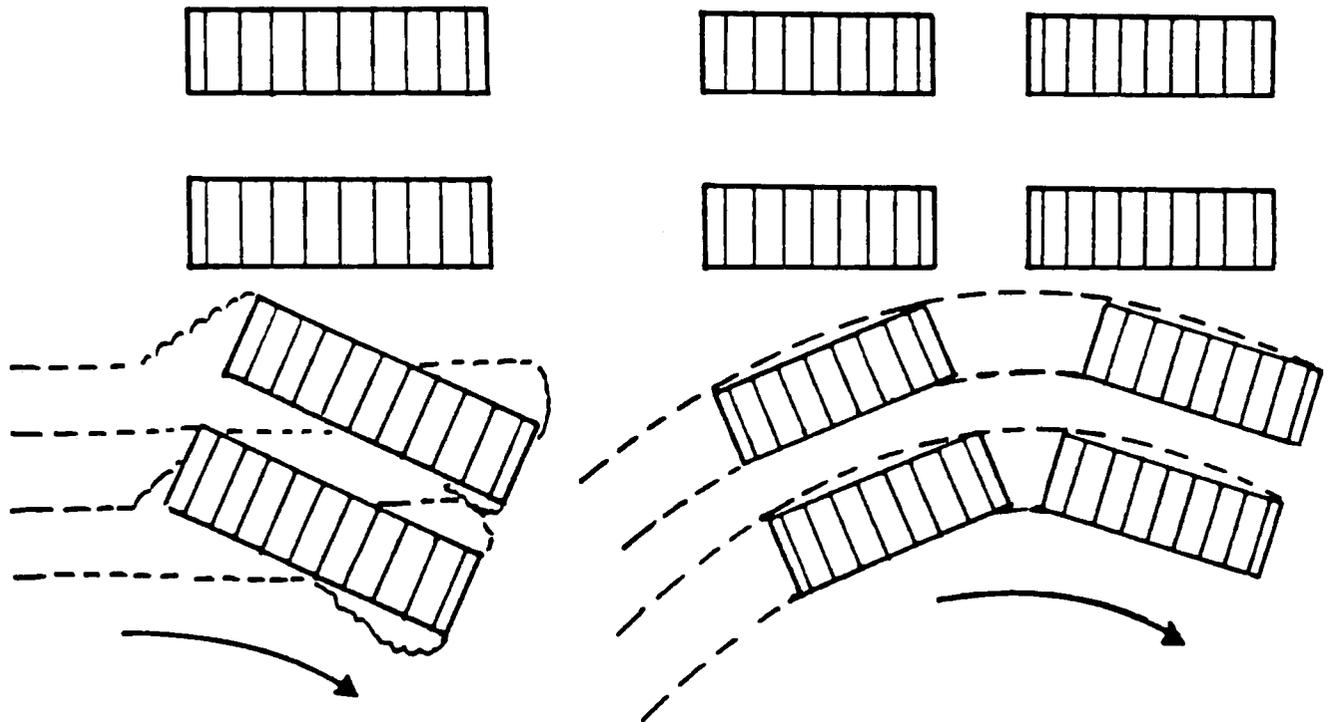
13. Wear a good fitting helmet with a face shield and adequate hearing protection. Use ear plugs as well, if needed.

14. If you're stuck, think it out first. Use your shovel or your partner's machine before you start pushing a 400- to 800- pound snowmobile around by hand. Best of all, think smart ahead of time--don't get stuck!!!
15. Follow all emergency operation procedures; i.e, establishing contact person and estimated time of return, as well as rescue plans.
16. Be on lookout for avalanche conditions.
17. Faithfully perform all maintenance recommended by the manufacturer.
18. Observe all local laws governing snowmobile operation.
19. Practice all rules of courtesy to others snowmobiling; i.e. use driving lights, do not tailgate, allow recreationists to pass, (they will often have faster and lighter machines), and do not create hazard by your operations.
20. An important part of snowmobile operation is being aware of the remote possibility of having to abandon the snowmobile while in motion or being ejected as a result of operator error. Be conscious of this as you select your protective helmet and other outer ware--as you select possible routes, and the relative closeness and potential hazards of fences, trees, rocks, overhangs, road dust, steep drop-offs, stream channels, and many others. You must be alert to all possibilities and think about the "what ifs----?". Have escape patterns in mind. Remember to fasten kill-switch card to your coat so that the machine's engine will stop if you are thrown off.
21. Additional things to know about larger multiple passenger enclosed cab snowcats:
  - a. Many different manufacturers and designs are available, but from an operational point of view, keep in mind that the primary intended use for these vehicles as they were developing during the 1940's and 50's was for light duty reconnaissance and rescue type work. This design is still superior for snow survey work because of our travel on unpacked trails into remote areas. The winter recreation industry has boomed during the last 20 years causing major manufacturers to concentrate their recent technology development on large, tractor-type vehicles for grooming slopes and trails. These tractor-type snowcats generally resemble a caterpillar tractor with very wide (4-6') tracks and operate similarly. The older lighter type vehicles typified by the Tucker 443 model or Thiolkol Imp are better suited to unpacked snow and long distance trips. More modern designs are also available applying lightweight fiberglass bodies, and hydrostatic drive.

b. Be very cautious loading and unloading your snowcat from the truck or trailer. Always park in a level area with ramps securely seated and fastened.

c. Select your routes carefully as these vehicles are not as maneuverable as snowmobiles and much less forgiving of your driving errors or getting stuck.

d. Sidehilling may be challenging since these vehicles are too big to be influenced by your body weight. Some vehicles have limitations in that their tracks will slip sideways in the snow. In these vehicles, you are safest using a straight-up straight-down driving technique. You may be forced, in emergencies, to shovel a cut across a steep slope to allow you to cross in this kind of vehicle. Steering across the slope in a 2-tracked vehicle is additionally challenging as the steering actions itself will be typically turning the vehicle up the slope to overcome the sideslipping. This means that the uphill track stops or slows an additional power/speed are applied to the downhill track--this, in turn, can cause the lower track to dig deeper resulting in increased slope to overcome. This is handled better by stopping the vehicle and backing it around until it is headed uphill. This puts the tractive force on the uphill track. The 4-tracked snowcats are easier to control on sideslopes as the tracks can be steered without loss of power or traction.



Turning motions of two-tracked and four-tracked snowcats.

- e. Prepare yourself to travel at slower speeds. Safe non-track abusing speeds range from 7-10 mph for the older steel-tracked Tucker snowcats to a top of 15-18 mph for latest rubber-tracked vehicles. Excessive speed will only bring premature breakdowns.
- f. Carry an extra battery if staying out overnight.
- g. Be cautious of carbon monoxide poisoning when riding for long hours in enclosed cab of snowcats.
- h. Do not overload vehicle or have load unevenly distributed, this will cause traction and steering difficulty.
- i. Learn from an experienced person.
- j. Avoid spring melt holes around trees and near stream channels.
- k. If you get stuck:
  - 1) Think first.
  - 2) Shovel next.
  - 3) Get vehicle out under its own power without abusing it.
- l. If stranded, stay with the vehicle. It should have a week's worth of survival supplies, and a rescue team should be on its way.
- m. Use radio communications, if available.

#### C. SERVICE AND REPAIR OF OVERSNOW MACHINES

Regular preventative maintenance and repair is of equal importance to proper snowmachine operation in conducting successful snow surveys.

It is not the intent of the Service to train you to be a snowmachine/snowcat mechanic, nor is it required. However, as the responsible operator, you should know a few basic maintenance needs that will prepare you to procure and evaluate proper service/repair. Any knowledge you have about the machine will be useful in an emergency field repair when you and your partner are on our own in the back country.

A maintenance outline follows that is applicable to all small snowmobiles. Manufacturers specific maintenance items will be noted in the maintenance manual provided for each machine. Maintenance needs for large enclosed-cab snowcats will be handled at the end of this section.

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