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*Adventures with your*

# SNOWMOBILE

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AGRICULTURAL EXTENSION SERVICE - UNIVERSITY OF MINNESOTA

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# *Adventures with your* **SNOWMOBILE**

by John A. True, Dayton M. Larsen, and Thomas A. Powell\*

## **An Invitation to Winter Fun**

Snowmobiling has “snowballed” into one of the most popular winter sports in Minnesota. Snowmobiling probably became so popular because it’s just plain fun. These machines have opened up a variety of winter activities that was not available before.

What’s more fun than spending a delightful day safely cruising the woods, relaxing and enjoying the beauty of sparkling snow on a crisp, clear winter day? Before the advent of the snowmobile, you probably never had the opportunity to explore and enjoy the backwoods and trails in the wintertime.

If you prefer company, it’s never hard to find a group of friends or neighbors to join you on the trail. Snowmobilers are a friendly lot, and love to get together to compare machines, and explore new places.

Minnesota is regarded as the “Snowmobile Capital of the World.” The state ranks first among all states in per capita ownership of snowmobiles. Perhaps you and your family will be enjoying the first thrills of snowmobiling this winter. If you are, the 4-H snowmobile project is for you.

By progressing through this project, you will learn how to have fun with your machine, safely. You will learn how to take care of your machine; how to haul it from place to place; and how to prepare it for summer storage. You will also discover which clothing and accessories are required when snowmobiling.

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If you are 14 or over but less than 18 years of age you must have a valid snowmobile safety permit before you may cross any state or county highway with your snowmobile. Permits are issued by the Commissioner of Conservation. If your 4-H project leader is a certified instructor for the state snowmobile safety course he can include the necessary instruction in the 4-H snowmobile project using this manual to fulfill the safety permit requirements.

The 4-H snowmobile project should appeal to active 4-H’ers who are looking for outdoor winter adventures. Get ready for a winter of fun—and good snowmobiling.

## **Know your Machine**

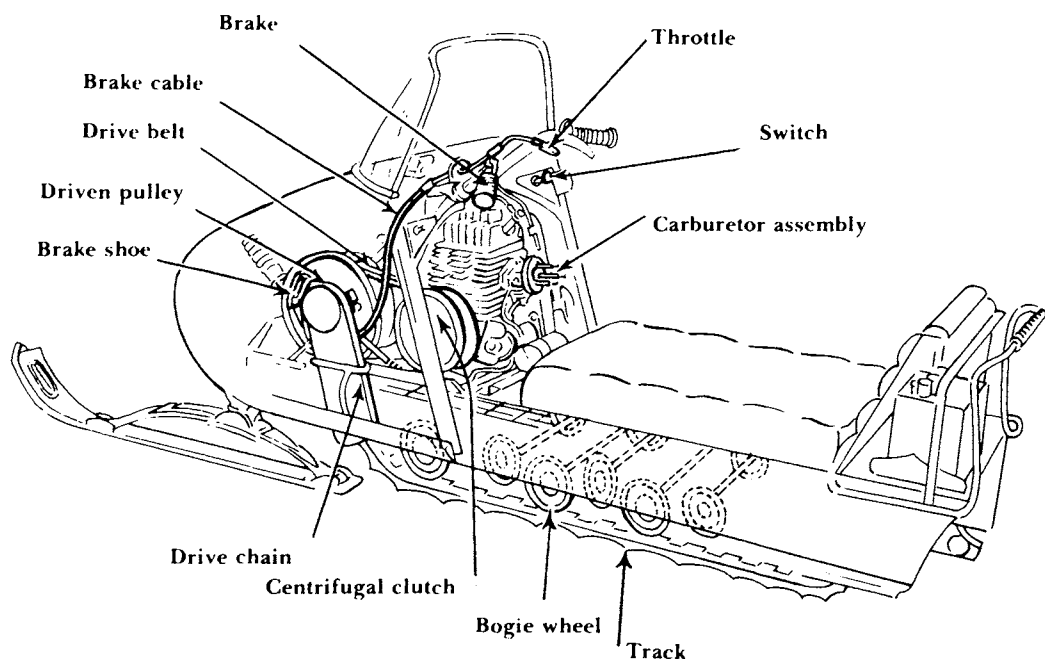
You need to know how your snowmobile works to fully enjoy and safely ride it. Begin by thoroughly reading the factory operating instructions. Become completely familiar with the controls and the response of your snowmobile.

### **THINGS TO LEARN**

When operating a snowmobile you must think of your own safety and the safety of others. You must protect yourself from the cold by wearing proper clothing and from injury by knowing how to handle the machine and avoid accidents. You should be prepared to correct certain breakdowns or arrange for help in case of emergency. You must protect the rights of others through safe operation of the machine, knowledge of the “rules of the trail,” and courtesy to other snowmobilers and property owners.

Start this project by learning the parts of your snowmobile and how they work. Learn the controls and basic operation of the machine and you’re ready for short rides to become familiar with the snowmobile. Then to be a

*Know the parts of your snowmobile.*



good and safe operator you will have to know how to take care of the machine, the proper fuel and oil mixture to use, and how to inspect the machine for necessary repairs or adjustment. When you are thoroughly familiar with the operation and maintenance of your snowmobile you will want to learn how to plan and take longer rides to enjoy fully the fun of Minnesota in the winter.

### GETTING STARTED

Most snowmobiles are very similar in design and operation. Normally, you will find the throttle control on the right handle bar, the brake control on the left, the ignition and other switches on the dash panel, and the choke on the front of the engine or the dash panel. Learn where these controls are on your machine.

Before you start your snowmobile read the starting procedure in the operator's manual. Always make sure your machine is safe to start by checking that the throttle control works freely. Firing up a machine with a partially or fully opened throttle means instant trouble. The first pull could send the machine hurtling out of control.

After you know and understand the parts of your machine, have thoroughly studied your owner's manual, and know how to start your machine you are ready for your first ride.

### Riding your Machine

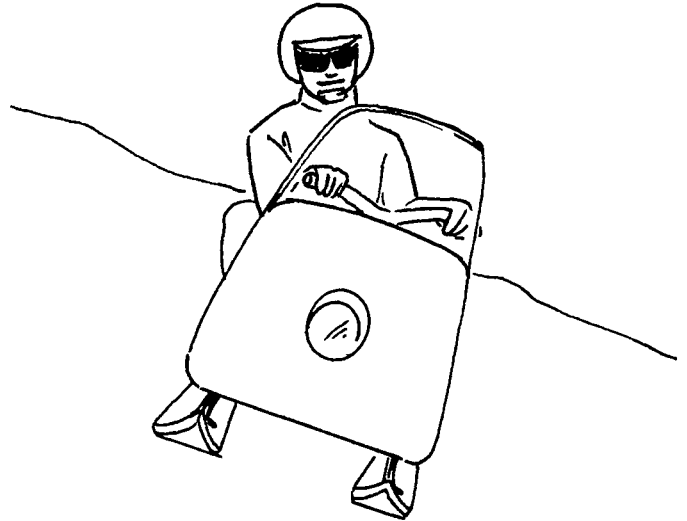
Everybody is a beginner the first time he sits behind the controls of a snowmobile, regardless of age or experience with other powered vehicles. Remember, the snowmobile is so deceptively simple to operate that it can be hazardous if you are the least bit reckless, inattentive, or uninformed about your machine.

A good snowmobile driver is like a good automobile driver. In traffic jams and confusing situations, he "keeps his cool" and uses commonsense. He has good road manners and handles his machine courteously and thoughtfully. He knows the snowmobile laws and regulations before venturing out with his machine.

Shifting your balance is necessary to control the machine properly. On rolling terrain or on the side of a hill, the snowmobile has a tendency to tip. You must be ready to shift your weight to counteract this tendency. For example: if you are traversing (crossing) a steep slope, you will have to lean toward the hill to maintain balance. At first you might overshift or undershift. Experience will teach you how much to lean on different grades or slopes.

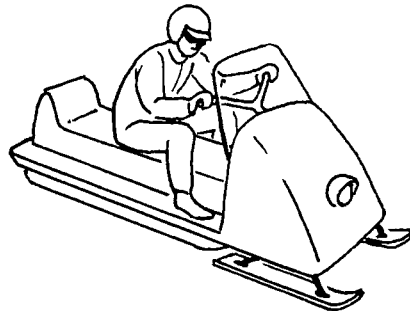
To operate efficiently and maintain maximum power, the snowmobile track must be in full contact with the snow at all speeds and in all turns. If the snowmobile banks (leans) too far to the left or to the right, the track will lose partial or total contact with the surface. The result is the same as jacking up the drive wheels of a car; you can accelerate all you want, but you will just spin your wheels and go nowhere. In the case of the snowmobile, you will just spin the track.

Again, experience will teach you how much to lean into turns at different speeds. Watch an expert snowmobile driver. Note how he shifts his weight in turns so that he maintains his balance and the machine retains track contact.



If you are riding double, both people must shift their weight to maintain balance. The person riding behind the driver should be prepared to shift his weight along with the driver when crossing rolling terrain or making turns. Be especially careful over bumps when riding double. Remember, the rear passenger gets a great deal more jolting than the driver.

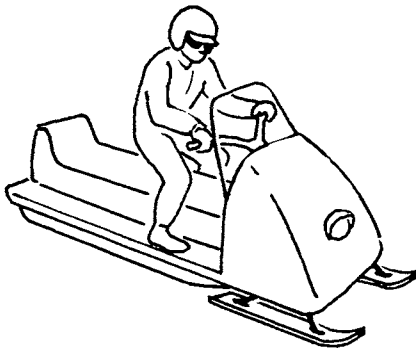
There are three driver positions that are used to attain best balance and track contact. They are:



1. *Sitting position:* This is the most common position and you should use it when learning to drive. It is the best position for high speeds because of the low center of gravity created.



2. *Kneeling position:* Place your right knee on the seat and your foot on the left running board, or vice versa. This is a good position to use when side hilling. It is easy to fall off when kneeling, but it is a position that gives you good control at low speeds.



3. *Standing position:* In this position, you straddle the seat with your feet on the running boards. Your knees are bent or flexed to absorb shock. This is a good position when riding over choppy terrain or in deep snow.

Practice all riding positions so you know which position best fits the conditions in which you will be driving.

When learning to drive a snowmobile, practice gradual acceleration. If you apply full throttle from a dead stop you may find yourself sitting bewildered in the snow. Also, remember that snowmobile brakes are designed to slow you down—not to “stop-on-a-dime.” By applying steady pressure on the brake control and while letting up on the throttle control, you should be able to make relatively quick stops. Be especially careful when applying brakes while going downhill because quick or hard applications of brakes could cause a dangerous skid.

There is no fixed formula for turning, stopping, or starting distances—and because of varying conditions of terrain, ice, snow, and weather it will be necessary to practice until you become an expert under all conditions.

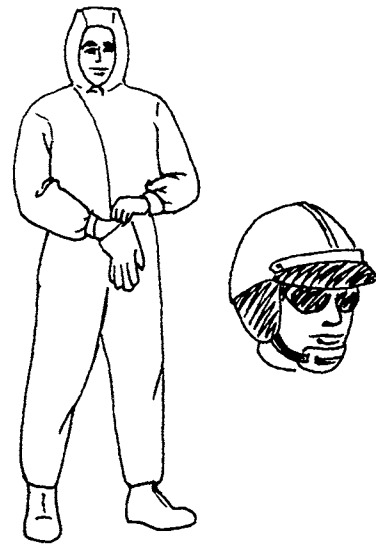
## Clothing

You perhaps have heard of the “wind chill index.” It represents the cooling power of cold air on exposed flesh

under calm conditions as compared to air of the same temperature at different wind speeds or snowmobile speeds. For example, if the temperature, on a calm day, is 10° above zero and you are riding a snowmobile at 30 mph, the “wind chill” temperature is -33°.

So, when you’re snowmobiling it’s not wise to wear the same clothes that you wear to school, a dance, or a movie. Snowmobiling demands commonsense protection against wind and low temperatures, so check the wind chill chart and dress accordingly.

Thermal underwear will create a layer of dead air between your skin and the next layer of clothing. This, with a wind resistant parka, should keep you warm under most winter conditions. An insulated, water resistant snowmobile or “jump” suit coverall is an even better outer garment.



WIND CHILL CHART

Intimated wind speed in MPH	ACTUAL THERMOMETER READING (°F.)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT TEMPERATURE (°F.)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-21	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-36	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-124
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER (for properly clothed person)			INCREASING DANGER				GREAT DANGER				
	Danger from freezing of exposed flesh											

Warm footwear is equally important. Remember, you’re not exercising as much as if you were walking, so your feet cool off fast on a snowmobile. Rubber-bottom, leather-top boots or rubber-bottom, nylon-top boots with heavy felt liners are probably the warmest footgear available. Rubber “Korean” type insulated boots and “Bunny Boots” are good also. For extra warmth wear two pair of socks—a light pair under a heavier, woolen pair.

On a snowmobile your hands are out in the airstream where severe cold can get to them quickly. A pair of heavy, leather mits with heavy, wool liners offer protection against the cold as well as snapping twigs and branches when you are in the woods.

Your head is also exposed to the airstream, and a good cap is absolutely necessary. A heavy stocking cap which pulls down over your ears is good. For extreme cold, a Peruvian type ski mask or a mask especially designed for snowmobiling is very effective.

Full face shields or visors are not recommended because the moisture in your breath will condense on the inside and cloud your vision.

Goggles are recommended for snowmobiling. A good pair of goggles will include three interchangeable lenses—gray or green for bright, glaring conditions; clear for hazy days; and amber or yellow for dark days or late afternoons. Use these lenses in the proper light conditions to overcome flat light which can hide depressions in the snow, or better yet, use the new photochromatic lenses that change with light conditions. In addition, goggles will shield your eyes from lashing branches and eye-watering wind.

Helmets are recommended by expert riders. A helmet is absolutely necessary if you plan to race. It can provide both warmth and protection from collisions, tree branches, and falls.

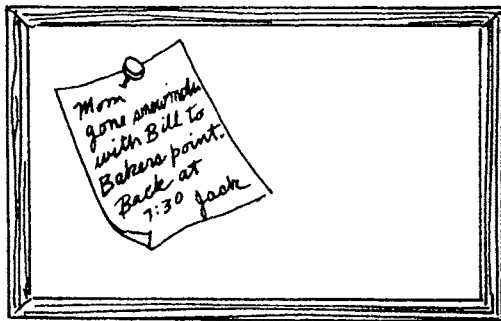
Buying all of this clothing and equipment strictly for snowmobiling might be pretty expensive. However, all of the clothing can be used for any winter outdoor activity in Minnesota. Chances are you probably already own most of the clothing described.

## Trail Riding

Safe driving is important when snowmobiling. Too often you hear or read about snowmobile accidents that could have been prevented if drivers had used common sense.

## PREPARING FOR A TRIP

If you plan a long trip into a remote or unknown area, never go alone. Use the "buddy system" for such excursions. For these trips, carry extra fuel, an extra drive belt, spark plugs, a can of gasline de-icer, a tool kit, flashlight (with extra bulb and batteries), matches, a first aid kit



and snowshoes. Dress appropriately for the occasion. Always let your family or friends know where you are going and when you plan to return.

You should learn the cruising range of your machine. Since snow and other conditions change from day to day, never depend on a miles-per-gallon or hours-per-gallon guess. Carry that extra can of fuel along—it might come in handy. Use only metal cans.

## CHECK THE TRAIL

A courteous snowmobiler never trespasses on private property. If you want to ride on some unfamiliar territory find out if it is private property. Either get permission from the owner or stay off.

## SAFARI RIDING

When traveling or maneuvering with other machines, keep a safe distance between you and the machine ahead of you. Many serious accidents result from "tailgating" other machines. Ramming or driving into another machine or hitting a fallen rider can cause serious injury and take all the joy out of a snowmobile outing.

## TRAVELING LAKES AND STREAMS

Minnesota's many lakes and streams offer tempting grounds for snowmobile fun. However, lakes and streams can be the most treacherous place to snowmobile. Springs, currents, and heavy snow cover can produce unsafe ice even during prolonged periods of subzero temperatures. Did you know that drowning is the most common cause of snowmobiling deaths? Unless you are positively sure that the ice on a lake or stream is safe—stay off!

## NIGHT RIDING

Snowmobiling at night can be one of the most enjoyable rides. But, here again, use commonsense. Never venture out alone at night. Be sure the head and tail lights work. Never travel over unfamiliar areas and stay on established trails. Too many deaths are caused by hitting fences, guy wires, low hanging branches, and cabled or chained road entrances.

Nighttime is no time to test the speed of your machine. Always go slowly. Many snowmobile accidents have occurred after dark and virtually all of them could have been prevented if the driver had been traveling at a safe speed.

## TRAIL SIGNS

Uniform snowmobile trail signs have been developed for use on all public snowmobile trails throughout the United States and Canada. You should know these signs.

The most common trail sign is the reassuring blazer. It is an orange-colored, 5" x 7", diamond-shaped sign placed often enough to let you know you are still on the trail.

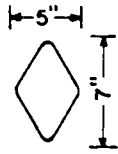
Turns are marked with an orange, diamond-shaped 9¼" x 12" sign containing an arrow pointing in the direction of the turn.

Intersections or trail crossings are marked with a larger diamond-shaped, 14" x 18¼" information blazer containing a 7½" cross.

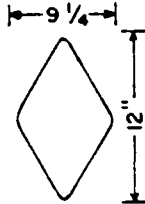
The familiar octagon-shaped, red stop sign is used along a trail prior to a road crossing.

## TRAIL SIGN ILLUSTRATIONS

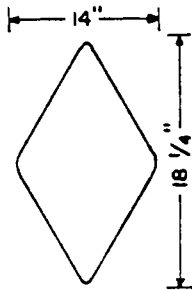
Reassuring  
blazer



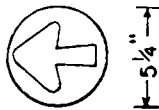
Directional  
blazer indicates  
minor changes in  
direction through  
use of 5 1/4 inch arrow decal



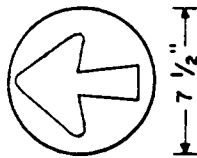
Information  
blazer indicates  
intersections or  
major changes  
in direction  
through use of  
7 1/2 inch decals



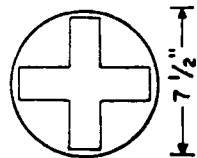
Directional  
decal



Larger  
directional  
decal



Intersection  
decal



Stop sign



## Care and Maintenance

A well-maintained machine is essential for an enjoyable and safe season of snowmobiling. The following information will help you learn and understand how to take care of a snowmobile. However, for detailed information on your machine you must obtain a copy of the operating manual designed for your make of machine. This is available from any dealer who sells your particular snowmobile.

### LUBRICATION AND FUEL

Lubricating oil must be pre-mixed with the gasoline for a two-cycle engine. The action of the moving parts separates the oil from the gasoline in the engine. The oil then forms a mist which lubricates the bearings and lower cylinder walls. Some of the oil is carried into the combustion chamber of the cylinder and burned with the gasoline to give the characteristic bluish exhaust of two-cycle engines.

Four-cycle snowmobile engines have an oil-fill cap where the oil is poured into the crankcase.

Since various dealers and manufacturers recommend certain grades of gasoline, consult your dealer's or operator's manual. Do not use a gasoline-oil mixture that has been mixed and kept in a can for 2 or 3 months. Fresh mixtures always give better results. Lubricating oils for two stroke cycle snowmobile engines are specially compounded with additives that provide superior engine lubrication and protection over regular oil. These additives insure a minimum of combustion chamber deposits; reduce varnish accumulation on pistons and rings; help guard against pre-ignition spark plug fouling, port plugging, cylinder wall scuffing, rust, and corrosion. Two-cycle oil also mixes easily with gasoline. Consult your operator's manual for the specific oil recommendations and always use whatever the manual recommends.

It is very important to have a uniform fuel and oil mixture. If improperly mixed, the oil can separate at the bottom of the tank and cause spark plug fouling, excessive smoking, and carbon build-up. A good mixture insures proper lubrication and performance. Here are some good rules to follow when mixing oil with gasoline.

1. Always mix fuel and oil in a metal container, other than the engine tank.
2. To half of the gasoline add the proper amount of oil. Add the rest of the gasoline and shake the container.
3. Use warm oil.
4. Check your operator's manual for recommendations for your particular engine. The typical mixture is 1/2 pint of oil per gallon of gasoline, or 1 quart of oil to 5 gallons of gasoline.

If your snowmobile is kept in a warm garage you should be aware of gas tank condensation. Water in the gas can cause gasline freezing, poor gas ignition, and wet spark plugs. To prevent gas tank condensation, make sure the gas tank is full if your snowmobile is not going to be used for a number of hours or is being stored inside. You can also add one-half can (no more) of a fuel system anti-freeze.

## ENGINE

The efficient operation of any engine depends largely on proper preventive maintenance. Preventive maintenance means servicing and cleaning the engine at the proper time to prevent serious problems. The motor mounts and head bolts of a snowmobile engine should be checked periodically for tightness. The severe vibration all snowmobiles encounter often loosens these bolts and if uncorrected could cause problems. When tightening the head bolts consult your operator's manual to find out if a torque wrench is needed and how much pressure is required.

Check the exhaust system to maintain motor efficiency and promote safety. Even out-of-doors, a leaky exhaust system can injure the rider who inhales the exhaust fumes. Snowmobiles used without the proper exhaust pipe or muffler may sound more powerful but have actually lost power.

Check such things as muffler clamps and the manifold studs for tightness. Check the manifold gaskets for wear or breaks and replace if necessary.

Good spark plug performance is absolutely necessary for the proper operation of a small one-cylinder engine. If the spark plug misfires the engine will not develop full power and in many cases will not start. Use the size spark plugs recommended for the engine. The proper plug for your engine will operate clean with very little deposit on the terminals and with very little terminal wear. Always keep a fresh plug on hand in case of trouble. You should clean and reset the spark plug gap every 5 to 30 hours of operation and replace the plug every 100 hours of operation.

Follow these steps to remove and replace the spark plug:

1. Clean around the plug to prevent dirt from falling into the cylinder when you remove the plug.
2. Use a deep spark plug socket wrench.
3. Wire brush caked carbon from the threads of the plug after you have removed it from the cylinder head.
4. Check proper spark plug gap—even on new plugs.
5. Screw the plugs in by hand, finger tight.
6. With a spark plug wrench tighten each plug firmly to properly seal the gasket.

The width of the gap between the two electrodes of a spark plug must be set precisely. For most small engines the proper gap width is .020 inch. Your operator's manual gives this information for your engine. When you set spark plug gap, always bend the outside electrode as needed. Never bend the inside electrode because you might crack or break the insulator. To remove carbon, soot, or outside coating from plugs, use a commercial spark plug cleaning machine which may be found in some service shops. Care must be exercised in operating these machines so that excessive use of the abrasive cleaner does not wear away the insulator tip and make the plug useless. Be sure to air clean the plugs sufficiently so that abrasive cleaning particles do not get into the cylinder and ruin the engine. If the plug is oily it must be cleaned with a solvent and blown dry before sandblast cleaning.

## CLUTCH

The snowmobile operates with a centrifical clutch. When the engine is idling, the clutch is disengaged and the machine should not move. As throttle operation increases engine speed, the clutch automatically engages and the snowmobile moves. When the throttle is released and returns to the idle position the machine slows down, the clutch disengages, and the machine stops. This throttle and clutch operation permits the machine to stop if the rider falls off. Under normal operation the machine will stop if the throttle is released. The brake is used only when a more rapid stop or slowdown is required.

Snowmobile clutches require periodic inspection to insure a safe and smooth operating machine. The automatic clutches on snowmobiles have weights on the inside mechanism which must be checked for wear periodically. A snowmobile should *never be used without the clutch guard cover*. The bolts that hold the guard on should also be tightened periodically. Riding a snowmobile without a clutch cover often results in torn clothing, or even worse—a cut knee or leg. The clutch cover also protects the driver from parts flying off a broken clutch.

Consult your operator's manual for information on inspecting and adjusting the clutch. If your snowmobile clutch requires grease, you should grease it as often as recommended by the manufacturer. Clutches which don't require grease should be cleaned at least once a year with kerosene.

## DRIVE SYSTEM

The bogie wheels on your snowmobile should be given two pumps of grease for each grease fitting. Greasing after each use forces the water out, thus preventing rust and a frozen bogie wheel bearing. Always use a low temperature grease for freer operation. The bogie springs should be checked frequently. A broken bogie spring can ruin the track of a snowmobile if it is not replaced immediately.

Check track tension periodically. The track life and efficiency depend largely on correct tension, alignment, and adjustment. Grease the adjustment shaft after each use. Consult your operator's manual for information on adjusting the track.

The snowmobile drive chain case is filled with oil. The oil level should be checked every 25 hours of use. On most machines you remove the oil plug and if oil runs out of the hole, the case is full. Use only gear lubes or chain oils recommended for your machine.

Be sure to check the drive belt for wear, proper tension, and proper alignment at least once a week. Consult your operator's manual for adjustment and replacement directions. If the drive belt is out of alignment as little as 1/32 of an inch, rapid wear may result. Continual revving and stopping of the engine may also be the start of drive belt wear. Carry a spare drive belt along on all snowmobile outings.

The drive pulley helps to set the tension on your drive chain. There should be no more than ¼-inch of play in the



drive chain. This can be checked by moving the drive pulley by hand, back and forth. To adjust the drive chain consult your operator's manual.

## STEERING

Check the steering mechanism of your snowmobile at least once a week. If the *steering arms* become loose or bent they may rub on the gas line or make the snowmobile hard to handle. Worn or loose spindle shafts may force the skis to turn out. Tighten the bolts which hold the skis onto the snowmobile before each use to prevent the loss of a ski.

Check the metal wear rods on the bottom of the ski for wear. If the wear rod is becoming thin it should be replaced. A broken wear rod may catch in the snow, tip the snowmobile, and cause an injury.

Pump grease into the fittings on the steering mechanism and ski legs at least once a week.

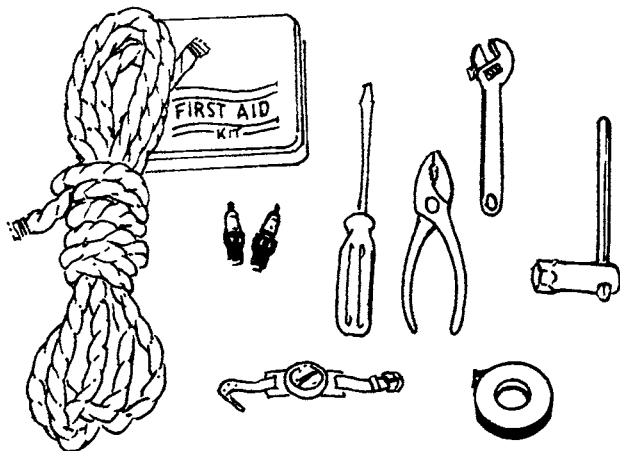
Consult your operator's manual for information on ski alignment. Proper ski alignment is necessary for good steering and stability. Properly aligned skis should be parallel to each other and parallel with the sled body when the steering handle is in a straight ahead position.

## BRAKES

Never use a snowmobile if the brakes are not working properly. Before each use, test the brakes to see if they are working. Consult your operator's manual for directions on how to adjust the brakes. Snowmobile brakes are generally designed to slow the machine down and not to stop it immediately. Always keep this in mind when riding.

## THROTTLE

If the throttle is not adjusted correctly the engine will not run at proper speed. The throttle should return to the idle setting when released—a sticking throttle often results in a runaway snowmobile. Consult your operator's manual for information on adjusting the throttle for your machine. Use only recommended lubricants.



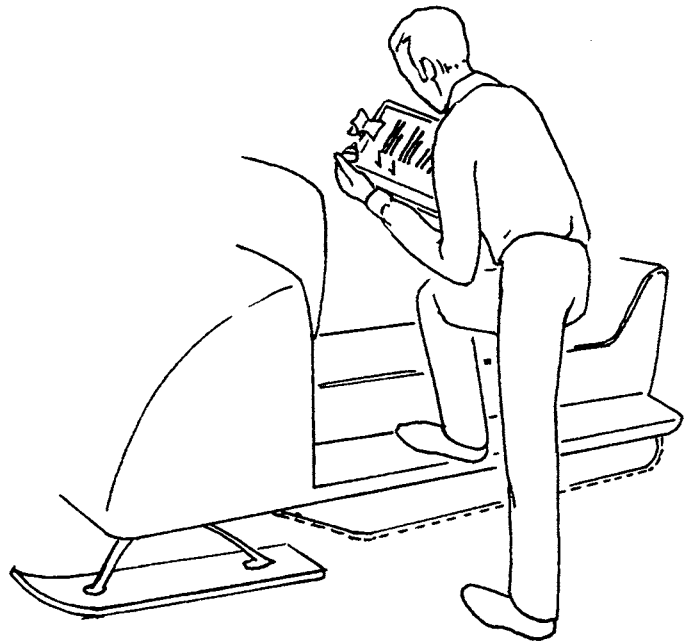
emergency kit

## ELECTRICAL SYSTEM

Check your snowmobile's electrical system at least once a week for loose wires, connections, and broken or bare wires. If your snowmobile has an electric starter you should carry extra fuses along on trail rides.

If the engine continues to run after the key is turned off, the ignition switch may be the cause. If it is faulty you should replace it.

Carry a roll of plastic electrical tape in your emergency kit for making electrical repairs.



using the checklist

## PRE-START CHECK LIST

Much of the maintenance on your snowmobile involves inspection to observe the needed adjustment. Make it a habit to inspect the machine quickly each time you ride it. The following pre-start check list will help you spot problems before they cause real trouble.

- Fuel*—is there enough, and of the proper mixture?
- Throttle and brake controls*—are they free?
- Steering*—any loose or bent parts? Ski alignment & wear rods okay?
- Lights*—Do they work? Do you have an extra bulb?
- Drive belt*—Properly aligned? Excessive wear?
- Guards*—in place? Bolts tight? Is clutch guard cover in place and secure?

Do you have the recommended emergency equipment?

- Drive belt
- Spark plug
- Flashlight
- Tool kit

## Transporting your Snowmobile

While some 4-H'ers have access to lands and trails open to snowmobile use, you may sometimes have to move your machine over public roads. Thus, you need to know how to load and transport your snowmobile safely.

Snowmobiles can be hauled from place to place on pickup trucks, station wagons, or trailers. Loading the machine is often accomplished by driving it up a ramp attached to the back of these vehicles. However, this can be quite hazardous since an inexperienced or careless snowmobiler could accelerate the machine into the back of the pickup, station wagon, or off the trailer.

A hand operated winch attached to the truck or trailer provides a safer loading method. With the winch you simply and safely crank the machine up the ramp and into place. If you can't adapt a winch to your vehicle, try to find a snowbank to back into so that your machine can be loaded and unloaded easily.

Once the machine is on the vehicle be sure to fasten it securely. A loose machine could bounce or slide off the vehicle causing serious damage or even a car accident. Since most station wagons are not long enough to accommodate the length of the snowmobile, you should fasten a large reflector to the rear of the machine.

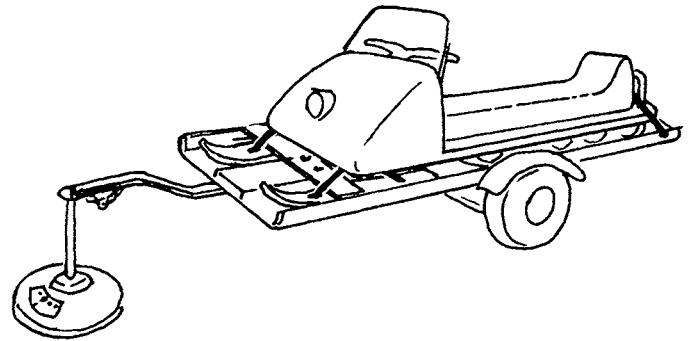
Tilt-bed trailers are available for transporting snowmobiles. The best method for loading is to tilt the trailer, back end down, and winch the machine in place. Anchor the machine on the trailer securely. A snowmobile is designed to slide over the snow and it will do the same thing on the trailer bed unless you anchor it on all four sides.

Don't use rope to tie down a snowmobile. It takes too much time and too much rope to do the job right; and sharp edges on trailers can cut through even the toughest nylon in a matter of minutes.

Rubber snubbing straps with "S" hooks on the ends do a good job, if you use enough of them. Some trailers have tiedown chains that are spring loaded and have cinch tightening devices. These are easy to use and do a good job if they are heavy enough. Some chains are so light that the first rough railroad crossing will either part the chains or straighten out the hooks. Don't take any chances. Make sure the chains will take the strain.

Probably the safest and most positive anchoring system available is a steel bar which fits across the skis between the springs and is secured to the trailer bed with some stout bolts. With chain or rubber snubbers on the back of the machine and a bar across the skis you can be sure your machine will stay on the trailer. A recently introduced variation of this system uses a positive locking cam in place of the bolts. Just fit the bar and throw a lever on each side and you are ready to drive away.

Some manufacturers have incorporated guide rails or stamped channels into their trailer beds. The skis ride in or against these and they prevent the front of the machine from shifting sideways while being trailered. If your trailer does not have guide rails or channels, it will be worth while to add rails by bolting a couple of lengths of angle iron or 2 x 4's to your trailer bed.



Proper load distribution is the secret to smooth riding, no matter what kind of a trailer you pull. Ideally, the hitch of your car should carry some weight but not more than 10 percent of the total trailer and cargo weight. Getting your trailer set up right is important and it isn't hard to do. Just load up and drive to the local building materials dealer or grain elevator and ask to weigh your outfit on the truck scale. You can do the actual balancing in your driveway. Get a sturdy box and put your bathroom scale on it; then lay the trailer tongue on the scale. If the balance is off, or if more than 10 percent of the trailer and snowmobile weight is on your scale, shift the machine accordingly. Once you have the right balance point, you can fit stop blocks to the trailer bed or merely paint a reference line somewhere so that you can correctly position your machine each time you load it.

You must have good trailer and clearance lights. Get a top quality connector and make sure that it is properly and securely wired into your car's electrical system. Locking metal connectors are the best. Most of the molded rubber connectors that come with the trailers are not designed for cold weather use. Carry spare bulbs as an added safety precaution.

License plate holders break easily. Most trailers come with a simple stamped bar with a couple of slots for screws. Backing into snowdrifts and even wind from highway travel will soon bend the lightweight aluminum plates if they are anchored only at the top or bottom. After a few bends, the plate breaks off and is lost. It helps to back your license plate with a piece of plywood and secure it at the top and bottom.

Trailer tires can be difficult to replace since they come in many sizes. If you get a flat you may not be able to find the size you need locally; therefore, it is best to invest in a spare tire and wheel. Remember, also, most small trailer tires are designed to carry higher air pressure than car tires. Know the correct air pressure for your trailer tires and keep them inflated properly. Carry a tire gauge in your car. Check the temperature of your trailer tires occasionally when on a trip. They should be no warmer than the car tires. If they are, add more air.

## Storing your Snowmobile

To insure many seasons of use and enjoyment, the snowmobile must be adequately prepared for storage. Arrange to have any needed dealer service done at this time or during the summer.

In preparing for storage you should drain all gasoline from the gas tank, fuel lines, and carburetor to prevent gum formation. You can either run the engine until the tank is dry or use a siphon. To drain the carburetor, disconnect the fuel line and run the engine until it stops.

To prevent rust on the inside of the cylinder walls, remove the spark plug and pour one tablespoon of oil into the spark plug hole. Turn the engine over a few times by pulling on the starter rope, to distribute the oil on the piston and the cylinder wall.

Take the tension off the track by loosening the track adjustment springs. This will prevent stretching. Block the track up off the garage floor or ground to prevent rubber deterioration. Consult your operator's manual for any special instructions on storage.

The entire snowmobile should be wiped down until it is dry. Grease all grease fittings. You may want to wax your snowmobile body with auto polish to keep it clean and bright. Finally, plug holes such as the ports and carburetor air intake to keep dust and moisture out of the engine. Cover the entire snowmobile with a tarpaulin or other suitable cover.

## Code of Ethics for Snowmobilers

1. I will be a good sportsman, I recognize that people judge all snowmobile owners by my actions. I will use my influence with other snowmobile owners to promote sportsmanlike conduct.

2. I will not litter trails or camping areas. I will not pollute streams or lakes.

3. I will not damage living trees, shrubs, or other natural features.

4. I will respect other people's property and rights.

5. I will lend a helping hand when I see someone in distress.

6. I will make myself and my vehicle available to assist search and rescue parties.

7. I will not interfere with or harass hikers, skiers, snowshoers, ice fishermen, or other winter sportsmen. I will respect their rights to enjoy our recreation facilities.

8. I will know and obey all federal, state, and local rules regulating the operation of snowmobiles in areas where I use my vehicle. I will inform public officials when using public lands.

9. I will not harass wildlife. I will avoid areas posted for the protection or feeding of wildlife.

10. I will stay on marked trails or marked roads open to snowmobiles. I will avoid cross-country travel unless specifically authorized.

This snowmobile code of ethics was proposed by a committee representing the U. S. Forest Service; Bureau of Outdoor Recreation; Michigan Conservation Commission; Minnesota Conservation Department; Department of Lands and Forests, Ontario, Canada; U. S. National Park Service; and several snowmobile manufacturers.

## State Laws Pertaining to Snowmobiles

Because snowmobiling is such a new sport, prior to 1967 there were no laws governing snowmobiling in Minnesota. Since that time, however, the state legislature has established several laws pertaining to the use of snowmobiles. In addition, many cities and villages throughout the state have adopted regulations and ordinances governing the use of snowmobiles on city streets and parks.

As a snowmobile operator, you should be familiar with local regulations and state laws. You also must be alert to changes of laws, particularly after the biennial state legislative sessions.

Following are some of the items covered in Minnesota statutes concerning the use of snowmobiles. Study them and become familiar with them!

### REGISTRATION OF SNOWMOBILES — M.S. 84.82 and M.S. 84.83

Snowmobiles owned and operated within the state must be registered with the Department of Conservation. The registration number must be properly displayed on the machine.

Transfer or termination of ownership shall be reported to the Department of Conservation.

### OPERATION ON STREETS AND HIGHWAYS — M.S. 84.87

No snowmobile shall be operated at anytime within the right-of-way of any interstate highway or freeway.

Snowmobiles may not be operated on the road way, shoulder, or inside bank or slope of a state or county highway. Travel after dark on these right-of-ways must be on the right hand side of the right-of-way and in the direction of traffic in the nearest lane.

Crossing a street or highway must be done at a right angle to the highway after coming to a complete stop and yielding to oncoming traffic. Crossing a divided highway must be done only at an intersection of that highway with another public street.

Any county, city, village, or town may regulate the operation of snowmobiles on public streets and highways or other public areas within its boundaries.

It is unlawful to operate a snowmobile in a careless and negligent manner so as to endanger the person or property of others.

## MUFFLERS — M.S. 84.71

Except in special cases, every snowmobile shall be equipped with a muffler that will prevent excessive and unusual noise.

## SAFETY CERTIFICATES — M.S. 84.872

Persons under 14 years of age may not cross state or county highways as the operator of a snowmobile. A person 14 years old, but less than 18 years of age may cross state and county highways if he has a valid snowmobile safety certificate issued by the Department of Conservation.

### Suggested Activities

Choose and complete as many of these activities as you can. The ones you choose will depend on your age, experience, interest, and resources.

1. Learn and practice the snowmobile code of ethics.
2. Study and become familiar with Minnesota laws which pertain to snowmobiling.
3. Use your snowmobile owner's manual, learn the names of the main parts of your snowmobile and their function.
4. Study the proper loading, tiedown, and unloading of a snowmobile on a trailer or pickup.
5. Learn the different snowmobile riding positions and when each is used.
6. Demonstrate to a competent and experienced driver, proper turning, hill climbing, hill descending, deep snow handling, and rough terrain handling of your machine.
7. Prepare an emergency survival kit and tool kit to carry on long snowmobile trips.
8. Lead a snowmobile safari and demonstrate safety tips you have learned in this project.
9. Become thoroughly familiar with proper kinds of clothing to wear for snowmobiling. Learn how to use the wind chill index.
10. Learn where officially designated snowmobile trails are in your area. See reference list for sources of literature on Minnesota snowmobile trails.
11. In cooperation with local, state, or federal foresters help layout, construct, and properly mark a snowmobile trail.
12. Under the supervision of a game biologist or conservation officer, help cut browse in a deer yard or make snowmobile trails to a browse area.
13. Visit a snowmobile manufacturer or dealer to learn more about the machines and careers in the snowmobile industry.
14. Keep a picture record of your snowmobiling activities.
15. Learn and practice snowmobile preventative maintenance procedures.
16. If you are 14-18, enroll in the state certification program.
17. Organize a relay race for fun.
18. Properly prepare your snowmobile for summer storage.
19. Visit a library and read magazines or books on snowmobiling. You may want to subscribe to a current magazine on snowmobiling.
20. Visit a meeting of a local snowmobile club. Find out the requirements for membership.
21. If you are a junior leader, meet with your project leader and plan cooperatively how you can help conduct your club program.
22. Practice safety that protects you; that shows consideration for others.
23. Compare your machine with others and note similarities and differences.
24. Take a ride on your snowmobile and identify all safety hazards you encounter.
25. Experiment with different kinds of clothing—footwear, face masks, goggles, etc. Compare the warmth, comfort, and cost of a jump suit and an improvised outfit.
26. Experiment with load distribution on a trailer by using a bathroom scale. Set up and conduct a clinic for your neighbors and friends on determining safe load distribution.
27. Talk to your local insurance agent on requirements and availability of insurance for snowmobiles.
28. If you are a junior leader, plan and conduct a safari or trail ride for less experienced snowmobilers considering route, safety, first aid, food, and fun.
29. Use the snowmobile to help bring food when the roads are blocked with snow, when someone needs a doctor, to work, or do other "good deeds."
30. Develop a concern for litter and pollution and spread this concern to others.
31. Stage a fashion show of snowmobile clothing for your club.
32. Plan a winter camping trip for your club.
33. Give a demonstration at your club meeting and county demonstration day. See next page for possible topics.
34. Prepare a window display or county fair booth on snowmobile safety.
35. If you have a special interest not listed in these suggestions, design your own program using guidelines contained in the 4-H self-determined project.



## Demonstration Topics

Here are some suggestions for regular or working demonstrations:

1. Proper mixing of gasoline and oil.
2. Names and functions of various parts of the snowmobile. Some parts could be developed into a separate demonstration such as carburetion, principles of internal combustion engines, ignition.
3. Proper driver positions, proper turning, hill climbing, hill descending, deep snow handling and rough terrain handling.
4. Safe starting and stopping procedures.
5. Preparing an emergency tool or survival kit.
6. How to load, transport, and unload a machine.
7. Routine maintenance of the snowmobile.
8. Wind chill index and clothing for the occasion.
9. Preparing machine for summer storage.
10. How to prepare for a safari or trail ride.
11. Tips for night riding.
12. Costs of operation and maintenance.
13. Determining proper load distribution on a trailer.
14. Making emergency repairs while wearing gloves—replace spark plug, change drive belt, and fill gas tank.
15. Trail signs.
16. Outdoor survival—shelter building, fire building, compass and map reading, running out of gas, drying wet clothing, etc.
17. First aid—frost bite, internal and external injuries, eye injuries, shock, snow blindness, sprains, strains, breaks, cuts, etc.
18. Search and rescue—how to set up and conduct a search for someone who is lost.

*Remember:* There is no need to confine demonstrations to meetings held indoors; a lot more can be done outdoors during the day or at night under a yard light.

## References

Additional reading material for further study:

1. 4-H Small Engine project member's manual—Available from your county extension office.
2. Owner's manual supplied by your manufacturer and/or dealer.
3. "Minnesota Snowmobile Safety Manual." Write to: Minnesota Department of Conservation, Centennial Office Building, St. Paul 55101. This manual is furnished free when you enroll in the State Certification Program.
4. "A Guide to Minnesota Snowmobiling"—A guide to places to snowmobile in Minnesota. Write to: Minnesota Department of Conservation Bureau of Information, Centennial Office Building, St. Paul 55101.
5. "Minnesota Snowmobile Safety Laws." Write to: Minnesota Department of Conservation License Center, 625 N. Robert Street, St. Paul 55101.
6. "ISIA Snowmobile Owners Safety Handbook." Write to: International Snowmobile Industry Association, 5100 Edina Industrial Blvd., Minneapolis 55435.

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