

the spinning propeller. Much of the trail twists and turns and in many spots an ordinary pickup used during the summer time must travel in low gear to have power enough to climb the grades. Many times it has been necessary to assist the sno-plane, while climbing a long grade, by kicking along with one foot much as a boy does with his coaster wagon; and on occasion I have actually led the sno-plane up grades. The pay off for the few tough miles encountered during the past four years, are the several thousand miles of easy swift travel which the sno-plane has delivered.

The sno-plane has been invaluable to the Minidoka Project of the Bureau of Reclamation in the operation and maintenance of Jackson Lake and Grassy Lake Reservoirs as well as in it's use in conducting Snow Surveys.

Numerous emergency runs have been made in cooperation with other government agencies, local law enforcement officers, and neighbors in distress. Emergency loads hauled in the Sno-plane have ranged from routine supplies delivered, to the isolated gate-tender at Grassy Lake Reservoir, to the rescue of airplane crash victims, or fast trips to the hospital with broken bones or a successful race with that noble bird, the stork.

The following is a short summary of the Sno-plane log sheet:

Total miles traveled - 11,805

Total gallons gasoline burned - 2,042

Miles per gallon - 5.8

Engine is a Lycoming 65 horsepower, 4 cylinder aircraft model.

Glenn H. Simmons

Following Mr. Simmons paper, a discussion prepared by James C. Marr, was read.

#### DISCUSSION

(Glenn H. Simmons' Paper on Sno-Plane Operation in Upper Snake Watershed)

Sno-planes can be expected to operate better on the watershed of upper Snake River than on Boise River drainage where I have had some recent experience with one of these machines. This is the case because of the condition of the snow and the type of terrain.

Since the sno-plane runs on skis, condition of the snow has a good deal to do with the ease with which it travels. If the snow is sticky or wet, it requires more power to start and keep the machine moving than is the case when the snow is dry and cold. Depending on the snow condition a sno-plane may become stalled, it may be able to move along at the rate of only a mile or so an hour, or it may travel at a breath taking pace. Up in the high altitudes along the Continental Divide on upper Snake River watershed where Mr. Simmons and others have operated sno-planes with the greatest success the temperatures are the lowest and the atmosphere the driest. Accordingly the snow cover is usually dry and cold. The difference in this respect between the upper Snake River watershed and the Boise River drainage is suggested by the mean monthly winter temperatures at Moran, Wyoming, and Arrowrock, Idaho.

Mean Monthly Temperatures

	<u>January</u>	<u>February</u>	<u>March</u>
Moran, Wyoming	10.4°F.	14.8°F.	22.0°F.
Arrowrock, Idaho	24.8°F.	30.4°F.	39.1°F.

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Occasionally the operators of sno-planes in upper Snake Basin must also travel light or during the coldest part of the day to avoid unfavorable snow conditions, and it is presumed that the only difference in this respect between the upper Snake River country and Boise River drainage is that more of this trouble is encountered in the latter area. The sno-plane which we have in Boise, Idaho, is almost identical with the one operated by Mr. Simmons at Moran, Wyoming. Our experience with it on Boise River watershed is limited to several trips totaling 108 miles made during the forepart of January, 1946. Eighty miles of this travel was made over deep wet snow during a rainy day. Snow surveys were made at two places during this trip, i.e., Squaw Meadow, where the average snow depth was 64 inches and the average water content of the snow 32 per cent, and Secesh Summit 67 inches snow depth and 29 per cent water content. The topography along the route of travel was relatively favorable. A road was followed, and the total climb amounted to about 1500 feet. The maximum grade encountered was approximately 12 per cent. All things considered, the sno-plane proved of benefit. Some trouble was encountered, however, and it is probable the snow condition could have been bad enough to stall the machine. Ordinarily three full days of arduous travel are required when this trip is made on foot. With the sno-plane it took only six hours, including the time spent making the two snow surveys. Under such conditions it was found necessary to keep the skis well waxed. Both the driver and passenger had to get out and push to get over steep and other difficult places. Finally, for the last half of the distance a track had to be first broken with the driver alone in the machine. Thus a return trip was necessary to pick up the assistant snow surveyor. The driver found it very difficult to turn the machine around in a narrow place by himself or to take it over fallen trees or other obstructions.

This same machine proved less successful on wet, sticky snow on a run to Crater Lake, Oregon, last spring before it was brought to Boise, Idaho. In that instance the plane would scarcely move with only one person in it and with the throttle wide open. It was believed that this would frequently be the case in the coastal region. For that reason the machine was brought further inland where the snow conditions would be more favorable.

The utility of a sno-plane also depends upon the kind of terrain to be traveled. In the upper Snake River country where Mr. Simmons operates, and where the sno-plane generally is heralded as a first-rate means of conveyance over snow, the terrain consists mostly of smooth gradual slopes and sufficient wide open spaces for turning and otherwise manipulating a sno-plane. On the Boise River watershed the topography is steep and rocky in comparison. In most cases travel in the higher altitudes, where we must go to snow survey, is confined to steep, narrow mountain roads. These are frequently so drifted with snow as to offer very rough and hazardous surfaces upon which to travel. Particular difficulty has been experienced in getting a sno-plane out of such terrain after it has once been

taken to a high elevation. If the load is light enough, the skis well waxed, and the snow conditions favorable, there is no particular difficulty or danger involved in driving a sno-plane up one of these steep, narrow mountain roads around hairpin turns on hard drifted snow surfaces with steep side slope and grades up to 20 per cent. With the throttle wide open the plane gets enough of a lift to keep it from sliding sideways downhill on the steep side slopes. The difficulty and the danger at such places is in the descent when the propeller is idling and the totally inadequate brakes fail to hold the machine. On the one 28-mile trip of this kind made on Boise River watershed this year we made the descent hazardously. One of us rode the front ski in order to hold to a safe course. The other member of our party was at the controls but poised to jump free from the machine should it get away from us.

The Idaho State Fish and Game Department operates three sno-planes. It has tried to provide adequate brakes for its machines without success except by rough-locking the skis of the sno-plane with log chains. Our snow survey crews will avoid some difficulty and danger hereafter by stopping short of the steep country with the sno-plane and proceeding on foot.

In conclusion it may be said that the utility of the sno-plane is limited to the carrying of light loads and to topography which is not too steep and obstructed to descend safely with it.

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During the following discussion, films were shown of the various types of snow equipment.

The Chairman asked that Mr. Tucker, or one of his sons, discuss their product, the Tucker Sno-Cat, "without getting too technical."

MR. MORRIS TUCKER: Here are some pictures that will give you a general idea of the principles of the Tucker Sno-Cat, and in particular will show its flexibility on rough uneven snow surfaces.

We want to stress the fact that in our first Sno-Cats we were forced to use inferior material for the tracks. Although the best obtainable it wasn't good enough. Since then better steel has become available and we are now using alloy steels in the tracks for the Sno-Cat that are giving us 100% service. Mr. Work's report on the Sno-Cat indicates that he drove the last 500 miles without trouble whatsoever excepting a defective steering gear bearing which did not cause any delay on his trip.

The Sno-Cat somewhat resembles a caterpillar drive. The drive is an open cleated track revolving on 108 flanged ball races, without touching the wide stainless steel pontoon skis which follow the contour of the snow surface.

The heavier the load carried on this pontoon skii the greater the traction on this open link drive, the caterpillar principle carries the entire weight on the revolving track link belt.