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LONG-DISTANCE TRAVEL BY SNOWMOBILE ON THE WEST COAST OF JAMES BAY

by

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With Appendix:

TRIAL RUN RADIO COMMUNICATIONS

by

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ABSTRACT

This paper is written as a guide to expeditions by snowmobile on the West Coast of James Bay based on experience from Trial Run, 1986. Access, accommodations, rail transportation, terrain, snow cover, ice conditions, communications, polar bears, the performance of snowmobiles and sledges and other pertinent subjects are examined.

RESUME

Cet article se veut un guide pour les expeditions en motoneige sur la côte ouest de la Baie James basé sur l'expérience de "Trial Run", 1986. L'accès par la route, les motels, le transport par voie ferrée, le terrain, les conditions de glace et de neige, les communications, les ours polaires, le fonctionnement des motoneiges et les traineaux et autres sujets pertinents sont examinés.

INTRODUCTION

In February of 1986, the author, accompanied by Brad Cain and Lloyd Reed travelled by snowmobile a total distance of 700 kilometers on the west coast of James Bay. Trial Run was carried out to gain experience in long-distance oversnow travel. It was a test of systems and of concepts (1) related to equipment trial methodology -- a rehearsal for future trials. While organising this trial, there were many questions concerning the logistics of deployment, geography, travel conditions, the capabilities of sledges, snowmobiles and their drivers for which answers could not be found. These answers and much other useful information were acquired during the course of this trial. In this report, lessons learned which relate to travelling by snowmobile in general, and travel on the west coast of James Bay in particular are discussed.

LOCATION

James Bay was chosen because of its easy and inexpensive access by rail at Moosonee. It was the area closest to Ottawa which could be expected to offer conditions approximating those found in the Arctic. Low temperatures were a necessity both for trial purposes and for ensuring a secure ice covering on waterways. Winds on the open expanse of the ice of James Bay were expected to produce windpacked snow typical of more northerly locations. Populated areas were few and easily avoidable. An attractive geographical goal, which is necessary to ensure the proper incentive to travel in cold conditions, was available in the form of Cape Henrietta Maria, the point at which James Bay and Hudson Bay meet approximately 550 km north of Moosonee.

TRANSPORTATION TO JAMES BAY

ROAD

Moosonee is reached by rail from Cochrane, Ontario which is 739 kilometers from Ottawa via highways 17 and 11. These are both excellent roads. North Bay is about half way to Cochrane from Ottawa. We arranged emergency accommodation at CFB North Bay in the event of bad weather or driver fatigue. Both the drivers of the staff car and the truck preferred to drive straight through to Cochrane, however.

All of the equipment for Trial Run was carried to Cochrane in a single truck which had a box measuring 7.9 m by 2.6 m wide and 2.1 m high. The komatiks were stacked along one side of the truck, unloaded.

RAIL SERVICE: PASSENGER

Moosonee is served by Ontario Northland Railway from North Bay or Cochrane. The mixed freight and passenger train travels from Cochrane to Moosonee on Mondays, Wednesdays and Fridays, and returns to Cochrane on Tuesdays, Thursdays and Saturdays. The ride to Moosonee lasts about five hours. The cars are steam heated with radiators beside the seats at floor level. On the outward trip these radiators were very hot and would have been useful for warming flexpack rations, had we had any. On the return trip, when flexpack rations were available, the radiators were of course cold. The train does have a snack bar but a carry on lunch is recommended. The fare is $25.00 each way.

RAIL SERVICE: FREIGHT

Rain transportation of equipment should be prearranged directly with agents at Cochrane and at Moosonee rather than the head office in Toronto. A small party such as ours can ship their load in an express car. We were given an otherwise empty car. You can request your own car, but this is much more expensive as the minimum load is 10,000 lbs (this is what the head office had suggested). Loading must be done the day before train day. In Cochrane it was possible to back the truck right up to the door of the car and load directly. The door is 2.7 m wide. The car is approximately 12 m long by 3 m wide. The charge for the shipment of approximately 3600 lbs was less than $350, one way. (Snowmobiles are counted as weighing 600 lbs.) No fuel is permitted in the load. Fuel is readily available at Moosonee. The price per litre of 61 cents was about 20% more than in Ottawa. Crates are not required for snowmobiles on this run if you are willing to sign a damage waiver. Our load shifted somewhat during the trip, but no damage occurred. Apparently, it is possible to tie things down by driving spikes into the floor and walls of the boxcar. Check with the express agent first! Both at Cochrane and at Moosonee the Ontario Northland Railway staff were very helpful.

On arriving at Moosonee, you must visit the Express office which is just down the track from the depot to request that your car be "spotted" at the loading ramp. This must be done before the train leaves the next morning, preferrably right away, as there is no yard locomotive at Moosonee. The loading ramp is at the end of the track near the river. They will move the car to the ramp, which is capable of taking flatcars as well as boxcars, and cut the spike (a large nail which is bent to "lock" the car door). The car door is opened by means of a large lever which lifts the door onto rollers. The channel in which the door rolls is likely to be filled with ice so some kind of tool to break out the ice would be useful. It is also necessary to request that a car be spotted at the ramp for the return trip when there is an engine in the yard, and to load it the day before the train leaves.

It is not necessary to lift the komatiks to remove them from the boxcar. Arranging the loads on the komatiks while in Cochrane saves time in Moosonee. There is enough room in the boxcar, and ample opportunity.

ACCOMMODATION AND SERVICES

COCHRANE

There are two recommended motels in Cochrane, the Westway and the Northern Lights Motel. The latter is a few dollars more, but it has a restaurant. The Westway is a short walk from food. The Westway is convenient in that its rooms are connected by a hallway making it easier to move between rooms in winter to check on last minute details and make final preparations. Reservations were essential even in February. Cochrane has many stores for last minute purchases.

MOOSONEE

The only accommodation in winter in Moosonee is the Polar Bear Lodge. It contains the only restaurant in the area. Fortunately, the food and the service are good. Meals are served only at specified hours, and the hotel doors are locked at 11 PM, after which there is no entry. The Lodge is a few blocks from the station, down the main street to the river and left. There is a taxi service.

On Reveillon Road, between the Lodge and the loading ramp, is a warehouse of the Department of Indian and Northern Affairs. Perhaps the MNR staff could advise on arranging to use this building to store equipment. The MNR headquarters building is only a block north of the Lodge on Reveillon Rd. Leaving a loaded komatik in front of the Lodge overnight is not recommended. On returning to Moosonee after the trial, arrangements were made with a contractor to place our loaded sledges in this warehouse for two days.

There are more snowmobiles than cars on the streets of Moosonee and Moose Factory, so the snowmobiles were useful for transportation in the town. The Alpine attracted attention wherever it went, especially from children who stopped whatever they were doing to have a good look. Everything which is related to the tourist industry is closed in the winter. There are a few stores in Moosonee and a Hudson Bay store in Moose Factory which are open. A visit to the local OPP detachment is probably a good idea, however, on this trip, we did not have any time before leaving on the trial. Visit the upper air station of Environment Canada for weather data for the period of your visit.

James Bay Travel is conveniently located next to the loading ramp. It operates the tractor train from Moosonee to Ft. Albany. They have a Bombardier Snowmobile, one of the larger passenger kind which can be used to recover irreparable vehicles at least as far north as Attawapiskat. Evacuation nearer to Cape Henrietta Maria might have to be carried out by helicopter from Timmins, as, apparently, pilots might be averse to landing on drifted snow on sea ice. The Moose Factory Hospital should be contacted to arrange a medical evacuation if one is necessary.

OTHER SETTLEMENTS

The other settlements were not visited. Accommodation can be arranged at the Catholic mission in Ft. Albany. There is a hospital there as well which has a cafeteria. Ft. Albany and Attawapiskat are served by Austin Airways.

Because of confusion concerning the route on crossing the Albany River, we found ourselves making an unplanned trip across the Ft. Albany Indian Reservation. Anyone planning such a trip should probably contact the Band first.

COMMUNICATIONS

Communications systems used during Trial Run are described in an appendix written by Lloyd Reed. Telephones are available at all communities.

POLAR BEAR PROVINCIAL PARK

Cape Henrietta Maria is within the boundaries of Polar Bear Provincial Park. The park can only be visited with the permission of the MNR staff in Moosonee.

TRAVEL CONDITIONS

GENERAL

Regional ice conditions and coastal geography have been described in a number of publications (2,3,4,5,6,7). A platform of landfast ice extends to an indeterminate distance (many kilometers) from the shore. The Ontario Ministry of Natural Resources maintains a snow road in winter which connects the communities of Moosonee, Ft. Albany, Kashechewan, and Attawapiskat. This road runs roughly parallel to the coast with side roads to the coast to service the communications towers at Big Piskwanish Pt (not seen) and Cockispenny Pt (visible only from the coast). Another tower, placed inland near Big Willow Creek, is visible from both the road and the coast. The road is made of packed snow only, there is no gravel on it.

Apparently, an abandoned Hudson Bay Co trading post exists at the location marked on some maps as Lake River and an abandonned Mid-Canada line site on the coast near Cape Henrietta Maria. The condition of any buildings or landing facilities is unknown. Hunting lodges, closed in winter of course, are located at North Pt, Nomansland Pt and at the mouth of a creek between Ekwan River and Ekwan Pt.

Airphoto coverage is limited mainly to river mouths and settlement areas. As it takes several weeks to process an order for Landsat images, very recent images showing conditions existing at the time of the trial could not be obtained. The only evidence of open water was a distant cloud rising from a polynia south of Akimiski Island. According to heavy equipment operators, there is thin ice on the narrow channel of the Albany river near Kashechewan due to the fast current.

SNOW ROAD

The snow on the road was mainly hard packed by traffic. It was drifted in places where it passed groups of trees in open bogs and was often marred by ruts. The road was widest and most travelled between Moosonee and Albany. Where wide channels of rivers are crossed, the road is marked by cut spruce trees standing at intervals of about fifty metres. Camp must be made off of the road as the tractor train travels at all hours. The snow off of the road was deep and soft. We found that much floundering around and effort could be saved if the komatiks were unhitched on the road, and the snowmobiles used to pack down the surface. A trail to the camp site and back onto the road was also packed. In a few hours this would set hard. Meanwhile, the komatiks were pulled to the site and camp set up. We found that in this metre deep snow, only the Alpine was really useful when pulling a loaded komatik. The smaller machines could pull straight ahead, but bogged down when attempting to turn the load, and were unable to start the load moving. When soft snow was less than a half metre deep the small machines were quite adequate.

The exact route of the road on crossing the Albany River is problematic. It appears that a new road has been cut since the airphoto was taken. It crosses the river near the Bay over the largest island.

JAMES BAY COAST

It was convenient to leave the snowroad via the Lawashi River. At the mouth of this river, much bare ice was encountered, presumably the result of an overflow of river water earlier in the season. We travelled out on the river channel past the ends of the ice levees. Each stream has a levee of ice floes on either side of its channel for some distance out to sea (it is hard to tell what is mudflat and what is sea ice except where the ice is rough). Shortly after leaving the mouth of the river, we encountered drifts of hardpacked snow, covered by soft snow. There was a band of smooth ice between the ice mounds near the shore and the rough ice farther out.

North of the mouth of the Attawapiskat River (the channel is marked by tall crosses and ice levees) we travelled over low grassy islands or exposed shoals covered with soft snow and through an area of rough ice through which an approximately straight course could be found.

Once past Ekwan Pt, the coast is no longer protected by Akimiski Island. Rough but trafficable ice occurs immediately off shore. We chose to travel on the snow covered beach. Gravel ridges parallel the coast along the beach. The treeline pulls away from the coast past Ekwan Pt, but the beach ridges provide good guides to direction. The snow was hardpacked (specific gravity 0.38) with sinuous ridges of softer snow perpendicular to the coast and thus the direction of travel. The crests of these ridges, which were most often in the form of cresent shaped dunes 30 to 50 cm high, and separated by 15 m or so, were marked by fine sand. Bare patches of gravel paralleled the beach ridges, seaward.

On the return we travelled closer to the "coast" from Ekwan Pt south to the Lawashi River. Channels inshore of the islands in the mouth of the Ekwan River were particularly easy to travel, no bumps and soft snow. On grassy flats south of these channels, fast travel was possible over 5 to 15 cm of soft snow overlying 10 cm of hard snow and 20 cm of depth hoar (sugary snow). Over mudflats the soft snowcover was drifted (0.3 m high, 5 to 10 m separation). North of the Albany River we travelled over a grassy area, a wide point perhaps, where the snow was soft and deep. In mukluks, each step sank 30 to 40 cm. The sledges sank about 15 cm at the back.

The mouths of the two channels of the Albany River were areas of rough ice -- large pieces frozen into the ice cover at random angles. Some minor deviations were necessary but larger vehicles could have traversed this section without much trouble. South of the river mouth ice mounds caused by the action of tides on floating ice over submerged boulders became common. These were easily detoured, and served to relieve the tedium.

Between Nomansland Pt, which inspite of its name appears to be a rather pleasant place, and North Point, large masses of grounded ice were encountered in places. Most of these could have been negotiated, but were more easily avoided as the ice inshore was smooth. The ridge points such as Long Point are no real obstacle and can be traversed easily.

From North Point to Wavey Creek, we travelled over grassy and reedy flats covered with soft snow. Wavey Creek and the Moose River were also covered with soft snow at least a half metre deep.

Because of the deep snow on the Moose River the snow road is recommended over the coast when travelling with heavy loads, as at the beginning of a trip with a full fuel load. It also provides a travelled route for shaking down equipment and gaining confidence in vehicles and methods.

NAVIGATION

On the snow road, navigation was simply a matter of following the road. There was some confusion at the Albany River crossing. At the second channel on the way north, the road divided. The seaward branch goes to Attawapiskat.

North of the Lawashi River on the sea ice, the desired heading was maintained by crossing drifts of snow at a constant angle. The angle was found by noting the proper direction with a hand compass standing some distance away from the snowmobile. In whiteout conditions the drifts were not visible, nor were any distant landmarks. This necessitated more frequent stops.

North of Ekwan Pt. the treeline moves away from the coast. We had been concerned that this would make it hard to determine the direction and the location of the coast, as the slope of the land is negligible. This fear proved groundless, as beach ridges and rough ice were sufficient to define the coastline for our purposes. Our actual location on the coast was often difficult to determine with any precision. The odometer of the Elan was used for dead reckonning. The odometer readings were consistently higher than distance taken from the map assuming straight line segments. The largest difference was only 15%. On the return, the points of land south of the Albany River made navigation easy. Camp positions were determined by turning on a satellite beacon. The signal was received by SARSAT and transmitted to Ottawa. The calculated position was transmitted the following day during the scheduled noon radio contact (the sked). On those occasions when we were confident of our position, the SARSAT fix was accurate to within 500 metres.

SNOWMOBILES

FUEL USE

Three snowmobiles were used, an Alpine, a Spirit and a new Elan. Their characteristics are listed in Table I. Fuel consumption was measured by weighing fuel cans to the nearest half pound with a spring scale (maximum 100 lbs × 1 lb) before and after filling the fuel tanks. A full fuel can weighed, typically, 40 lbs. The Elan had an odometer which was used to measure the distance between refuelling stops to the nearest mile. At James Bay Travel, the proper amount of oil was poured into the empty fuel cans which were then filled from a gas pump. This, plus the vibration of travel, mixed the oil and gas sufficiently. The gas from the pump was probably relatively warm as it had been stored underground, and the oil was warm as it had been stored in the building. Gas line antifreeze was taken along, and added to the tank occasionally. The caps of the five gallon plastic fuel cans (Sceptre) tended to loosen from vibration and occasionally come right off. When this happened methanol was added to the opened cans. It was not used routinely, as it has been suggested that it can result in the overheating of the engine (8).

Fuelling was greatly facilitated by modifying one fuel can spout by cutting it short and attaching a length of large diameter Tygon tubing with a hose clamp. This spout was used on each can. Standard procedure was to refuel during the noon sked as it saved stopping later and each evening to avoid condensation in a partly full tank. Fuel records are presented in Table II. Consumption rates are given in Table III. The Alpine used fuel at twice the rate of the smaller machines even when the loads were comparable. Fuel consumption was not related to the load on the komatiks. It was noticeably higher after leaving the snowroad.

TABLE I

Characteristics of Snowmobiles Used on Trial Run

	Year	Engine Size (cm^3)	Mass (kg)	Snow Contact Area (m^2)
Skidoo Elan	1986	250	130	0.7
Motoski Spirit	1986	250	130	0.7
Skidoo Alpine	1986	497	300	1.4

TABLE II

Data from Trial Run

Distance (km)	Time (h)	Fuel Added To:			Load Towed By:		
		Spirit (kg)	Elan (kg)	Alpine (kg)	Spirit (kg)	Elan (kg)	Alpine (kg)
37	--	--	--	--	450	390	520
88	16.8	5.7	5.0	11	440	375	515
133	18.9	4.1	3.6	9.5	420	375	515
203	23	8.2	7.3	15	415	345	515
270	27.2	8.2	5.2	15	385	345	510
326	31	8.2	5.0	13	355	345	510
414	37.6	13	11	26	340	315	505
464	41.5	8.6	7.3	15	305	315	505
486	43.8	4.3	3.9	6.1	300	300	505
550	47.2	10	8.0	17	290	270	500
576	49.2	5	3.6	7.7	290	255	500
605	51.5	4.1	2.7	7.7	270	255	500
675	55.3	9.8	7.5	16	255	240	495

TABLE III

Fuel Consumption Rates

	Spirit		Elan		Alpine	
	(km/l)	(l/h)	(km/l)	(l/h)	(km/l)	(l/h)
Snow Road	6.2	2.8	7.7	2.2	3.2	5.4
Coast	4.5	3.2	5.8	2.5	2.6	5.5

SPEED

Average speeds, calculated from the Elan odometer and the engine hour-meter on the Spirit (including idling time) were higher on the snowroad (17.5 km/h) than on the coast (14.4 km/h). The cruising speed was about 30 km/h, as set by the Elan or Spirit. Many short halts for such purposes as rewarming freezing hands, load relashing, etc., were mainly responsible for the average speed being so much lower.

REPAIRS

Spare parts carried included bogie wheel sets, springs, fuel pumps, pistons with rings, needle cages, carburator, recoil starter parts, gaskets, drive belts, fuel filters, spark plugs and extra leads. The electrical system of the Alpine gave us some trouble. This was never completely repaired but was not too important as it did not effect the ignition system. As will be described in the next section, an axle on the Alpine was damaged accidentally. The two bolts which secure the power-take-off side of the engine of the Elan to its mounting springs were broken on the last day of travel. This was not repaired in the field, rather, speed was reduced over rough surfaces. Both the Spirit and the Elan lost a couple of bolts which secured the engine cooling shroud. The resulting vibration was the source of much noise. Neither drive belts nor spark plugs were changed. Suspension damage, i.e. broken springs, is to be expected. On this trip none occurred.

ENGINE STARTING

The engines were easier to start if they were primed about fifteen minutes prior to attempting to start them. Incidentally, when pulling the starting cord, do not pull back behind your body as this straightens the arm at the elbow. This can and did result in a painful and long-lasting affliction identical to "tennis elbow". The author developed this in both elbows, having switched arms when the first became painful, unaware of the cause.

It was our practice to warm the engines thoroughly in the morning and after the noon radio sked. We also allowed the engines to idle for some time when stopping for the sked or to camp so that they would cool evenly.

MIRRORS

The snowmobiles were fitted with convex mirrors. These were next to useless. It was impossible to keep track of following snowmobiles as they could only be seen if they were less than 20 m or so behind. At this distance they appeared to be on the horizon. It was necessary for the leader to stop at intervals and turn around to see where everyone else was. Turning around while driving is not recommended. Each machine should have two plane mirrors, one set for the kneeling position, and the other for sitting. These should ideally be on opposite sides of the cowling.

ACCESSORIES

Each machine should have an odometer and an hour meter. Another useful addition would be a pocket or a clip for maps and a notebook and pencil somewhere on the cowling where it is handy. Heated hand grips, if they work, would be a blessing. Consideration should be given to adding a second throttle which could be operated by the left hand.

SLEDGES

DESIGN

The sledges were modelled after the Inuit komatik. Their construction has been described by Arima (9). George Qulaut of the Eastern Arctic Scientific Resource Centre at Igloolik kindly offered advice and instruction on the subtleties of the design and construction. The scale model which he built at our laboratory was used to produce full scale patterns in stiff paper which were subsequently transferred to the wood. Somehow, in the transition, some of the simple elegance of the Igloolik style was lost, but the result was satisfactory in performance. Although a komatik appears to be an unsophisticated design, it incorporates some quite ingenious features. The design continues to evolve following the change to snowmobiles from dog teams.

The completed komatiks are very strong. Since the pieces are lashed together the joints can deform slightly to absorb the shock of hitting an obstacle. The strain is distributed over all of the crosspiece/runner junctions. They also flex so that the runners can independently conform to the terrain to some extent.

They pull very easily. In local trials, one komatik was loaded with 540 kg of concrete blocks and pulled at 25 km/h by the Elan. On the snowroad the drag coefficient of one of the komatiks averaged only 0.04. In the deep snow on the Moose River, it was estimated from travel speed with and without the sledge to be about 0.08. They are however heavy, weighing about 100 kg.

Because of their length, they are hard to turn in deep snow. In turning, snow on the inside of the turn next to the runner and between the runners must be pushed aside. At the back, snow on the outside of the turn is pushed aside. The centre of mass of the loaded sledge was as close to the back as possible to gain advantage when pulling the sledge over obstacles. This may have made turning more difficult. As George Qulaut had suggested, the centre of mass should probably be just behind the centre of the load carrying platform.

MATERIALS

The runners were made from kiln dried straight-grained, knot-free BC fir planks which were acquired rough, and then minimally planed. These planks were nominally 2 inches by 10 inches by 16 feet. At the time of writing, lumber is still bought and sold in English units. In metric units, this is 5 cm by 25 cm by 5.5 m. To build three komatiks, eight planks were purchased so that the best six could be chosen. Initially, it was hoped to buy 20 foot lengths of 3x10, finished. The lowest price available was $260.00 per plank and the highest, $450.00 per plank. This seemed too expensive. The planks which we used were purchased for $75.60 each. They were stored in an unheated room through December, and then taken to the carpentry shop in pairs as they were required. In the heat of the shop they developed splits and warps. After being cut and fashioned into runners, one set was so badly split that 6 mm fir plywood was laminated to it on both sides with white glue and nails every 10 cm or so around the perimeter. As soon as possible, the runners were coated with urethane floor sealer. In the north, komatiks are usually built outside, and thus runners would be less liable to warp and split. Sitka spruce is also recommended for runners. It is more expensive, but is said to be less prone to developing splits.

About two-thirds of the crosspieces were made from scrap birch. The rest of the crosspieces were made from spruce two by fours. These were lashed to the runners with 3/16" braided nylon line (0.5 cm). Each runner required about 15 m of line, plus that required to lash on the first and last crosspieces which are lashed separately as they are most prone to breakage. This line was also used to lash the load. In total about 165 m of this useful line were required for the three komatiks. Another 10 or 15 m would have made load lashing more convenient.

Runners were shod with UHMW 1900, ultra-high molecular weight polyethylene. Strips, 5 cm wide and 1.3 cm thick were attached to the full length of the runners with wood screws. These were somewhat scratched from being pulled over the gravel on the streets in town and in garages, but were not otherwise appreciably worn after 700 km.

The cost of materials in each komatik was about $280.00.

TOW ROPE

Half inch (1.3 cm) braided nylon anchor line was used for the pulling rope which was in the form of a "Y" with the base attached to the snowmobile, and the two top arms attached to the runners of the sledge. The top part, the "V-shape", was long enough that it could reach the back of the sledge when attached. The single rope was tied so that it could not slip to the centre of the "V". The knot was about half way between the snowmobile and the sledge where it tended to drag a bit on the snow. This did not damage it.

It is possible to entangle the tow rope in the track of an Alpine or any other snowmobile with a reverse gear. Care must be exercised when reversing, especially in soft snow which holds the rope up so that it can be picked up by the track rather than simply driven over by it. This happened to the Alpine on Trial Run. The inside end of the left rear axle was popped out of its bearing. The repair job this necessitated caused much temporary suffering and a loss of several hours.

A rigid tow bar would give the extra control needed on town streets, the snow road, and in rough ice. The locals used tow bars, as do many others throughout the north.

LOADS

Initially, each sledge carried approximately 220 kg of mixed fuel in 12 fuel cans lashed onto the back half of the sledge in four rows of three cans. They were used from front to back so that the centre of mass would remain close to the back. The platform was first covered with cardboard boxes open at the top, about 25 cm high. This was intended to help keep the fuel cans from slipping, and to protect the crosspiece lashings from abrasion. This was not entirely satisfactory. A flexible box with rigid sides and one strap or lashing for each row of fuel cans is recommended.

Two of the sledges used the load covers from the standard CF "two hundred pound" toboggan. A piece of 6 mm fir plywood was cut to fit inside the cargo tank. Holes were bored through the plywood floor so that it could be tied in four places to the load platform crosspiece of the komatik. This held it securely even when the sledge tipped. The cargo covers could have been larger and it was unfortunately necessary to sometimes undo the whole thing to get at something inside -- a considerable inconvenience in the cold.

CLOTHING

The clothing worn on Trial Run consisted of standard mukluks, combat trousers and shirt, insulated trousers, standard or commercial snowmobiling mitts and an inner and outer parka. The shells of this clothing were coated with Dermoflex, which is completely wind proof but water-vapour permeable. A modified form of the DREO cold-weather head protector was worn by two of us continually, and by one for half of the trip. For the other half of the trip, the third member used an advanced development model of the new respirator. The latter proved to be more reliable, and offered better vision and equivalent protection.

The weak point in the system is the mitts. Heated handgrips should be tried. Fifteen minutes of travel left the throttle thumb in particular, excruciatingly cold. Hands were alternately cold and hot as the engine cooling system was used to rewarm them, sometimes excessively. Chemical heat sources, small packages which produce heat when exposed to air seemed to help. These were unfortunately too large to fit into the thumb of the mitt.

The entire body cooled excessively (to our surprise, see Effects on Personnel). This made it impossible keep hands and feet warm.

POLAR BEARS

Polar Bear Provincial Park is a major winter denning area. These bears are rarely seen south of Akimiski Island. In mid-February, few bears would have left the dens. These would be female bears with new cubs, who would be anxious to avoid humans. The male bears are on the floating ice or at the edge of the land-fast ice where seals are easier to catch, although they may frequent the land-fast ice to find agloos, seal birthing dens. Only shotguns loaded with slugs are permitted in the park. Consult recent works concerning deterrence and prevention of bear encounters (10,11,12). When we had passed Akimiski Island we had planned to use two tents each night. One to sleep in, pitched up wind from the other in which we cooked and ate. This is an elementry precaution. As well, we had fashioned a "trip wire" bear alarm which was to be deployed around the tents. The officials at Moosonee assured us that it was extremely unlikely that a bear would bother us.

EFFECTS OF TRAVEL ON PERSONNEL

VIBRATION AND COLD

Soft snow less than half a metre deep, such as that found on grass covered flats, was preferred for travel. On the ice itself, the snow cover tended to be a combination of hard and soft drifts which resulted in a rough ride. A rough ride was also a cold ride. On the small machines, the drivers had to kneel on the seat so that the knees could be used to absorb some of the shock of pounding over drifts at 30 km/h. This put the upper body into the windstream over the windshield. This position also caused forced ventilation of the air in the clothing each time the hips and knees flexed resulting in the unexpected cooling mentioned earlier. The skin on the knees were abraded. The discomfort caused by this "rug burn" was preferred to the vibration which was experienced when riding in a seated position for more than a short period when the surface was rough. The driver of the Alpine was less affected by the cold possibly since it rides more smoothly over (or through) drifts, and produces twice as much waste heat.

NOISE

Ear plugs were taken but were sometimes forgotten. After leaving the tent it was too inconvenient to find and to insert them. Some people cannot tolerate them for long periods. The noise was loud and continuous. Even during short halts, we would congregate at one snowmobile or an other to shout a few words over the din of the engine while warming our hands with the engine heat.

FATIGUE

A typical day's travel covered 95 kilometers, over a period of about six hours of actual travelling. Getting away in the morning was a slow process. Typically, we were not ready to leave before 10:30 after waking up at 6:30. By the end of the day, in which, on the average about 9.5 hours had been spent outside of heated shelter with no food or water since breakfast, we were very fatigued and cold. A subjective fatigue checklist was filled out in the morning and in the evening. At the end of eight days the averaged fatigue ratings were equivalent to those of groups of men who had been without sleep for periods of 48 to 60 hours. It is possible that with a very convenient and easily pitched shelter, that after a rest of an hour or more and a meal, a few more hours of travel would have been possible. We did not travel, except on the last day, very long after sunset.

CARBON MONOXIDE

It has been reported that CO poisoning can be a serious problem when driving a snowmobile for a long period of time on a constant heading when the apparent wind is from the right direction (13). On Trial Run the CO content of the hemoglobin in the blood was measured by determining the content of CO in expired air. Although this test was carried out in a tent heated by open flame stoves, the results of two tests on two separate days indicated less than 2% saturation. Smokers are normally about 5% saturated. Further testing would be required to rule out the possibility entirely, as wind direction is critical, apparently.

CONCLUSION

The James Bay area is easily and cheaply accessible. It has a secure ice cover in mid winter, a variety of snow conditions, a climate which is often severe, and infrastructure which would be useful in mounting trials or exercises.

The snowmobile/komatik combination makes long distance unsupported winter travel above the treeline possible. The Elan and Spirit carried enough fuel and other requirements for a traverse of at least 1400 kilometres.

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APPENDIX A

TRIAL RUN RADIO COMMUNICATIONS

L.D. Reed

The field party was equipped with a military radio system (AN/PRC 515 transceiver plus spare and accessories) capable of high frequency (HF) operation on upper side band or morse code with a maximum power output of 20 watts. The primary antenna used with this transceiver was a corner fed delta loop provided by Dr. J.S. Belrose of the Communications Research Centre (CRC) of the Department of Communications. The loop was cut for the main frequency (approximately 10.2 mHz). An adjustable dipole antenna system developed by Dr. Belrose for northern "Trial Radio" operations was also carried by the field party. At Ottawa, the radio equipment of CRC was used. The directional antenna used was a large log periodic array (25 × 20 m at a height of 32 m).

This equipment was intended to allow communications between the field party and Ottawa (with the assistance, if necessary, of CFB Borden) during the noon halt. Poor conditions prevented communications on only one day of the trip. With good conditions, the field party was able to transmit effectively to Ottawa using a power of only two watts. Scheduled communications were established mainly to relay information such as weather forecasts and SARSAT fixes of the position of the previous night's camp to the field party.

Additional radio equipment was provided to the field party by the Department of Energy, Mines and Resources (Polar Continential Shelf Project (PCSP)). This included a small 1.6 to 8 mHz, 10 watt, crystal controlled, single sideband receiver (Spilsbury Communications Ltd. Model SBX-11A) and a mast and two-dipole antenna system devised by Mr. H. Splett for use by PCSP field parties. Communications between the field party and Ottawa were successfully established with this equipment on the two evenings it was used.

The radio equipment carried by the field party provided the capability of operating on a variety of HF frequencies including those normally used by the station at CRC, PCSP field parties, the Military Aeronautical Communications System (MACS) and the frequency (4.48 mHz) used by field parties reporting to the office of the Ontario Ministry of Natural Resources at Moosonee Ontario.

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13. ABSTRACT

This paper is written as a guide to expeditions by snowmobile on the West Coast of James Bay based on experience from Trial Run, 1986. Access, accommodations, rail transporation, terrain, snow cover, ice conditions, communications, polar bears, the performance of snowmobiles and sledges and other pertinent subjects are examined. (U)

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CARBON MONOXIDE POISONING
COLD WEATHER OPERATIONS
EXPEDITIONS
FUEL CONSUMPTION
JAMES BAY
LOGISTICS
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POLAR BEARS
RADIO COMMUNICATION
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