

*Equipment and Provisions for the JARE
South Pole Traverse 1968-69*

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1. Equipment

Clothing used by the JARE South Pole Traverse party proved to be highly satisfactory, in both quality and quantity.

As a matter of fact, the clothing had been much improved for the conditions expected on the way to the South Pole, such as climate, working condition, living condition in the snow vehicle, and so on. Since the first expedition in 1956, JARE has been developing its original antarctic clothing referring to that for Himalayan or antarctic expeditions by other countries. A sufficient supply of antarctic clothing and personal equipments carefully developed and prepared for this traverse, in accordance with changes in the mode of travel; on foot, by dog sledge, snow vehicle KC20 series, and KD60 series.

It should be mentioned that the active use of synthetic fibers as a clothing material by JARE has been quite remarkable. Experts on equipment have eagerly adopted the successful outcome in clothing materials. Synthetic fibers, artificial leather, synthetic fibers for filling, and synthetic rubber took the place of natural fibers, fur, down, wool and rubber to a great extent, and were used also in treatment and sewing such as boa lining and quilting. Test samples of these new materials were made and tried before they were put to practical use in the Antarctic. Thus, as far as the clothing was concerned, no anxiety was felt in starting this traverse.

In the early stage of the traverse, between late September to early October, the traverse team experienced the severest climatic condition of this journey. Daytime was short and temperature fell down from -30°C to -60°C as the elevation increased from the sea level to 3,800 m above sea level. Southeastery wind of 10 to 15 m/s was frequently experienced during this period, and coldness index indicated more than $2,000 \text{ cal/m}^2\cdot\text{h}$. Under these conditions, the journey made little progress and there were many outdoor works to do such as transferring loads from one sledge to another, shovelling snow from caterpillars of the snow vehicles, joining and disjoining sledges, and so on. Clothing was consequently

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heavy during this period, as follows: Russian "ushanka" headgear, silk scarf or heavy woolen muffler, thick woolen underwear, flannel shirt, quilted underwear and drawers, ski trousers, wolverine fur-trimmed jacket, nylon anorak and drawers, woolen gloves, heavy mittens, Norwegian greasy woolen socks, polyacrylic chloride ("Kanekalon") pile socks, snow boots or mukluks. Blanket was put inside the double-layered sleeping bag, and those who were exposed in the field for astronomical or geomagnetic observations were wearing down-filled parka and trousers.

After the middle of November, when the journey advanced into the inland of Antarctica, the sun never set and the temperature rose to -30°C . The weather was generally fine with no wind and then coldness index went up to between 1,000 and 2,000 $\text{cal}/\text{m}^2\cdot\text{h}$. As the effect of solar radiation was great, especially in the polar high pressure belt, the black-painted outer wall of the vehicle was scorched, becoming almost untouchable by bare hands, and the room temperature inside the vehicle sometimes became $+30^{\circ}\text{C}$ while the outdoor temperature was -30°C . During this period, clothing became quite light except when working a long time outside. Example of the normal wear was a skiing cap with boa lining and ear muff with laps, heavy underwear, trousers, nylon windproof suite, woolen gloves, leather gloves, woolen socks, snow boots, and single-layered sleeping bag. Even when the difference in the temperature was great, as from $+20^{\circ}\text{C}$ inside the vehicle to outside temperature of -60°C , proper dressing and undressing, and insulating effect of the cloth itself relieved the temperature difference and caused no physiological troubles to the team members.

As for the personal equipments and camping tools, a careful planning and preparation, with consideration for a long journey under severe conditions and the limited space available in a vehicle, were made by the crew of each vehicle during the preparation period at Syowa Station.

Clothing: During the trip to and from the South Pole, most of the team members were the following clothes:

Under-garments: Cotton shirt, one or two wool shirts, and long, loose woolen underpants.

Insulating layer: Woolen sweaters and trousers. The roomy and bulky eiderdown suit, and the parka with a hood. The down suit gave all the warmth needed for observers and mechanics who had to stay a long time outside the vehicle.

Windproof suit: Anorak and trousers, made of nylon cloth, were large enough to fit loosely over the eider down suit. Anorak was a simple pullover smock with a hood. Parka was made of polyester chloride ("Tetron") with hood lined with polyvinyl chloride fiber ("Teviron") boa.

Vest: This was made of Tetron cloth and it was adjustable to fit over the clothing and had a hood hemmed with wolverine fur.

Hand wear: Each member had one pair of thermal mittens lined with Teviron boa, "Bear paw" mittens with Teviron boa, two pairs of nylon mittens lined

Table 1. Personal and common equipments.

1. Field equipment	(Quantity)	(Weight)	(Total weight)
(Item)			
Canvas sheet, Vinylon	7	4.0 kg	28.0 kg
Duralumin stakes, 2 m	6	3.0	18.0
Bamboo markers (poles)	1,900	abt 0.2	270.0
Man-hauled sledge	1	25.0	25.0
Skis	3	5.2	15.6
Ski stocks	6	0.4	2.4
Rope-ladder, 6 m	3	6.0	18.0
Pick, large	3	4.0	12.0
Snow-shovel	14	1.8	25.2
Rope, Tetoron 11 mm, 30 m	10	3.0	30.0
Karabiner, large	5	0.2	1.0
Karabiner, small	10	0.1	1.0
Frame pack, duralumin	2	1.5	3.0
Ice axe	10		7.0
Ice piton	20		3.0
Crampon	4	1.0	4.0
Tent, pyramid 5 men	2	25.0	50.0
Mattress	12	0.5	6.0
Brush	6		2.0
Candle, 40 g	10		0.4
Tent repair tool	1		4.0
2. Clothing	(Per head)		
Windproof suit, nylon	2	0.88	1.76
Vest with hood, wolverine	1	0.33	0.33
Ski jacket and trousers	1	0.95	0.95
Cold weather jacket	1	1.50	1.50
Quilted jacket and trousers	1	0.90	0.90
Field trousers, wool	1	0.73	0.73
Muffler, wool	1	0.23	0.23
Balclava cap	1	0.12	0.12
"Ushanka" headgear	1	0.30	0.30
Sweater	1	0.47	0.47
Woolen shirt	2	0.42	0.84
Heavy underwear	2	0.52	1.04
Light underwear	3	0.40	1.20
Undershirt, netted	2	0.20	0.40
"Bear paw" mittens, nylon cloth with Tevicon boa	1	0.54	0.54
Thermal mittens, lined with Tevicon boa	1	0.42	0.42
Tetoron mittens, lined with Tevicon boa	2	0.50	1.00
Shell leather gloves	4	0.15	0.60
Buckskin gloves	2	0.03	0.06
Heavy woolen gloves	3	0.09	0.27
Light woolen gloves	5	0.03	0.15

(Item)	(Quantity per head)	(Weight)	(Total weight)
Tetoron gloves	5	0.03 kg	0.15 kg
Thin socks, Tetron	5	0.04	0.20
Thin socks, cashmere	2	0.04	0.08
Socks, Kanekalon pile	5	0.08	0.40
Woolen socks	4	0.09	0.36
Mukluk	1	1.94	1.94
JIX snow boots, D type	1	1.50	1.50
Sleeping bag, double	1	7.30	7.30
Clothing bag	1	0.26	0.26
3. Cooking utensiles			
Kerosine stove, Corona	6	1.5	9.00
Svea stove	3	1.2	3.60
Primus stove	1	1.5	1.50
Stove repair tool	1 set	2.0	2.00
“Meta” tablets	180 c/s		25.00
Wind proof matches	10 c/s		1.00
Cooking set	3	5.0	15.00
Kettle, 2 l	1		
Frying-pan	1		
Cooking pot	1		
Sauce-pan	1		
Can opener	1		
Knife	1		
Table-spoon	1		
Tea strainer	1		
Chopping board	1		
Mug	4		
Bowl	4		
Plate	4		
Chopsticks with case	4		
Fork and spoon	4		
Dish-cloth	4		
Brush	1		
4. Miscellaneous goods			
Adhesive tape	10		
Bond cement	2		
Kitchen table	2		
Head lamp	3		
Dry battery, 1.5 V	20		
Spare lamp	10		
Pocket warmer	4		
Thermos	6		
Smoke candle	4		
Snow marker	4		
Sewing set	2		
Wash-basin	2		

(Item)	(Quantity per head)
Tooth brush	2 dz
Tooth paste	2 dz
Soap	2 dz
Kitchen cream	1 dz
Hair clipper	1
Electric razar	2
Pencil	2 dz
Felt pen	2 dz

with Teviron boa, four pairs of leather gloves with wool inside, two pairs of soft leather gloves three pair of thick wool gloves, and five pairs of Tetron and wool gloves. It was most usual for all members to use shell leather gloves in ordinary work including driving, and nylon mittens in outside work excluding such a delicate operation as requested in astronomical observation and gravity measurement, etc.

Socks: A variety of long and short woolen socks were taken, and each member had one pair of nylon cloth socks filling with tetron staple for camp use.

Boots: Each member had one pair of JIX boots D-type, made of low-moisture Teviron canvas, felt, and staple filling with moulded rubber sole, designed to give protection against antarctic coldness. The boots were most useful during the trip. All members had one pair of Mukluk with Nylon cloth inner socks filling with Teviron staple quilting, which was protected from sweat. This knee length Mukluk, made of stout Tetron canvas which fitted loosely, was a success. On the other hand, half-high boots made of synthetic leather was neat enough and tough enough to be worn continually during the trip, instead of, as first intended, only inside the vehicle.

Bedding: Each member of the party had two sleeping-bags made of nylon cloth, stuffed with Tetron staple. The larger outer bag weighted about 3.7 kg, and the smaller inner bag 2.6 kg; the bag had a zip-fastener, along one side and across the foot, and could be opened up as a quilt. The combination allowed a great deal of adjustment to suit temperatures which varied from the severe cold of pre-austral summer to the mid-summer heat in the antarctic plateau.

Personal and common equipments are listed in Table 1.

2. Provisions

2.1. Planning

In planning the food for the South Pole Traverse we tried to keep the balance between simplicity, which may easily lead to boredom, and luxurious variety. The ration was composed on the basis of the following conditions:

- (1) Ordinary food for 12 men for 150 days and emergency food for 12 men for 30 days were to be prepared.
- (2) Daily ration per head had to be within 1.5 kg in weight.

(3) According to the daily ration system, ordinary food was to be prepared in 150 boxes.

(4) Daily total caloric intake had to be over 5,000 cal.

(5) As meals would be taken in both KD604 and KD605 vehicles, the convenience of cooking was taken into consideration when the ration was composed.

2.2. Use of the ration

A total of 150 ration boxes, each weighing approximately 15 kg, consisted of two kinds of contents, the basic food plus additional A (A-ration) and the basic food plus additional B (B-ration). The food in each box was for three men for four days. Each item was packed in bulk, because we did not wish a man to be confronted each day with a "one-man-day" pack containing minute amounts of several foods, some of which he might not like.

A group of six men was to take one A-ration containing basic food for the first two days and additional food for 4 days and one B-ration containing basic food for the following two days and additional food for 4 days, while the other group was to take A and B rations in the reverse order, so that they could take various food containing different kinds of nutrients. Besides these rations flavoring of proper quality and quantity was prepared in the kitchen of the vehicles and it was allowed to resupply them in compliance with the requirements.

2.3. Characteristics of the ration

(1) A wide variety of food was chosen lest the expedition members should get tired of the food during a long trip. About 100 kinds of materials were used.

(2) In order to make cooking easier, materials were classified into breakfast, lunch, supper, and snack, which were prepared so as to have three main nutrients taken every day. Carbohydrate was used for the snack as a temporary source of energy which is quickly absorbed. Thus, confectionery was always provided in each vehicle. Protein and lipid in the form of beef, pork, and chicken, were concentrated in the supper which was the heaviest meal of the day.

From these rations the following nutritive value was expected: total caloric requirement about 5,200 cal/day, protein about 170 g/day, lipid about 235 g/day, and carbohydrate about 560 g/day. (Actual intake was calculated by time-study and the results are given in the chapter on medicine.)

(3) Because of the weight limit, few canned food were included.

(4) Spices were carried in the form of raw material without processing.

(5) Many kinds of frozen fresh food were made available.

(6) Enough vitamins were provided as pills.

2.4. Consideration of the results obtained

(1) No complaints about the food were heard at all, and the only special desire expressed was for beer.

(2) Changes in body weight during the traverse (all the members lost 3 to 6 kg) did not seem to be due to the food.

(3) Powdered fruit juice should have been provided.

(4) As it was warm in the vehicle compared with a severe cold temperature in the open air, it was possible to cook fancy food, which must have added to the members' enjoyment of their meals.

Table 2. Composition of ration.

1. A-ration

(a) Basic food (for 12 men/day)

Corn flakes	200 g × 2 boxes	400 g
Meat (beef, pork, beef, chicken) or (pork, beef, pork, chicken)	12 pcs	2000
Ham	abt 20 g × 12 pcs	250
Bacon	abt 20 g × 12 pcs	250
Milk		200
Frozen egg		250
Powdered egg		300
Chinese noodle	85 g × 6 bags	510
Rice cake (glutinous, milled)	1 piece	800
Bread	400 g × 3 pcs	1200
Dried meat		300
Cheese	225 g × 3 packet	675
Cookies		800
"Senbei" cracker		(230)
Biscuit		(160)
Rice cracker		(160)
"Rusk" biscuit		(150)
"Karinto"		(100)
Candy and others		1030
Sweet jelly beans	small-6	(315)
Chocolate	large-1 } small-6 }	(215)
Wheat-gluten		(100)
Raisin		(100)
Cashew nut, peanut		(150)
Chewing gum		(50)
Peanut cracker		(100)
Honey	150 g × 3 pcs	450
Alpha-rice (steamed and dried)	160 g × 10 bag	1600
Vegetables (dried and dehydrated) (Stone-leek, onion, spanish paprika, french bean, carrot, spinach)		200
Butter	225 g × 3 pcs	675
Soy bean paste (miso)		500
Sugar		1000
Salt		100
"Nori" (purple laver)	10 pcs	20

Pickles		200
(Pickled greens, pickled radish, chinese cabbage, spinach)		
2 rolls of toilet paper and 2 boxes of matches		
Drugs, vitamins (vitamin C, multivitamins)		
	Total	13,710
(b) Additional food (for 12 men/day)		
Cigarettes		400 g
"Peace"	50 pcs × 2	
"Hi-lite"	20 pcs × 8	
"Midway"	20 pcs	
"Abdulla"	25 pcs	
"Capstain" tobacco	2 ounce	
"Old port" cigar	5 pcs × 2	
Boiled fish paste	1	180
Salmon roe		80
Cod roes		70
Dried fish (shisyamo)		80
Swellfish		80
Shell-ligament		40
Potatoes, dehydrated		40
Caviar		40
Pudding		14
Instant curry cube		60
Dried mullet roe		32
Scraped tangle		10
"Wasabi" preserved in sake lees		60
Fish flour		40
Salami		80
Sake lees		20
"Azuki" beans (boiled and seasoned)		60
	Total	1,326
	Grand total	15,036

2. B-ration

(a) Basic food (for 12 men/day) is the same as in A-ration.

(b) Addition food (for 12 men/day)

Beverages	700
"Ovaltine" (Millo)	(400)
Coffee	(120)
Black tea	(100)
Green tea	(80)
Roux	150
Starch	50
Herring-roe	50
Salted tangle	50
Sliced vegetables preserved in soy sauce	50

Rice flour noodle		140 g
Mushroom		40
Dried bonito		50
Eel		120
Salmon		140
Japanese hotchpotch		80
Fish paste		40
Pickled plums		20
Sea urchin		26
Salted fish guts		14
Dried bean curds		10
Light cake made of wheat gluten		28
Dried fried beancurd		10
	Total	1,768
(a) + (b)	Grand total	15,478
3. Flavorings		
“Shoyu” soy sauce		46 l
Garlic	A proper quantity	
Pepper	“	
Salt	“	
Curry	“	
“Ajinomoto”	“	
“Ajimate” (glutinate)	“	
Wheat flour		4 g
Juice (lemon, strawberry, vanilla)	A proper quantity	
Concentrated whisky		150 l
4. Emergency food (for 12 persons for 30 days)		
Meat		40 kg
Butter		23
Cheese		15
Salt		
Powdered bean paste	}	
Powdered soy sauce		
Starch		
Eutrophic (vitamins)		
	Total	96