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Special Report 18
 PROJECT JELLO
 SIPRE Greenland Expedition 1955
 Report on special foods provided by the
 Quartermaster Food and Container Institute

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PROJECT JELLO: SIPRE Greenland Expedition 1955
Report on special foods provided by the Quartermaster
Food and Container Institute

by
C. S. Benson and R. H. Ragle

ABSTRACT

Expedition "Jello" of the Snow, Ice, and Permafrost Research Establishment (SIPRE) conducted a program of glaciological research for 100 days on the Greenland Ice Cap during the Spring and Summer of 1955.

The expedition was resupplied entirely by air drops which were spaced approximately 30 days apart. This report discusses the specific logistic problem of food and its solution. The problem was two-fold:

- (1) To provide a proper and adequate diet for six men engaged in strenuous physical work at high elevations and low temperatures. These conditions result in increased food consumption.
- (2) To restrict the necessary food-cargo weight per man-day so that it did not equal nor exceed the figure required for a diet of C-6 or 5-in-1 rations.

During the Winter of 1955 the Quartermaster Food and Container Institute, Chicago, Illinois, worked with SIPRE to solve the problem. Special dehydrated and frozen foods were utilized with excellent results.

The expedition personnel were provided with a greater quantity and variety of foods than could have been obtained with 5-in-1 or C-6 rations; however, the total required weight was significantly less than that required by either 5-in-1 or C-6 rations or combinations thereof.

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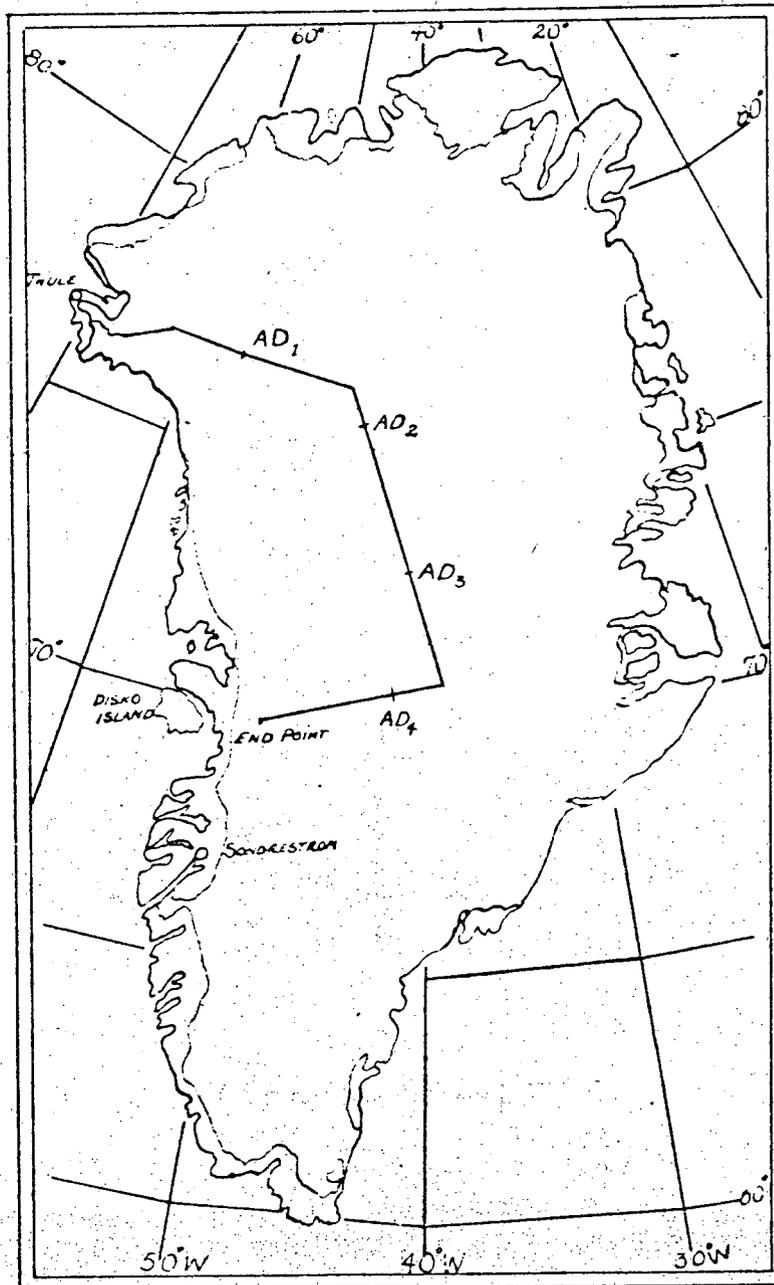


Figure 1. Sketch Map of Project "Jello" Route
13 May - 22 August 1955.

INTRODUCTION

Expedition Jello of the Snow, Ice, and Permafrost Research Establishment (SIPRE), Corps of Engineers, U. S. Army, spent 100 days on the Greenland Ice Cap during the spring and summer months of 1955. The expedition included two glaciologists from SIPRE, a physician, and three graduate students as follows:

Carl S. Benson, SIPRE (glaciologist)
Richard H. Ragle, SIPRE (glaciologist)
Robert W. Christie, M. D., Dartmouth Medical School
(expedition physician)
James B. Holston, Northwestern University (expedition radioman)
Alan C. Skinrod, Northwestern University (expedition mechanic)
George Wallerstein, California Institute of Technology
(expedition navigator)

The men arrived in Thule, Greenland, on 13 April 1955 and spent a full month preparing for the field season on the interior of the ice cap. Six sleds were built, essentially from the runners up. Two were wannigans (covered wagons on runners) constructed of light-weight material such as cardboard, glasswool, and canvas. The other four sleds were specially modified to be towed as pairs hooked in tandem behind a weasel. One of each pair carried fuel while the other carried food. Transportation was provided by four M29C weasels which had been modified according to SIPRE specifications.

The expedition began its trip at the edge of the ice cap near Thule, Greenland, on 13 May 1955 and traveled eastward to a point near the center of the ice cap ($76^{\circ} 58' N$, $46^{\circ} 59' W$) where it turned southward and followed closely along the west side of the "crest" for 425 mi. At the end of the north-south traverse ($71^{\circ} 05' N$, $38^{\circ} 58' W$), a westward turn was made. The expedition stopped 60 mi from the edge of the ice cap in the vicinity of Disko Island. All equipment and surplus food was cached at the end-point ($69^{\circ} 43' 55'' N$, $48^{\circ} 04' W$) for use in 1956 field season. Expedition members were picked up by a ski-wheel C-47 from Sondrestrom Air Base on 22 August 1955; thus 100 days were spent traveling and working on the ice cap, and the total distance traveled was nearly 1200 mi. (See Fig. 1.)

Temperatures

Temperatures were always below 32F (0C) and ranged from 0F to +20F during 87% of the time. Of the remaining 13% of the days spent on the ice cap, 6% averaged above 20F and 7% below 0F. The lowest recorded surface air temperature was -21.4F, and the highest recorded was +29.2F.

"Wind chill"

At low temperatures, body heat loss is primarily through the lungs and through convective transfer to the air. Evaporation of water and the warming and cooling of the air in the lungs accounts for most of the heat lost by the body, but convective transfer to the air does play a part. It is realized that any computation of convective heat loss alone may approximate less than two-thirds of the total body heat loss -

in cold climates. Nevertheless, the "wind chill factor" as computed from wind speed and air temperature is important because it provides additional information about the climate. Average monthly values of air temperature, wind speed and the "wind chill factor" are shown in Table I. It is interesting to note that the "mean climate" (in terms of wind chill) was essentially constant at a value slightly "colder" than "bitterly cold" according to the wind chill nomogram (Fig. 2).

Table I.

Month	No. days observed	Average Wind (m. p. h.)	Average Air Temp. (°F)	"Wind chill" factor*
May	18	10	7.5	1260
June	30	8	6.5	1260
July	31	9	7.0	1250
August	21	11	12.4	1225

* The "wind chill factor" is the rate of cooling of a body at neutral skin temperature (33C, 91.4F); it has the units of kcal/m²/hr (1). †

Elevations

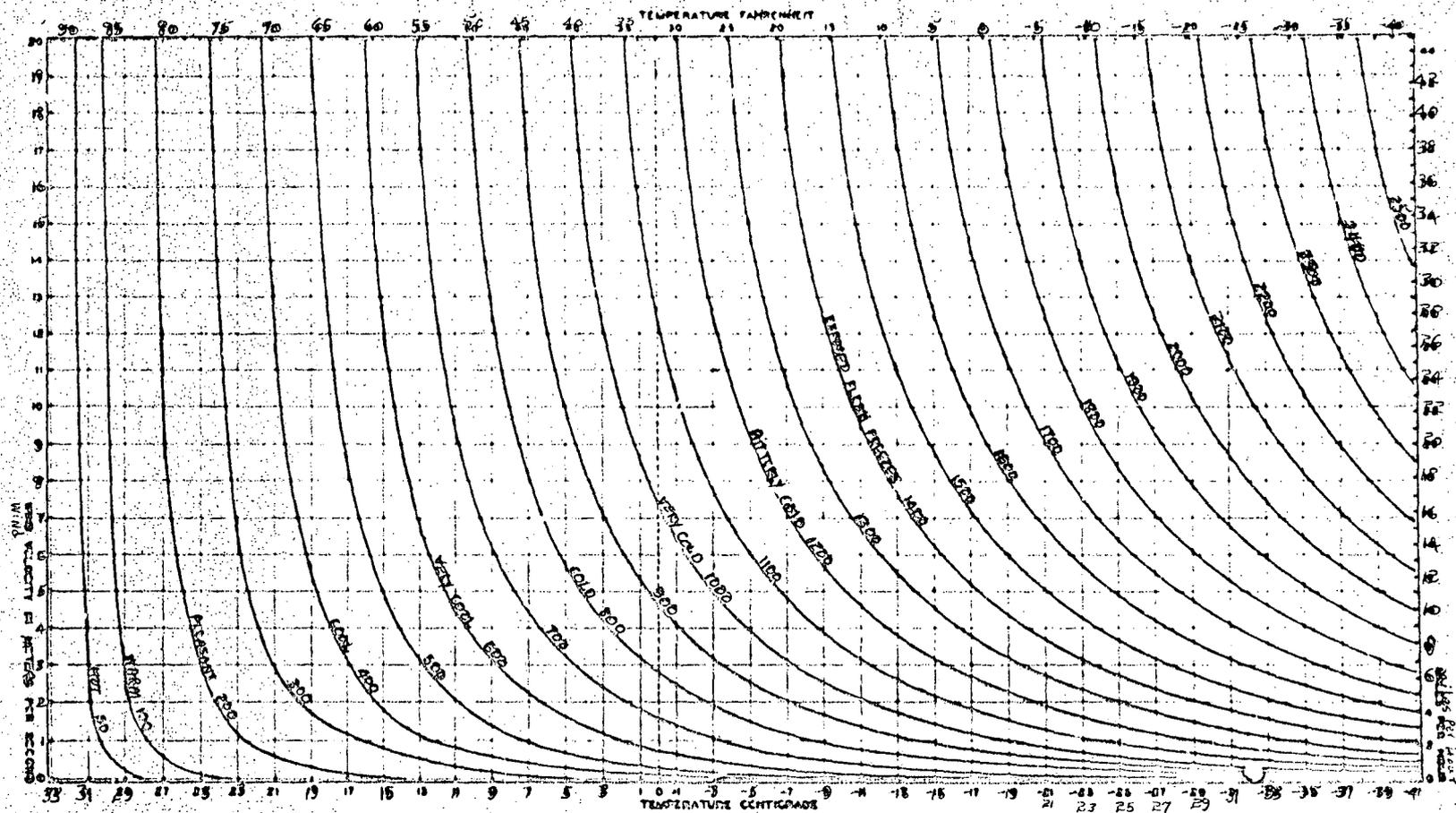
Elevations ranged from 1700 ft above sea level at the edge of the ice cap to more than 10,200 ft above sea level in the central area. The party was above 5000 ft about 95% of the total time, above 7000 ft about 78% of the total time, and above 9000 ft about 50% of the total time. (See Fig. 3.)

PLANNING

The success of this type of expedition may depend upon the inclusion or exclusion of a small detail. Weight is important, and the two largest weight factors which must be considered are the food and the fuel. With a known distance and a known consumption, fuel requirements and, therefore, fuel weights cannot be altered to any large degree. Food requirements, however, though generally similar for all small expedition in so far as staples are concerned, can be regulated both as to bulk and weight. On Expedition Jello, food and diet were carefully planned to fulfill certain particular requirements, an important one of which was minimum weight. Others are dictated by individual likes and dislikes (morale factors), nutritional needs, ease of preparation, etc.

† Numbers in parentheses refer to references cited on page 11.

SELECTION OF CLOTHING FOR COLD CLIMATES



WIND CHILL NOMOGRAM

THE "WIND CHILL" FACTOR INDICATES THE RATE AT WHICH THE NAKED HUMAN BODY LOSES HEAT WHEN EXPOSED TO VARIOUS TEMPERATURES AND WIND VELOCITIES. THIS CHART SHOWS THAT HIGH WINDS IN AREAS OF LOW TEMPERATURE HAVE A DECIDED EFFECT ON THE RATE AT WHICH THE HUMAN BODY COOLS. NOTE THAT WITH A WIND VELOCITY OF 30 MPH, YOUR FACE WILL FREEZE IN ONE-HALF MINUTE AT -32 DEGREES FAHRENHEIT.

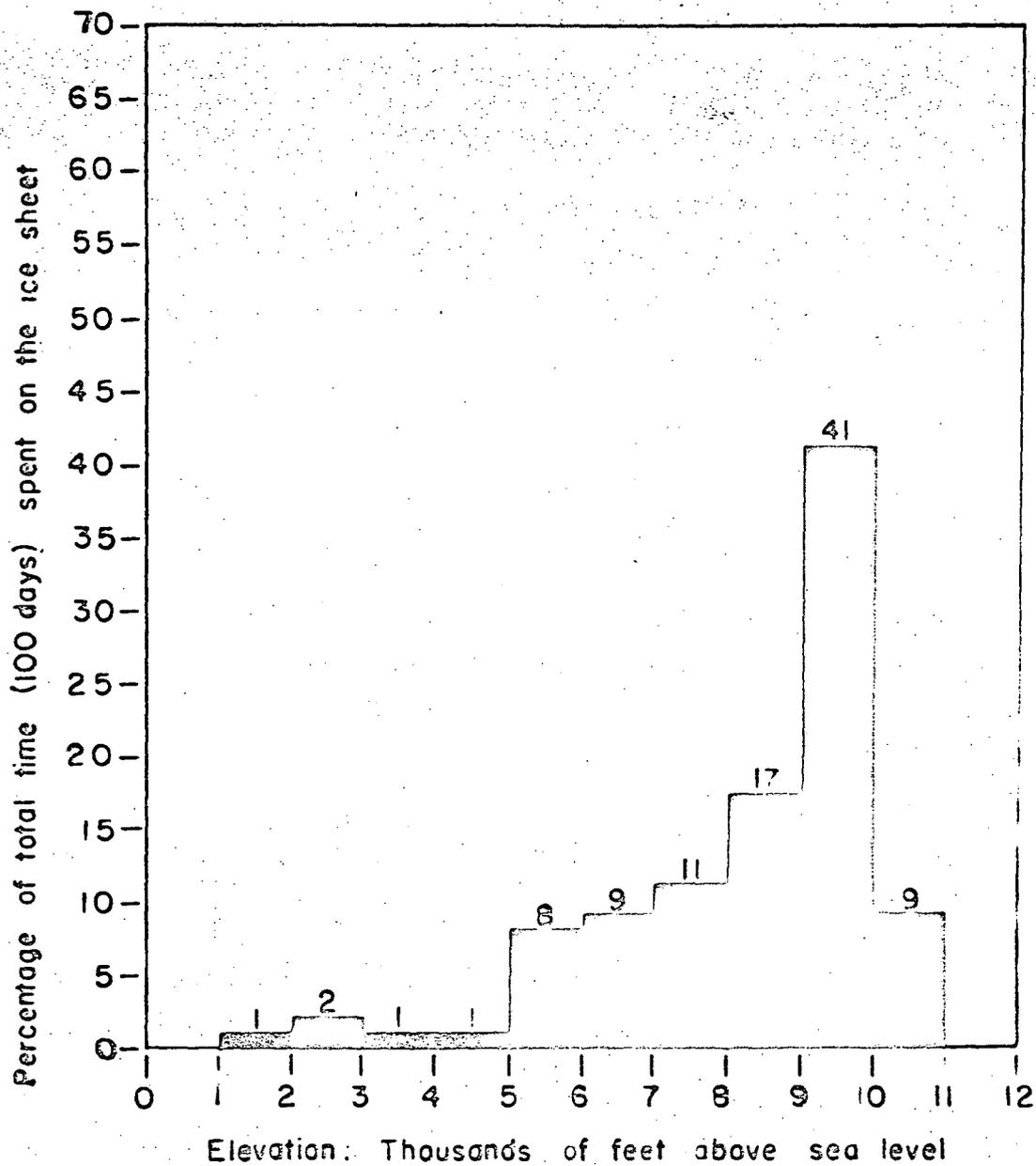


FIGURE 3

Distribution of the total time spent on the Greenland ice sheet in 1955 (100 days) according to elevation above sea-level.

Logistics

Expedition Jello had very significant logistical problems. The distance covered was 1200 mi; with four weasels this amounted to 4800 weasel mi. The vehicles actually consumed 19,850 lb of gasoline. This fuel was largely delivered by airdrop and involved handling 4770 lb of steel drums (weight of empty gasoline drums, discarded as fuel was used). In addition, fifty 5-gal gasoline cans, totalling 500 lb, were part of the basic load.

Pit stations were marked, and 181 bamboo accumulation markers and plywood accumulation boards were placed. This amounted to nearly 2500 lb of bamboo and plywood. In addition, nearly 1500 lb of scientific equipment was carried.

In planning the logistic support of the 1955 expedition, it was realized that the large food requirement of 7.4 lb per man per day had to be reduced (Crystal, 1954), (2). The distance and time relations were new, and it was realized from past experience that airdrops must be kept to a minimum. Airdrops are expensive and often difficult because of weather and mechanical failures. Dependence on a large number of them can seriously affect the working efficiency of an expedition.

The standard Army field rations, such as the individual combat C-6 rations and the small-detachment 5-in-1 rations, are not suitable for small expeditions on the ice cap which must exist independently for several months, primarily because they do not provide enough food per unit for men doing physical work in the high Arctic. In 1954 the food-cargo consumption on SIPRE's Expedition Crystal was equivalent to 1.1 or 1.3 rations per man per day based on C-6 and 5-in-1 rations respectively. Also, these rations include too many luxuries for field use. In spite of their excellent quality, much of their cargo-weight is not eatable (such as tin cans, cardboard boxes and wire) or unnecessary, such as the large quantity of fluid in canned foods. The increased food needs are due to more rapid combustion to provide body heat, and in the case of both SIPRE expeditions (Crystal, 1954, and Jello, 1955) to fairly strenuous physical exertion, which helps to run up the grocery bill. As an example, on the 1955 trip, in addition to the normal logistical work, 59 glaciological test pits were dug. Of these, 26 were at least 4 m deep, 17 were between 2 and 3 m and 13 were 3m deep. This easily amounts to over 600 tons of snow moved by hand shovels.

Increased food needs may be met by:

1. using more C-6 and 5-in-1 rations;
2. adding fresh, frozen, and canned foods to the C-6 and 5-in-1 diet;
3. utilizing concentrated foods.

The first two choices result in excessive cargo weight, as experienced by the Transportation Corps and the 1954 SIPRE Expedition Crystal. Therefore, special effort was made to procure dehydrated foods and thereby avoid carrying the fluid included in most canned foods.

The Quartermaster Food and Container Institute of Chicago, Illinois recognized the problem and gave wholehearted cooperation by providing special dehydrated and frozen foods. Their help is greatly appreciated, for without it at least one extra airdrop would have been required.

The food consumption on Jello was approximately 4.9 lb per man per day. This amounted to 4474 lb, which includes a 30-day safety factor. If we had allowed 10 lb per man per day, as the Transportation Corps is currently doing in similar though less strenuous operations and with the same 30-day safety factor, the food load would have been 7930 lb, a difference of 3456 lb or nearly 2 tons. Besides reducing load, the inclusion of 829 lb of specially dehydrated and frozen foods enabled the personnel of Jello to eat more than the C-6 or 5-in-1 diet provides. (See Fig. 4).

The approximate range of modern sledge and mountaineering groups is indicated in Figure 4 as an extreme minimum. Mobile expeditions such as we are considering are essentially moving laboratories and workshops. They must support men who are engaged in strenuous physical activity at low temperatures for 3 or 4 months and are not expected to reach the minimums attained by sledge and mountain-climbing groups. The latter groups have their prime interest in "covering distance" rather than in research, and they seldom operate continuously for long time intervals. On the other hand, the figure of 10 lb/man day is close to that used at large permanent bases such as Thule; this must be regarded as an extreme maximum.

The members of the expedition planned their resupply and personally packed all of their foods for airdrop before they left Thule. No major planning or packaging problems were left to the support personnel who remained at the base (insofar as food was concerned). Foods were packed in barrels, and the content and weight of each was known. Certain items were cancelled simply by eliminating specific barrels from airdrops (3).

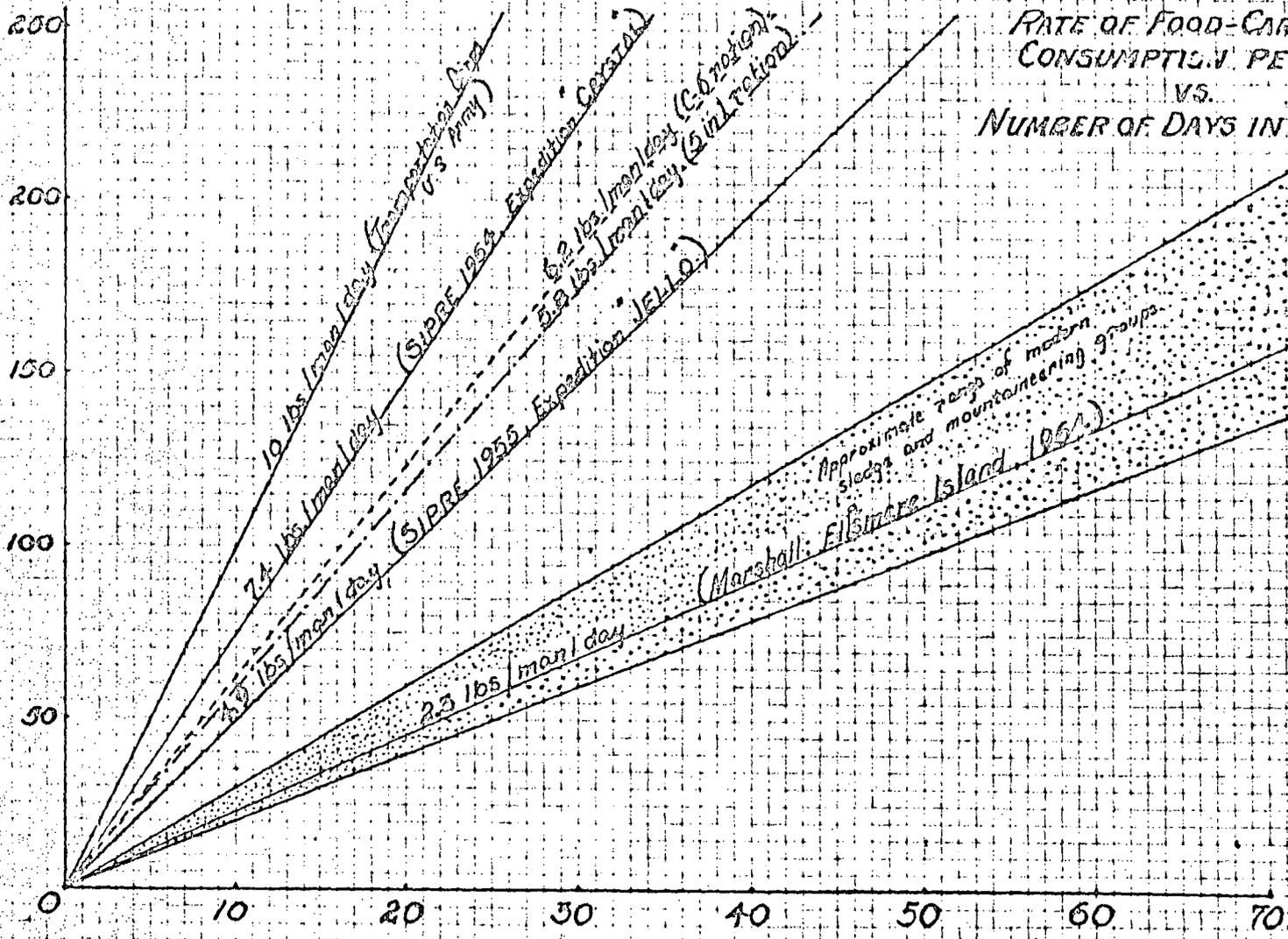
Living quarters

Living quarters consisted of the weasels and two canvas-covered prefabricated wannigans which were specially constructed for Jello in Thule, Greenland, by the expedition members. Quarters were small, seldom warm by ordinary standards, and often damp. Heat was introduced only in the evenings when physical exertion was at a minimum and was generated primarily by Coleman gas stove or to a lesser extent by Coleman lanterns. The latter were lit during twilight and darkness for plotting data, reading, and short social sessions before bed. No heat was used during the day nor when sleeping. Members of the expedition averaged between 6 and 7 hours sleep a night, which at high elevations was found to be the minimum requirement.

Cooking equipment

Cooking was done in a tent placed next to the larger of the two living wannigans in which the meals were served. Cooking utensils included a two-burner Coleman Camp Stove, a pressure cooker, an oven which fitted over the stove, two large frying pans, and assorted pots and pans from the Small Detachment Cooking Outfits. Preparation of meals took more time than is usual in low elevation temperate climates because of cold temperatures and high elevation. Procurement of water took time, even though a constant effort was made by all individuals to melt snow whenever a stove was going. The large meals were breakfast and dinner while

FOOD-CARGO WEIGHT IN POUNDS.



RATE OF FOOD-CARGO WT.
CONSUMPTION PER MAN
VS.
NUMBER OF DAYS IN THE FIELD

DAYS IN THE FIELD

5 in 1 ration: 29 lbs. & 1.1 ft.³ Per Unit Pkg.
C-6 ration: 37 lbs. & 1.2 ft.³ " " "

FIG. 4.

lunch was a light meal. This schedule was found to be the most satisfactory since it allowed members of the expedition to do most of their outside work during the warmest part of the day. Although for the most part there were 24 hours of sunlight, the diurnal temperature range was great enough to make this eating and working arrangement the most desirable.

SUMMARY

For a small, mobile expedition weight considerations are extremely important. Fuel weights for a given distance cannot be easily altered, but food cargo weight can be altered by careful choice of dehydrated and frozen foods. Frozen meats generally were better received than the dehydrated meats, i. e., the dehydrated steaks and pork chops. But the ease of preparation and light weight of the dehydrated meats makes them a valuable contribution to small expeditions which must exist independently for several months. The dehydrated fruit juices were very good and well received by all members of the expedition.

Of the four dehydrated vegetables, the potato granules were liked most. The sweet potatoes and cabbage were controversial. All found them "satisfactory" and practically all preferred them to canned varieties for their packaging, portioning, weight, and ease of preparation. The green beans were particularly liked because of the ease of preparation and taste, but especially because of the fresh green color which evidently was a good morale factor.

The soups were also controversial, but well packaged and simple and quick to prepare. However, they had a marked tendency to "settle out" soon after they were mixed. Of the three flavors provided, the onion soup was preferred.

The dairy products were liked by most expedition members, though some confessed to a dislike of any powdered milk. The cheese was tasty and particularly good for a lunch snack and for flavoring hot dishes.

Individual comments were not obtained on the powdered eggs. However, they were well received by all save one, who refuses to eat fresh eggs as well. They were successfully used in all recipes requiring eggs and were excellent when prepared as scrambled eggs or omelets.

The potato sticks were very well liked and eaten at all hours. They went particularly well with the canned tuna fish items which most rated as filling but not too tasty.

Most of the foods were praised and all were appreciated. A few items, notably the soups, could stand improvement. Time to prepare some of the meats was more than was available and so precludes such choice cuts as roasts from an expedition of this sort. It is generally concluded that small parties must rely more upon the weight-saving dehydrated foods, whereas larger expeditions and less mobile expeditions could better afford the luxury of time, weight, and manpower necessary to utilize the tastier frozen foods.

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- (2) Benson, Carl S. (1955) Operations and logistics of Ice Cap Party Crystal, 1954, Report 25, Snow Ice and Permafrost Research Establishment, Corps of Engineers, U. S. Army, 21 pages.
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- (4) Marshall, E. W. (1954) Personal communication.

APPENDIX I

FOODS PROVIDED BY THE QUARTERMASTER FOOD AND CONTAINER
INSTITUTE, CHICAGO, ILLINOIS

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E. Alan E. Skinrood	
F. George Wallerstein	

LIST OF FOODS PROVIDED BY THE QUARTERMASTER FOOD AND
CONTAINER INSTITUTE, CHICAGO, ILLINOIS:

<u>Dehydrated Foods</u>	<u>WT. (lb)*</u>
1 case Cabbage	10.5
2 cases Green Beans	30.0
1 case Potato Granules	30.0
1 case Eggs	28.0
1 case Sweet Potatoes	23.3
3 cans Cranberries	2.3
8 cans Cheese	16.0
1 case Milk	39.0
1 case Fruit Mix	27.0
12 cases Orange Juice	76.0
12 cases Grapefruit Juice	76.0
3 cases Potato Soup	15.5
3 cases Lima Bean Soup	13.5
3 cases Onion Soup	16.5
1 case Pork Chops	14.0
1 case Pork Chops and Steaks	15.0
1 case Steaks	16.0
16 Meat Bars	4.0
Total	<u>457.6 lb</u>
 <u>Frozen Foods</u>	
1 carton Broiling Steaks	53
1 carton Ground Beef	50
1 carton Swiss Steaks	59
1 carton Diced Beef	66
1 carton Oven Roasts	37
1 carton Pot Roasts	40
3 cartons Veal Loaf	162
2 cartons Turkey	108
Total	<u>575 lb</u>
 <u>Miscellaneous</u>	
2 cases Tuna and Noodles w/Cheese Sauce	84
1 case Tuna and Noodles w/Vegetables	42
1 case Potato Sticks	14
Total	<u>140 lb</u>
Sum Total	<u>1173 lb</u>

* Net weights are listed; the total gross weight (including packaging) of food-cargo was 1400-1500 lb.

COMMENTS BY PERSONNEL:

FROZEN MEATS

I. BONELESS T-BONE AND PORTERHOUSE STEAKS

A. By far the most popular meat item of the entire group. The steaks were used at least once each week — for breakfast as well as for dinner — as long as they lasted. They were completely gone when the trip was $\frac{2}{3}$ over. The size of the individual pieces was adequate. A favorite of mine.

B. Excellent meat. Used several times a week — until they ran out. Fried, mostly over gasoline burning stove. Well packaged, easily stored under our environmental conditions. Served on plates in wannigan — often cooked outside, in mess tent.

C. Excellent! These were my personal favorites, particularly the Porterhouse Steaks. Both kinds were used almost every day until they finally ran out about $\frac{2}{3}$ of the way. These steaks are the simplest of all the meat products and meats to prepare (except the canned rations). We usually pan-fried them, either in their own grease or in a bit of butter or shortening, on the open flame of a Coleman Handy stove. Their best feature is that they may be cooked while frozen, which is a real time-saver. They were served on mess-kit tins, immediately after cooking. Too bad we couldn't broil them!

D. (All were consumed.) These steaks were the most popular items both because of the ease and short time of preparation and the flavor and tenderness. Steaks were eaten at the morning and evening meals. All were cooked in a frying pan, and all were eaten.

Preparation of this item was very simple since the meat was pre-cut and since thawing before cooking was not absolutely necessary.

E. Used 3 or 4 times per week. Fried over Coleman stove. This was probably the most popular item since it could be thawed more readily than roasts and was quickly and easily prepared. Packaging was excellent and economical with space.

F. Used about once or twice a week. Fried in an open pan. Helped feeding problem tremendously because it is so delicious and so easy to thaw and cook. It was flavorful, tender, and I liked it. I would gladly use it at home. Packaging was successful in preventing damage.

II. OVEN ROASTS

A. This was a popular item; but for our group it had a serious drawback in that the time of preparation was long. Once a roast was prepared, however, it was excellent. What was left over from the main meal was used for sandwiches for lunch and travel. For a group with an assigned cook (which we did not have) this item should be highly desirable. A favorite of mine.

B. Used twice a week while they lasted. Roasted in oven placed above two burner gasoline stove, which had to be attended while meat was cooking. This was a drawback, but the meat was excellent, liked by all.

C. Very good, if properly cooked. Usually they were a little rare in the center, due to short guesses on cooking time and temperature. These factors are difficult to control in Arctic conditions, and I do not believe they resulted in any serious mishaps with this meat. Because fooling around with the oven represented a time problem, we didn't eat these as often as steak or hamburger. I did not cook any roasts, so I can't comment on methods.

D. (All were consumed.) The roasts were cooked in an oven after a thaw period of from six to eight hours. Usually the thaw period was not sufficient, but what unthawed meat remained was thawed during the cooking process. The cooking process took from three to four hours in a medium oven. Texture and flavor were excellent. The time taken to prepare a roast was more than was generally available; therefore, it was a more difficult item to fit into the schedule than some of the other meats.

E. Flavor and texture were good but it was difficult to cook properly since the roasts could not be completely thawed. Used about once per week. Packaging was not as economical with space as were steaks. Preparation would be easier if roasts were cut into smaller pieces.

F. Used about once a week or once each two weeks. Cooked on a two burner gas stove with an oven on the top. It had good flavor and texture, and I would use it at home. Packaging O. K.

III. POT ROASTS

A. Prepared most successfully in the pressure cooker. This was a favorite of mine and provided an excellent roast meat.

B. Cooked in pressure cooker — excellent, easy to prepare; good flavor, easy to carry as packaged.

C. My comments concerning oven roasts apply here too. We cooked these in a pressure cooker; they came out tender, juicy, and delicious.

D. (Half of these were consumed.) Pot roasts were cooked in the pressure cooker. The meat had very good flavor and was tender. Time was a factor that prevented us from using all the meat we had. Preparation, whether pre-thawed or in the frozen state, took more time than was generally available.

E. Prepared in pressure cooker. Used once every two weeks. This was a good item and would be more readily usable if divided into smaller roasts. Packaging was adequate although not too economical with space. Flavor and texture were excellent.

F. Not used until we ran out of oven roasts — this was a mistake. Used about once a week or once every two weeks after that. Cooked in a pressure cooker. Made feeding easy. Excellent flavor and texture. Would eat it at home. Packaging O.K.

IV. DICED BEEF

A. Too tough to pan fry — perhaps we were not even supposed to try it that way. It was satisfactory when cooked in the pressure cooker, and this method of preparation was used exclusively after our first experience.

B. Tough; good flavor. Cooked in pressure pot. Well packaged. Not a popular item because some of the meat almost impossible to masticate well enough to swallow.

C. This was the clinker. The beef is low-quality and tough. We tried pan-frying it, roasting it, and combining it with other items, but it always came out tough and not particularly palatable.

D. (Only $\frac{1}{4}$ of the diced beef was used.) The diced beef was prepared in a pressure cooker. Usually frozen when it was put into the cooker it took one-half to three-quarters of an hour to thaw and cook through. Vegetables were added and a sort of stew resulted. This item was not very popular and seemed tough and tasteless. More spices, more time and preparation were needed to make this a tasty meal. No whole potatoes can be taken on such an expedition; and a stew without potatoes is not a stew!

E. Diced beef was seldom used until it was found that, when cooked in a pressure cooker, the texture was much improved. Too tough to prepare any other way. Flavor was very good. Packaging was adequate.

F. Used about once a month because we had much beef stew in the 5-in-1 rations. Good flavor — would use at home. Packaging O.K.

V. GROUND BEEF

A. Excellent! Many variations were attempted. Some mixed dried cereal and cracker crumbs with it to make it stick together and to add flavor. It was very lean and tended to crumble unless mixed with some binding material.

B. Hamburgers were a popular item. Everyone liked them. I often added cheese, onions (fresh, when available — onion soup was a good substitute when fresh onions were not available). Fried in bacon fat or their own fat. Well packaged.

C. Excellent! Next to the steaks, hamburger was (and is) my favorite meat. The thawing process took a long time, but we set the beef in a pan on the weasel engine while traveling, and it would thaw almost completely after a few hours of running. This might be countered by making the individual chunks of meat smaller. Hamburgers were easy to prepare — just pan-fry in a small amount of butter or shortening.

D. (All but 18 lb was consumed.) This beef was of much higher quality than the ground beef we have had in the past and was used for breakfasts and evening meals. The only problem again is the time it takes to thaw. If this was planned for in advance, a good quickly prepared meal was the happy result. The ground beef was used for hamburgers and as an ingredient in spaghetti sauce.

E. Ground beef was somewhat difficult to use since it required complete defrosting. Quality of beef was not as good as the steaks, roasts, and diced beef. It would be more readily thawed in smaller units, say 2 to 3 pounds.

F. Used about once a week or once every two weeks. Not as good as the other beef items above but I would eat it at home. Packaging O. K.

VI. SWISS STEAKS

A. Prepared easily in the pressure cooker. It was an excellent item. The meat was tender, most flavorful, and rates among the finest Swiss steak that I have ever eaten.

B. Very good. Well liked. Cooked in pressure pot. Were handy for short order meals, since they could be thawed quickly in pressure pot because of relative thinness. Packaging was good.

C. Swiss steaks were used about once a week. They were much more tender when cooked in a pressure cooker for about a half hour. Flavor and texture were good when prepared in this manner. A nice change in diet.

D. (All were consumed.) When placed frozen in a pressure cooker with diced corn and canned tomatoes and cooked until tender these steaks were delicious. They became tender and very tasty. It was quickly prepared since the meat was pre-cut, no thawing was necessary, and the cooking process could be started immediately.

E. Very good when cooked in pressure cooker, but time did not permit long broiling as they should have been prepared. Too tough to fry of course. Packaging good.

F. Used about once every two weeks and cooked in the pressure cooker. Helped feeding problem especially when we ran out of other steaks. Flavor and texture were good — would eat it at home.

VII. BONELESS TURKEY

A. This item was not prepared in strict adherence to the directions which accompanied it; because of our field conditions it was not possible to do so. However, we enjoyed some fine Turkey Dinners with cranberries, green beans, and mashed potatoes with gravy or butter. We prepared the turkey in several ways, the simplest one of which was to merely place it in water and heat it. It was also roasted after it was thawed. The roast turkey was the most popular. We used a Coleman oven which was set on a two-burner stove. After a turkey dinner we had cold turkey on hand for sandwiches during the following day.

B. Very popular — used about once a week. Had to be thawed. Treated as a roast, in cooking, and took several hours to heat through in oven, and thus needed someone in attendance.

C. This was used about once per week and was a welcome change from the steady diet of beef. The method of preparation specified was too time consuming to be used, as well as being almost impossible to perform in the arctic. Turkey was thawed in boiling water and then browned in an oven. Flavor and texture were excellent.

D. (All but three were consumed.) The boneless turkey was delicious. Two methods were used to prepare it: first, the packaged, frozen turkey was placed in hot water, allowed to thaw and heat until ready to eat; secondly, if more time was available, the turkey was removed from the water after it had been thawed, the wrapping removed, and the meat placed in a medium oven to brown. Occasionally, gravy or cranberry jelly was served with it.

E. Used once per week since preparation took a long time. Instructions for thawing could not possibly have been carried out, so it was defrosted in hot water. Was a good change from the regular diet of beef and flavor and texture were excellent.

F. Used once a week or once every two weeks — takes a long time to heat. Cooked either in a pot or the oven — oven was better. Helped feeding. I liked it. A good variety item. I would not eat it at home. Packaging O. K. except the cellophane cover often broke letting the juice run out.

VIII. VEAL LOAF

A. This was an excellent item but had the same drawback as the oven roasts in that it required a large amount of preparation time. Two loaves were prepared at a time. They provided fine sandwich meat and were often used at breakfast. The cartons leaked while they were being roasted.

B. Veal loaf was the least popular of all meats next to diced beef. Good cold for sandwiches. Packaging was main hazard.

C. This item is very good both for a main dish and for sandwich meat. It is excellent baked according to the recipe, cold after baking, or sliced and pan-fried in butter. The loaves are quite large, which makes individual slices big for most bread. The packaging would hold up when baking until almost completely cooked, then it would spring a leak. We had one rather messy grease fire because of this. I think perhaps more foil and a heavier box might be the answer for that, but then the cooking time would have to be increased even more. We would usually bake two loaves at a time, use one for a couple of main meals and the other for a breakfast supplement or sandwiches. This is probably the most versatile item among the frozen meats.

D. (Two-thirds of what we had was eaten.) Veal loaf was used for all meals. For breakfast it was fried and served with eggs, for lunch it was used as a cold sandwich meat, and for supper it was heated in the oven and served with gravy or a tomato sauce. The loaf is highly but tastefully spiced. Time was a governing factor in preparing the loaf and time means fuel.

E. Veal loaf was prepared in an oven and then often was fried for breakfast. Fat content excessive as large quantities leaked out during baking. Flavor only fair. Suggested cooking in the packaging was impossible since it always leaked. Very economical of space and by reducing fat content it would be a good item.

F. About once every two weeks. Roasted in the oven. Often fried up again in slices. Helped feeding problem — especially for a quick lunch. I liked the item fairly well. Flavor good, but too much pepper and spice. I would not eat it at home. Packaging O. K.

DEHYDRATED MEATS

I. PORK CHOPS

A. This was the only pork in our diet — the chops were small and again I would have liked more fat on them. They were of a slightly tough consistency and different from fresh chops. I think some of the toughness may be because of the fact that they were so lean. Some of the meat near the bone and scraps of fat would have made this item even more attractive to me. The packaging was fine. Only on a few of the packages was the vacuum seal broken. Both the rapid and slow methods of rehydration were used with equally fine results.

B. Good items where weight is a factor. Flavor not as good as fresh pork and not nearly as satisfying as the dehydrated steaks. Well packaged, although the vacuum seal was often broken. The aluminum wrappings for roasting on a fire were impractical for our use, since we used gasoline stoves and it was easiest to fry meat.

C. These were not nearly as tender or flavorful as the dehydrated steaks. Ninety-five percent of the envelopes retained the vacuum. More work is needed to overcome the problem of incomplete hydration. The quick method was generally used, but the slower method produced no better results.

D. (All were consumed.) The pork chops were good but a little tough and quite dry. An individual chop was small; therefore, three or four were used per person per serving. Rehydration is simple and the saving in weight is wonderful and very worth while.

E. Used once per week as a welcome change from beef. Quick method of preparation was used, but hydration was only fair. Texture and flavor only fair. Packaging worked and most envelopes held the vacuum. Needs more work to improve hydration.

F. Used about once a week until we ran out. Fried in a pan. A good variety food. I liked the flavor but a few were dry. Packaging was good. I prefer the cellophane to the aluminum foil. About 10% lost vacuum.

II. BEEF STEAKS

A. Slightly tougher than the frozen equivalent. Rehydration was easily accomplished. The meat was good and flavorful, but the size of the individual steaks was too small for me. I would also be interested in seeing more fat on these items.

B. Good items where weight is a factor. Handled after hydration like frozen steaks. Flavor not as good, and more required to fill the belly per meal.

C. These, though small, were very tasty. The rehydration process was little or no problem, except that I had to be careful not to let the steaks freeze while they were drying after soaking. Can packaging is a good idea, although one can is seldom enough for six men. We could easily eat three steaks each at one sitting. The steaks compare in quality with the boneless T-bone frozen steaks, although they are not as large. Pan-frying in butter was the most satisfactory cooking method. The steaks do not contain sufficient grease to be fried in their own fat. Because of this, they would sometimes stick to the pan, but I don't remember having to eat any burned steak at any time. Incidentally, I'm a great beefeater any time.

D. (All were consumed.) These were not as good as the frozen steaks but were easy to prepare and the taste was satisfactory. For some reason they were a little tough. Also the portions were small and to make a serving for one person two or three steaks were used. The item was served both for breakfast and for the evening meal.

E. Used once per week. An easy and quick method of preparation is the chief advantage. Flavor and texture not as good as frozen steaks. Weight saving a big advantage although much more space required than frozen meats.

F. Used about once a week or once each two weeks. Helped feeding problem; supplemented frozen steaks. Good flavor and texture. Could have a little more fat on it for arctic use. I would not use this item at home if other steaks were available. Packaging a bit inefficient, big can — small steaks.

DEHYDRATED VEGETABLES

I. SWEET POTATOES

A. I liked them and also eat them frequently at home. However, this was the only one of the dehydrated vegetables which I thought had any flavor alteration — to me it had a faint carrot taste.

B. Poor item. Not at all popular. Did not taste like sweet potatoes. Diced form was one drawback. Well packaged. (I like sweet potatoes at home.)

C. Seldom used since these were flavorless. I have a personal dislike for sweet potatoes in any form, and so I am not an impartial judge of this item. Packaging was adequate.

D. (One-fourth of what was available was used.) This item was not too popular though I personally liked it. Served with pepper and butter, sweet potatoes are delicious.

E. Used only once or twice since flavor was virtually nil. I personally do not like sweet potatoes in any shape or form however.

F. Used once a month boiled in a pot. Did not help the feeding problem much because most people did not like them. I would not eat it at home.

II. CABBAGE

A. An excellent item. It was prepared always as a cooked vegetable, once as a breaded casserole.

B. Not popular with many. I personally liked the items. I prepared a cream sauce with cheese to go with it on one occasion, but it was not too popular with others. The cream sauce and cheese took a long time to make.

C. Excellent! One member fixed a breaded casserole of some sort which was the best vegetable dish we had all summer. But that midget stuff sure fools the cook.

D. (About $1/2$ of what was available was used.) This item was served boiled and tried breaded. Preparation of the breaded cabbage took more time than was available, so it was only tried once. The cabbage was very good, but because it seemed to develop a lot of gas in the system it was used less than we would have liked.

E. Used once a month. Don't like it at home so I can't comment objectively.

F. Used about once every two weeks — boiled. A good supplement to the 5-in-1 vegetables. I liked it and might use it at home.

III. POTATO GRANULES

A. Excellent! Mashed potatoes were a favorite of mine and of the others. We used them consistently and heavily. Our supply was exhausted before the trip was over; this was regretted by all. The item was a tremendous success for our expedition and is highly recommended for future use.

B. Good. We were sorry when we ran out of them. Well packaged. Could be made to taste like "real" mashed potatoes.

C. An excellent item which was used five times per week. Preparation was easy since it was merely necessary to add boiling water to the powder. One problem in the arctic is in keeping the potatoes warm once prepared, but this can be solved by preparation just prior to eating.

D. (All consumed.) A very good item. If care was taken these potatoes could hardly differ from the fresh mashed potatoes mother used to make. Packaging was excellent and portion was just right.

E. Very good and used almost every day until the supply ran out. Quick and easy to prepare as well as weight saving. Some other form of potatoes other than these and potato sticks would be desirable for variety.

F. The dried potatoes were excellent. Used about every two days.

IV. GREEN SNAP BEANS

A. Excellent! Rehydration was easily accomplished. This item rates as highly in my estimation as the potato granules. It could be made to taste like a fresh food and was even comparable to canned beans. The packaging was satisfactory.

B. I liked them; some did not care for them. Easy to prepare, and when cooked they looked fresh and green which was a good psychological point where most items looked pretty drab.

C. Very good. I preferred these and the cabbage to the sweet potatoes and most of the canned vegetables. These have a taste so close to the real thing when properly cooked that sometimes I had to think twice to be sure we weren't eating fresh beans.

D. (Half of what was available was used.) I liked this item but some did not. Again if care was taken these beans could be very tasty. Cooking time was more than directions called for. But the bean was green and it was the only green we saw in one hundred days.

E. Used once a week. Flavor good and a good weight-saver.

F. Very good.

DEHYDRATED SOUPS

I. ONION SOUP

A. In my mind this was the best of the soups which we tested. It was used consistently, was flavorful and good. It did not settle to the bottom of the cooking containers to the same extent as the other soups.

B. Good. Well packaged. Easy to prepare. Some did not like onion soup at home, and so did not like it in the field. Hot soup is an excellent food item.

C. Powder could not be kept dissolved in the water. In five minutes after preparation, all the powder would precipitate to the bottom. Flavor was only fair.

D. (All was consumed.) Of the three soups we had, this was the most popular. I thought it was exceptionally good as the first course of an evening meal — very hot!

E. Poor, To me the onion tasted like onion — and I do not like onion. It would not stay mixed with water.

F. This was the best of the three but not very good. Have you seen the dried onion soup put out by the Drilite Company? It is excellent not only as a soup but as an onion sauce for meat.

II. POTATO SOUP

A. A good item. I am a poor judge of it since I do not eat much scup at home. However, I thought it was flavorful and enjoyed it quite a bit. Generally we had a thick gruel at the bottom of our pans or cups for it was known to settle out quickly.

B. Not very popular. Tastes much like the lima bean soup. Packaging good, preparation easy. Hard to clean the pots.

C. Same comment about settling out of the powder again applies. This tasted like very weak onion soup, certainly not like potato.

D. (Two-thirds of what we had available was used.) This was the next most popular soup. It is a little insipid if used as it comes from the can; however, with a little gravy base mixed in or anything to give or bring out a bit more flavor it becomes more tasty. If it stands to long before it is drunk it settles to the bottom of the pan and never does re-mix well.

E. Poor. Tasted like weak onion soup.

F. Not very flavorsome and it settles into a sludge at the bottom of the cup.

III. LIMA BEAN SOUP

A. The same comment as for the potato soup.

B. As above.

C. This also could not be properly mixed and was almost devoid of flavor. It is a very poor item. The soups in general were space-and weight-saving, but were low in quality. Tomato or chicken noodle dehydrated soups would have been welcome.

D. (One-third of what we had was used.) This was the least popular of the soups. It settles very quickly. The flavor is good, and I am not particularly bothered by the sediment. I liked it.

E. Absolutely flavorless!

F. The worst of the three — no flavor and it settles as fast as sand — tastes as good, too.

DEHYDRATED FRUIT JUICE

I. ORANGE JUICE

A. This was an extremely good item. I often diluted mine a bit more than the directions called for and I think this even improves the flavor. This item was a tremendous weight saver for us. In quality of taste it is infinitely better than the heavy canned orange juice which we have used in the past. It is on a par with frozen orange juice concentrate and second only to fresh oranges.

B. Excellent. Handy to carry and prepare. We drank a lot of it and enjoyed it.

C. Used every other day on the expedition since it was easy to prepare and had an excellent flavor. For groups it would be more economical of space if larger cans were used.

D. (Virtually all was used.) Everybody had orange juice every other day for breakfast. Occasionally, I would make up a pint at noon or after perspiring a lot. The flavor was excellent, the packaging very good, and preparation was easy.

E. Orange juice was excellent and used every day. Flavor was good as was the ease of preparation. A further space and weight saving would be to package in larger cans.

F. Excellent. Used about $\frac{1}{2}$ the mornings for breakfast. Would use it at home.

II. GRAPEFRUIT JUICE

A. Very fine. I think it could stand slightly more water as in the case of the orange juice. The comments pertaining to orange juice apply equally well to the grapefruit juice.

B. Excellent. Good flavor. Enjoyed the item. Well packaged. Package convenient to carry and store.

C. This was also used on the average of every other day. Flavor, ease of preparation, and light weight make this an excellent item.

D. (Virtually all was used.) If anything I liked the grapefruit juice better than the orange juice. It is an excellent item and should be included in all rations and certainly on all trail expeditions such as the one we were on.

E. Excellent item. See my comments on orange juice.

F. Very good. Same comment as for orange juice.

DAIRY PRODUCTS

I. POWDERED MILK

A. An excellent item — when properly mixed it was not lumpy. We also found mixing easier when the water was heated; warm milk is no drawback when it is cold out. I liked warm milk on the cooked cereal. We requested small packages for our milk, but I would ask for $\frac{1}{2}$ or 1 gallon cans in any future work.

B. Good. Lumpy milk results, however. Well packaged and quite handy for individual use.

C. This is the only powdered milk I have ever consumed that I liked. I wish we'd had more of the individual packages. Those are very easy when you just want an individual glass, or if you're measuring specific quantities for omelets, etc. The canned stuff wasn't quite as easy or as tasty, but it was still very good for cooking.

D. (All was consumed.) The powdered milk was used primarily for breakfast cereals and not as a beverage. It was packaged well and was not difficult to mix. It did not, however, have the rich flavor that the powdered milk had which we picked up at the French Central Station. We, therefore, often mixed in some of the powdered cream that we took from the 5 in 1's and C-rations.

E. Flavor fair and was somewhat difficult to mix. Used mainly with cold cereal for breakfast.

F. No comment.

II. DEHYDRATED CHEESE

A. This worked very well as a flavor adder on many foods, especially for the spaghetti — C-rations, of course. Several cheese spreads were made up and I found them to be good.

B. Went well with canned plain crackers. I used it with hamburgers. Not much was used. Tended to dry out quickly on standing. I ordinarily do not like this type of cheese.

C. Very good! It keeps well, makes a nice snack. Wonder how it would be as a cooking cheese. Don't remember that it was tried in this way. The flavor tended to be bitter since it was so strong.

D. This item was used mostly as a sandwich spread for noon pickup lunches. And it was good. I also tried it in some cooking, i. e., to flavor the boiled cabbage, to flavor hamburgers, to flavor the powdered eggs, and so forth.

E. An item which would be unnecessary for most expeditions. Flavor good although somewhat bitter.

F. I prefer the canned cheese in the 5 in 1 rations.

MISCELLANEOUS

I. FRUIT MIX

A. Excellent — This was not used very much as a desert because we were able to pick up an abundance of canned fruit cocktail in Thule. It should be a fine replacement for canned fruit and in future work I would tend in that direction because of the weight factor. It was used with great success in cooked cereal. We ate cooked farina every morning and varied the "flavor" by adding either raisins or the dried fruit mix. I highly recommend it.

B. Used with cooked farina, it was a welcome change. I made fruit pudding on one occasion which was good, but took a long time to make and was not overwhelmingly popular.

C. Good, dehydrated or reconstituted. We would munch on the dehydrated fruit between meals, and use it as a dessert or cereal topping after reconstitution.

D. (All was consumed.) Used three or four times a week in the cooked cereal. Soaked over night in the water the cereal would be cooked in, it was cooked right along with the cereal and added much to an otherwise boring fare. A few times it was served as a compote and a few times as the fruit in a "jello" dessert.

E. Not often used since canned fruit had a better flavor and texture. The weight saving was good but frozen fruit was more easily used.

F. Not nearly as good as the canned fruit but could be useful on sledge expeditions where the canned fruit is terribly heavy. Good in cereal.

II. DEHYDRATED CRANBERRIES

A. Excellent item; it was prepared as a jelly and used with the turkey. I am especially fond of cranberries with all meats and would want to include them on any future trips.

B. Good with the turkey. Package made too big a volume of sauce for our use. Used only with turkey, as far as I remember.

C. Went very well with the turkey.

D. (About $\frac{1}{2}$ was used.) For some reason this was not used for making juice. I cannot remember and I have no notes about whether it was even tried. We did make some very delicious cranberry sauce for the turkey dinners. But this could not be done too many times because of the amounts of sugar needed to complete the recipe.

E. Seldom used and I don't like cranberries.

F. Not very good. I just don't like cranberries.

III. POTATO STICKS

A. This was an overwhelming success. These potatoes were used with meals as the potato course and as a snack material. The item was a favorite of mine and I often ate it like popcorn.

B. Very good — popular because easy to prepare. If browned in the oven, they were even better. Packaging was good.

C. Great staple. We ate 'em for breakfast, lunch, and dinner, as well as between meals. They have an excellent fresh taste and are well seasoned. Wish they could be bought in stores.

D. (All were used early.) A very popular item for snacks and at evening meals when we were pushed for time. This is a "must" item for any type of expedition work in the field. They do not weigh anything, they are tasty, and they are easy to prepare cold or heated in the oven.

E. Good flavor and texture and was used 3 times per week. Packaging was certainly economical with space and weight.

F. Very good.

IV. TUNA AND NOODLES WITH CHEESE

A. I liked both of these tuna mixtures but would have liked them better if they were not so highly processed. The fish taste was hard to find; some people may like it that way but I missed it. In all fairness I must add that I love canned herring and sardines.

B. We had an awful lot of this item left over when we cooked. A colorless item with not too good a flavor.

C. Ok, but we sure had more than we needed. This sort of thing gets monotonous after a while, and we ate less than half of what we carried. Easy for a quick meal, though. One can really fill me up.

D. This item was heated by individuals for quick, hot lunches and in bulk for an evening meal when time was important. It is tasty and easy to prepare. When served with hot soup and potato sticks it becomes a wholesome, quickly prepared, main meal. I liked it.

E. Flavor and texture were good although at home I seldom eat noodles. Easily prepared by warming in hot water.

F. Good. Easy to prepare and generally tasty.

V. TUNA AND NOODLES WITH VEGETABLES

A. See my comments on tuna and noodles with cheese — these items can't be beat for a quick hot lunch.

B. Better than the tuna and noodles w/cheese, definitely. I used it when I was cook for Friday dinner, heated up in the pressure pot. It was not a popular dish.

C. Same comment as for tuna and noodles with cheese.

D. The vegetables added a little something to the overall palatability of the food when eaten alone with no supplementary items. It is a good tasty, easily prepared item, and I liked it.

E. Flavor and texture were good, although at home I seldom eat noodles. Easily prepared by warming in hot water.

F. Not as good as tuna and noodles with cheese.

VI. POWDERED EGGS

General Comments.

Though all the powdered eggs were eaten, the members complained of a "musty" taste to the eggs cooked in any form. The taste never was disguised though many cooking methods were attempted.

1. Scrambled, plain
2. Scrambled w/bacon
3. Scrambled w/hamburger
4. Egg pancakes w/jelly or jam
5. Omelettes
6. Mixed as a paste to hold the hamburger meat together.

Only one person never ate the powdered eggs, and he does not eat eggs at home.

SUMMARIES

A. These foods were consistently the best of any I have used over a period of five field seasons in the Arctic. All items were good and many were excellent. I would be happy to use any of them at home. Not one item was untasty or undesirable. The only item which had a foreign taste (slightly on the carrot side) was the dehydrated sweet potato. The only meat item which was tough in my estimation was the diced beef; it was unfit for pan frying, but fine when prepared in the pressure cooker. In general, the dehydrated meats were slightly tougher than their frozen counterpart. More fat might have helped to make the pork chops a bit more juicy. I would say more fat could be included in all of the meats, but especially in the dehydrated ones. This is not a serious thing as it is largely a personal preference and I am prone to eat too much fat.

A beef bouillon soup of broth made from the small concentrated cubes is a good item for our type of expedition. The soups which we had were fine with the exception of the settling that I mentioned in my comments on the individual items.

I have the feeling that I ate more "fresh" food in the field season of 1955 than ever before under similar circumstances. That is the main feeling; the "fresh" green beans, "fresh" frozen meat and "fresh" juices make delightful memories. I am very thankful for the opportunity of using all of these items.

B. Frozen meats were most satisfying with regard to flavor, but thawing was of course a problem, and a meal had to be planned many hours in advance, which often made it difficult to utilize the items.

The dehydrated meats, and pork chops in particular, were well packaged, although the vacuum seal was often broken. The aluminum wrappings for roasting on a fire were impractical for our use, since we used gasoline stoves and it was easiest to fry meat. Almost all meat was fried except veal loaf and turkey. We did some roasting, but since this took hours with someone in attendance, roasts were not as practical as other meats; however, when cooked, the meat was superb.

The package of the veal loaf was not entirely satisfactory since two of several packages leaked grease which in our instance necessitated use of a CO₂ fire extinguisher to avert a tragedy when the stove caught on fire and flames licked the ceiling of the wannigan.

Soup was popular. The lima bean and potato soups were not as well liked as the onion although the packaging was excellent.

Baumer Foods, Inc. is chiseling on jam.

A small percentage of canned items was ruined by deformation of the can. Canned bread often was so affected, and made almost impossible to use. It should be in a stronger package.

Many thanks should be given to those responsible for providing us with such excellent food.

C. C-rations — my main comment here is that these are too well packed for this kind of use. The weight of packaging almost exceeds that of food, and most of the dry-pack material (EXCEPT COCOA AND CIGARETTES!!) was thrown out. The C's were nice when a man had to prepare his own meal on the weasel engine. The 5-in-1's provided many staple and entree items when the camp was together, but so much of the material concerned was just plain waste that I think we could have done without both in the long run. These are excellent combat rations, however; they're just a bit impractical for this kind of service.

The general opinion which I have of the food is that the packaging as well as preparation is quite well adapted for arctic use. The comments on these sheets represent opinions on palatability, but the primary requisite of food is nourishment. The measure of this is that despite the rugged life on the Greenland Ice Cap, I gained five pounds in the three and one-half months.

D. In general the packaging of all of the frozen meats was very good. The pre-cut broiling steaks saved much time. Pre-shaping the hamburger should be considered for expeditions of this kind — where thawing takes so much time when it cannot be done right in the pan.

The veal package is not wholly satisfactory. The carton leaks during the cooking process and creates a fire hazard.

The plastic envelopes are superior to the aluminum foil envelopes. Most of the dehydrated meats were vacuum sealed; a few, however, had not sealed and the longer method of preparation was needed. The aluminum foil was never used to cook in as was first thought possible.

Packaging of other items was excellent; i. e., the dehydrated vegetables, fruit juices, fruit, potatoes, soups, cheese and milk. None of the items were damaged or contaminated.

The frozen beef was of good quality, generally tender and tasty. The most popular cuts were the broiling steaks, ground beef, Swiss steaks, oven roasts, and pot roasts in that order. (The popular items are determined by both taste and ease of preparation.) The easiest and quickest to prepare were the pre-cut items, i. e., the broiling steaks, Swiss steaks, and diced beef. With a little planning and fore-thought the roasts and ground beef could be set out on a weasel engine hood to thaw enough during travel so that they could be prepared the following afternoon. Had the ground beef been previously formed into hamburger patties separated by a waxed paper

then frozen, time taken for preparation would be greatly reduced. Large cuts like the oven roast take a lot of time to prepare and time means fuel and fuel is important.

E. In general, the frozen meats were excellent in flavor and tenderness when properly prepared. Broiling steaks could be fried, but the swiss steaks and diced beef were better and more tender when cooked in a pressure cooker for one-half hour. Cooking in a pressure cooker proved to be a time-saving as well as a labor-saving method.

The instructions for thawing the turkey could not be followed due to the amount of time required. A more rapid method of preparation was to defrost it in boiling water and then to brown the outside in an oven.

The packaging of the dehydrated pork chops was excellent, and the quick method of hydration was generally used. However, the pork chops were rather tough probably due to incomplete hydration. The dehydrated steaks were excellent and much more tender than the pork chops.

The dehydrated soups were unpopular. The lima bean soup was flavorless and the potato soup tasted like weak onion soup. The powder would not stay mixed with the water but rather precipitated to the bottom of the container within ten minutes.

The veal loaf was good as a luncheon meat or, when fried, for breakfast. The packaging was not altogether successful, because, when cooked in the package, large amounts of fat came from the meat and often leaked out of the carton.

All in all, the foods were generally very good with the most popular items being broiling steaks and fruit juices. In my opinion, the use of dehydrated fruit and vegetables is proper when weight is a very critical item. But for arctic work, with refrigeration being no problem, frozen products are better because of the ease and speed with which they can be prepared.

F. All in all most items were excellent; only the soups were poor. For expeditions that travel by sledge the dried items are highly recommended. Where weight is no problem as in our case, the frozen meats provide luxury that previous expeditions have generally missed.

APPENDIX II.

TOTAL FOOD SUPPLY

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CAMP TUTO SUPPLY

	WT. (lb)
12 cases of 5-in-1 (29 lb per case)	116
4 ea menu No. 1	116
4 ea menu No. 2	116
4 ea menu No. 5	185
5 cases of C-6 rations (37 lb per case)	48
1 case Fruit Cocktail, 6 ea No. 10 cans	40
1 case Peaches, 6 ea No. 10 cans	48
1 case Pears, 6 ea No. 10 cans	41
1 case Corn, Cream style, 24 ea No. 2 cans	47
1 case Peas, 6 ea No. 10 cans	40.5
1 case Asparagus, 24 ea No. 2 cans	51
1 case Jám; Strawberry, 3 ea No. 10 can; Peach, 3 ea No. 10 can	20
20 lb of Fresh Butter	25
25 lb of Flour, Wheat, Hard	25
25 lb of Flour, Wheat, Soft	2
1 ea No. 10 can, Catsup, tomato	.1
2 ea No. 10 can, Raisins	10
10 lb Sugar	10
10 lb Salt	
<hr/>	
Cinnamon, ground	
Garlic Salt	
Ginger, ground	
Paprika, ground	
Pepper, black	
Sage, rubbed	3
Sauce, steak	
Sauce, Worcestershire	
Sauce, Chili	
<hr/>	
1 carton Tuna and Noodles (2 cs: 1w/cheese sauce; 1w/veg.)	84
1 carton Dehyd. Foods; 1 cs Cabbage and 1 cs Green Beans	29
1 carton Dehyd. Foods; 1 cs Fruit Mix and 1 cs Green Beans	27
1 carton Dehyd. Foods; 1 cs Potato Sticks and 1 cs Potatoes	53
1 carton Dehyd. and Canned Food; 1 cs Tuna and Noodles w/cheese sauce; 1 cs dehyd. Eggs	70
1 carton Canned Food; 1 cs Dehyd. Sweet Potatoes; 1 cs assorted C-Ration Meat	49
1 case Potato Granules	1
2 cans Cranberries; 1 lb per can	2
3 cases Onion Soup; 6 ¹ / ₄ lb per case	20.25
5 cases Potato Soup; 6 ¹ / ₄ lb per case	20.25
3 cases Lima Bean Soup; 6 ¹ / ₄ lb per case	20.25
12 cases Orange Juice; 8 lb per case	96
12 cases Grapefruit Juice; 8 lb per case	96
1 case Dehyd. Milk	39
8 cans Cheese, 2 lb per can	16
Meat Bars, 1 box; 16 bars per box	4
3 cartons Veal loaf (frozen)	162
2 cartons Turkey (frozen)	108
Total Food-Cargo	
	<u>1841 lb</u>
5 ea, 50 gal drums of MO Gasoline	1950
1 ea, 50 gal drum of White Gasoline	390
100 ea Bamboo poles, trail markers	150
Grand Total food, fuel, and trail markers	
	<u>4331 lb</u>
In addition to the load taken on at TUTO, 10 50-gal drums of MO Gasoline were picked up at Camp Morris (I-0), ie., an additional 3900 lb.	

RESUPPLY AT AD-1

	<u>WT. (lb)</u>
5 cases 5-in-1 rations (@29 lb ea.)	0 cases Menu No. 1 000 2 cases Menu No. 2 58 3 cases Menu No. 3 87
9 cases C-6 rations (@37 lb ea.)	333
1 case Grapefruit, 24 No. 2 cans	38
1 case Butter	36
4 cans Bacon	6
1 case 4-way Beef	53.5
4 lbs Butter	4
1 No. 10 can Catsup	4
1 case Cereal, Cornflakes	7
1 case Cereal, uncooked	37
16 loaves of Bread	8
1 carton Broiling Steaks	53
1 carton Ground Beef	50
1 carton Swiss Steaks	59
1 carton Diced Beef	66
1 carton Oven Roasts	37
1 carton Pot Roasts	40
1 carton Dehydrated Steaks and Pork Chops	15
1 carton Dehydrated Pork Chops	14
1 carton Dehydrated Beef Steaks	16

Food-cargo: 1021.5 lb

14 drums of MO gasoline
400 Bamboo poles

Fuel: 5460
1600

7060 lb

Grand total: 8081.5 lb.

Note: 228 lb of food-cargo were dropped from the amount originally ordered.

RESUPPLY AT AD-2

	<u>WT. (lb)</u>
9 cases of 5-in-1 rations (@29 lb ea.)	3 cases Menu No. 1 87
	3 cases Menu No. 2 87
	3 cases Menu No. 5 87
4 cases C-6 rations (@37 lb ea.)	148
1 case Fruit Cocktail	48
1 case Peaches, 6 No. 10 cans	40
1 case Pears, 6 No. 10 cans	48
1 case Corn, 24 No. 2 cans	41
	<hr/>
	Food-cargo: 586 lb
16 drums of MO gasoline	Fuel : 6240
100 Bamboo poles	400
	<hr/>
	6640 lb
	<hr/>
	Grand total: 7226 lb

RESUPPLY AT AD-3

	<u>WT. (lb)</u>
7 cases 5 in 1 rations (@ 29 lb ea.)	4 cases Menu No. 1 116
	2 cases Menu No. 2 58
	1 case Menu No. 5 29
4 cases C-6 rations (@ 37 lb ea.)	148
	Food-cargo: <u>351 lb</u>
1 drum White Gasoline	Fuel: 390
16 drums MO gasoline	Fuel: 6240
100 Bamboo poles	400
	<u>7030 lb</u>
	Grand Total <u>7381 lb</u>

Note: 348 lb of food-cargo were dropped from the amount originally ordered.

RESUPPLY AT AD-4

	<u>WT. (lb)</u>
7 cases 5-in-1 ration (@ 29 lb ea.)	1 case Menu No. 1 29 3 cases Menu No. 2 87 3 cases Menu No. 5 87
3 cases C-6 rations (@ 37 lb ea.)	111
	<u>Food-cargo: 314 lb</u>
Tower equipment	1549
Aluminum Tubes	509
	<u>2058 lb</u>
16 drums of MO gasoline	Fuel: 6240
200 Bamboo poles	800
	<u>7040 lb</u>
	<u>Grand Total: 9412 lb</u>

Note: 283 lb of food-cargo were dropped from the amount originally ordered.

FOODS CACHED AT END POINT

<u>Frozen Foods</u>	<u>WT. (lb)</u>
1 box Diced Beef	45
2 chunks 4-way Beef	14
1 box Ground Beef	18
1 box Pot Roast	30
1 box Turkey	21
2 boxes Veal Loaf	108
1 box Butter	14
 <u>Dehydrated Foods</u>	
1 case Green Beans	15
1 box Cabbage	13
5 cans Sweet Potatoes	17
1 case Lima Bean Soup	10
1 case Potato Soup	5
1 can Milk, No. 10 can	15
 <u>Canned Foods</u>	
15 cans Asparagus, No. 2 cans	30
1 can Apple Butter, No. 10 can	8
2 cans Peanut Butter, No. 10 cans	16
1 ² / ₃ cases Cream Style Corn, No. 2 cans	50
5 cans Fruit Cocktail, No. 10 cans	40
1 can Peach Jam, No. 10 can	8
9 cans Peaches, No. 10 cans	72
4 cans Pears, No. 10 cans	32
1 can Peas, No. 10 can	8
8 cases C-6 rations	296
5 cases 5 in 1 rations	145
1 case Tuna and Noodles w/vegetables	30
1 case Tuna and Noodles w/cheese	30
 <u>Miscellaneous Foods</u>	
2 cans Cereal, uncooked	6
7 cans Cocoa	7
1 bag Flour (opened)	45
Total:	1148 lb

SUMMARY OF C-6 AND 5 IN 1 RATION REQUIREMENTS

	TUTO	AD-1	AD-2	AD-3	AD-4	TOTAL
MENU No. 1						
5-in-1	4	0	3	4	1	12
MENU No. 2						
rations	4	2	3	2	3	14
MENU No. 5	4	3	3	1	3	14
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TOTAL						
5 in 1	12	5	9	7	7	40
C-6	5	9	4	4	3	25

Note: 5 5-in-1 rations cached at END POINT.

8 C-6 rations cached at END POINT.

TOTAL 5-in-1 rations used was 35

TOTAL C-6 rations used was 17