TECHNICAL REPORT
NATICK/TR-83/002

THE EMERGENCY/ASSAULT FOOD PACKET WITH THE ARCTIC SUPPLEMENT - AN EVALUATION OF AN ARCTIC RATION AND ASSESSMENT OF WATER DISCIPLINE

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DECEMBER 1981

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* THE EMERGENCY/ASSAULT FOOD PACKET WITH THE ARCTIC SUPPLEMENT – AN EVALUATION OF AN ARCTIC RATION AND ASSESSMENT OF WATER DISCIPLINE IN THE ARCTIC		5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Kerry W. Wyant, Science and Advanced Technology Laboratory Paul L. Caron, Food Engineering Laboratory		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Natick Research & Development Laboratories ATTN: DRDNA–YBH Natick, MA 01760		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 1L162724AH99/BB036
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE December 1981 13. NUMBER OF PAGES 79
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

CONSUMER ACCEPTANCE	EMERGENCY/ASSAULT FOOD PACKET	WATER DISCIPLINE
ARCTIC RATIONS	COMPRESSED FOODS	WATER CONSUMPTION
MILITARY RATIONS	COLD WEATHER	DEHYDRATION
FREEZE DRIED FOODS	FIELD FEEDING	AMPHIBIOUS RATIONS
DEHYDRATED FOODS		MILITARY REQUIREMENTS

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Acceptance measures of a 4700 kilocalorie arctic ration were administered to a company of Marines who were participating in the NATO exercise, Cold Winter B1, in northern Norway. Measures of the British 24-Hour Ration Pack Arctic were administered to a second company of Marines who received the British ration. Additionally, water discipline was assessed. As a part of this assessment, urine samples were taken on four occasions during the test period from 17 Marines who received the Arctic Ration Prototype.

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20. ABSTRACT (cont'd)

Results indicated that the Emergency/Assault Food Packet (E/AP) with the Arctic Supplement provided an acceptable arctic ration and that preferences for the E/AP food items tended to be reliable across three studies. Both the Arctic Ration Prototype and the British artic ration were rated favorably, but the Arctic Ration Prototype received higher ratings. Comments indicated that the E/AP may contain too many sweets and not enough non-sweet snacks. Following the exercise, urines were found to be maximally concentrated suggesting dehydration. In addition, daily water consumption was generally inadequate. Water discipline and procedures for preparing food and for coordinating food preparation with other activities were poor.

PREFACE

The present study was conducted by the Behavioral Sciences Division of the Science and Advanced Technology Laboratory and the Food Engineering Laboratory, US Army Natick Research and Development Laboratories, under Project No. 1L162724AH99/BB036, in response to US Marine Corps Requirement 2–5.

We are indebted to Major William W. Kastner III, US Marine Corps Liaison Officer, who assisted in the design and implementation of the study and who coordinated the study with elements of the First Battalion, 6th Marines, who participated in the 1981 NATO exercise, Cold Winter 81.

We are also greatly indebted to COL F. L. Tolleson, 36th MAU Commander; Commander Dooley, Captain of the USS Barnstable County (LST–1197); LTC John F. Juul, Battalion Commander; LT R. E. Hibbert, Executive Officer, Bravo Company; and LT Edward Larkin, Executive Officer, Charlie Company whose cooperation and support made the study possible. Finally, we are indebted to the Marines of Bravo and Charlie Companies who participated in the study.

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INTRODUCTION

A cold weather consumer acceptance test of the prototype U.S. Marine Corps Arctic Ration (AR) was conducted in March of 1981 in northern Norway during the NATO exercise Cold Winter 81. The Emergency/Assault Food Packet (E/AP), recently developed by the Food Engineering Laboratory of the Natick Research and Development Laboratories (NLA8S), was combined with an Arctic Supplement (AS) to produce the AR.

The E/AP, developed in response to a Marine Corps requirement, is a lightweight low volume food packet designed to be used as a restricted diet during assaults, reconnaissance missions, and other non-resupply situations. The packet consists largely of compressed and freeze-dried compressed food bars that are convenient to use and carry and that may be eaten either dry or rehydrated. When issued one per day, the packet provides enough nutrition to maintain satisfactory performance of physically active men for short periods of time. The E/AP's (Appendix A) consist of entree bars, intermediate moisture meats, cereal bars, confection bars, a beverage bar, and coffee, cream and sugar.

The Arctic Supplement (Appendix 8) was developed in response to a recent Marine Corps requirement for a supplement to be issued in combination with two E/AP's to formulate a 4700-kilocalorie (kcal) arctic ration intended for use in cold weather climates under rigorous physical conditions. The supplement contains breakfast items, soups, beverages, and some high caloric density items. The Arctic Ration will provide sufficient calories to balance energy expenditures of men performing heavy work in extremely cold weather (Consolazio, 1966; Welch et al., 1957).[1,2]

Two earlier cold weather tests were designed to assess the acceptability, operational characteristics, and user performance of E/AP prototypes. Under severe cold weather conditions, Wilkinson et al. (1980)[3] for five days in March of 1979 studied two groups of Marines undergoing routine mountain warfare training and found a consistent preference for the E/AP over the Long Range Patrol (LRP) Food Packet, both in terms of convenience and overall quality. Some of the E/AP food items were found unacceptable and were eliminated. In addition, intermediate moisture meat items were added.

[1] C.F. Consolazio, Nutrition variation in world population and performance potential. New York Academy of Sciences, 1966, 134, 885–886.

[2] 8.E. Welch, L.M. Levy, C.F. Consolazio, E.R. 8uskirk and T.E. Dee. Caloric intake for prolonged hard work in the cold. US Army Medical Nutrition Laboratory Report No. 202, 22 March 1957.

[3] W.C. Wilkinson, E.T. Chao, H.L. Meiselman and L.E. Symington. Consumer opinion of emergency/assault food packet under rigorous field conditions in a cold weather environment. US Army Natick Research and Development Command Technical Report, NATICK/TR–80/009, January 1980.

The modified packet was tested the following year by Wyant et al. (1980).[4] In addition to assessing consumer acceptance, possible performance decrements were studied during five days of the mountain winter-warfare training. The modified E/AP was found to be highly acceptable and was preferred over the traditional Meal Combat Individual (MCI), both in terms of convenience and overall quality. However, the quantity of food, when one E/AP was issued per day, was rated slightly inadequate. No performance differences, as measured by the three-mile timed run, were found between an E/AP group and a MCI group (3600 kcal per day) or within the E/AP group between Marines who received one issue of the E/AP (1500 kcal per day) and Marines who received two issues of the E/AP (3000 kcal per day). The short duration of the test and mild environmental conditions may have militated against obtaining differences.

There were some indications, however, in both the Wilkinson et al. and Wyant et al. studies, that the troops were not receiving enough water either for rehydrating their food or for drinking. These indications are consistent with studies of voluntary dehydration which report that men will voluntarily dehydrate themselves by failing to drink enough water to replenish the amount of water lost through various physiological functions (e.g., Adoph and others, 1949; Hubbard, 1981).[5,6]. Thirst is not an adequate stimulus for replacing water. In addition, men may not drink enough water to replenish the water lost due to diuresis that occurs during the initial exposure to cold weather (Consolazio, 1966).[7] Voluntary dehydration increases with increased extremes (both high and low) in ambient temperature, increased work rates, inaccessibility of water, and poor water discipline. Because the job of melting snow and ice is tedious and boring, troops will not melt enough to satisfy water requirements unless they understand their water requirement in terms of quarts per day and strict water discipline is enforced. Both physical and mental performance decline with dehydration (Willison et al., 1980).[8,9]

[4] K.W. Wyant, W.C. Wilkinson, H.L. Meiselman, L.E. Symington and J.G. Hunn. Performance, physiological, and acceptance tests of a 1500-kcal emergency/assault food packet diet in a cold weather environment. US Army Natick Research and Development Command Technical Report, NATICK/TR–81/022, November 1980.

[5] E.F. Adolph and others. Physiology of man in the desert. London: Interscience Publishers Ltd., 1949.

[6] R.W. Hubbard. Water is a tactical weapon. Presented to the Defense Science Board Water Support Task Force, Pentagon, Washington, DC, 22 January 1981.

[7] C.F. Consolazio. Nutrient requirements of troops in extreme environments. Army Research and Development News Magazine, November 1966, pp. 24–27.

[8] Ibid.

[9] J.R. Willison, D.J. Thomas, G.H. DuBoulay, J. Marshall, E.A. Paul, T.C. Person, R.W. Ross Russell, L. Syman and G. Wetherley-Mein. Effect of high haematocrit on alertness. The Lancet. April 19, 1980, 846–848.

The current study was designed first to assess the acceptability and operational characteristics of the Arctic Ration Prototype. Employing two companies of Marines, the field test took place in March of 1981 in northern Norway during the NATO exercise, Cold Winter 81. One company received the Arctic Ration Prototype while the other received the British 24-Hour Ration Pack Arctic (Appendix C). Because there were some indications in the two earlier cold weather studies that the Marines were not getting enough water for food preparation and drinking, the study was also designed to assess water discipline. Water discipline was assessed primarily through the measurement of water consumption and urine osmolatities and specific gravities.

METHOD

Subjects and Materials

Subjects were active duty personnel from Charlie and Bravo Companies, 1st Battalion, 6th Marines, 2nd Marine Division. Tests were conducted while subjects were participating in the 1981 NATO exercise Cold Winter in northern Norway. Members of Charlie Company received the Arctic Ration Prototype while members of Bravo Company received the British 24-hour Ration Pack Arctic. The 90 members of Charlie Company who completed the post exercise questionnaire (Appendix G) had a median grade of private first class and a median time in service of 26 months. The 71 members of Bravo Company who completed the post exercise questionnaire had a median rank of private first class and a median time in service of 31 months. Seventeen volunteers from Charlie Company also completed two additional questionnaires and had urine samples taken on four different occasions during the test period.

Materials consisted of paper and pencil instruments and two Goldberg refractometers, obtainable from the Scientific Instrument Division of the American Optical Corporation. Paper and pencil materials consisted of a seven-item Body Fluid Scale (BFS), a 34-item Environmental Symptoms Questionnaire (ESQ), 9-point hedonic scales, an Emergency/Assault Food Packet and Arctic Supplement Consumer Survey, and a British 24-Hour Ration Pack Arctic Consumer Survey. Questions on the BFS were concerned with physical symptoms of dehydration and were rated on either 4-point, 6-point, or 7-point scales (Appendix D). The ESQ, developed by the Health and Performance Division of the US Army Institute of Environmental Medicine, consists of items describing a wider range of physical and psychological symptoms, for example, "I feel dizzy," "I feel depressed," which respondents might be experiencing as a function of extreme or unusual environmental conditions. Each symptom is rated on a 6-point scale ranging from NOT AT ALL to EXTREME (Appendix E).

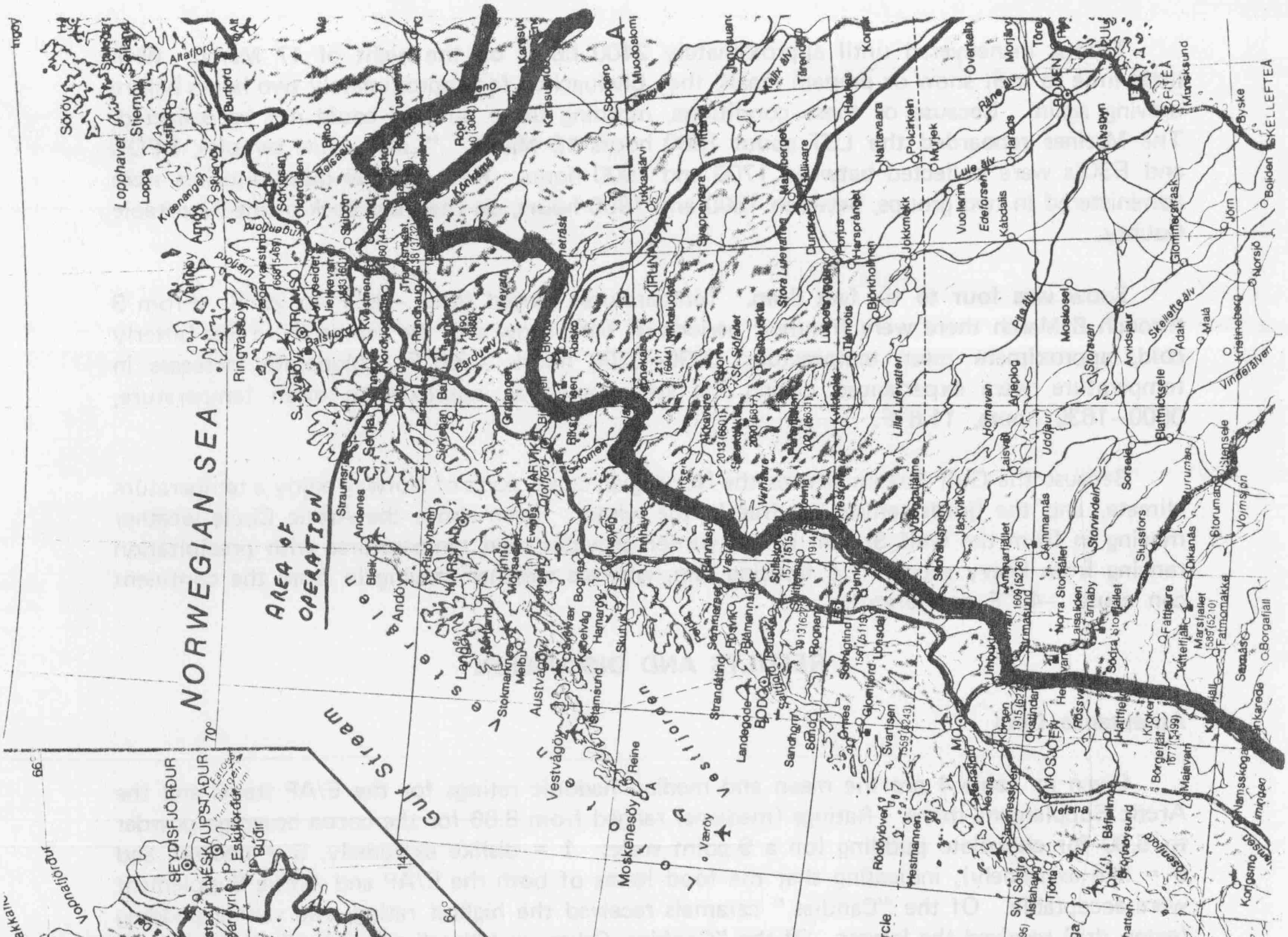
The hedonic rating scales, which were administered in face-to-face interviews and in groups, ranged from LIKE EXTREMELY to DISLIKE EXTREMELY and allowed respondents to rate items eaten dry or rehydrated with either hot or cold water (Appendix F). Items on the Emergency/Assault Food Packet and Arctic Supplement Consumer Survey were concerned with preferences for food items and for food categories, adequacy of variety and quantity of food, quality of the products, convenience of use, preferences for beverages, water availability, and water discipline. Respondents were also requested to comment on several issues contained in the questionnaire and on any issue not adequately covered (Appendix G). The items used to assess the acceptability and operational characteristics of the British Ration were similar in nature to those used for the Arctic Ration Prototype (Appendix H).

Procedure

Charlie Company arrived at the base camp, just outside the village of Setermoen (near Bardu on attached map), on 25 February 1981; Bravo Company had arrived two days earlier on the 27th. Between 25 February and 2 March, the Marines in C Company were bivouacked in heated tents, and water was available from taps. From 3 through 5 March, however, C Company was in the field. This was their first prolonged exposure to snow and cold in Norway. Physical activity, which included night patrols and sentry duty, was extreme, and time for sleep was minimal. During the field excerise, members of C Company were issued Meals, Combat Individual (MCI's) and Long Range Patrol Food Packets (LRP's). From 6 through 9 March, C Company Marines were in base camp. The first morning urine was taken on 6 March, the day after C Company had arrived back from the field. On the night of the 5th, however, C Company was given B rations and had the opportunity to purchase cokes and beer. Results, though probably affected by these events, were still in the predicted direction of dehydration.

On 10 March, B Company began their movement overland toward Nordkjosbotn, about 45 miles northeast of Setermoen, where the exercise was planned to occur. Movement was by vehicle until the 13th when members of B Company began a ten-hour forced march, carrying full packs, toward their first objective. Movement was restricted to foothills and was by snow shoes. On the 10th, they began a continuous diet of the British arctic ration. Charlie Company, however, on 9 March, boarded the USS Barnstable County (LST–1197) and remained aboard until the morning of the 13th. During this time the Marines of C Company were sedentary and received A rations. Morning urine samples were taken on 11 and 12 March. Environmental Symptoms Questionnaires and BFS's were also administered on each occasion. To provide "base line" estimates, data from each measure were averaged across the two days. Data from the ESQ, though strongly indicating an increased frequency of cold and flu symptoms following the exercise than before, are not reported because the Marines had reboarded the LST and had the opportunity to drink water or beverages just prior to the administration of the last ESQ. On the 12th, C Company Marines were also briefed on the use of Arctic Ration Prototype.

On the morning of 13 March the Marines of C Company made an amphibious landing from Balsfjord at Markenes Beach (see map). Throughout the exercise, movement was largely by amphibious tracked vehicles and was restricted to main highways. (Existing tracked vehicles cannot maneuver in snow deeper than 36 inches.) When not in the tracked vehicles, members of C Company either moved forward by foot, usually carrying loads of 35 pounds or less, or maintained static defensive positions. They received four to six hours sleep nightly and frequently did not have enough time to melt snow or prepare meals individually. Further, these tasks were usually not coordinated with other activities or among the troops. The tent team concept was not well instituted. Certain individuals, for example, were not given the tasks of preparing hot water for beverages and rehydrating meals while others were setting up tents, standing guard, or patrolling. It was not until 1100 hours of the third day that C Company was given two "administrative" hours in which they were to put up tents (Norwegian tent sheets), rest, and prepare meals. Marines were further hampered by malfunctioning newly issued squad stoves. Rather than the planned one stove per four Marines, there was approximately one stove per eight. Charlie Company Marines were issued three rations of the Arctic Ration Prototype on the 13th and one on the 16th. Rations for the 17th and 18th were lost. Hedonic scales were administered on a daily basis whenever possible.


NORWEGIAN SEA
AREA OF OPERATION
Gulf Stream
ATLANTIC OCEAN
ARCTIC OCEAN
GREENLAND SEA
BARENTS SEA
SOVIET UNION
FINLAND
SWEDEN
NORWAY
NORWEGIAN SEA
NORTH SEA
BALTIC SEA
Polar Circle
Vatnajökull
Lofoten
Vesterålen
TROMSØ
NARVIK
KIRUNA
BODØ
MOSJØEN
SKELLEFTEÅ
PITEÅ

Troops maneuvered until approximately 2400 hours on the night of 17 March. With little time to melt snow or prepare meals, they bivouacked for approximately two hours before moving again. Because of these conditions, morning urine samples could not be collected. The Marines reboarded the LST about 1600 hours 18 March. "Late" urine samples, BFQ's and ESQ's were collected between 1700 and 1900 hours. Post exercise questionnaires were administered in two groups, between 1800 and 1900 hours, on the mess deck of the Barnstable County.

Snow was four to six feet deep. Temperatures ranged from −20°F to 25°F. From 3 through 8 March there were frequent periods of light snow and the temperature was bitterly cold, approximate mean temperature, 0730–2200 hours, −3.6°F. Moderate increases in temperature were experienced during the actual exercise, approximate mean temperature, 0600–1630 hours, 11.6°F.

Because the Gulf Stream sweeps the Norwegian coast, parts of Norway enjoy a temperate climate, and the fjords remain ice free in the winter. Even above the Arctic Circle weather moving in from the Gulf Stream in the winter provides mild temperatures with precipitation ranging from heavy snowfall to freezing rain, whereas weather moving in from the continent can cause −40°F temperatures.

RESULTS AND DISCUSSION

Acceptance Data

Given in Table 1 are the mean and median hedonic ratings for the E/AP items and the Arctic Supplement items. Ratings (medians) ranged from 8.66 for the cocoa beverage powder to 5.00 for chocolate pudding (on a 9-point scale: 1 = dislike extremely, 5 = neutral, and 9 = like extremely), indicating that the food items of both the E/AP and Arctic Supplement were acceptable. Of the "Candies," caramels received the highest rating, and vanilla pudding (eaten dry) received the lowest. Of the "Cookies, Cakes, and Nuts" catagory, fig bars received the highest rating, and maple nut cake received the lowest rating. Chicken a la king received the highest entree rating, beef hash, the lowest. Cocoa received the highest beverage rating, fudge bar as a drink, the lowest.

In comparison to the E/AP items, supplemental items were well received. Half of the ten most liked foods were supplemental items. By decreasing median hedonic rating, the ten most preferred items were cocoa beverage, lemon tea, oatmeal with apples, fig bars, caramels, chicken noodle soup, oatmeal with maple sugar, oatmeal cookie bar, granola bar, and starch jelly. Given by increasing median hedonic rating, the ten least liked items were chocolate pudding rehydrated, vanilla pudding rehydrated, vanilla pudding eaten dry, fudge bar beverage, chocolate pudding eaten dry, fudge bar candy, beef hash, chicken and rice, orange beverage dry, and chocolate bars.

Seven of the ten supplemental items received a median rating of 8.0 or better. By decreasing hedonic rating, these were cocoa, lemon tea, oatmeal with apples, chicken noodle soup, oatmeal with maple sugar, beef vegetable soup, and nuts and fruit. Chocolate covered brownie, maple nut cake, and skim milk received ratings of 7.93, 7.67, and 7.14 respectively.

Table 1

E/AP and Arctic Supplement Food Items Rank-Ordered by
Decreasing Mean Hedonic Rating
Nine Point Scale, Nine Equals Like Extremely

	1981		Group Count	1980	Group Count	1979	Group Count
	Mean	Median		Mean		Mean	
Candies							
Caramels	7.66	8.56*	(154)	8.38	(148)	8.1	(30)
Starch Jelly	7.24	8.28*	(126)	7.18	(112)	7.54	(35)
Orange Beverage (Dry)	6.67	7.00	(63)			6.42	(24)
Chocolate Bar	6.65	7.04	(150)	7.58	(166)	7.59	(22)
Chocolate Pudding (Dry)	6.28	6.40	(25)			7.57	(7)
Fudge Bar	5.82	6.47+	(140)	6.62	(156)	8.53	(19)
Vanilla Pudding (Dry)	5.30	5.58	(27)			7.80	(5)
Cookies, Cakes & Nuts							
Fig Bars	7.52	8.58*	(131)				
Oatmeal Cookie Bar	7.49	8.44*	(162)	7.97	(174)	7.91	(34)
Granola Bar	7.27	8.29*	(158)	7.89	(180)	7.60	(70)
Nuts & Fruit	7.22	8.15*	(148)				
Chocolate Covered Brownie	7.12	7.93*	(130)				
Maple Nut Cake	6.89	7.67*	(135)				
Pudding Bars**							
Vanilla Pudding	5.00	5.25+	(19)	6.89	(86)	7.45	(11)
Chocolate Pudding	4.63	5.00+	(19)	7.00	(92)	7.92	(24)
Beef Snacks							
Beef Jerky	7.30	7.97*	(171)	8.59	(180)		
Beef Pepperoni	6.69	7.36	(153)	8.23	(145)		
Entree Bars**							
Chicken A La King	6.84	7.64*	(70)	7.99	(101)	7.12	(34)
Chicken Stew	6.80	7.56*	(66)	7.59	(83)	6.91	(35)
Pork & Escalloped Potatoes	6.73	7.29*	(60)	7.17	(90)	6.00	(35)
Beef & Vegetables	6.72	7.53*	(57)	7.39	(97)	6.77	(26)
Beef Hash	6.10	6.80	(69)	6.12	(101)	5.68	(31)
Chicken & Rice	5.92	7.00+	(79)	7.54	(98)	5.49	(37)

Table 1

E/AP and Arctic Supplement Food Items Renk-Ordered by
Decreasing Mean Hedonic Rating
Nine Point Scale, Nine Equels Like Extremely (cont'd)

	1981		Group Count	1980	Group Count	1979	Group Count
	Mean	Median		Meen		Mean	
Cereals**							
Oatmeal w/Apples	7.61	8.58*	(77)				
Oatmeal w/Maple Sugar	7.37	8.53*+	(87)				
Soups**							
Chicken Noodle	7.48	8.53*	(60)				
Beef Vegetable	7.26	8.19*	(47)				
Beverages**							
Cocoa Beverage Powder	7.68	8.66	(76)				
Lemon Tea	7.19	8.61*+	(48)				
Coffee	6.60	7.50*+	(42)	7.97	(126)		
Skim Milk	6.43	7.14+	(37)				
Orange Beverage	6.33	7.14*	(21)	7.92	(159)	7.74	(34)
Fudge Bar	4.95	6.00+	(19)				

*Skew is equal to or greater than −1.0 but is less than −2.0. All others, skew is less than −1.0. Medians will be appreciably higher than means for skews greater than −1.0.

+Standard deviation is equal to or greater than 2.5 but less than 3.5. All others, standard deviation is less than 2.5.

** Rehydrated with hot water.

Preferences for E/AP food items (exclusive of Arctic Supplement items) as rank-ordered by the survey sample are given in Table 2. Correspondence with the hedonic ratings was poor. (Correspondence between preferences as determined by ratings and as determined by assigned ranks was also poor for the 1979 sample but was very good for the 1980 sample.) However, chicken a la king was the most preferred entree bar, eaten dry or rehydrated. Pork and escalloped potatoes was the least preferred. Of the dry non-meatbars -- including candies, cookies, and pudding bars -- caramels was the most preferred and vanilla pudding (eaten dry) was the least preferred. Of the two intermediate moisture meats, beef jerky was more highly preferred than beef pepperoni. Supplemental beverage items were rank-ordered along with the three E/AP drinks, and cocoa was the most preferred and fudge bar the least.

On seven-point scales, respondents were asked to indicate their relative preference for either coffee or tea, coffee or cocoa beverage, and tea or cocoa beverage (see Appendix G, items 29 to 31 for description of scale). Results are given in Table 3. Respondents were also asked to rate these beverages (Table 1) and to rank-order them by decreasing preference (Table 2). Results consistently indicated that cocoa was preferred to coffee and tea. Results were somewhat mixed for coffee and tea but tended to indicate that tea was preferred to coffee. Respondents rated and ranked tea higher than coffee but tended to indicate no preference when asked to compare them (Table 3). In addition, individuals receiving the E/AP requested three cups of tea but only two cups of coffee (Table 4). However, individuals receiving the British ration did not indicate this difference. Thus, while respondents consistently indicated a greater preference for cocoa than for the coffee or tea, results were slightly mixed for coffee and tea.

Reliability of Acceptance Data

Reliability of mean hedonic ratings and of preferences as rank-ordered by respondent across three studies (1979, 1980, and 1981 samples) is given in Table 5. For entrees, correlations ranged from 0.54 to 0.94, were generally higher for hedonic ratings, and indicated some reliability of preferences across the samples. Visual inspection of the hedonic ratings suggests that they were very reliable with the exception of the ratings for chicken and rice and pork and escalloped potatoes. Chicken and rice received the lowest mean ratings of the entrees by the 1981 and 1979 samples but received the third highest ratings by the 1980 sample. However, chicken and rice was ranked second by all three samples. Pork and escalloped potatoes was rated lower than beef and vegetables by the 1980 and 1979 samples but was rated higher by the 1981 sample. The median rating, however, was lower. Pork and escalloped potatoes was consistently ranked low. Preferences as determined by rank order were very consistent between the 1981 and 1980 samples, but these tended to be inconsistent with the 1979 sample. The relative ordinal position of entree items remained the same whether eaten dry or wet.

Generally, chicken a la king was liked best, and pork and escalloped potatoes and beef hash, the least. Beef and vegetables and chicken stew received intermediate ratings and ranks. The picture for chicken and rice was unclear, but it at least had an intermediate status. Irrespective of their relative standings, the entrees were liked slightly to very much.

To a large extent, the correlations for the cereal, cookie, and candy bars are misleading. First, they are given only for preferences as rank-ordered by the three samples. Second, it was probably not appropriate to ask consumers to compare the cereal and cookie bars with

Table 2

Preferences for Food Items as Renk Ordered by Survey Sample

Renk	Food Item	Mean Renk	Group Count	Rank	Food Item	Mean Rank	Group Count
	Entree Bars Dry				Entree Bars Rehydrated		
1	Chicken A La King	2.82	22	1	Chicken A La King	2.45	67
2	Beef & Vegetables	2.93	27	2	Chicken & Rice	2.71	72
3.5	Chicken Stew	2.95	19	3	Beef & Vegetables	3.06	63
3.5	Chicken & Rice	2.95	20	4	Chicken Stew	3.21	63
5	Beef Hash	3.00	21	5	Beef Hash	3.30	61
6	Pork & Escalloped Potatoes	3.68	22	6	Pork & Escalloped Potatoes	3.84	64
	Non-Meat Bars Eaten Dry				Beverages		
1	Caramels	2.56	84	1	Cocoa	1.53	81
2	Fig Bar	2.76	68	2	Tea, Sweet, Lemon	2.54	72
3	Oatmeal Cookie Bar	3.51	73	3	Coffee	2.90	63
4	Starch Jelly	4.05	65	4	Orange Beverage Bar	3.10	68
5	Granola Bar	4.24	70	5	Skim Milk	4.36	45
6	Chocolate Bar	4.38	78	6	Fudge Bar	4.88	41
7	Fudge Bar	5.84	71				
8	Chocolate Pudding Bar	6.92	50				
9	Vanilla Pudding Bar	7.13	47				
	Puddings Eaten Rehydrated				Intermediate Moisture Meats		
1	Vanilla Pudding Bar	1.40	40	1	Beef Jerky	1.32	82
2	Chocolate Pudding Bar	1.55	42	2	Beef Pepperoni	1.65	77

Table 3

Relative Preferences for Coffee, Tea, and Cocoe Beverage
Seven Point Scale

	Mean	Group Count
Coffee vs. Tea*	4.33 Neutral	(88)
Coffee vs. Cocoa	5.78 Moderately Prefer Cocoa	(88)
Tea vs. Cocoa	5.06 Slightly Prefer Cocoa	(89)

*Sweet Lemon Tea

Table 4

Mean Number of Requested Servings of Coffee and Tea in the
Arctic Ration and British 24-Hour Ration Pack Arctic

	E/AP & Arctic Supplement		British 24-Hour Ration Peck Arctic	
	Mean	Group Count	Mean	Group Count
Number of Requested Servings of Coffee	2.20	(92)	2.44	(71)
Number of Requested Servings of Tea	2.99	(92)	1.94	(71)

Table 5

Reliability of Preferences as Determined by Renk Order and Reliability of Mean Preference Retings and Preferences for Items Eeten Dry vs. Rehydrated*

Preference for Entree Bars Rehydrated as Rank Drdered

	1979	1980	1981
1979			
1980	0.54		
1981	0.60	0.94	

Preference for Entree Bars Rehydrated as Determined by Ratings

	1979	1980	1981
1979			
1980	0.66		
1981	0.94	0.60	

Preference for Cereal, Cookie, end Candy Bars as Rank Ordered

	1979	1980	1981
1979			
1980	0.05		
1981	0.20	0.61	

Preference for Entree Bars Eaten Dry vs. Rehydrated

	1979	1980	1981
1979	0.91	0.91	0.90

*Reliabilities may have been influenced by menu changes between 1979 and 1980 and between 1980 and 1981, changes in reformulation of individual items, and different concepts of use in the three different studies.

the candies. When the cereal and cookie bars are omitted, preferences as determined by either ranks or hedonic ratings across the three years is very good, with the following exceptions. First, starch jellies were liked less than the chocolate bars by the 1980 and 1979 samples but were liked more than the chocolate bar by the 1981 sample. Second, fudge bar was liked best, as indicated by hedonic ratings, by the 1979 sample but was liked least of all in all other instances. Generally, caramel was liked best and fudge bar the least. Chocolate bar and starch jellies received intermediate ratings and ranks.

The oatmeal cookie bar was consistently liked better than the granola bar, either by hedonic ratings or relative ranks, with one exception. Granola bar was ranked higher by the 1979 sample. Eaten dry as a candy, the chocolate pudding bar was liked better, as indicated by ratings and ranks, than the vanilla pudding bar. Results for the pudding bars eaten wet were highly inconsistent. Only limited results from the 1981 and 1980 studies are available for the fudge bar and the orange beverage bar but suggested that the orange beverage bar both as a candy and a beverage was liked better than the fudge bar. Only limited results from the 1980 and 1981 studies are also available for orange beverage and coffee but indicated that coffee was preferred over orange beverage. Finally, data on the intermediate moisture meats are only available from the 1981 and 1980 studies, but results indicated that beef jerky was consistently rated and ranked higher than beef pepperoni.

Data given in Table 6 indicated that almost no one had problems understanding instructions for preparing the E/AP and arctic supplement items and that only 8.7% of the respondents had consumed foods or beverages that were not issued to them and were in addition to the Arctic Ration. Twenty-eight percent of the respondents, however, indicated that they had had problems using the rehydration bags. Thirty percent of the respondents in the 1980 study also indicated they had had problems. Suggested improvements were to use heavier bags, shorten package length, add a water line and a cardboard base, and develop a bag that could be used with a canteen cup.

The British 24-Hour Ration Pack Arctic

The British 24-Hour Ration Pack Arctic and the Arctic Ration are described in Table 7. The size and weight of the rations are nearly identical and they contain a nearly identical number of food items. The Arctic Ration, however, contains a slightly greater number of calories, requires less water to rehydrate and prepare the food items, and requires less time to prepare. This is partly due to the British entree package that contains five separate items with each item requiring separate preparation (if directions are followed).

Mean preference ratings of the Arctic Ration and of the British ration are given in Table 8. The rations were rated on five catagories: drinks, sundries, main meals, breakfast, candies, and other snacks, for example, biscuits and nuts in British ration and granola, jerky, and nuts in the Arctic Ration. Generally, both rations were liked slightly to moderately. However, the drinks, entrees, and breakfast of the Arctic Ration were rated significantly higher than those of the British ration.

Table 6

Percent of Respondents Who Reported Having Difficulty With the Instructions, Who Had Problems Using the Rehydration Bags, and Who Had Any Foods or Beverages in Addition to the Issued Rations

	Percent	Group Count
Difficulty Understanding Instructions	1.1	(92)
Problems Using Rehydration Bags	28.4	(88)
Additional Foods or Beverages	8.7	(84)

Table 7

Volume and Weight Dimensions, Number of Calories, Water Required for Rehydration, and Number of Food Items for the Arctic Ration and the British 24-Hour Ration Pack Arctic*

	Arctic Ration	British 24-Hour Ration Pack Arctic
Dimensions		
Length	6.75	7.00
Height	6.50	5.50
Width	4.75	5.50
Volume	208.00	211.70
Weight	3.10 lb (1407 g)	3.10 lb (1407 g)
Calories	4700 kcal	4470 kcal
Water Required for Rehydration		
Ounces	86–118**	90–138**
Quarts	2.7–3.7	2.8–4.3
Number of Food Items		
Drinks+	13	15
Entree Packages	2	1 (5 items)
Breakfast	1	1
Candies & Cakes	5–7	6
Other Snacks	7	4

*Classification of food items by type (e.g., drinks, candies, and cakes) is somewhat arbitrary.

+Includes soups but not sugar.

**Low figure excludes preparation of coffee and tea.

Table 8

Mean Preference Ratings of Meals and Itams in the Arctic Retion and the British 24-Hour Ration Pack Arctic Seven Point Scale, Seven Equals Like Very Much

	Arctic Ration		British 24-Hour Retion Peck Arctic		Difference
	Mean	Group Count	Mean	Group Count	
Drinks	6.19	(85)	4.55	(71)	1.64*
Sundries	5.33	(87)	5.30	(71)	0.03
Main Meals	5.64	(85)	4.60	(70)	1.04*
Breakfast	6.16	(84)	5.10	(71)	1.06*
Candies	6.20	(90)	5.93	(71)	0.27
Other Snacks	6.38	(90)	6.04	(71)	0.34
	Like Slightly–Like Moderately		Like Slightly–Like Moderately		

*Significant at or below the 0.001 level, t test.

No significant differences were obtained for sundries, candies, and other snacks. Data given in Table 9 suggest that the obtained differences were due to a relatively greater ease of preparation of the Arctic Ration food items and better quality. Given in Table 9 are ratings of adequacy of variety, adequacy of quantity, quality of ration, and convenience of preparation. The Arctic Ration received significantly better ratings on quality and convenience of preparation (for example, entree items). However, the differences may also be due to a novelty effect. Ratings are apt to be influenced by the newness of the items, and Charlie (Arctic Ration) and Bravo (British Arctic Rations) Companies subsisted on their respective rations for different periods of time. Members of Charlie Company received only four issues of the Arctic Ration (13 March to 16 March) while Bravo Company subsisted on the British ration for eight days (10 March to 17 March). The British ration may have received lower ratings because it was used for a longer period of time, and the novelty of the ration had subsided.

Also given in Table 9 are data from the 1980 study in which one or two issues of the E/AP were compared with the meal combat individual (MCI). The quantity of food provided by the MCI was considered more adequate than one issue of the E/AP, but the E/AP was liked better and thought more convenient. Novelty considerations are even more relevant here, the MCI being the traditional field ration.

Three-day supplies of each ration were rated for bulkiness and weight in Table 10. The British ration was given a higher "bulkiness" rating, and in comparison to 12 MCI's (a three-day supply) the Arctic Ration was rated moderately light while the British ration was rated only somewhat light. Because the bulk and weight dimensions of these two rations is nearly identical, these differences were probably due to either the relatively greater novelty of the Arctic Ration or to a "halo effect," related to its convenience and quality.

Data given in Table 11 indicated that respondents generally thought that there was neither too many nor too few of the food items in the categories drinks, entrees, breakfast foods, and candies and cakes. Individuals receiving the British ration, however, indicated that the ration contained too many drinks and too few breakfast foods.

Respondents' Comments

On the post exercise questionnaires, respondents were also asked to comment on issues that were not adequately covered by the questionnaires. Results are given in Tables 12 and 13. In the 1980 study, the large majority (68%) of the comments were related to the sugar content of the E/AP. Respondents indicated that more non-sweet foods were needed and that there were too many sweets. In the present study, 13% of the respondents made these comments. The most frequently made comment was laudatory in nature. Twenty-seven percent of the respondents indicated that they liked the ration or that it compared favorably with the MCI or Long Range Patrol (LRP) Food Packet. The second most frequently made comment (20%) indicated that either the entree portions were too small or that more specific food items were needed. Similar comments were the third most frequently occurring in the 1980 study. The third most frequent comment (16%) in the present study indicated that the food items took too long to prepare under combat conditions. The fourth most frequently occurring (11%) comment indicated the food items required too much water for the conditions of the exercise.

Table 9

Mean Retings of Arctic Ration and British 24-Hour Ration Pack Arctic for 1981, end of the E/AP end MCI for 1980, end of the E/AP for 1979 on Veriety of Entrees, Quality, Quantity, and Convenience of Use*
Seven Point Scale

		Arctic Retion	British 24-Hour Ration	One or Two Issues E/AP	Three Issues MCI	One Issue E/AP+
		1981	1981	1980	1980	1979
Adequacy of Variety of Entree One Equals Extremely Adequate		3.74 (92)	4.01 (71)			
Adequacy of the Quantity of Food One Equals Extremely Adequate		3.71 (91)	3.90 (71)	3.94 (96)	3.32++ (65)	3.90
Quality of Ration One Equals Extreme Good	E/AP Supplement	2.34 2.38 (91)	3.91** (69)	2.20 (96)	3.68++ (64)	3.03
Convenience One Equals Extremely Convenient		3.01 (91)	4.59** (69)	1.79 (96)	4.23++ (64)	
Quality Relative to the MCI One Equals Much Better		2.85 (91)		2.33 (90)		3.81
Convenience Relative to the MCI One Equals Much More		3.04 (91)		2.34 (89)		2.55

*Group counts are in parentheses.

+Some food items in the 1979 issue were discontinued in subsequent productions.

**Significantly different from the 1981 of the Arctic Ration t test, $p<0.001$.

++Significantly different from the 1980 rating of the E/AP, t test, quantity at the 0.025 level, quality and convenience below the 0.001 level.

Table 10

Mean Ratings of a One-Man Three-Day Supply of the Arctic Ration and the British 24-Hour Ration Pack Arctic on Bulkiness and Weight

	Arctic Ration		British 24-Hour Ration Pack Arctic	
	Mean	Group Count	Mean	Group Count
Too Bulky to Carry in Rucksack Six Point Scale, Six Equals Extremely Bulky	1.93	(91)	2.99	(69)
In Comparison to 12 MCI's, How Heavy Seven Point Scale, Seven Equals Extremely Heavy	1.76	(91)	2.71	(69)

Table 11

Mean Rating of Whether There Were Too Few or Too Many Food Items in Each of Five Categories of Food in the Arctic Ration and the British 24-Hour Ration Pack Arctic, Seven Point Scale, Seven Equals Very Much Too Few

	Arctic Ration		British 24-Hour Ration Pack Arctic	
	Mean	Group Count	Mean	Group Count
Drinks	4.25	(92)	3.45	(69)
Entrees	4.40	(86)	4.37	(65)
Breakfast Foods	4.66	(90)	5.03	(69)
Candies & Cakes	4.04	(91)	4.10	(69)
Other Snacks	4.36	(89)	4.62	(69)
	Neutral–Too Few		Too Many–Too Few	

Table 12

Comments About the Arctic Ration
Rank Ordered by Decreasing Frequency

Rank		Frequency of Comment	Relative Percent
1	Liked the ration, liked the ration with exceptions, compared favorably with MCI or LRP*	33	27
2	Entree portions too small, needs more snacks, needs more of other specific items+	24	20
3.	Takes too long to prepare under combat conditions	20	16
4	Requires too much water for conditions of exercise	14	11
5	Needs more non-sweet snacks	8	7
6	Too many sweets	7	6
7	Too many snacks, not enough solid food	4	3
8.5	Want bags that can be used with canteen cup	3	2
8.5	Ration difficult to prepare	3	2
10.5	Want entrees to be pre-crushed in bags	2	2
10.5	Did not like cold meals	2	2
12.5	Problems with bags melting	1	1
12.5	Cold candy difficult to eat	1	1

*Frequency of comments: Liked ration 13; liked ration but with exceptions 16; compared favorably with MCI or LRP 4.

+Frequency of comments: Entree portions too small 14; needs more snacks 4; needs more of other specific items such as cocoa, oatmeal, coffee, vegetables and fruit, candy, and sugar 6.

Table 13

Comments About the British 24-Hour Ration Pack Arctic Rank Ordered by Decreasing Frequency

Rank		Frequency of Comment	Relative Percent
1	Compares unfavorably with the MCI (Meal, Combat Individual) or LRP (Long Range Patrol Food Packet) or did not like ration*	26	23
2	Not enough food or nourishment or needs more of a specific item+	24	21
3	Takes too long to prepare under combat conditions	23	20
4	Requires too much water for conditions of exercise	22	20
5	Spoon not provided	11	10
6	Liked lightness	2	2
9	Liked snacks	1	1
9	Too bulky	1	1
9	Bothered by unfamiliar product names	1	1
9	Meats unappetizing	1	1
9	Too many candies	1	1

*Frequency of comments: Compares unfavorably with MCI 6; compares unfavorably with LRP 13; did not like ration 7.

+Frequency of comments: Not enough food 11; needs more oatmeal 5; need more snacks 2; needs more of other specific items such as cocoa, fruit, and salt 6.

The third (20%) and fourth (20%) most frequently made comments about the British ration were exactly the same. The most frequent (23%) comments however, were derogatory indicating that the ration did not compare favorably with the LRP or that the respondents did not like the ration. The second most frequently (21%) made comment about the British ration indicated that it did not provide enough food.

Generally, comments indicated that the Arctic Ration was liked better than the 8ritish ration and that both rations need more of certain items. Comments also strongly indicated that the entree items took too long to prepare and required too much water for the conditions of the exercise. Consistent with these comments were the number of individuals receiving the Arctic Ration who indicated that they did not prepare an entree during the first 60 hours of the exercise (Table 14). During the first 60 hours, 65% of the respondents indicated that they had not prepared a main meal or soup and that they had subsisted on snacks and oatmeal.

Dehydration and Water Discipline

Given in Table 15 are measures of urine specific gravity and urine osmolality. Urine samples were taken from the same group of 17 individuals on 6 March after 2.5 days in the field, 11 and 12 March after several days in base camp and aboard ship, and 18 March after 5.5 days in the field. Values given for 6 March were based on morning urines collected after subjects had been given the opportunity to rehydrate (beer and other beverages were made available the previous night) and do not directly reflect the physiological conditions of the subjects at the end of the 2.5 day training exercise. Values given for 11 and 12 March are averaged values for the two days. Values given for 18 March were based on samples collected in the late afternoon and early evening between the hours of 1700 and 1900.

Specific gravity is the comparison of the mass of a solution with the mass of an equal amount of water and is expressed as a ratio. 8ecause it is a comparison of weights, it is directly related to the number of solute particles but is not an exact measurement of them. Osmolality is a measure of the number of dissolved particles in a solution. Values for specific gravity in adults with normal fluid intake range from 1.016 to 1.022 (Diem & Leutner, 1970; Harry, 1979).[10,11] Values as large as 1.026 are considered high (they occur after 24 hours without fluid), and values as large as 1.030 are associated with dehydration. Normal osmolality values range from 500 to 850 mOsm/kg water. Values range from 800 to 1400 mOsm/kg water in states of dehydration.

As indicated in Table 15, significant differences were obtained across the three measurements of specific gravity ($F(2,32) = 29.43$, $p < 0.001$) and osmolality ($F(2,32) = 16.98$, $p < 0.001$). Osmolality values based on samples taken on 6 and 18 March

[10] K. Diem and C. Leutner, (Eds.). Scientific tables. (7th ed.) New York: Geigy Pharmaceuticals, 1970.

[11] J.B. Harry. Clinical diagnosis and management by laboratory methods. Vol. I (16th ed.). Philadelphia: W.8. Saunders Co., 1979.

Table 14

Food Items Eaten Dry or Rehydrated Rank Ordered by Decreasing Percent of Respondents Who Consumed Each Item During the First 60 Hours of the Exercise (Group Count = 57)

Rank	Food Item	Mean Rating	Count	Percent
1	Beef Jerky	7.60	53	93
2	Granola Bar	7.87	47	82
4	Beef Pepperoni	6.96	45	79
4	Chocolate Bar	7.22	45	79
4	Oatmeal Cookie Bar	8.11	45	79
6.5	Caramels	7.95	42	74
6.5	Fudge Bar	6.95	42	74
8	Nut and Fruit Mixture	7.43	40	70
9	Orange Beverage Bar	6.93	37	65
10	Maple Nut Cake	7.32	34	60
11	Oatmeal w/Maple and Brown Sugar	6.88	33	58
12	Fig Bar	7.47	32	56
13.5	Starch Jelly	7.41	31	54
13.5	Chocolate Covered Brownie	7.77	31	54
15	Oatmeal w/Apples and Cinnamon	7.28	29	51
16	Cocoa Beverage Powder	8.19	21	37
17	Chicken and Rice Bar	5.60	20	35
20.5	Beef Hash Bar	6.13	16	28
20.5	Beef and Vegetables Bar	6.13	16	28
20.5	Chocolate Pudding Bar	6.56	16	28
20.5	Vanilla Pudding Bar	6.38	16	28
20.5	Fudge Bar (Beverage)	6.56	16	28
20.5	Lemon Tea	8.38	16	28
24	Chicken Noodle Soup	8.33	15	26
25.5	Chicken Stew Bar	6.43	14	25
25.5	Pork and Escalloped Potatoes Bar	6.43	14	25
27	Chicken a la King Bar	5.83	12	21
28.	Beef and Vegetable Soup	7.64	11	19
29	Coffee	6.90	10	18
30	Skim Milk	6.00	9	16

Table 15

Mean Urine Specific Gravities and Osmolatities Based on Samples Taken Following 2.5 Days in the Field, after 7 Days in Camp or Aboard Ship, and 5.5 Days in the Field*

	6 March	11, 12 March+	18 March
	2.5 Days in Field	3.5 Days Base Camp 1.5 to 2.5 Days Shipboard	5.5 Days in Field
Specific Gravity	1.025 (0.003)	1.024 (0.004)	1.032** (0.003)
Osmolality	1030.82** (121.83)	914.68 (162.76)	1153.65** (126.32)

*Standard deviations are in parentheses.

**Significantly different from average, Newman-Keuls test, $p < 0.01$.

+Values are averages based on samples taken 11 March and 12 March.

were both significantly different from the averaged values (Newman-Keuls tests, $p < 0.01$). Only the 18 March specific gravity measure differed significantly from the averaged specific gravity values (Newman-Keuls test, $p < 0.01$). Nonetheless, results indicated maximally concentrated urines indicating poor water discipline for the conditions of the exercise and strongly suggested the possibility of dehydration in a number of the troops. Further, specific gravities and osmolalities were already elevated on 11 and 12 March suggesting that water discipline was inadequate not only in the field but also in base camp and aboard ship. Finally, urine samples collected on the 18th were taken in the late afternoon and early evening when urinary osmolality may be expected to be decreased (Harry, 1979).[12] Charlie Company Marines had some opportunity for fluid intake while in the field on the 18th (much of their time was spent waiting during which they could have melted snow), and they had an opportunity for fluid intake after they had boarded ship before the urine samples were taken. This condition suggests that the specific gravity and osmolality measurements on 18 March may have been conservative.

Although changes in the color of urine can reflect the use of various drugs foods consumed, or disease states, it can also reflect concentrated urine and dehydration. Pale urine in the normal person follows high amounts of fluid intake. Darker urines occur when fluids are withheld or following excessive sweating or vomiting. Color, therefore, may roughly indicate urine concentration (Harry, 1979)[13] and can be used as rough indicator of hydration in some situations, as for example, in a cold environment where dehydration is likely to occur. Given in Table 16 are the items used on the Body Fluid Scale (BFS). Also given in the table are the mean averaged responses to the items on 11 and 12 March and the mean responses given on 18 March. The first two items are concerned with color dimensions, brightness and hue, respectively, whereas the remaining items are concerned with frequency and volume of urine, dryness of mouth, tightness of skin, and the subjective experience of thirst. Results suggested that urines were significantly darker following 5.5 days in the field than after several days aboard ship. The light-dark dimension of the first item was probably the most sensitive measure. Although differences were significant on the color dimension, Marines tended to restrict their responses to the first two alternatives, which were concerned with brightness rather than color (See Appendix D). Respondents also reported urinating less (amount) and that their skin felt relatively loose or limp after 5.5 days in the field. Responses to the items concerned with dryness of mouth and the subjective experience of thirst may have been affected by the availability of beverages just prior to the final administration of the BFS.

That water discipline was inadequate is further supported by Table 17. Charlie Company indicated that while they were "fairly often" able to get enough water to rehydrate food, they could only "sometimes" get enough water to satisfy their thirst. In addition, only 30% of Charlie Company Marines reported that they were able to get enough water to rehydrate food, and only 23% reported being able to get enough water to satisfy their thirst. Percentages were much smaller for members of 8 Company who received the British ration. Only 15%

[12] Ibid.

[13] Ibid.

Table 16

Means and Standard Deviations for Rasponses to the Body Fluid Scala
Aftar 7 Days in Camp and 5.5 Days in the Field*
(Group Count = 18)

		11, 12 March	18 March	
		3.5 Days Base Camp and 1.5 to 2.5 Days Shipboard	5.5 Days in Field	Difference
1	How light or dark is your urine today? 7-point scale, 7 equals extremely dark	2.83 (1.08)	4.00 (1.19)	-1.17+
2	Rate the color of your urine as it has occurred today. 4-point scale, 4 equals brown	1.03 (0.27)	1.50 (0.62)	-0.47+
3	Are you urinating more or less often than usual? 7-point scale, 7 equals extremely less	3.31 (0.94)	3.67 (0.97)	-0.36
4	Is the amount you are urinating more or less than usual? 7-point scale, 7 equals extremely less	3.28 (0.71)	3.72 (0.75)	-0.44**
5	Does your mouth feel dry? 6-point scale, 6 equals extremely	2.17 (1.43)	2.11 (1.02)	0.06
6	Does your skin feel loose or limp? 6-point scale, 6 equals extremely	1.03 (0.32)	1.61 (1.24)	0.58
7	Are you thirsty? 6-point scale, 6 equals extremely	2.17 (1.04)	2.72 (1.52)	-0.56

*Standard deviations are in parentheses.

+Significant at or below the 0.001 level, t test for dependent samples

**Significant below the 0.10 level, t test for dependent samples.

Tebla 17

Mean Rating of the Availability of Water for Eating and Drinking, and the Percent of Respondents Who Indicated They Were Able to Gat Enough Water for Eating and Drinking

	Arctic Ration		British 24-Hour Ration Pack Arctic		E/AP		E/AP
	1981	Group Count	1981	Group Count	1980	Group Count	1979
Able to Get Enough Water to Rehydrate Food, One Equals Always	4.45 Fairly Often	(92)	5.20 Sometimes	(71)			
Able to Get Enough Water to Satisfy Thirst, One Equals Always	4.86 Sometimes	(92)	5.80 Almost Never	(77)			
Difficulty of Obtaining Water, One Equals Very Easy	4.58	(92)	5.56	(69)			
Percent of Respondents Able to Get Enough Water to Rehydrate Food	30.4	(92)	14.8	(71)	60.0	(95)	31.2
Percent of Respondents Able to Get Enough Water to Satisfy Thirst	22.8	(92)	5.9	(71)	43.8	(96)	34.4

indicated they were able to get enough water for rehydrating food, and only 6% indicated that they were able to get enough water to quench thirst. In contrast, much larger percentages were reported in 1980 (60 and 44%, respectively), whereas the percentages reported in 1979 were consistent with those found in the present study. The environmental and tactical conditions found in the 1979 study were similar to those in the present study; those of the 1980 study were not.

It is not clear how much water was actually used. Estimates of the amount of water used for eating and drinking is given for Charlie and Bravo Companies in Table 18. Also given in the table is the mean number of canteens used daily as reported by 11 of the 17 Charlie Company Marines from whom urine samples were taken. This latter group was requested to record daily the number of canteens of water used for eating and drinking. Data in Table 18 indicate that about 2.5 canteens of water (2.5 quarts) was used daily per man by both companies and that snow was melted three to five times daily. In contrast, the group of Marines who were instructed to record daily water consumption reported using approximately 1.5 canteens daily. It is unlikely that they actually used less water than the rest of the company, as the Marines were randomly selected from each of the three platoons. Marines may have over-estimated their water use on the post-exercise questionnaire, or the 11 Marines may have failed to accurately record the amount of water used. Nevertheless, these results indicate that water consumption was well below the 3.5 quarts per individual recommended for the current Arctic Ration. This recommendation resulted from a laboratory controlled study by Naval Submarine Medical Research Laboratory investigators in the Arctic Chamber at the US Army Natick R&D Laboratories.[14]

[14]D.V. Tappan, M.J. Jacey and E. Heyder. Water requirements in military personnel working in cold environments and receiving arctic rations containing high salt levels. Naval Submarine Medical Research Laboratory Report No. 968, 23 February 1982.

Teble 18

Mean Number of Canteens end Centeen Cups of Water Used Each Day By Cherlie end Brevo Companies end the Number of Times Snow or Ice was Melted in Order to Obtain Water

	Charlie Co Arctic Ration		Bravo Co British 24-Hour Ration Pack Arctic	
	Mean	Group Count	Mean	Group Count
Number of Canteens Used Each Day	2.34	(92)	2.48	(71)
Number of Canteen Cups of Water Used Each Day	3.97	(91)	4.08	(65)
Number of Times Snow or Ice was Melted	Three Times Each Day		Four to Five Times Each Day	
Type of Vessel Used	2-litre pot or canteen cup		2-litre pot or canteen cup	

Mean number of canteens of water used daily as recorded daily by 11 Marines: 1.67.

CONCLUSIONS

1. The food items of both the E/AP and Arctic Supplement units of the Arctic Ration were acceptable. By decreasing median hedonic rating, the ten most preferred items were cocoa beverage, lemon tea, oatmeal with apples, fig bars, caramels, chicken noodle soup, oatmeal with maple sugar, oatmeal cookie bar, granola bar, and starch jelly. The pudding bars and fudge bar were among the least liked items.

2. Cocoa beverage liked better than either coffee or tea, and coffee and tea were liked better than either skim milk or orange beverage.

3. Preferences tended to be reliable across three studies. For entrees, chicken a la king was liked best and pork and escalloped potatoes and beef hash was liked the least. Preferences for beef and vegetables, chicken stew, and chicken and rice fell in between these two extremes. Of the candies, caramels were liked best and fudge bar the least. Preferences for the chocolate bar and starch jellies were intermediate to these. Beef jerky was consistently preferred over beef pepperoni.

4. Many individuals reported having problems using the rehydration bags. The problems, however, were not serious involving such difficulties as being able to stand the bags up.

5. Both the E/AP Arctic Ration and the British 24-Hour Ration Pack Arctic were liked, but the Arctic Ration was liked better. The difference may have been due to the perceived better quality of the Arctic Ration and to the greater ease of preparation. However, because the British ration was used for a longer period of time, differences may also have been due to a novelty effect.

6. Entree items took too long to prepare and required too much water for conditions of the exercise. Procedures for preparing food and for coordinating food preparation with other activities were poor.

7. Respondents' comments indicated that the Arctic Ration contained too many sweet snack items and that the British ration did not contain enough food. However, Table 14 shows that the snack items are most likely to be used under difficult conditions and are thus vital in providing adequate caloric intake.

8. Reported daily water consumption was far below the amount needed to maintain body fluid balance and following the field exercise, many urine samples were maximally concentrated. Results suggest that many troops were dehydrated and indicate that poor water discipline was practiced.

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APPENDICES

APPENDIX A

EMERGENCY/ASSAULT FOOD PACKET

MARINE CORPS EMERGENCY/ASSAULT PACKET

	Weight (Grams)	Calories	Protein	CHO	Fat	Moisture
			/----------Grams----------/			
Menu #1						
Chicken Stew	90	396	25.8	40.8	14.5	0.7
Beef Jerky	30	100	15.0	2.2	3.2	6.8
Granola Bar	43	198	4.8	28.2	7.4	1.8
Oatmeal Cookie Bar	50	232	4.7	32.1	9.5	2.7
Chocolate Bars	56	282	7.0	31.3	16.6	1.0
Vanilla Pudding Bar	28	127	2.1	20.4	4.1	0.7
Orange Beverage Bar	28	111	0.2	27.3	0.2	0.1
	325	1446	59.6	182.3	55.5	13.8
Menu #2						
Beef & Vegetables	90	414	39.6	29.7	15.7	1.0
Pepperoni	30	142	10.1	1.5	11.4	5.1
Granola Bar	43	198	4.8	28.2	7.4	1.8
Oatmeal Cookie Bar	50	232	4.7	32.1	9.5	2.7
Caramels	68	273	3.9	52.2	5.5	5.2
Fudge Bar	43	167	3.5	30.5	4.5	3.9
Orange Beverage Bar	28	111	0.2	27.3	0.2	0.2
	352	1537	66.8	170.3	54.2	19.9
Menu #3						
Pork & Escalloped Potatoes	90	426	25.9	35.6	19.8	1.1
Beef Jerky	30	100	15.0	2.2	3.2	6.8
Granola Bar	43	198	4.8	28.2	7.4	1.8
Oatmeal Cookie Bar	50	232	4.7	32.1	9.5	2.7
Starch Jelly	56	207	0.1	49.3	0.4	5.6
Chocolate Bar	56	282	7.0	31.3	16.6	1.0
Orange Beverage Bar	28	111	0.2	27.3	1.2	0.2
	353	1556	57.7	206.0	57.1	19.2

MARINE CORPS EMERGENCY/ASSAULT PACKET

	Weight (Grams)	Calories	Protein	CHO	Fat	Moisture
			/-----Grams-----/			
Menu #4						
Chicken A La King	90	466	38.2	17.2	27.2	1.3
Beef Jerkey	30	100	15.0	2.2	3.2	6.8
Granola Bar	43	198	4.8	28.2	7.4	1.8
Oatmeal Cookie Bar	50	232	4.7	32.1	9.5	2.7
Chocolate Pudding Bar	28	127	2.1	20.4	4.1	0.7
Fig Bar	58	206	2.3	41.2	3.7	9.9
Fudge Bar	43	167	3.5	30.5	4.5	3.8
Orange Beverage Bar	28	111	0.2	27.3	0.2	0.2
	370	1607	70.8	198.3	59.8	27.3
Menu #5						
Chicken & Rice	90	447	35.0	27.6	20.9	0.9
Pepperoni	30	142	10.1	1.5	11.4	5.1
Granola Bar	43	198	4.8	28.2	7.4	1.8
Oatmeal Cookie Bar	50	232	4.7	32.1	9.5	2.7
Chocolate Bars	56	282	7.0	31.3	16.6	1.0
Fudge Bar	43	167	3.5	30.5	4.5	3.9
Orange Beverage Bar	28	111	0.2	27.3	0.2	0.2
	340	1579	65.3	178.5	70.5	15.6
Menu #6						
Beef Hash	90	489	26.2	27.9	29.9	0.8
Beef Jerky	30	100	15.0	2.2	3.2	6.8
Granola Bar	43	198	4.8	28.2	7.4	1.8
Oatmeal Cookie Bar	50	232	4.7	32.1	9.5	2.7
Caramels	68	273	3.9	52.2	5.5	5.2
Fudge Bar	43	167	3.5	30.5	4.5	3.9
Orange Beverage Bar	28	111	0.2	27.3	0.2	0.2
	352	1570	58.4	200.4	60.2	21.4

MARINE CORPS EMERGENCY/ASSAULT PACKET

MEAN VALUES:

Calories = 1549

Protein = 63.1 g

CHO = 189.3 g

Fat = 59.5 g

Moisture = 19.4 g

Weight (net w/o cof, crm, sug) = 348.6 g

Weight (packaged = 444 g)

Volume = 59.8 cu in

NOTES:

1. In addition to the above listed components, all meal packets will contain salt, matches, toilet paper, a spoon, and coffee, and cream substitute, and sugar.

2. An additional 48 kcal and 9 g of CHO can be added for the consumption of the coffee, cream, and sugar.

3. Fudge bars, which are in four of the six menus, can also be used to make a hot chocolate beverage.

APPENDIX B

ARCTIC SUPPLEMENT

ARCTIC SUPPLEMENT

Supplement A

Quantity	Item	Size	Weight	kcal
2	Instant Quaker Oatmeal (Maple & Brown Sugar)	1–1/2 oz/42 g	84 g	320
2	Skimmed Milk Powder (Instant)	1/2 oz/14 g	28 g	100
3	Instant Soup, Beef Veg	1/2 oz/14 g	42 g	150
2	Coco Beverage Powder	43 g	86 g	380
2	Lemon Tea (Sweet)	14 g	28 g	90
1	Brownie, Chocolate Covered	50 g	50 g	270
1	Fruit/Nut Mixture	56 g	56 g	250
			375 g	1560

Supplement B

2	Instant Quaker Oatmeal	1–1/4 oz/35 g	70 g	260
2	Skimmed Milk Powder (Instant)	1/2 oz/14 g	28 g	100
3	Instant Soup, Chicken Noodle	.375 oz/10.6 g	32 g	135
2	Coco Beverage Powder	43 g	86 g	380
2	Lemon Tea (Sweet)	14 g	28 g	100
1	Maple Nut Cake	90 g	90 g	420
1	Fruit/Nut Mixture	56 g	56 g	250
			390 g	1635

APPENDIX C

BRITISH 24-HOUR RATION PACK ARTIC

24-HOUR ARCTIC RATION

Serial	Commodity	Scale oz	kcal	Protein g	Fat g	Carbo-hydrate g	Water g	Calcium mg	Iron mg	Thiamine	Ribo-flavin mg	Nicotinic Acid mg	Ascorbic Acid mg
						MENU "A"							
	Breakfast												
1	Rolled Oats	1–1/2	170	5.10	3.75	30.90	3.75	24.00	1.80	0.21	0.05	0.45	––
2	Skimmed Milk Powder	1	100	10.34	0.37	15.00	1.16	337.00	0.01	0.12	0.45	0.34	2
3	Drinking Choc Mix	2–1/2	244	10.08	1.92	53.53	1.99	575.00	1.35	0.16	0.40	0.45	––
	Snack												
4	Biscuit SP	3	414	6.90	15.90	64.80	2.40	93.00	0.60	0.15	0.03	0.90	––
5	Biscuit Fruit Filled	3	333	1.22	2.02	22.00	2.75	23.00	0.70	0.14	0.12	0.24	––
6	Beef Spread	2	114	8.58	7.44	1.82	37.38	124.00	0.80	0.04	0.10	1.70	––
7	Chocolate Milk	1–1/2	246	3.75	16.05	23.25	––	105.00	0.75	0.15	0.17	0.45	––
8	Chocolate Biscuit & Fruit	1–1/2	211	3.00	11.55	22.50	1.95	73.50	0.45	0.05	0.12	0.15	3
9	Chocolate Caramel (Rolo)	4	504	5.60	20.40	78.80	8.80	192.00	0.80	0.56	0.32	0.40	––
10	Nuts & Raisins	1–1/2	198	5.70	8.40	24.75	2.10	33.00	1.30	0.18	0.015	2.85	––
11	Dextrose Tablets	1–1/2	153	––	––	42.00	2.09	––	––	––	––	––	––
	Drinks												
12	Coffee Instant	6/16	16	0.41	0.08	3.79	0.19	15.00	0.41	––	0.01	4.80	––
13	Tea Instant	2/16	––	––	––	––	0.14	3.91	––	––	––	––	––
14	Chicken Stock Cube	1/4	20	2.08	0.38	0.28	0.71	25.56	0.55	0.05	0.02	0.57	––
15	Sugar	5	560	––	––	149.00	––	––	––	––	––	––	––
16	Skimmed Milk Powder	2	201	20.68	0.74	30.00	2.32	674.00	0.02	0.24	0.90	0.68	4
	Main Meal												
17	Soup Powder	1	107	3.90	2.20	18.90	1.10	19.00	0.90	0.04	0.03	1.00	1
18	Beef Granules	2–1/2	408	30.90	28.40	10.08	1.14	25.56	4.19	0.07	0.22	4.76	––
19	Mash Potato Powder	2	206	4.80	0.40	45.80	2.60	22.00	2.40	––	0.06	3.20	6
20	Peas Quick Dried	1–1/2	135	10.50	––	23.25	2.70	39.00	2.85	0.03	0.23	3.45	16
21	Apple Flakes	1	107	0.40	0.60	25.00	0.70	11.00	0.60	––	0.02	0.20	––
	Sundries												
22	Salt	7.5 g	––	––	––	––	––	2.18	0.02	––	––	––	––
	TOTAL		4447	133.94	120.60	688.45	75.97	2416.71	20.50	2.19	3.27	26.59	32

PROTEIN	133.94 g	= 536 kcal	= 12.05%
FAT	120.60 g	= 1085 kcal	= 24.40%
CARBOHYDRATE	688.45 g	= 2581 kcal	= 58.04%

24-HOUR ARCTIC RATION

Serial	Commodity	Scale oz	kcal	Protein g	Fat g	Carbo-hydrate g	Water g	Calcium mg	Iron mg	Thiamin mg	Ribo-flavin mg	Nicotinic Acid mg	Ascorbic Acid mg
						MENU "B"							
	Breakfast												
1	Rolled Oats	1–1/2	170	5.10	3.75	30.90	3.75	24.00	1.80	0.21	0.045	0.45	—
2	Skimmed Milk Powder	1	100	10.34	0.37	15.00	1.16	337.00	0.01	0.12	0.45	0.34	2
3	Drinking Choc Mix	2–1/2	244	10.08	1.92	53.53	1.99	575.00	1.35	0.16	0.40	0.45	—
	Snack												
4	Biscuits SP	3	414	6.90	15.90	64.80	2.40	93.00	0.60	0.15	0.03	0.90	—
5	Biscuits Fruit Filled	3	334	3.66	6.06	66.03	8.26	68.16	2.13	0.41	0.35	0.71	—
6	Chicken Spread	2	114	8.20	9.00	—	38.00	78.00	0.40	—	0.06	1.40	—
7	Chocolate Milk	1–1/2	246	3.75	16.06	23.25	—	105.00	0.75	0.015	0.165	0.45	—
8	Chocolate Biscuit & Fruit	1–1/2	211	3.00	11.55	25.50	1.95	73.50	0.45	0.045	0.12	0.15	3
9	Chocolate Caramel (Rolo)	4	504	5.60	20.40	78.80	8.80	192.00	0.80	0.56	0.32	0.40	—
10	Nuts & Raisins	1–1/2	198	5.70	8.40	24.75	2.10	33.00	1.35	0.18	0.015	2.85	—
11	Dextrose Tablets	1–1/2	153	—	—	42.05	2.09	—	—	—	—	—	—
	Drinks												
12	Coffee Instant	6/16	16	0.41	0.08	3.79	0.19	15.00	0.41	—	0.01	4.80	—
13	Tea Instant	2/16	—	0.59	—	—	0.14	3.91	—	—	—	—	—
14	Beef Stock Cube	1/4	16	2.72	0.24	0.85	0.65	—	1.74	—	—	—	—
15	Sugar	5	560	—	—	149.10	—	—	—	—	—	—	—
16	Skimmed Milk Powder	2	201	20.68	0.74	30.00	2.32	674.00	0.02	0.24	0.90	0.68	4
	Main Meal												
17	Soup Powder	1	107	3.90	2.20	18.90	1.10	19.00	0.90	0.04	0.03	1.00	1
18	Curried Beef Granules	2–1/2	317	23.30	15.41	24.50	3.28	49.00	5.40	0.10	0.17	4.12	—
19	Pre-Cooked Rice	3	321	6.00	0.30	78.00	8.10	18.00	0.30	0.03	—	0.30	6
20	Peas Quick Dried	1–1/2	135	10.50	—	23.25	2.70	39.00	2.85	0.03	0.23	3.49	16
21	Apple & Apricot Flakes	1	114	0.74	—	15.39	2.19	9.09	0.45	0.02	0.03	0.54	—
	Sundries												
22	Salt	7.5 g	—	—	—	—	—	2.18	0.02	—	—	—	—
	TOTAL		4475	131.17	112.37	768.39	91.17	2407.89	21.73	2.32	3.34	22.99	32

PROTEIN 131.17 g = 525 kcal = 11.73%

FAT 112.37 g = 1011 kcal = 22.59%

CARBOHYDRATE 768.39 g = 3174 kcal = 64.39%

24-HOUR ARCTIC RATION

MENU "C"

Serial	Commodity	Scale oz	kcal	Protein g	Fat g	Carbo-hydrate g	Water g	Calcium mg	Iron mg	Thiamine mg	Ribo-flavin mg	Nicotinic Acid mg	Ascorbic Acid mg
	Breakfast												
1	Rolled Oats	1–1/2	170	5.10	3.75	30.90	3.75	24.00	1.80	0.21	0.045	0.45	—
2	Skimmed Milk Powder	1	100	10.34	0.37	15.00	1.16	337.00	0.01	0.12	0.45	0.34	2
3	Drinking Choc Mix	2–1/2	244	10.08	1.92	53.53	1.99	575.00	1.35	0.16	0.40	0.45	—
	Snack												
4	Biscuits SP	3	414	6.90	15.90	64.80	2.40	93.00	0.60	0.15	0.03	0.90	—
5	Biscuits Fruit Filled	3	334	3.66	6.06	66.03	8.26	68.16	2.13	0.41	0.35	0.71	—
6	Chicken & Bacon Spread	2	102	9.03	6.02	0.97	38.68	18.74	0.97	0.02	0.14	1.76	—
7	Chocolate Milk	1–1/2	246	3.75	16.05	23.25	—	105.00	0.75	0.015	0.165	0.45	—
8	Chocolate Biscuit Fruit	1–1/2	211	3.00	11.55	25.50	1.95	73.50	0.45	0.045	0.12	0.15	3
9	Chocolate Caramel (Rolo)	4	504	5.60	20.40	78.80	8.80	192.00	0.80	0.56	0.32	0.40	—
10	Nuts & Raisins	1–1/2	198	5.70	8.40	24.75	2.10	33.00	1.35	0.18	0.015	2.85	—
11	Dextrosol Tablets	1–1/2	153	—	—	42.05	2.09	—	—	—	—	—	—
	Drinks												
12	Coffee Instant	6/16	16	0.41	0.08	3.79	0.19	15.00	0.41	—	0.01	4.80	—
13	Tea Instant	2/16	—	0.59	—	—	0.14	3.91	—	—	—	—	—
14	Chicken Stock Cube	1/4	20	1.81	0.35	1.45	0.71	25.56	0.55	0.05	0.02	0.57	—
15	Sugar	5	560	—	—	149.10	—	—	—	—	—	—	—
16	Skimmed Milk Powder	2	201	20.68	0.74	30.00	2.32	674.00	0.02	0.24	0.90	0.68	4
	Main Meal												
17	Soup Powder	1	107	3.90	2.20	18.90	1.10	19.00	0.90	0.04	0.03	1.00	1
18	Mutton Granules	2–1/2	416	28.90	28.26	10.08	1.21	22.01	4.12	0.64	0.19	4.12	—
19	Mashed Potato Powder	2	206	4.80	0.40	45.80	2.60	22.00	2.40	—	0.06	3.20	6
20	Peas Quick Dried	1–1/2	135	10.50	—	23.25	2.70	39.00	2.85	0.03	0.23	3.45	16
21	Apple Flakes	1	107	0.40	0.60	25.00	0.70	11.00	0.60	—	0.02	0.20	—
	Sundires												
22	Salt	7.5 g	—	—	—	—	—	2.18	0.02	—	—	—	—
	TOTAL		4444	135.15	123.05	732.95	82.85	2353.06	22.08	2.88	3.51	26.48	32

PROTEIN 135.00 g = 541 kcal = 12.17%

FAT 123.05 g = 1107 kcal = 24.91%

CARBOHYDRATE 732.95 g = 2749 kcal = 61.86

24-HOUR ARCTIC RATION

Serial	Commodity	Scale oz	kcal	Protein g	Fat g	Carbo-hydrate g	Water g	Calcium mg	Iron mg	Thiamine mg	Ribo-flavin mg	Nicotinic Acid mg	Ascorbic Acid mg
						MENU "D"							
	Breakfast												
1	Rolled Oats	1–1/2	170	5.10	3.75	30.90	3.75	24.00	1.80	0.21	0.045	0.45	—
2	Skimmed Milk Powder	1	100	10.34	0.37	15.00	1.16	337.00	0.01	0.12	0.45	0.34	2
3	Drinking Choc Mix	2–1/2	244	10.08	1.92	53.53	1.99	575.00	1.35	0.16	0.40	0.45	—
	Snack												
4	Biscuits SP	3	414	6.90	15.90	64.80	2.40	93.00	0.60	0.15	0.03	0.90	—
5	Biscuits Fruit Filled	3	334	3.66	6.06	66.03	8.26	68.16	2.13	0.41	0.35	0.71	—
6	Beef Spread	2	114	8.58	7.44	1.82	37.39	124.00	0.80	0.04	0.10	1.70	—
7	Chocolate Milk	1–1/2	246	3.75	16.05	23.25	—	105.00	0.75	0.015	0.165	0.45	—
8	Chocolate Biscuit Fruit	1–1/2	211	3.00	11.55	25.50	1.95	73.50	0.45	0.045	0.12	0.15	3
9	Chocolate Caramel (Rolo)	4	504	5.60	20.40	78.80	8.80	192.00	0.80	0.56	0.32	0.40	—
10	Nuts & Raisins	1–1/2	198	5.70	8.40	24.75	2.10	33.00	1.35	0.18	0.015	2.85	—
11	Dextrosol Tablets	1–1/2	153	—	—	42.05	2.09	—	—	—	—	—	—
	Drinks												
12	Coffee Instant	6/16	16	0.41	0.08	3.79	0.19	15.00	0.41	—	0.01	4.80	—
13	Tea Instant	2/16	—	0.59	—	—	0.14	3.91	—	—	—	—	—
14	Beef Stock Cube	1/4	16	2.72	0.24	0.83	0.65	—	1.74	—	—	—	—
15	Sugar	5	560	—	—	149.10	—	—	—	—	—	—	—
16	Skimmed Milk Powder	2	201	20.68	0.74	30.00	2.32	674.00	0.02	0.24	0.90	0.68	4
	Main Meal												
17	Soup Powder	1	107	3.90	2.20	18.90	1.10	19.00	0.90	0.04	0.03	1.00	1
18	Chicken Supreme Granules	2–1/2	367	20.45	22.29	10.08	1.63	277.00	4.12	0.64	0.19	4.12	—
19	Pre-Cooked Rice	3	321	6.00	0.30	78.00	8.10	18.00	0.30	0.03	—	0.30	6
20	Peas Quick Dried	1–1/2	135	10.50	—	23.25	2.70	39.00	2.85	0.03	0.23	3.45	16
21	Apple & Apricot Flakes	1	114	0.74	—	15.39	2.19	9.09	0.45	0.02	0.03	0.54	—
	Sundries												
22	Salt	7.5 g	—	—	—	—	—	2.18	0.02	—	—	—	—
	TOTAL		4525	128.70	117.69	755.79	88.90	2701.84	20.85	2.90	3.40	23.29	32

PROTEIN 128.70 g = 515 kcal = 11.38%

FAT 107.69 g = 969 kcal = 21.45%

CARBOHYDRATE 755.79 g = 2834 kcal = 62.63%

APPENDIX D

BODY FLUID SCALE

BODY FLUID SCALE

US Army Natick Research & Development Laboratories
Natick, MA 01760

1. How LIGHT or DARK is your urine today? (CIRCLE ONE):

EXTREMELY LIGHT	MODERATELY LIGHT	SLIGHTLY LIGHT	NEITHER LIGHT NOR DARK	SLIGHTLY DARK	MODERATELY DARK	EXTREMELY DARK
1	2	3	4	5	6	7

2. Rate the COLOR of your urine as it has occurred today. (CIRCLE ONE):

LIGHT YELLOW	DARK YELLOW	ORANGE	BROWN
1	2	3	4

3. Are you urinating more or less OFTEN than usual? (CIRCLE ONE):

EXTREMELY MORE	MODERATELY MORE	SLIGHTLY MORE	NEITHER MORE NOR LESS (Normal)	SLIGHTLY LESS	MODERATELY LESS	EXTREMELY LESS
1	2	3	4	5	6	7

4. Is the AMOUNT you are urinating more or less than usual? (CIRCLE ONE):

EXTREMELY MORE	MODERATELY MORE	SLIGHTLY MORE	NEITHER MORE NOR LESS (Normal)	SLIGHTLY LESS	MODERATELY LESS	EXTREMELY LESS
1	2	3	4	5	6	7

5. Does your MOUTH fee DRY?

NOT AT ALL	SLIGHTLY	SOMEWHAT	MODERATELY	QUITE A BIT	EXTREMELY
1	2	3	4	5	6

PLEASE TURN THE PAGE

6. Does your SKIN feel LOOSE or LIMP?

NOT AT ALL	SLIGHTLY	SOMEWHAT	MODERATELY	QUITE A BIT	EXTREMELY
1	2	3	4	5	6

7. Are you THIRSTY?

NOT AT ALL	SLIGHTLY	SOMEWHAT	MODERATELY	QUITE A BIT	EXTREMELY
1	2	3	4	5	6

APPENDIX E

ENVIRONMENTAL SYMPTOMS QUESTIONNAIRE

ENVIRONMENTAL SYMPTOMS QUESTIONNAIRE

US Army Reseorch Institute of Environmentol Medicine, Notick, MA 01760

INSTRUCTIONS: Dorken the number on each item to correspond to HOW YOU FEEL AT THIS MOMENT. PLEASE ANSWER EVERY ITEM. If you do not hove the symptom dorken the first ovol (NOT AT ALL).

DATE: DAY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

MONTH

YEAR 80 1 2 3 4 5 6

	NOT AT ALL	SLIGHT	SOMEWHAT	MODERATE	QUITE A BIT	EXTREME
1. I feel lightheaded	0	1	2	3	4	5
2. I have a headache	0	1	2	3	4	5
3. I feel sinus pressure	0	1	2	3	4	5
4. I feel dizzy	0	1	2	3	4	5
5. I feel faint	0	1	2	3	4	5
6. My vision is dim	0	1	2	3	4	5
7. My coordination is off	0	1	2	3	4	5
8. I'm short of breath	0	1	2	3	4	5
9. It's hard to breathe	0	1	2	3	4	5
10. It hurts to breathe	0	1	2	3	4	5
11. My heart is beating fast	0	1	2	3	4	5
12. My heart is pounding	0	1	2	3	4	5
13. I have chest pains	0	1	2	3	4	5
14. I have chest pressure	0	1	2	3	4	5
15. My hands are shaking or trembling	0	1	2	3	4	5
16. I have muscle cramps	0	1	2	3	4	5
17. I have stomach cramps	0	1	2	3	4	5
18. My muscles feel tight or stiff	0	1	2	3	4	5
19. I feel weak	0	1	2	3	4	5
20. My legs or feet ache	0	1	2	3	4	5
21. My hands, arms or shoulders ache	0	1	2	3	4	5
22. My back aches	0	1	2	3	4	5
23. I have a stomach ache	0	1	2	3	4	5
24. I feel sick to my stomach (nauseous)	0	1	2	3	4	5
25. I have gas pressure	0	1	2	3	4	5
26. I have diarrhea	0	1	2	3	4	5
27. I'm constipated	0	1	2	3	4	5
28. I have to urinate MORE than usual	0	1	2	3	4	5
29. I have to urinate LESS than usual	0	1	2	3	4	5
30. I feel warm	0	1	2	3	4	5
31. I feel feverish	0	1	2	3	4	5
32. My feet are sweaty	0	1	2	3	4	5
33. I'm sweating all over	0	1	2	3	4	5
34. My hands are cold	0	1	2	3	4	5
35. My feet are cold	0	1	2	3	4	5
36. I feel chilly	0	1	2	3	4	5
37. I'm shivering	0	1	2	3	4	5
38. Parts of my body feel numb	0	1	2	3	4	5

	NOT AT ALL	SLIGHT	SOMEWHAT	MODERATE	QUITE A BIT	EXTREME
39. My skin is burning or itchy	0	1	2	3	4	5
40. My eyes feel irritated	0	1	2	3	4	5
41. My vision is blurry	0	1	2	3	4	5
42. My ears feel blocked up	0	1	2	3	4	5
43. My ears ache	0	1	2	3	4	5
44. I can't hear well	0	1	2	3	4	5
45. My ears are ringing	0	1	2	3	4	5
46. My nose feels stuffed up	0	1	2	3	4	5
47. I have a runny nose	0	1	2	3	4	5
48. I've been having nose bleeds	0	1	2	3	4	5
49. My mouth is dry	0	1	2	3	4	5
50. My throat is sore	0	1	2	3	4	5
51. I've been coughing	0	1	2	3	4	5
52. I've lost my appetite	0	1	2	3	4	5
53. I feel sick	0	1	2	3	4	5

	NOT AT ALL	SLIGHT	SOMEWHAT	MODERATE	QUITE A BIT	EXTREME
54. I feel hungover	0	1	2	3	4	5
55. I'm thirsty	0	1	2	3	4	5
56. I feel tired	0	1	2	3	4	5
57. I feel sleepy	0	1	2	3	4	5
58. I couldn't sleep well	0	1	2	3	4	5
59. My concentration is off	0	1	2	3	4	5
60. I'm more forgetful lately	0	1	2	3	4	5
61. I feel worried or nervous	0	1	2	3	4	5
62. I feel irritable	0	1	2	3	4	5
63. I feel restless	0	1	2	3	4	5
64. I'm bored	0	1	2	3	4	5
65. I feel depressed	0	1	2	3	4	5
66. I feel alert	0	1	2	3	4	5
67. I feel good	0	1	2	3	4	5

APPENDIX F

ACCEPTANCE INTERVIEW

EMERGENCY/ASSAULT FOOD PACKET ACCEPTABILITY

US Army Natick Research & Development Laboratories
Natick, MA 01760

CIRCLE EACH OF THE BELOW FOOD ITEMS THAT YOU HAVE EATEN IN THE LAST 24 HOURS	CIRCLE HOW EATEN*			DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY		LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1. BEEF JERKY	D			1	2	3	4	5	6	7	8	9
2. BEEF PEPPERONI	D			1	2	3	4	5	6	7	8	9
3. BEEF HASH	D	C	H	1	2	3	4	5	6	7	8	9
4. BEEF & VEGETABLES	D	C	H	1	2	3	4	5	6	7	8	9
5. CHICKEN A LA KING	D	C	H	1	2	3	4	5	6	7	8	9
6. CHICKEN & RICE	D	C	H	1	2	3	4	5	6	7	8	9
7. CHICKEN STEW	D	C	H	1	2	3	4	5	6	7	8	9
8. PORK & ESCAL POTS	D	C	H	1	2	3	4	5	6	7	8	9
9. OATMEAL W/MAPLE & BROWN SUGAR		C	H	1	2	3	4	5	6	7	8	9
10. OATMEAL W/APPLES & CINNAMON		C	H	1	2	3	4	5	6	7	8	9
11. CARAMELS	D			1	2	3	4	5	6	7	8	9
12. CHOCOLATE BAR	D			1	2	3	4	5	6	7	8	9
13. FUDGE BAR	D			1	2	3	4	5	6	7	8	9
14. FIG BAR	D			1	2	3	4	5	6	7	8	9
15. STARCH JELLY	D			1	2	3	4	5	6	7	8	9

*D = Eaten DRY
C = Rehydrated with COLD water
H = Rehydrated with HOT water

PLEASE TURN THE PAGE

CIRCLE EACH OF THE BELOW FOOD ITEMS THAT YOU HAVE EATEN IN THE LAST 24 HOURS	CIRCLE HOW EATEN*			DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY		LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
16. GRANOLA	D			1	2	3	4	5	6	7	8	9
17. OATMEAL COOKIE	D			1	2	3	4	5	6	7	8	9
18. CHOCOLATE COVERED BROWNIE	D			1	2	3	4	5	6	7	8	9
19. NUTS & FRUIT	D			1	2	3	4	5	6	7	8	9
20. MAPLE NUT CAKES	D			1	2	3	4	5	6	7	8	9
21. CANDY COVERED ALMONDS	D			1	2	3	4	5	6	7	8	9
22. CHOCOLATE PUDDING	D	C	H	1	2	3	4	5	6	7	8	9
23. VANILLA PUDDING	D	C	H	1	2	3	4	5	6	7	8	9
24. ORANGE BEVERAGE	D	C	H	1	2	3	4	5	6	7	8	9
25. FUDGE BAR (Beverage)		C	H	1	2	3	4	5	6	7	8	9
26. COFFEE		C	H	1	2	3	4	5	6	7	8	9
27. SKIM MILK		C	H	1	2	3	4	5	6	7	8	9
28. BEEF VEGETABLE SOUP		C	H	1	2	3	4	5	6	7	8	9
29. CHICKEN NOODLE SOUP		C	H	1	2	3	4	5	6	7	8	9
30. COCO BEVERAGE POWDER		C	H	1	2	3	4	5	6	7	8	9
31. LEMON TEA		C	H	1	2	3	4	5	6	7	8	9

*D = Eaten DRY
C = Rehydrated with COLD water
H = Rehydrated with HOT water

APPENDIX G

EMERGENCY/ASSAULT FOOD PACKET AND ARTIC SUPPLEMENT CONSUMER SURVEY

ARCTIC RATION

EMERGENCY/ASSAULT FOOD PACKET AND ARCTIC SUPPLEMENT EVALUATION (POST–EXERCISE)

US Army Natick Research & Development Laboratories
Natick, MA 01760

For the field exercise just completed, you were issued samples of a new type of food packet and an arctic supplement. Some of these foods are intended to be eaten either dry, with drinking water on the side, or after rehydration with either hot or cold water. Your experiences with these foods and your reactions to them are important to their future development.

Your responses on this survey are confidential and will not be identified with you individually.

1. How long have you been in the Marine Corps? _____YEARS, _____MONTHS.

2. What is your rank? _____

3. Please rank-order your preferences for the ENTREE BARS eaten DRY and eaten REHYDRATED by placing the number "1" in the blank next to the entree bar that you liked the MOST (your #1 favorite), the number "2" next to your second most favorite, "3" next to your third, etc. If you did not eat one of the entree bars, leave it blank. Rank each category separately.

EATEN DRY	EATEN REHYDRATED
_____BEEF HASH	_____BEEF HASH
_____BEEF & VEGETABLES	_____BEEF & VEGETABLES
_____CHICKEN A LA KING	_____CHICKEN A LA KING
_____CHICKEN & RICE	_____CHICKEN & RICE
_____CHICKEN STEW	_____CHICKEN STEW
_____PORK & ESCALLOPED POTATOES	_____PORK & ESCALLOPED POTATOES

4. Next, please rank-order your preferences for the following four categories of bars that you ate by placing the number "1" in the blank next to the bar that you liked the MOST (your #1 favorite), the number "2" next to your second most favorite, etc. If you did not eat one of the items, leave it blank. Rank each category separately.

NON–MEAT BARS EATEN DRY

_____CARMELS

_____CHOCOLATE BAR

_____FUDGE BAR (eaten dry)

_____GRANOLA BAR

_____OATMEAL COOKIE BAR

_____STARCH JELLY BAR

_____FIG BAR

_____CHOCOLATE PUDDING

_____VANILLA PUDDING

INTERMEDIATE MOISTURE MEATS

_____BEEF JERKY

_____BEEF PEPPERONI

EATEN REHYDRATED

_____CHOCOLATE PUDDING

_____VANILLA PUDDING

BEVERAGES

_____FUDGE BAR (rehydrated)

_____ORANGE BEVERAGE

5. Overall, rate the following MEALS and ITEMS:

	DISLIKE VERY MUCH	DISLIKE MODER–ATELY	DISLIKE SLIGHT–LY	NEITHER DISLIKE NOR LIKE	LIKE SLIGHT–LY	LIKE MODER–ATELY	LIKE VERY MUCH
DRINKS	1	2	3	4	5	6	7
ACCESSORY PACK (SUNDRIES)	1	2	3	4	5	6	7
ENTREES (MAIN MEALS)	1	2	3	4	5	6	7
BREAKFAST (QUAKER–OATMEAL)	1	2	3	4	5	6	7
CANDIES & CAKES	1	2	3	4	5	6	7
OTHER SNACKS (GRANOLA, JERKY, NUTS, ETC.)	1	2	3	4	5	6	7

6. How adequate was the VARIETY of entrees (main meals)? (CIRCLE ONE):

EXTREMELY ADEQUATE	MODERATELY ADEQUATE	SLIGHTLY ADEQUATE	NEUTRAL	SLIGHTLY INADEQUATE	MODERATELY INADEQUATE	EXTREMELY INADEQUATE
1	2	3	4	5	6	7

7. How adequate was the QUANTITY (amount) of food for the conditions of the exercise? (CIRCLE ONE):

EXTREMELY ADEQUATE	MODERATELY ADEQUATE	SLIGHTLY ADEQUATE	NEUTRAL	SLIGHTLY INADEQUATE	MODERATELY INADEQUATELY	EXTREMELY INADEQUATE
1	2	3	4	5	6	7

8. All things considered, how would you RATE the new EMERGENCY/ASSAULT FOOD PACKET (exclusive of arctic supplement)? (CIRCLE ONE):

EXTREMELY GOOD	MODERATELY GOOD	SLIGHTLY GOOD	NEUTRAL	SLIGHTLY BAD	MODERATELY BAD	EXTREMELY BAD
1	2	3	4	5	6	7

9. Overall, how would you RATE the ARCTIC SUPPLEMENT (exclusive of the emergency assault food packet)? (CIRCLE ONE):

EXTREMELY GOOD	MODERATELY GOOD	SLIGHTLY GOOD	NEUTRAL	SLIGHTLY BAD	MODERATELY BAD	EXTREMELY BAD
1	2	3	4	5	6	7

10. Do you prefer your meats and vegetables mixed and compressed into a single bar or would you prefer them packaged SEPARATELY in different pouches? (CIRCLE ONE):

EXTREMELY PREFER MIXED	MODERATELY PREFER MIXED	SLIGHTLY PREFER MIXED	NEUTRAL PREFER-ENCE	SLIGHTLY PREFER SEPARATE	MODERATELY PREFER SEPARATE	EXTREMELY PREFER SEPARATE
1	2	3	4	5	6	7

11. Rate whether there were TOO FEW or TOO MANY of each of the following foods in a day's ration:

	VERY MUCH TOO MANY	MUCH TOO MANY	TOO MANY	NEITHER TOO MANY NOR TOO FEW	TOO FEW	MUCH TOO FEW	VERY MUCH TOO FEW
DRINKS	1	2	3	4	5	6	7
ENTREES	1	2	3	4	5	6	7
BREAKFAST FOODS	1	2	3	4	5	6	7
CANDIES & CAKES	1	2	3	4	5	6	7
OTHER SNACKS	1	2	3	4	5	6	7

12. How MANY servings of COFFEE would you like in a day's ration?

Number of Servings (CIRCLE ONE): 0 1 2 3 4 5 6

13. How MANY servings of TEA would you like in a day's ration?

Number of Servings (CIRCLE ONE): 0 1 2 3 4 5 6

14. Please circle the number below that indicates how difficult it was to rehydrate each item. Skip those items that you did not try to rehydrate.

	VERY EASY	MODER-ATELY EASY	SLIGHTLY EASY	NEUTRAL	SLIGHTLY HARD	MODER--ATELY HARD	VERY HARD
BEEF HASH	1	2	3	4	5	6	7
BEEF & VEGETABLES	1	2	3	4	5	6	7
CHICKEN A LA KING	1	2	3	4	5	6	7
CHICKEN & RICE	1	2	3	4	5	6	7
CHICKEN STEW	1	2	3	4	5	6	7
PORK & ESCAL POTS	1	2	3	4	5	6	7
CHOCOLATE PUDDING	1	2	3	4	5	6	7
VANILLA PUDDING	1	2	3	4	5	6	7
FUDGE BAR (beverage)	1	2	3	4	5	6	7
ORANGE BEVERAGE	1	2	3	4	5	6	7

15. Did you eat your food? (CIRCLE ONE):

a. At regular meal intervals.

b. Throughout the day as time permitted.

c. All at once.

16. a. Were you able to get enough water to rehydrate the food items that you wanted to rehydrate? (CIRCLE ONE):

ALWAYS	ALMOST ALWAYS	OFTEN	FAIRLY OFTEN	SOMETIMES	ALMOST NEVER	NEVER
1	2	3	4	5	6	7

b. Were you able to get enough water to satisfy your thirst? (CIRCLE ONE):

ALWAYS	ALMOST ALWAYS	OFTEN	FAIRLY OFTEN	SOMETIMES	ALMOST NEVER	NEVER
1	2	3	4	5	6	7

c. How difficult was it to obtain water? (CIRCLE ONE):

VERY EASY	MDDERATELY EASY	SLIGHTLY EASY	NEUTRAL	SLIGHTLY HARD	MODERATELY HARD	VERY HARD
1	2	3	4	5	6	7

17. One the average, how many CANTEENS (one canteen = 32 ounces or one quart) of water did you use each day for drinking and eating?

Number of
Canteens (CIRCLE ONE): 0 1 2 3 4 5 6

18. On the average, how many canteen CUPS (one canteen cup = 16 ounces) of water did you use each day for drinking and eating?

Number of
Cups (CIRCLE ONE): 1 2 3 4 5 6 7 8 9 10 11 12

19. How many times did you have to melt snow or ice in order to obtain water? (CIRCLE ONE):

NEVER	ONE TO FDUR TIMES	ONCE EACH DAY	TWICE EACH DAY	THREE TIMES EACH DAY	FDUR TIMES EACH DAY	FIVE OR MORE TIMES EACH DAY
1	2	3	4	5	6	7

20. If you melted snow or ice, did you melt it in a canteen cup or in a larger vessel? (CIRCLE ONE):

CANTEEN CUP	LARGER VESSEL	DID NOT MELT SNOW
1	2	3

21. How would you rate the emergency assault packet and supplement if you had to consume the food items dry (eaten without rehydrating)? (CIRCLE ONE):

DISLIKE VERY MUCH	DISLIKE MODER– ATELY	DISLIKE SLIGHT– LY	NEITHER DISLIKE NOR LIKE	LIKE SLIGHT– LY	LIKE MODER– ATELY	LIKE VERY MUCH
1	2	3	4	5	6	7

22. In your opinion, is a one-man three-day supply of the emergency assault packet and supplement TOO BULKY to carry in your RUCKSACK? (CIRCLE ONE):

NOT AT ALL	SLIGHTLY BULKY	SOMEWHAT BULKY	MODERATELY BULKY	OUITE A BIT	EXTREMELY BULKY
1	2	3	4	5	6

23. In comparison to 12 MCI's (twelve Meals, Combat Individual), how HEAVY is a one-man three-day supply of the emergency assault packet with supplement to carry in your RUCKSACK? (CIRCLE ONE):

EXTREMELY LIGHT	MODERATELY LIGHT	SOMEWHAT LIGHT	NEITHER LIGHT NOR HEAVY	SOMEWHAT HEAVY	MODERATELY HEAVY	EXTREMELY HEAVY
1	2	3	4	5	6	7

24. Overall, how CONVENIENT was the emergency/assault food packet to use in the field? (CIRCLE ONE):

EXTREMELY CONVENIENT	MODERATELY CONVENIENT	SLIGHTLY CONVENIENT	NEUTRAL	SLIGHTLY INCONVENIENT	MODERATELY INCONVENIENT	EXTREMELY INCONVENIENT
1	2	3	4	5	6	7

25. In comparison with the MCI (Meal, Combat Individual), if you have ever carried it into the field, how CONVENIENT was the emergency/assault food packet and arctic supplement to use in the field? (CIRCLE ONE):

MUCH MORE	SOMEWHAT MORE	SLIGHTLY MORE	NEUTRAL	SLIGHTLY LESS	SOMEWHAT LESS	MUCH MORE
1	2	3	4	5	6	7

26. In comparison to the MCI (Meal, Combat Individual), if you have ever carried it into the field, how much better or worse was the QUALITY of the food in the emergency/assault food packet and supplement? (CIRCLE ONE):

MUCH BETTER	SOMEWHAT BETTER	SLIGHTLY BETTER	NEUTRAL	SLIGHTLY WORSE	SOMEWHAT WORSE	MUCH WORSE
1	2	3	4	5	6	7

27. a. Did you have any difficulty in understanding or following the instructions for rehydration printed on the labels. (CIRCLE ONE):

YES NO

b. If you circled YES, please explain the difficulty: _____

_____

_____

c. Can you think of any changes that would improve the instructions? _____

_____

_____

28. a. Did you have any problems using the plastic rehydration bags for the entrees and puddings? (CIRCLE ONE):

YES NO

b. If you circled YES, please explain the problem: _____

_____

_____

29. Which do you prefer: (CIRCLE ONE):

EXTREMELY PREFER COFFEE	MODERATELY PREFER COFFEE	SLIGHTLY PREFER COFFEE	NO PREFER-- ENCE	SLIGHTLY PREFER TEA	MODERATELY PREFER TEA	EXTREMELY PREFER TEA
1	2	3	4	5	6	7

30. Which do you prefer: (CIRCLE ONE):

EXTREMELY PREFER COFFEE	MODERATELY PREFER COFFEE	SLIGHTLY PREFER COFFEE	NO PREFER– ENCE	SLIGHTLY PREFER COCOA BEVERAGE	MODERATELY PREFER COCOA BEVERAGE	EXTREMELY PREFER COCOA BEVERAGE
1	2	3	4	5	6	7

31. Which do you prefer: (CIRCLE ONE):

EXTREMELY PREFER TEA	MODERATELY PREFER TEA	SLIGHTLY PREFER TEA	NO PREFER-ENCE	SLIGHTLY PREFER COCOA BEVERAGE	MODERATELY PREFER COCOA BEVERAGE	EXTREMELY PREFER COCOA BEVERAGE
1	2	3	4	5	6	7

32. Please rank order your preferences for the following categories of beverages that you drank by placing the number "1" in the blank next to the drink that you liked the MOST (your #1 favorite), the number "2" next to your second most favorite, etc. If you did not drink one of the beverages, leave it blank. Rank each item separately.

_____ ORANGE BEVERAGE

_____ FUDGE BAR (REHYDRATED)

_____ COFFEE

_____ TEA

_____ COCOA BEVERAGE

_____ SKIM MILK

33. Did you have any foods or beverages in addition to the rations issued to you? (CIRCLE ONE):

YES NO

34. Please feel free to use the space below to comment on any issues not adequately addressed above:

_____

_____

_____

_____

APPENDIX H

BRITISH 24-HOUR RATION PACK ARTIC CONSUMER SURVEY

BRITISH 24–HOUR RATION PACK ARCTIC, ONE MAN (POST–EXERCISE)

US Army Natick Research & Development Laboratories
Natick, MA 01760

For the field exercise just completed, you were issued samples of the British 24-Hour Ration Pack Arctic. Your experience with these items and your reactions to them are important to the future development of our rations.

Please answer all questions by circling ONE alternative unless otherwise indicated. Your responses on this survey are confidential and will not be identified with you individually.

1. How long have you been in the Marine Corps?_____Years_____Months

2. What is your rank?_____

3. Overall, rate the following MEALS and ITEMS.

	LIKE VERY MUCH	LIKE MODER–ATELY	LIKE SLIGHT–LY	NEITHER DISLIKE NOR LIKE	DISLIKE SLIGHTLY	DISLIKE MODER–ATELY	DISLIKE VERY MUCH
Drinks	1	2	3	4	5	6	7
Sundries (accessories)	1	2	3	4	5	6	7
Main Meals (entrees)	1	2	3	4	5	6	7
Breakfast (rolled oats mix)	1	2	3	4	5	6	7
Candies	1	2	3	4	5	6	7
Other Snacks (biscuits, nuts, etc.)	1	2	3	4	5	6	7

4. How adequate was the VARIETY of entrees (main meals)? (CIRCLE ONE):

EXTREMELY ADEQUATE	MODERATELY ADEQUATE	SLIGHTLY ADEQUATE	NEUTRAL	SLIGHTLY INADEQUATE	MODERATELY INADEQUATELY	EXTREMELY INADEQUATE
1	2	3	4	5	6	7

5. How adequate was the QUANTITY (AMOUNT) of the food ration issued to you for the conditions of the exercise? (CIRCLE ONE):

EXTREMELY ADEQUATE	MODERATELY ADEQUATE	SLIGHTLY ADEQUATE	NEUTRAL	SLIGHTLY INADEQUATE	MODERATELY INADEQUATE	EXTREMELY INADEQUATE
1	2	3	4	5	6	7

6. All things considered, how would you RATE the 24-Hour Ration Pack?

EXTREMELY GOOD	MODERATELY GOOD	SLIGHTLY GOOD	NEUTRAL	SLIGHTLY BAD	MODERATELY BAD	EXTREMELY BAD
1	2	3	4	5	6	7

7. Rate whether there were TOO FEW or TOO MANY of each of the following foods in a day's ration.

	VERY MUCH TOO MANY	MUCH TOO MANY	TOO MANY	NEITHER TOO MANY NOR TOO FEW	TOO FEW	MUCH TOO FEW	VERY MUCH TOO FEW
Drinks	1	2	3	4	5	6	7
Entrees	1	2	3	4	5	6	7
Breakfast foods	1	2	3	4	5	6	7
Candies	1	2	3	4	5	6	7
Other Snacks	1	2	3	4	5	6	7

8. How many servings of coffee would you like in a day's ration?

Number of
Servings (CIRCLE ONE): 0 1 2 3 4 5 6

9. How many servings of tea would you like in a day's ration?

Number of
Servings (CIRCLE ONE): 0 1 2 3 4 5 6

10. Were you able to get enough water to rehydrate the food items that you wanted to rehydrate: (CIRCLE ONE):

ALWAYS	ALMOST ALWAYS	OFTEN	FAIRLY OFTEN	SOMETIMES	ALMOST NEVER	NEVER
1	2	3	4	5	6	7

11. Were you able to get enough water to satisfy your thirst? (CIRCLE ONE):

ALWAYS	ALMOST ALWAYS	OFTEN	FAIRLY OFTEN	SOMETIMES	ALMOST NEVER	NEVER
1	2	3	4	5	6	7

12. How difficult was it to obtain water? (CIRCLE ONE):

VERY EASY	MODERATELY EASY	SLIGHTLY EASY	NEUTRAL	SLIGHTLY HARD	MODERATELY HARD	VERY HARD
1	2	3	4	5	6	7

13. On the average, how many CANTEENS (one canteen = 32 ounces or one quart) of water did you use each day for drinking and eating?

Number of
Canteens (CIRCLE ONE): 0 1 2 3 4 5 6

14. On the average, how many canteen CUPS (one canteen cup = 16 ounces) of water did you use each day for drinking and eating?

Number of
Cups (CIRCLE ONE): 0 1 2 3 4 5 6 7 8 10 11 12

15. How many times did you have to melt snow or ice in order to obtain water? (CIRCLE ONE):

NEVER	ONE TO FOUR TIMES	ONCE EACH DAY	TWICE EACH DAY	THREE TIMES EACH DAY	FOUR TIMES EACH DAY	FIVE OR MORE TIMES EACH DAY
1	2	3	4	5	6	7

16. If you melted snow or ice, did you melt it in a canteen cup or in a larger vessel? (CIRCLE ONE):

CANTEEN CUP	LARGER VESSEL	DID NOT MELT SNOW
1	2	3

17. In your opinion, is a one-man three-day supply of the 24-Hour Ration Arctic TOO BULKY to carry in your rucksack? (CIRCLE ONE):

NOT AT ALL	SLIGHTLY BULKY	SOMEWHAT BULKY	MODERATELY BULKY	QUITE A BIT	EXTREMELY BULKY
1	2	3	4	5	6

18. In comparison to 12 MCI's (twelve Meals, Combat Individual), how HEAVY is a one-man three-day supply of the 24-Hour Ration Arctic to carry in your rucksack?

EXTREMELY LIGHT	MODERATELY LIGHT	SOMEWHAT LIGHT	NEITHER LIGHT NOR HEAVY	SOMEWHAT HEAVY	MODER-ATELY HEAVY	EXTREMELY HEAVY
1	2	3	4	5	6	7

19. Overall, how CONVENIENT was the 24-Hour Ration Pack to use in the field? (CIRCLE ONE):

EXTREMELY CONVENIENT	MODERATELY CONVENIENT	SLIGHTLY CONVENIENT	NEUTRAL	SLIGHTLY INCON-VENIENT	MODERATELY INCON-VENIENT	EXTREMELY INCON-VENIENT
1	2	3	4	5	6	7

20. Please feel free to use the space below to comment on any issues not adequately addressed above:

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