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EVALUATION OF THE RATION, COLD WEATHER DURING A 10-DAY COLD WEATHER FIELD TRAINING EXERCISE

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<p>The Ration, Cold Weather (RCW) was compared with the Meal, Ready-to-Eat (MRE) during a 10-day cold weather training exercise. Soldiers from the 10th Special Forces Group were assigned to either the RCW or the MRE group for the duration of the exercise. The results of the field study indicate that the RCW was more acceptable to troops than the MRE in terms of taste, looks, amount of food, and variety. Most components of the RCW received 7s and 8s on a 9-point hedonic scale; but several items were unpopular and these items should be reformulated or substituted with more acceptable products. Moderate negative energy balance and moderate dehydration were evidenced in soldiers in both ration groups. Substituting an entree for one of the less popular sweet items should enhance caloric intake, and substituting popular soups and beverages, such as chicken soup and cider for the unpopular fruit soup may encourage fluid consumption. The composition of the RCW resulted in lower protein and sodium intake by soldiers in the RCW group when compared to intake by soldiers in the MRE group. Thus, the study also demonstrates that (cont.)</p>			
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the RCW may have a nutritional advantage over the MRE by minimizing water demand in the field.

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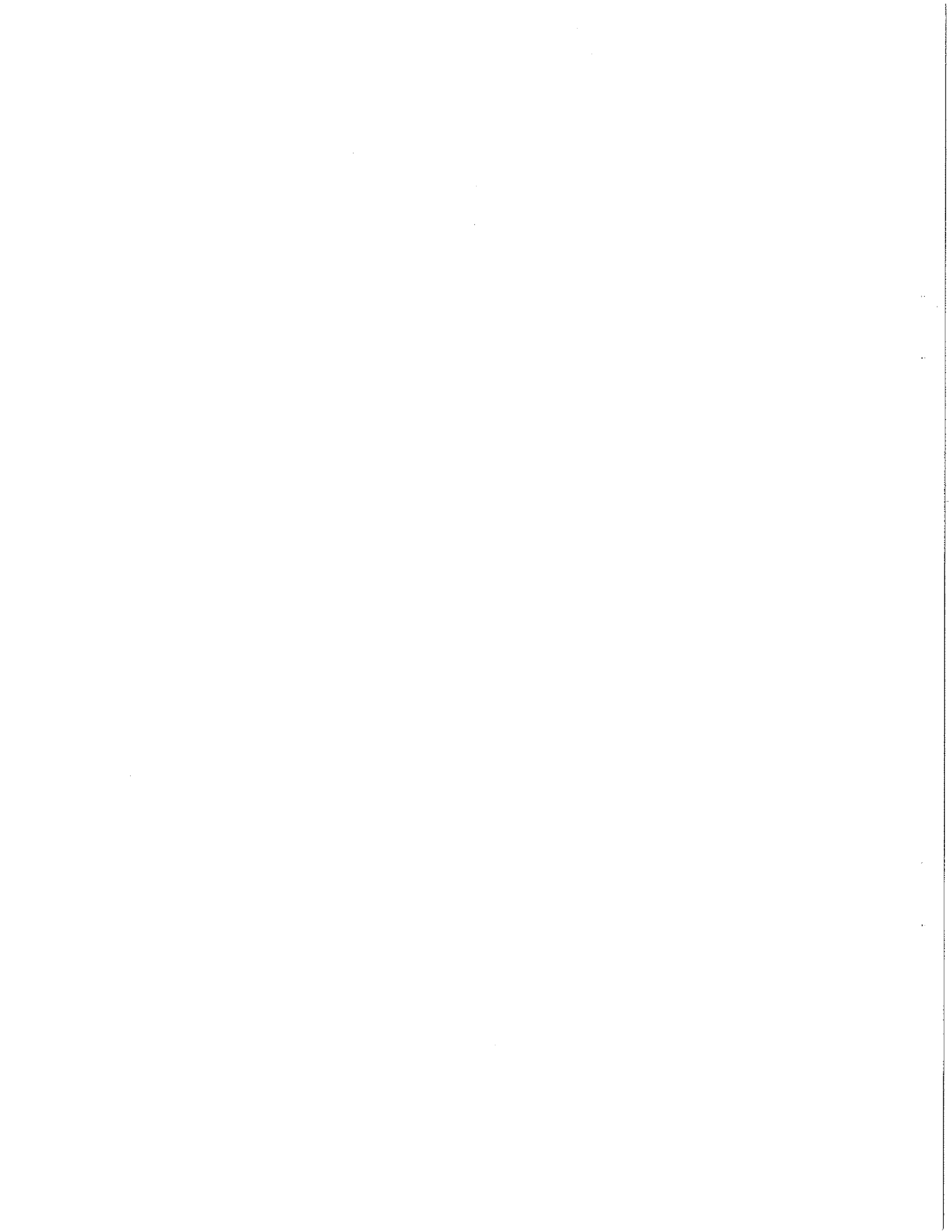
Human subjects participated in these studies after giving their free and informed voluntary consent. Investigators adhered to AR 70-25 and USAMRDC Regulation 70-25 on Use of Volunteers in Research.

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PREFACE

The data for this report were collected by investigators from U.S. Army Natick Research, Development & Engineering Center (Natick) and the U.S. Army Research Institute of Environmental Medicine (USARIEM) during the 10th Special Forces Cold Weather Field Exercise. The field aspects of this test took place during January 1986 in the White Mountains near Plymouth, New Hampshire. Pre- and postexercise tests were conducted at Ft. Devens, Massachusetts. This report encompasses nutrient and water intakes, nutritional and hydration status, ration acceptability, and human factors issues. Water intake, ration acceptability/intake and human factors aspects of this test were evaluated by the Science & Advanced Technology Directorate (SATD), Natick, under project No. 1L162724AH99. USARIEM was responsible for nutrient intake/status, hydration status, and the muscle strength evaluation.

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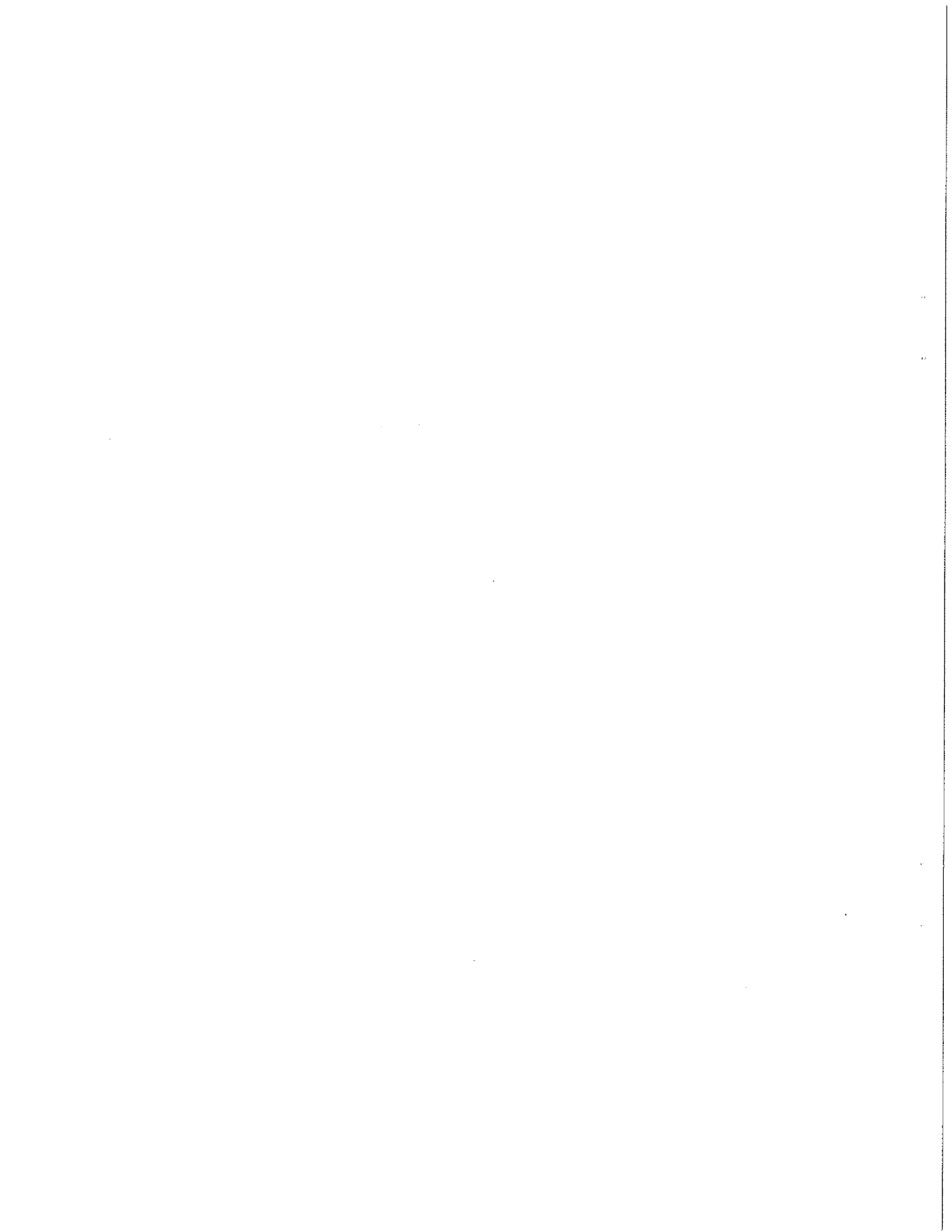


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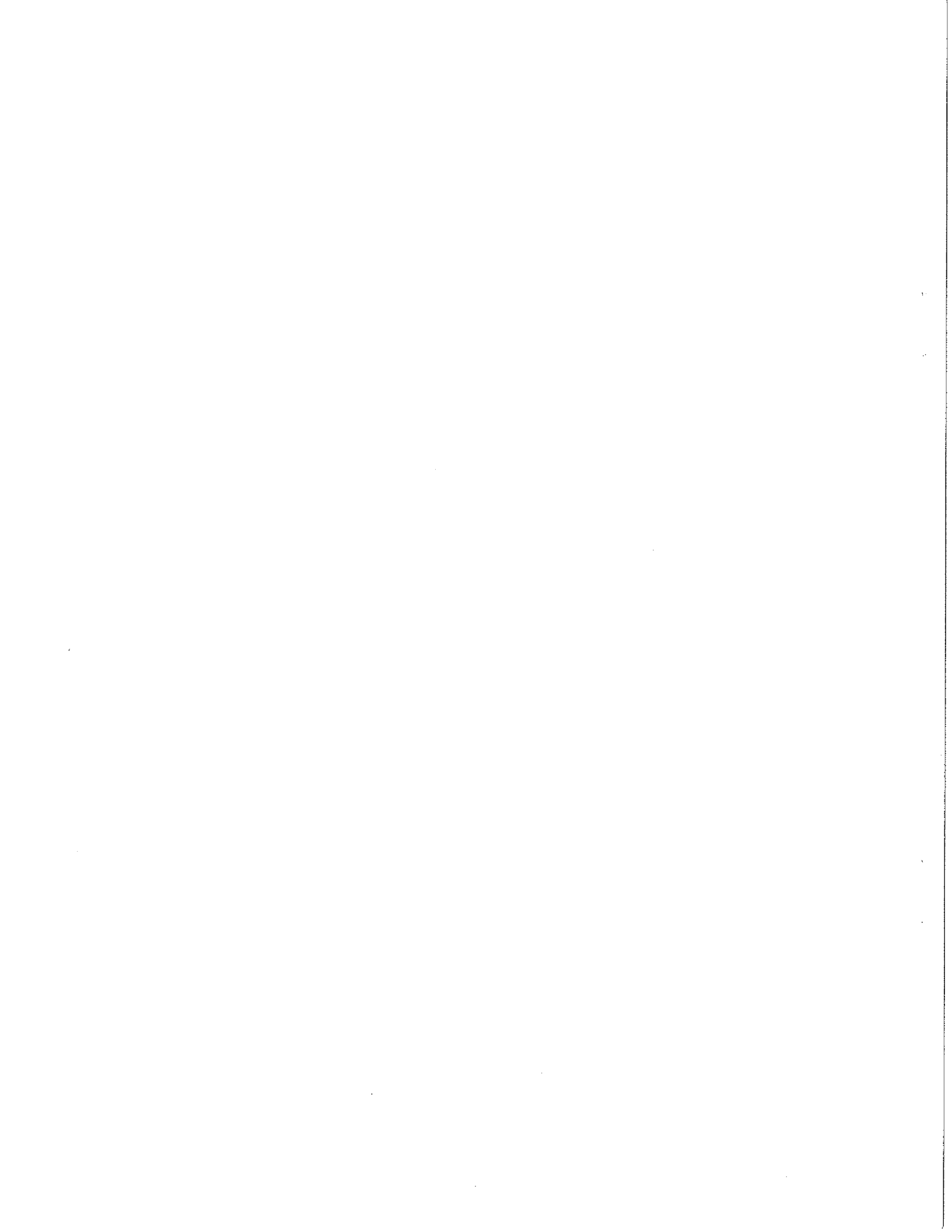
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EVALUATION OF THE RATION, COLD WEATHER DURING A 10-DAY
COLD WEATHER FIELD TRAINING EXERCISE

INTRODUCTION

An operational ration for cold weather has recently been developed by the Food Engineering Directorate at the U.S. Army Natick Research, Development and Engineering Center (Natick). The development of the Ration, Cold Weather (RCW) was initiated in 1983 in response to a requirement from the U.S. Marine Corps, the Service responsible for defending the northern flank of Europe. The Marine Corps requirement calls for a ration that meets the special demands of a cold environment: a 4500-calorie daily menu that has a lowered sodium content within the guidelines of AR 40-25 (1) and includes entrees, snacks, and a variety of flavored powders to make hot beverages; nonfreezable components; flat, flexible, and waterproof external packaging; and relatively lightweight and small components. A one-day supply of the RCW should be significantly lighter and smaller than a one-day supply of the Meal, Ready-to-Eat (four MREs). Rations currently available in the system are unacceptable for cold weather operations because the food items are too bulky and heavy and tend to freeze.

During the development of the RCW, several laboratory and field tests were conducted to evaluate the various RCW prototypes. Testing during two Marine NATO exercises in northern Norway (2,3), an exercise at the U.S. Marine Corps Mountain Warfare Training Center in California (4), and a

controlled laboratory study conducted at the climatic chamber facilities at Natick (5) have revealed some problems with the early versions of the RCW. In addition to identifying food acceptance problems, the field studies demonstrated insufficient fluid intake by Marines during the exercises. Although the results from the field tests suggested that dehydration may be a serious problem during cold weather operations, the design of the field studies precluded the determination of whether the RCW, the cold environment, and/or some other aspect of cold weather training was the cause of the dehydration. The laboratory test, however, demonstrated that subjects in this controlled environment consumed insufficient quantities of water to prevent dehydration when an early version of the RCW was the sole source of food for five days in the cold chamber test (5).

The problem of soldiers becoming dehydrated during cold weather operations was addressed by RCW reformulation. The sodium content has been reduced to lessen the soldier's need for water (6), and a variety of beverage flavors have been included to enhance the consumption of beverages (7). Food acceptance problems were addressed by product improvement and substitution.

The current RCW consists of six 24-hour meal packs (See Appendix A for menus and nutrient information). Each pack provides an average of 4547 kilocalories, 108 g protein, 683 g carbohydrate, 152 g fat, and 4308 mg of sodium. Each pack includes eight dehydrated beverage products (drinks and soups), a nut/raisin mix, an assortment of desserts/snacks (granola, chocolate, and fruit bars, cookies, brownies), dehydrated oatmeal (one of three flavors) and a compressed, freeze-dried entree bar that is different

in each of the six menus. Ration components are individually packaged and packed into a white, flexible retort pouch that has a volume of 183 cubic inches and weighs 1220 g.

At the present time, because there is no cold weather doctrine in the Army's field feeding system, four MREs per man per day are issued during cold weather training exercises. This was the reason that four MREs were used in the control condition in the present field study. Four MREs (MRE V) contain about 4892 kilocalories, 173 g protein, 547 g carbohydrate, 223 g fat, and 8688 mg of sodium. Four MREs have a volume of 381 cubic inches and weigh 2031 g. Each of the twelve MRE menus (see Appendix B for menus and nutrient information) has a different entree supplemented with coffee, sugar, and cream substitute and crackers with either cheese, peanut butter, or jelly. Nine of the menus have either cake, cookies, or brownies; five of the menus have candy; five of the menus have either beans or potato; five of the menus have dehydrated fruit; seven of the menus have cocoa mix. Although the RCW provides about the same amount of food as four MREs, the RCW is lower in protein, fat, and sodium. A one-day supply of the RCW is also smaller and lighter than a one-day supply of the MRE ration.

The purpose of the field study presented here was to evaluate the latest version of the RCW. This field study offers a comprehensive evaluation of the latest version of the RCW during a 10-day cold weather training exercise. Ration acceptability, nutritional status, hydration status, and human factors of the RCW were evaluated in a direct comparison of the RCW and the MRE. Unlike previous field tests of the RCW, this field study was designed to address the question of whether the RCW adversely affects hydration status.

METHOD

Subjects

Twenty-four soldiers from the 10th Special Forces Group served as subjects for the field test. Subjects had an average (\pm SE) weight of 77.3 (\pm 1.4) kg, height of 170.3 (\pm 0.96) cm, and percent body fat of 14.4%. There were no significant differences between subjects in the two ration groups. Subjects were 26.2 (\pm 0.71) years of age, and had served in the Armed Forces for an average of six years and 10 months at the time of the study.

Procedures

The field test was conducted during the 10th Special Forces Group (Ft. Devens, MA) winter warfare training exercise that took place near the White Mountain National Forest in New Hampshire. The ten-day evaluation of the RCW began at Fort Devens during a "lock-down" period when the soldiers were separated into squads to discuss their respective missions for the exercise. The last day of the lock-down before deployment to New Hampshire served as the first day of the study.

On the first day of the study subjects were briefed on the purpose and methods of the study and were asked to sign a Volunteer Agreement Form (see Appendix C). All volunteers were assigned to either the MRE or RCW group for the duration of the winter warfare exercise. Subjects in the MRE group were required to consume the MRE ration, and those in the RCW

group were required to consume the RCW as their sole source of food. No additional food nor beverage was allowed during the exercise.

Before being airlifted to New Hampshire from Fort Devens, each subject was issued either one RCW (4500 kcal) or four MREs (4800 kcal) per day. The RCW group was instructed to bring the entire ration to the field. However, the MRE group was allowed to bring as much of the available MREs (four MREs per man per day) as they desired. On the average, soldiers chose to bring about 70% of almost all MRE components into the field. A log booklet to record ration and beverage intake and acceptability on a daily basis, and plastic bags to store food wrappers and uneaten food were also issued at this time. Sample pages from the log booklets can be found in Appendix D. Similar instruments have been used previously to collect food intake data in the field (8). Direct measures of food intake have been made to validate the method and indicate that there is a high correlation between estimated intake of packaged food and actual food intake (8).

To ensure that subjects' food intake estimates were accurate, subjects' food wrappers from consumed ration components and uneaten packaged rations were collected at the completion of the field exercise. If there was a discrepancy between a subject's reported food intake in the log booklet and the intake calculated by counting food wrappers and packages, data from the log booklets were used. Because we did not have access to the soldiers in the field to make direct measurements of fluid intake and because there are no means to double check fluid intake estimates, a laboratory study was conducted before the field test to determine the accuracy of the fluid intake estimation instrument. The

results from the study indicated that there was a high correlation between reported fluid intake and actual intake ($r = 0.89$).

Blood pressure, skin-fold, and body weight measurements, as well as blood and urine samples were obtained before deployment and at the termination of the field exercise. Blood and urine assays were performed to determine nutritional and body fluid status at these times. A muscle strength test was also given to subjects before and following the exercise. Details on procedures for the physiological measurements and tests are described in a U.S. Army Research Institute of Environmental Medicine Technical Report (9). While in the field, medics collected a daily sample from each subject's first urine and recorded specific gravity and ketone levels as indicated by dipsticks. The dipstick measures provide gross estimates of hydration and nutritional status.

The weather during the field test was typical for February in New Hampshire. The temperature range was between 4 and 35 F. There was light snowfall on two days, and on one day about 8 inches of snow fell. The snow depth ranged between 18 and 26 inches so that snow shoes were required for insertion into and exfiltration from the field. Detailed weather data can be found in Appendix E.

The activity level of the soldiers during the field test was variable. During insertion and exfiltration, the activity level was high due to the energy demands of snowshoeing, hiking, and climbing across rugged terrain. However, the soldiers' activity level was relatively low during most of the exercise.

RESULTS AND DISCUSSION

Nutrient Intake and Nutritional Status

Results from the validated log booklets indicated that caloric intake was quite similar in the MRE and RCW groups. The mean caloric intakes (\pm SE) were 2733 (\pm 65) and 2751 (\pm 70) kcal per man per day for MRE and RCW groups, respectively. Although sufficient calories were available, soldiers in both groups did not consume the suggested caloric intake of 4500 kcal per man per day for moderately active soldiers in an arctic environment (AR 40-25) (1). Soldiers in the MRE group consumed about 56% of the available calories, while soldiers in the RCW group consumed about 60% of the available calories. Table 1 illustrates the percentage of the available calories and nutrients consumed by soldiers in the MRE and RCW groups.

TABLE 1.

Percentage of Daily Total Available Calories and Nutrients Consumed.

<u>Composition</u>	<u>4 MREs</u>	<u>RCW</u>
Calories	56%	60%
Carbohydrate (g)	55%	56%
Protein (g)	57%	77%
Fat (g)	57%	64%
Sodium (mg)	68%	79%

While the caloric consumption was remarkably similar in the two ration groups, the intake of macronutrients (carbohydrate, protein, and fat) was different primarily because of differences in ration composition. For

example, the daily ration of four MREs provides about 173 g of protein, while the RCW provides about 108 g of protein. Table 2 illustrates the differences in the caloric and nutrient composition of the MRE and RCW. Table 2 also shows the mean (\pm SE) caloric and nutrient intake of each ration during the field study.

TABLE 2.

Comparison of Caloric and Nutrient Composition of the MRE and RCW and the Quantity Consumed During the Field Study (average per man, per day).

<u>Composition</u>	<u>MRE (4 MREs)</u>		<u>RCW</u>	
	<u>Available</u>	<u>Consumed</u>	<u>Available</u>	<u>Consumed</u>
Calories	4892	2733	4547	2747
Carbohydrate (g)	547	302	686	384
Protein (g)	173	99	108	83
Fat (g)	223	127	152	98
Sodium (mg)	7188	4859	4462	3533

The differences in protein, carbohydrate, fat, and sodium intake between the MRE and RCW groups are illustrated in Figures 1, 2, 3, and 4, respectively. Soldiers in the RCW group ate significantly less protein and sodium than soldiers in the MRE group ($p < 0.05$). Reduced but adequate protein and sodium consumption may be viewed as being advantageous in terms of optimizing the hydration status of soldiers in the field because both protein and sodium place relatively high water demands. Carbohydrate intake was higher in the RCW group than in the MRE group ($p < 0.05$), and fat intake was lower in the RCW group than in the MRE group ($p < 0.05$). The overall nutrient intake of soldiers in the RCW group may be considered more desirable than that of soldiers in the MRE group, especially in extremely cold environments where water availability may be low. A

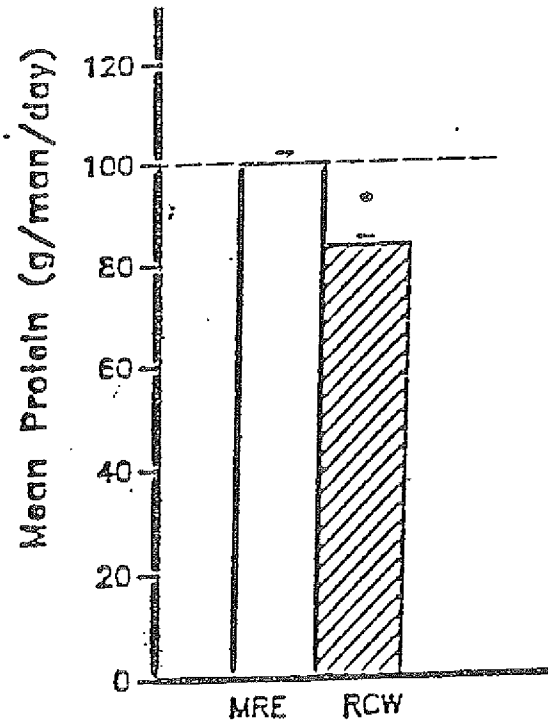


Figure 1. Mean protein consumed in MRE & RCW groups.

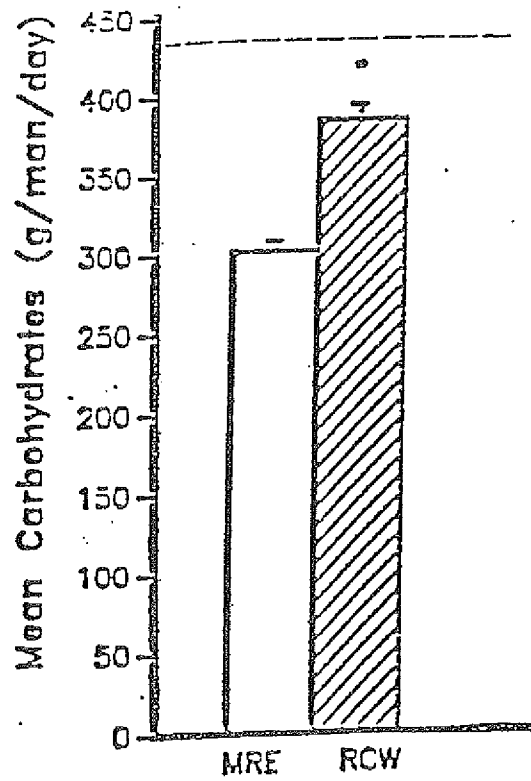


Figure 2. Mean carbohydrate consumed in MRE & RCW groups.

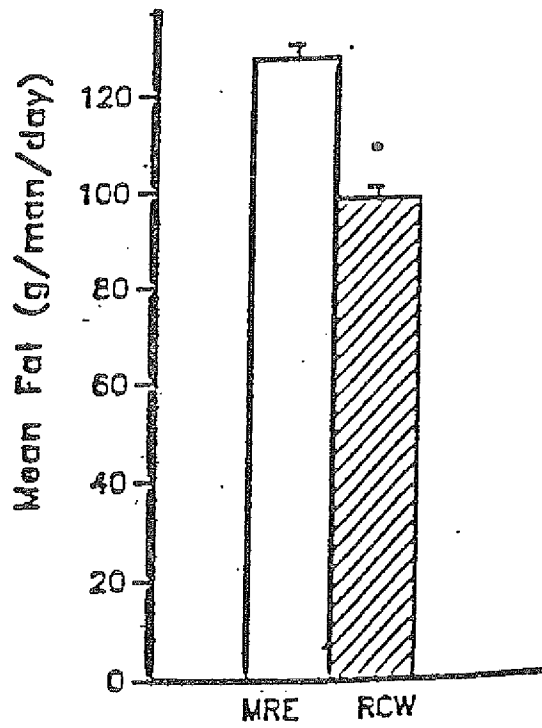


Figure 3. Mean fat consumed in MRE & RCW groups.

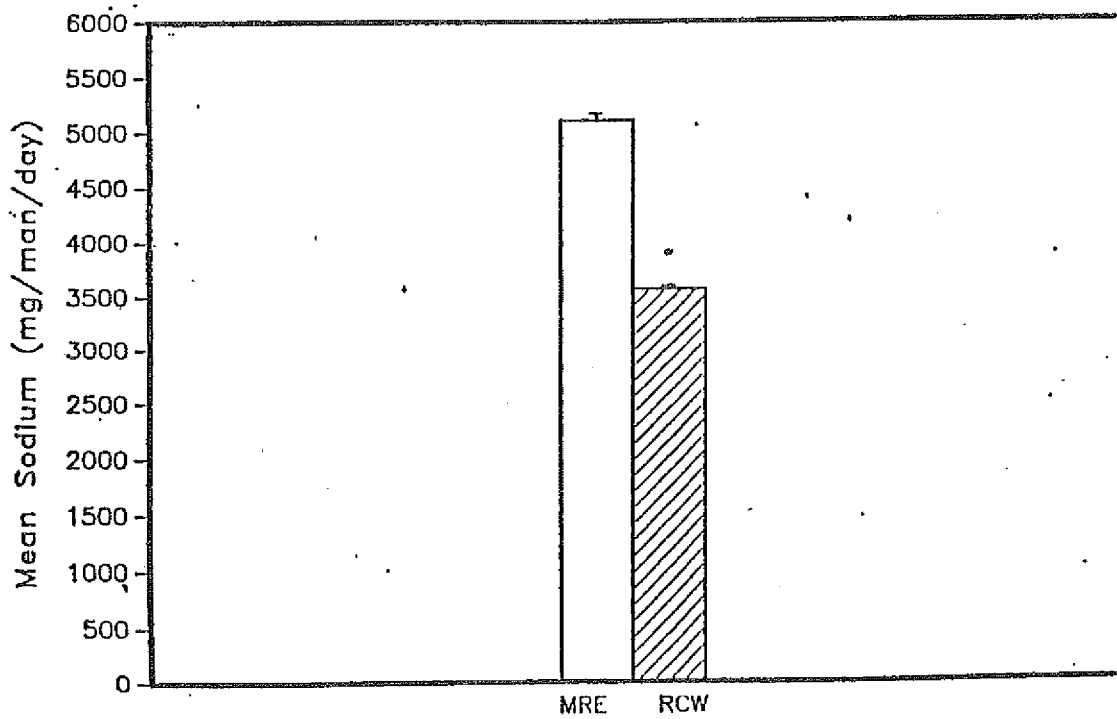


Figure 4. Mean sodium consumed in MRE & RCW groups.

thorough discussion of nutritional status during this test may be found in a USARIEM report (9).

Did soldiers who participated in the exercise eat enough to maintain their body weight? While soldiers in both ration groups lost a significant amount of weight during the field training, a statistical difference was not found between the MRE and RCW groups. The average weight loss in the MRE group was 3.2 kg (7 lb), a 4% reduction in body weight; the average weight loss in the RCW group was 2.5 kg (5.6 lb), a 3% loss in body weight (See Figure 5).

Although an exact quantification of weight loss cannot be performed because total body water measurements were not taken and caloric expenditure in the field is not known, the average caloric deficit during the exercise may be estimated using data from Consolazio (10) that indicates that the caloric requirement for moderately active men in a cold environment ranges from 47 to 55 kcal/kg body weight. Using these data and body weight and caloric intake data from the field study, a deficit of between 8,415 and 14,049 kcal per man for 9 days can be estimated. This range of caloric deficit corresponds to weight losses between 2.4 and 4.0 lb per man for 9 days. Because soldiers lost more than 4 lb (6.9 lb and 5.6 lb in the MRE and RCW groups, respectively) and specific gravity data (9) indicate that soldiers in both groups were moderately dehydrated, we can conclude that part of the weight loss was fat catabolized for energy, and the remainder of weight loss was water. The average percent body fat loss was about 2% in the MRE group and about 1% in the RCW group (see Figure 6). Although the difference in percent body fat between groups was significant ($p < 0.05$), the body weight and fat losses were relatively moderate and did not affect muscle strength and endurance (9).

Body Weight

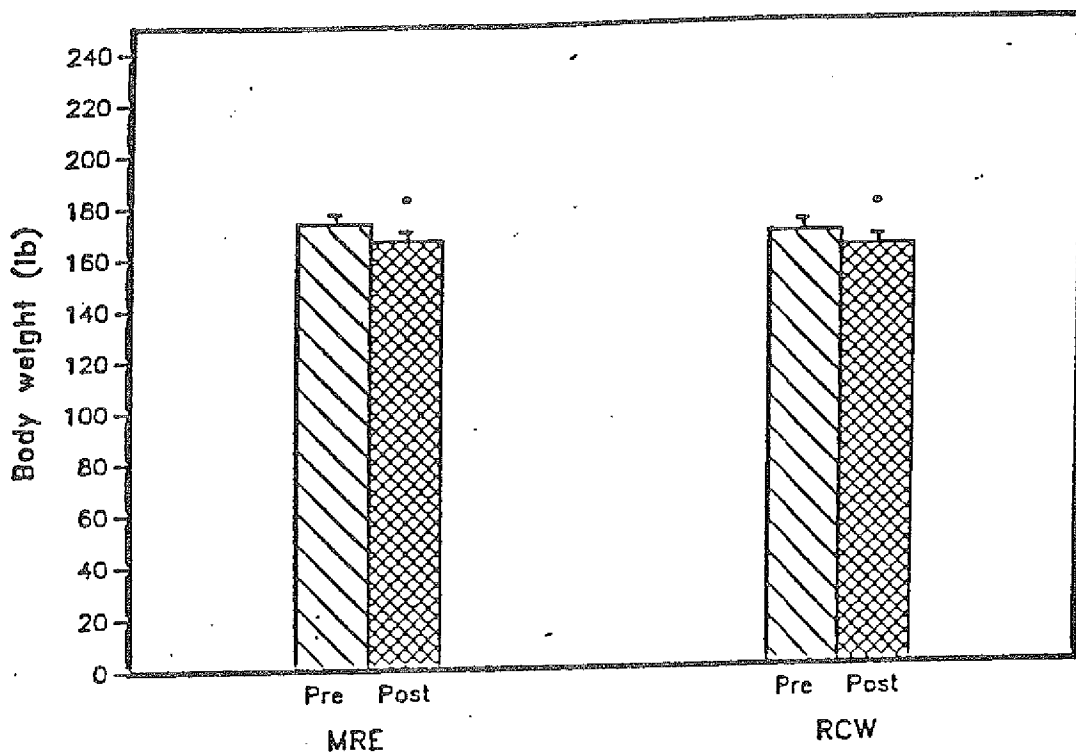


Figure 5. Mean body weight in MRE & RCW groups - Pre- and posttest.

Body Fat

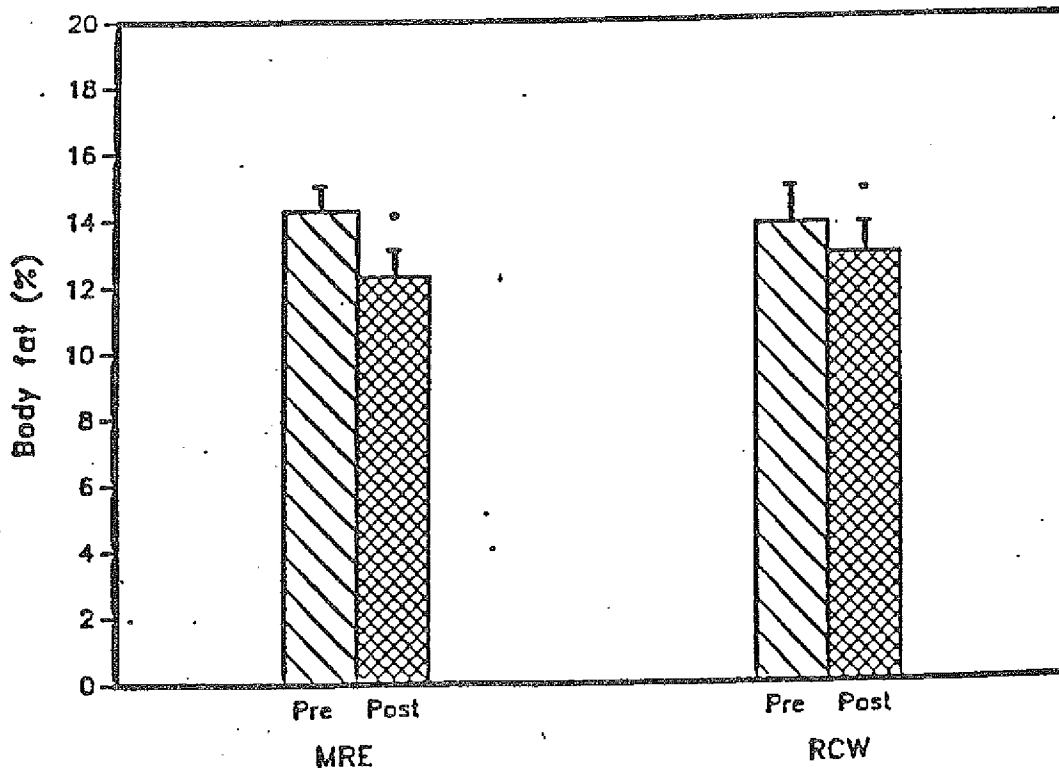


Figure 6. Mean body fat (%) in MRE & RCW groups - Pre- and posttest.

Water Intake and Hydration Status

Water intake was remarkably similar in the two ration groups. Although the RCW provided significantly less water than the MRE, soldiers in the RCW group compensated for this difference by adding water to the ration. Drinking water intake in both groups was about 2 liters per man per day. Overall water intake (including the water in and added to the ration plus drinking water) was about 3 liters per man per day in each group. Table 3 and Figure 7 illustrate the overall water intake (mL per man per day) during the field test.

TABLE 3.

Average (+SE) Water Intake (mL per man per day)
During Cold Weather Exercise.

	MRE Mean (+SE)	RCW Mean (+SE)
Water in Ration	303 (1)	28 (10)
Water Added to Ration	615 (33)	979 (34)
Drinking Water	2059 (126)	1963 (129)
Total Water Intake	2977 (128)	2970 (138)

Results from the posttest questionnaire (see Appendices F and G) indicate that soldiers in both groups were almost always able to get enough water to rehydrate the dehydrated ration items and satisfy their thirst. Most of the soldiers reported that they obtained most of their water supply from unfrozen streams and by melting snow. They indicated that they worked in small groups to melt snow about once a day. Most soldiers also said that the water in their canteens sometimes froze before they had the chance to drink all the water in the canteens.

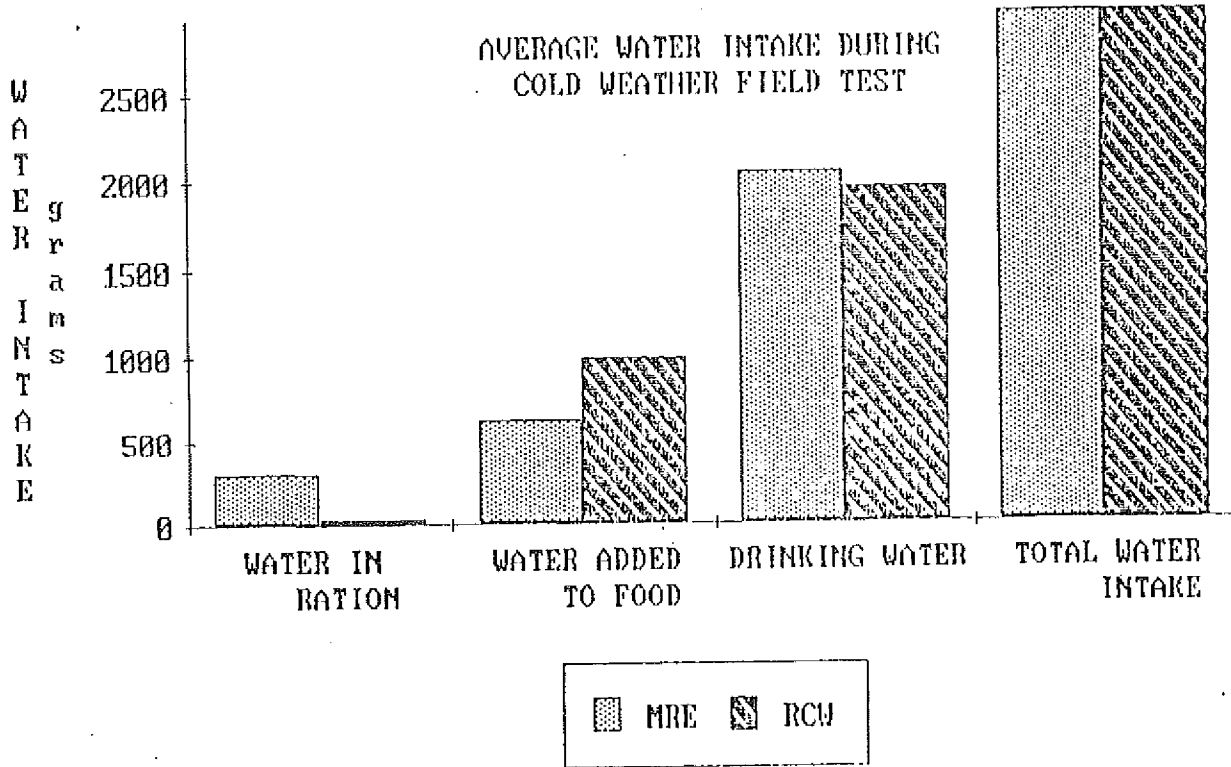


Figure 7. Mean water intake during 10th Special Forces' cold weather exercise.

Despite the availability of water, specific gravity data indicate that soldiers in both groups were moderately dehydrated in the field (9). Specific gravity data also revealed that soldiers in both groups were dehydrated at the end of the lock-down period at Fort Devens, that is, before they were airlifted to the field. The soldiers in the RCW group were slightly more dehydrated during the initial three days. On the first day there was a statistically significant difference between the groups ($p < 0.05$). However, after the first day there were no significant differences between the groups. There was a slight improvement trend in specific gravity values during the last three days of the field test in both groups.

Dehydration has been observed in troops during other cold weather exercises (11,12,13). While it is widely recognized that voluntary dehydration occurs in severely hot environments (14,15,16), only a few studies have noted that individuals become dehydrated in the cold because voluntary consumption of water does not completely compensate for water lost from perspiration, respiration, and diuresis (17,18,19). Several factors may contribute to insufficient fluid intake in an extremely cold environment. Among these factors are the considerable demands of time and effort involved in melting snow and the unacceptable taste and/or temperature of the available drinking water.

Studies (7,20) suggest that beverage consumption may be enhanced by providing beverage flavors that are palatable. In addition to providing the soldiers with a variety of beverage flavors, it is critical that water discipline be implemented during field exercises. In the present case,

the 10th Special Forces' cold weather test, soldiers could have been told to increase their water intake while they were in the barracks during the lock-down period. In the field, soldiers should be encouraged to drink, especially in extreme environments where dehydrated soldiers may not feel thirsty.

Ration Acceptance and Human Factors

Soldiers were asked to rate the ration items that they ate in a log booklet daily during the exercise (Appendix D). Soldiers also rated all the ration items on a posttest questionnaire (Appendices F and G). In general, the acceptability ratings were slightly higher in the log booklets than in the questionnaire. Because soldiers either trade or give away less preferred products for those that they like to eat, they tend to eat and rate the more preferred ration items. Thus, the ratings from the log booklets may be considered to be skewed toward the higher end of the acceptability scale. Data from the posttest questionnaire will be presented in this report. However, when the difference between the log booklet and postquestionnaire data are statistically significant, both will be presented.

In general, the 10th Special Forces soldiers found the RCW to be more acceptable than the MRE. The mean acceptability ratings for RCW and MRE ration items can be found in Tables 4 and 5, respectively. Most RCW items received 7's and 8's on a 9-point hedonic scale where 1 corresponds to "extremely dislike", 5 corresponds to "neither like nor dislike", and 9 corresponds to "like extremely". Among the most popular RCW items were the oatmeal entrees, spaghetti with meat sauce, chicken soup, and the

TABLE 4.

Mean (\pm SE) Acceptance of RCW Items.*

<u>Product</u>	<u>Hedonic Rating (+ SE)</u>
Oatmeal (Apple & Cinnamon)	7.9 (\pm 0.3)
Oatmeal (Maple & Brown Sugar)	7.8 (\pm 0.3)
Oatmeal (Strawberry)	8.1 (\pm 0.3)
Chicken Stew	7.2 (\pm 0.3)
Beef & Vegetable	7.3 (\pm 0.4)
Pork & Esc. Potatoes	7.7 (\pm 0.3)
Chicken a la King	7.9 (\pm 0.2)
Spaghetti & Meat Sauce	8.1 (\pm 0.2)
Chicken & Rice	7.3 (\pm 0.3)
Chicken Soup	8.2 (\pm 0.2)
Fruit Soup (Strawberry)	5.4 (\pm 0.5)
Fruit Soup (Raspberry)	4.6 (\pm 0.5)
Lemon Tea	6.7 (\pm 0.3)
Orange Beverage	5.9 (\pm 0.6)
Cocoa	7.2 (\pm 0.3)
Coffee	5.7 (\pm 0.7)
Cookies (Chocolate Covered)	7.0 (\pm 0.3)
Cookies (Oatmeal)	5.7 (\pm 0.5)
Brownie	5.6 (\pm 0.5)
Granola Bar	5.3 (\pm 0.5)
Blueberry Bar	8.0 (\pm 0.3)
Fig Bar	7.2 (\pm 0.5)
Chocolate Bar	6.3 (\pm 0.4)
Raisin-Nut Crunch	7.4 (\pm 0.3)

* Items were rated on a nine-point hedonic scale where 1 corresponds to "dislike extremely", 5 is "neutral", and 9 corresponds to "like extremely".

TABLE 5.

Mean (\pm SE) Acceptance of MRE Items.*

<u>Product</u>	<u>Hedonic Rating (\pm SE)</u>
Beef with BBQ Sauce	6.4 (\pm 0.5)
Beef with Gravy	5.1 (\pm 0.5)
Beef with Spice Sauce	6.1 (\pm 0.5)
Beef Patty	6.0 (\pm 0.5)
Beef Stew	5.8 (\pm 0.4)
Chicken a la King	5.6 (\pm 0.5)
Frankfurters	5.7 (\pm 0.7)
Ham & Chicken Loaf	5.8 (\pm 0.6)
Ham Slices	8.1 (\pm 0.4)
Meatballs with BBQ Sauce	7.3 (\pm 0.3)
Pork Patty	5.6 (\pm 0.5)
Turkey with Gravy	6.6 (\pm 0.4)
Crackers	6.4 (\pm 0.4)
Jelly	6.1 (\pm 0.6)
Peanut Butter	6.5 (\pm 0.6)
Applesauce	6.5 (\pm 0.6)
Mixed Fruits	7.1 (\pm 0.4)
Peaches	7.3 (\pm 0.3)
Strawberries	7.6 (\pm 0.4)
Brownie	6.2 (\pm 0.6)
Cookies (Chocolate Covered)	7.3 (\pm 0.4)
Cherry Nut Cake	7.0 (\pm 0.5)
Fruit Cake	6.3 (\pm 0.8)
Maple Nut Cake	6.8 (\pm 0.6)
Orange Nut Cake	5.7 (\pm 0.7)
Pineapple Nut Cake	5.8 (\pm 0.7)
Chocolate Nut Cake	8.5 (\pm 0.2)
Cocoa	7.8 (\pm 0.3)
Coffee	6.8 (\pm 0.4)
Catsup	5.7 (\pm 0.4)
Gravy Base	6.7 (\pm 0.4)
Candy (all types)	6.9 (\pm 0.4)

* Items were rated on a nine-point hedonic scale where 1 corresponds to "dislike extremely", 5 is "neutral", and 9 corresponds to "like extremely".

blueberry bar; these items all received 8's on the hedonic scale. Among the least favorite items, which were given 5's and 6's on the hedonic scale, were the fruit soups, granola bar, orange beverage bar, and brownie.

When the RCW entrees were compared to the MRE entrees, a significant difference was found in the average hedonic ratings for entrees ($t = 6.58$, $p < 0.001$). The mean (\pm SE) rating for RCW entrees was 7.6 (± 0.1), while the mean rating for the MRE entrees was 6.2 (± 0.1).

Average RCW and MRE beverage hedonic ratings were identical in the log booklets. However, in the posttest questionnaire, MRE beverage ratings were significantly higher than RCW ratings, 7.4 compared to 6.5., ($t = 2.23$, $p < 0.05$). The difference between MRE and RCW beverage ratings on the questionnaire is due mainly to a difference in coffee and cocoa ratings and the RCW orange beverage bar rating. Soldiers in the MRE group rated coffee and cocoa higher than soldiers in the RCW group. The orange beverage bar was less preferred than other beverages; thus, its rating also contributes to this difference between RCW and MRE beverage ratings. A comparison of ration components grouped by entrees, desserts, and beverages can be seen in Table 6.

TABLE 6.

Comparison of Mean Hedonic Ratings of MRE and RCW Entrees, Desserts, and Beverages Including Results of Statistical Analyses.

<u>Components</u>	MRE		RCW		<u>t</u>	<u>p</u>
	<u>Mean</u>	<u>(+SE)</u>	<u>Mean</u>	<u>(+SE)</u>		
Entrees	6.2	(0.1)	7.7	(0.1)	6.58	< 0.001
Beverages	7.4	(0.3)	6.5	(0.2)	-2.23	< 0.05
Desserts	6.8	(0.2)	6.5	(0.2)	0.90	ns

Soldiers indicated how satisfied they were with the portion sizes of the RCW and MRE components using a 7-point scale where 1 corresponds to "much too small", 4 corresponds to "just right", and 7 corresponds to "much too large". Portion size ratings for RCW and MRE component categories are shown in Table 7. In general, most soldiers (75% in the MRE group and 78% in the RCW group) indicated that the entree portions were too small. Ratings of beverage portion sizes were different in the ration groups. While 100% of the respondents in the RCW group thought that the amount of beverage was either just right or too large, 56% of the MRE group thought that the beverage portion was too small. Over half of the soldiers in the RCW group expressed that the fruit soup portion was too large. However, almost every soldier in the RCW group thought that the chicken soup portion was too small. These data indicate that the soldiers would like more of the traditional soups such as chicken and vegetable, and less of the nontraditional fruit soups. Ratings of beverage portion size in the RCW group were found to be significantly different from those in the MRE group, ($F = 4.4$, $p < 0.05$). The MRE group indicated that the beverage portions were smaller than the RCW group reported.

TABLE 7.

Comparison of Portion Size Ratings in MRE and RCW Groups.

<u>Food Category</u>	<u>MRE</u> <u>Mean (+SE)</u>	<u>RCW</u> <u>Mean (+SE)</u>	<u>F</u>	<u>p</u>
Entrees	3.2 (0.4)	2.7 (0.2)	1.30	ns
Desserts	3.6 (0.4)	4.2 (0.3)	1.42	ns
Beverages	3.2 (0.5)	4.1 (0.1)	4.43	<0.05

Variety was perceived as adequate for RCW beverages and fruit soups. However, soldiers' ratings indicated that more variety was desired in MRE entrees, starches, desserts, beverages, and fruits. In the RCW group more variety was requested in entrees and soups; more variety was also desired for oatmeal and desserts, but to a lesser extent. The variety of each food category was rated by soldiers on a 4-point scale where 1 corresponds to "variety now enough" and 2, 3, and 4 correspond to increasing levels of more variety required. Table 8 presents average variety ratings in MRE and RCW groups. The only statistical difference between ration types was evidenced when beverage variety ratings were compared.

TABLE 8.

Mean Ratings of Variety (\pm SE) in MRE and RCW Groups with Soldiers'
Perceptions of Adequacy of Variety in Current Rations.

<u>Food Group</u>	<u>Mean (+ SE)</u>	<u>Enough Variety</u> (percent)	<u>More Variety Desired</u> (percent)
<u>MRE</u>			
Entree	2.6 (0.3)	25	75
Starch	2.8 (0.3)	13	87
Dessert	1.9 (0.3)	44	56
Beverages	2.6 (0.3)	19	81
Fruit	2.1 (0.3)	50	50
<u>RCW</u>			
Entree	2.1 (0.2)	28	72
Breakfast Entree	1.7 (0.3)	50	50
Dessert	1.8 (0.3)	56	44
Beverages	1.1 (0.1)	94	6
Fruit Soups	1.4 (0.2)	72	28
Chicken Soup	2.7 (0.2)	17	83
Candy	1.4 (0.1)	67	33
Trail Mix	1.4 (0.1)	71	29

Soldiers in the MRE group wanted more variety added to the current beverage products than soldiers in the RCW group. The results of the statistical analyses comparing variety ratings by ration group are shown in Table 9.

TABLE 9.

Comparison of Variety Ratings by Food Category by Ration Group
With Results of Statistical Analyses.

<u>Category</u>	<u>MRE</u> <u>Mean (+SE)</u>	<u>RCW</u> <u>Mean (+SE)</u>	<u>F</u>	<u>p</u>
Entree	2.6 (0.2)	2.1 (0.2)	1.46	ns
Desserts	1.9 (0.3)	1.8 (0.3)	0.19	ns
Beverages	2.6 (0.3)	1.1 (0.1)	29.47	<0.001

Soldiers in each group expressed their level of satisfaction with six aspects of the ration, namely: ease of preparation, taste, looks, amount of food, daily variety, and day-to-day variety. Degree of satisfaction was expressed on a 7-point bipolar scale where 1 corresponds to "very dissatisfied", 4 corresponds to "neither satisfied nor dissatisfied", and 7 corresponds to "very satisfied". Statistically significant differences were found when the RCW was compared to the MRE in four of these categories. Table 10 shows the mean ratings and the results of statistical analyses that were used to compare ratings in the ration groups.

TABLE 10.

Mean Ratings (+SE) of Satisfaction in MRE and RCW Groups and Results of Statistical Analyses Comparing the Ration Group Ratings.

<u>Ration Attribute</u>	<u>MRE Mean (+SE)</u>	<u>RCW Mean (+SE)</u>	<u>F</u>	<u>P</u>
Ease of Preparation	4.5 (0.5)	5.4 (0.3)	2.91	ns
Taste	4.3 (0.4)	6.2 (0.2)	22.22	<0.001
Looks	3.9 (0.4)	6.3 (0.2)	31.89	<0.001
Amount of Food	2.8 (0.3)	4.6 (0.5)	9.07	<0.01
Variety (one day)	4.3 (0.4)	5.3 (0.3)	4.60	<0.05
Variety (day-to-day)	4.0 (0.3)	4.6 (0.3)	1.54	ns

Soldiers in the RCW group were more satisfied with the taste, looks, amount of food, and daily variety of the ration than soldiers in the MRE group. Although soldiers in the RCW group were more satisfied with ease of preparation and day-to-day variety than soldiers in the MRE group, the difference in satisfaction was not statistically significant. Table 11 illustrates the percentage of soldiers in each ration group who were at least slightly satisfied with these six aspects of the rations. The results shown in Table 11 clearly demonstrate that more soldiers in the RCW group were satisfied with their ration than soldiers in the MRE group.

TABLE 11.

Percentage of Soldiers in Each Ration Group Satisfied with MRE or RCW.

<u>Ration Attribute</u>	<u>MRE</u>	<u>RCW</u>
Ease of Preparation	56	88
Taste	62	100
Looks	43	100
Amount of Food (one day)	12	50
Variety (one day)	50	66
Variety (day-to-day)	37	55

In addition to hedonic ratings of ration components, the consumption rate of a component is a good indicator of troop acceptance. Consumption rate can be expressed as a percentage, calculated by comparing the number of components eaten to the number of components issued. When entrees were evaluated in this way, RCW entrees were found to be more acceptable than MRE entrees; the average consumption rate for RCW entrees was 81%, while the consumption rate for the MRE entrees was only 56%. The highest consumption rates in the RCW were found for the breakfast and dinner entrees, the chicken soup, and dessert bars. The most unpopular RCW items were the fruit soups; only about 24% of the fruit soups were consumed. Consumption rates and soldiers' stated preferences and opinions indicate that substituting another entree, a traditional soup, and cider for the fruit soup, orange beverage bar, and some of the sweet items will serve the purpose of enhancing caloric and fluid intake. Tables 12 and 13 present consumption rates in the RCW and MRE groups, respectively.

TABLE 12.

Percentage of RCW Components Consumed by Troops
During the Cold Weather Exercise.

<u>Product</u>	<u>Percentage Consumed</u>
Oatmeal (Apple & Cinnamon)	75
Oatmeal (Maple & Brown Sugar)	70
Oatmeal (Strawberry)	70
Chicken Stew	93
Beef & Vegetables	80
Pork & Esc. Potato	96
Chicken a la King	70
Spaghetti & Meat Sauce	83
Chicken & Rice	93
Chicken Soup	61
Fruit Soup (Strawberry)	28
Fruit Soup (Raspberry)	20
Lemon Tea	31
Orange Beverage	24
Cocoa	40
Coffee	17
Apple Cider	44
Cookies (Chocolate Covered)	62
Cookies (Oatmeal)	69
Brownie	59
Granola Bar	69
Blueberry Bar	67
Fig Bar	70
Chocolate Bar	44
Raisin-Nut Crunch	66

TABLE 13.

Percentage of MRE Components Consumed by Troops
During the Cold Weather Exercise.

<u>Product</u>	<u>Percentage Consumed</u>
Beef with BBQ Sauce	57
Beef with Gravy	40
Beef with Spice Sauce	50
Beef Patty	55
Beef Stew	62
Chicken a la King	57
Frankfurters	61
Ham & Chicken Loaf	56
Ham Slices	59
Meatballs & BBQ Sauce	58
Pork Patty	53
Turkey with Gravy	66
Crackers	46
Jelly	31
Peanut Butter	45
Cheese	42
Potato Patty	41
Beans with Tomato Sauce	58
Brownie	54
Cookies (Chocolate Covered)	44
Cherry Nut Cake	26
Fruit Cake	49
Maple Nut Cake	66
Orange Nut Cake	60
Pineapple Nut Cake	43
Chocolate Nut Cake	69
Cocoa	59
Coffee	26
Cream Substitute	26
Catsup	17
Gravy Base	25
Candy	51
Salt	1

Additional comments on the rations were elicited from soldiers in each ration group. A number of soldiers in the MRE group expressed the need for more hot beverages including a soup mix. Another popular request was either a longer spoon or a means to open the MRE entree packet along the longer side. With the existing packaging, when the soldier has to reach into the packet with a relatively short spoon his hands and uniform get wet and soiled with food.

The most popular request from soldiers in the RCW group was to reduce the number of "sweets" in the ration and to add more entrees and soups. About 20% of the RCW group said to drop the fruit soup, and about 40% requested additional soups, for example, vegetable, chicken, and beef. A few soldiers suggested that a clear outer plastic bag be used instead of an opaque white bag to package the ration components. A clear outer package would facilitate the locating of ration components in the package.

CONCLUSIONS AND RECOMMENDATIONS

The results of this field study indicate that the RCW was more acceptable to troops than the MRE during a 10-day cold weather field exercise. The 10th Special Forces Group was more satisfied with the RCW than the MRE in terms of taste, looks, amount of food, and amount of variety. Most components of the RCW received 7's and 8's on a 9-point hedonic scale; but several items were unpopular and these items should be reformulated or substituted with more acceptable products. Moderate negative energy balance and moderate hypohydration were evidenced in soldiers in both ration groups. Substituting an entree for one of the less popular sweet items should enhance caloric intake, and substituting popular soups and beverages (chicken soup, cider) for the fruit soups may encourage fluid consumption. The composition of the RCW resulted in lower protein and sodium intake by soldiers in the RCW group when compared to intake by soldiers in the MRE group. Thus, the RCW may have some nutritional advantage over the MRE by reducing protein and sodium intake, which should minimize the demand for water in the field.

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APPENDIX A. Menus and Nutrient Information, Ration, Cold Weather

RATION, COLD WEATHER

FEBRUARY 1986

#1 MEAL PACK	PROTEIN (g)	CHO (g)	FAT (g)	WATER (g)	CALORIES	NETWT (g)
Chicken Stew Bars	52.6	43.7	17.8	2.0	545.1	120.0
Oatmeal, Strawberry	10.9	90.5	15.4	6.1	544.2	125.0
Granola Bars	7.5	59.2	14.0	2.8	392.6	86.0
Oatmeal Cookies	7.5	67.9	19.4	3.5	476.4	100.0
Cookies, Choco Covered	2.9	26.1	12.3	0.7	226.7	43.0
Raisinut Crunch	13.9	62.5	29.0	4.2	566.6	112.0
Blueberry Bars	1.6	44.4	5.0	8.5	229.0	60.0
Chocolate Bars	4.6	35.1	14.3	1.4	287.7	56.0
Cider	0.0	47.5	0.0	5.2	190.0	50.0
Orange Beverage Bars	0.5	58.5	0.0	0.4	236.0	60.0
Cocoa Beverage	6.8	58.8	14.5	2.0	392.9	86.0
Lemon Tea	0.1	27.8	0.1	0.1	112.5	28.0
Fruit Soup, Strawberry	0.1	48.6	0.1	1.2	195.7	50.0
Chicken Noodle Soup	3.6	9.8	2.6	0.7	77.0	18.0
Coffee, Cream, Sugar, Gum	0.3	12.3	1.1	0.4	60.3	23.0
	112.9	692.7	145.6	39.2	4532.7	1017.0

#2 MEAL PACK	PROTEIN (g)	CHO (g)	FAT (g)	WATER (g)	CALORIES	NETWT (g)
Beef & Vegetable Bars	41.9	40.9	26.5	2.4	569.1	120.0
Oatmeal, Apple & Cinn	10.2	93.0	12.1	7.3	521.1	125.0
Granola Bars	7.5	59.2	14.0	2.8	392.6	86.0
Oatmeal Cookies	7.5	67.9	19.4	3.5	476.4	100.0
Brownie	3.8	25.1	16.9	3.6	267.7	50.0
Raisinut Crunch	13.9	62.5	29.0	4.2	566.6	112.0
Fig Bars	2.4	41.4	3.9	9.3	210.3	58.0
Chocolate Bars	4.6	35.1	14.3	1.4	287.7	56.0
Cider	0.0	47.5	0.0	5.2	190.0	50.0
Orange Beverage Bars	0.5	58.5	0.0	0.4	236.0	60.0
Cocoa Beverage	6.8	58.8	14.5	2.0	392.9	86.0
Lemon Tea	0.1	27.8	0.1	1.2	112.5	28.0
Fruit Soup, Raspberry	0.1	48.5	0.1	1.3	195.3	50.0
Chicken Noodle Soup	3.6	9.8	2.6	0.7	77.0	18.0
Coffee, Cream, Sugar, Gum	0.3	12.3	1.1	0.4	60.3	23.0
	103.1	688.3	154.4	45.7	4555.5	1022.0

RATION, COLD WEATHER

FEBRUARY 1986

#3 MEAL PACK	PROTEIN (g)	CHO (g)	FAT (g)	WATER (g)	CALORIES	NETWT (g)
Pork & Escall Potato	38.3	47.7	22.6	2.5	547.3	120.0
Oatmeal, Apple & Cinn	10.2	93.0	12.1	7.3	521.1	125.0
Granola Bars	7.5	59.2	14.0	2.8	392.6	86.0
Oatmeal Cookies	7.5	67.9	19.4	3.5	476.4	100.0
Brownie	3.8	25.1	16.9	3.6	267.7	50.0
Raisinut Crunch	13.9	62.5	29.0	4.2	566.6	112.0
Fig Bars	2.4	41.4	3.9	9.3	210.3	58.0
Chocolate Bars	4.6	35.1	14.3	1.4	287.7	56.0
Cider	0.0	47.5	0.0	5.2	190.0	50.0
Orange Beverage Bars	0.5	58.5	0.0	0.4	236.0	60.0
Cocoa Beverage	6.8	58.8	14.5	2.0	392.9	86.0
Lemon Tea	0.1	27.8	0.1	0.1	112.5	28.0
Fruit Soup, Strawberry	0.1	48.6	0.1	1.2	195.7	50.0
Chicken Noodle Soup	3.6	9.8	2.6	0.7	77.0	18.0
Coffee, Cream, Sugar, Gum	0.3	12.3	1.1	0.4	60.3	23.0
	99.5	695.2	150.6	44.5	4534.2	1022.0

#4 MEAL PACK	PROTEIN (g)	CHO (g)	FAT (g)	WATER (g)	CALORIES	NETWT (g)
Chicken a la King	53.7	22.2	33.2	1.8	602.0	120.0
Oatmeal, Maple	10.5	91.9	12.5	7.5	522.7	125.0
Granola Bars	7.5	59.2	14.0	2.8	392.6	86.0
Oatmeal Cookies	7.5	67.9	19.4	3.5	476.4	100.0
Cookies, Choco Covered	2.9	26.1	12.3	0.7	226.7	43.0
Raisinut Crunch	13.9	62.5	29.0	4.2	566.6	112.0
Fig Bars	2.4	41.4	3.9	9.3	210.3	58.0
Chocolate Bars	4.6	35.1	14.3	1.4	287.7	56.0
Cider	0.0	47.5	0.0	5.2	190.0	50.0
Orange Beverage Bars	0.5	58.5	0.0	0.4	236.0	60.0
Cocoa Beverage	6.8	58.8	14.5	2.0	392.9	86.0
Lemon Tea	0.1	27.8	0.1	0.1	112.5	28.0
Fruit Soup, Raspberry	0.1	48.5	0.1	1.3	195.3	50.0
Chicken Noodle Soup	3.6	9.8	2.6	0.7	77.0	18.0
Coffee, Cream, Sugar, Gum	0.3	12.3	1.1	0.4	60.3	23.0
	114.5	669.5	157.0	41.3	4549.0	1015.0

RATION, COLD WEATHER

FEBRUARY 1986

#5 MEAL PACK	PROTEIN (g)	CHO (g)	FAT (g)	WATER (g)	CALORIES	NETWT (g)
Chicken & Rice	59.5	40.6	10.8	1.8	497.1	120.0
Oatmeal, Strawberry	10.9	90.5	14.9	6.2	539.3	125.0
Granola Bars	7.5	59.2	14.0	2.8	392.6	86.0
Oatmeal Cookies	7.5	67.9	19.4	3.5	476.4	100.0
Brownie	3.8	25.1	16.9	3.6	267.7	50.0
Raisinut Crunch	13.9	62.5	29.0	4.2	566.6	112.0
Blueberry Bars	1.6	44.4	5.0	8.5	229.0	60.0
Chocolate Bars	4.6	35.1	14.3	1.4	287.7	56.0
Cider	0.0	47.5	0.0	5.2	190.0	50.0
Orange Beverage Bars	0.5	58.5	0.0	0.4	236.0	60.0
Cocoa Beverage	6.8	58.8	14.5	2.0	392.9	86.0
Lemon Tea	0.1	27.8	0.1	0.1	112.5	28.0
Fruit Soup, Strawberry	0.1	48.6	0.1	1.2	195.7	50.0
Chicken Noodle Soup	3.6	9.8	2.6	0.7	77.0	18.0
Coffee, Cream, Sugar, Gum	0.3	12.3	1.1	0.4	60.3	23.0
	120.7	688.6	142.6	42.0	4520.8	1024.0

#6 MEAL PACK	PROTEIN (g)	CHO (g)	FAT (g)	WATER (g)	CALORIES	NETWT (g)
Spaghetti & Meat Bars	39.2	45.0	28.0	2.3	588.7	120.0
Oatmeal, Maple	10.5	91.9	12.5	7.5	522.7	125.0
Granola Bars	7.5	59.2	14.0	2.8	392.6	86.0
Oatmeal Cookies	7.5	67.9	19.4	3.5	476.4	100.0
Cookies, Choco Covered	2.9	26.1	12.3	0.7	226.7	43.0
Raisinut Crunch	13.9	62.5	29.0	4.2	566.6	112.0
Blueberry Bars	1.6	44.4	5.0	8.5	229.0	60.0
Chocolate Bars	4.6	35.1	14.3	1.4	287.7	56.0
Cider	0.0	47.5	0.0	5.2	190.0	50.0
Orange Beverage Bars	0.5	58.5	0.0	0.4	236.0	60.0
Cocoa Beverage	6.8	58.8	14.5	2.0	392.9	86.0
Lemon Tea	0.1	27.8	0.1	0.1	112.5	28.0
Fruit Soup, Raspberry	0.1	48.5	0.1	1.3	195.3	50.0
Chicken Noodle Soup	3.6	9.8	2.6	0.7	77.0	18.0
Coffee, Cream, Sugar, Gum	0.3	12.3	1.1	0.4	60.3	23.0
	99.2	695.3	152.9	41.0	4554.4	1017.0

RATION, COLD WEATHER

FEBRUARY 1986

SUMMARY	PROTEIN (g)	CHO (g)	FAT (g)	CALORIES
MENU #1	112.9	692.7	145.6	4532.7
MENU #2	103.1	688.3	154.4	4555.5
MENU #3	99.5	695.2	150.6	4534.2
MENU #4	114.5	669.5	157.0	4549.0
MENU #5	120.7	688.6	142.6	4520.8
MENU #6	99.2	695.3	152.9	4554.4
Average	108.3	688.3	150.5	4541.1

APPENDIX B. Menus and Nutrient Information, Meal, Ready-To-Eat

TOTALS	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NAACL (G)
MENU NR.											
1	126.44	34.84	57.60	9.25	421	761	5.73	2062	1188	96	4.31
2	116.78	51.63	53.75	7.60	241	631	6.55	1754	1009	149	3.74
3	119.94	43.99	64.72	12.76	473	792	9.91	3446	1190	133	6.96
4	99.71	45.00	58.22	7.31	276	524	7.82	1454	1245	161	3.41
5	120.13	45.43	59.06	8.64	300	674	7.77	1783	1348	165	3.93
6	172.22	35.76	49.39	10.96	332	573	8.08	2546	1493	124	5.93
7	129.86	43.76	50.83	9.22	268	701	6.30	2036	1407	116	4.49
8	218.19	51.53	49.31	9.70	439	790	9.75	2330	1163	126	4.16
9	141.47	40.12	50.29	9.72	447	882	6.07	2223	1165	100	4.16
10	117.35	36.64	58.55	10.34	290	659	8.09	2184	1644	133	5.00
11	114.89	46.02	55.00	12.02	442	1018	6.68	3021	1225	102	6.06
12	100.49	44.73	61.07	8.10	288	515	7.72	1732	1312	165	4.05
MEAN	131.46	43.29	55.65	9.63	351	710	7.54	2214	1282	131	4.73

Meal Requirements
1/3 AR 40-25
15 May 1985

33.33 53.3 267 267 6.0 1667-2334 625-1825 133

MENU NR.	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHD (G)	CALORIES	WEIGHT (G)
1	5460	.009	5470	95	3.53	1.00	7.7	3.17	124.0	1154	352
2	1440	.007	1450	60	2.07	1.02	15.0	.70	115.3	1151	345
3	2770	.126	2980	45	2.04	.88	8.6	2.01	133.6	1293	375
4	1810	.425	2520	47	2.21	.96	13.4	.82	131.3	1229	342
5	4260	.577	5230	137	3.24	.99	12.4	1.87	154.3	1330	388
6	3050	.139	3280	93	2.59	.92	7.9	1.84	157.1	1216	424
7	2890	.004	2900	72	2.51	1.02	14.1	2.03	158.7	1267	392
8	2580	.126	2790	42	1.92	.92	9.5	2.12	101.3	1055	430
9	5280	.116	5480	89	2.87	1.07	12.0	2.97	133.0	1145	375
10	2890	.326	3440	75	2.49	1.06	9.6	1.90	169.5	1352	392
11	5270	.061	5370	93	3.14	1.13	10.3	3.06	138.6	1234	367
12	1810	.007	1820	63	2.21	.91	13.2	.83	129.2	1245	344
MEAN	3293	.160	3561	76	2.57	.99	11.1	1.94	137.2	1223	377

Meal Requirements
1/3 AR 40-25
15 May 1985

Percent of calories from: protein - 14 percent
Fat - 41 percent
CHO - 45 percent

8.0(N.E.) 0.73 146.7 1200

Fat when option non-dairy coffee whitener is omitted = 40 percent

RECORD OF NUTRITIVE VALUES PORTION

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MENU 1	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NACL (G)
PORK SSG PAT	.31	15.84	14.21	1.78	6	138	.99	401	232	16	1.07
APPLESAUCE	104.33	1.15	.13	.13	5	8	.63	15	93	4	.03
CHEESE SPR	17.36	6.08	16.28	2.02	172	290	.24	592	28	6	.73
CRACKERS	1.69	4.66	6.03	1.89	139	48	2.02	600	70	10	1.37
COOKIES CHCV	.74	2.93	12.30	.48	28	70	.84	77	93	22	.14
COCOA BEV PD	.99	3.42	7.26	1.49	53	159	.64	138	386	24	.25
CATSUP	.65	.48	.30	.98	6	10	.12	221	134	4	.69
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03
SUM	126.44	34.84	57.60	9.25	421	761	5.73	2062	1188	96	4.31

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	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHD (G)	CALORIES	WEIGHT (G)
PORK SSG PAT					.48	.14	3.2	.15	1.9	199	34
APPLESAUCE				1	.01	.04	.1	.04	20.3	87	126
CHEESE SPR	2380		2380	25	.51	.08	.0	1.20	.8	174	43
CRACKERS	0	.000	0	0	.98	.53	2.8	.38	30.7	196	45
COOKIES CHCV	220		220	1	.25	.06	.3	.17	26.1	227	43
COCOA BEV PD	2860		2860	49	1.29	.11	.1	1.21	29.4	197	43
CATSUP		.009	10	3	.01	.01	.3	.02	4.6	23	7
COFFEE INSTA				15	.00	.01	.8	.00	2.2	9	3
SUGAR	0	.000	0	0	.00	.00	.0	.00	6.0	24	6
CREAM SUB ND					.00	.03		.00	2.1	19	4
SUM	5460	.009	5470	95	3.53	1.00	7.7	3.17	124.0	1154	352

RECORD OF NUTRITIVE VALUES PORTION

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MENU 2	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NAACL (G)
STRAWBER SW	.16	.72	.04	.39	17	23	.73	5	151	12	.01
HAMCHC LOAF	98.56	29.12	6.16	2.52	15	230	1.54	633	290	28	1.30
CRACKERS	1.69	4.66	6.03	1.89	139	48	2.02	600	70	10	1.37
PEANUT BUT	.26	12.49	22.23	1.26	28	159	.67	205	258	70	.50
PINEA NUT CK	15.73	4.36	18.19	1.06	31	133	1.34	293	88	19	.52
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00
SUM	116.78	51.63	53.75	7.60	241	631	6.55	1754	1009	149	3.74

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	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHO (G)	CALORIES	WEIGHT (G)
STRAWBER SW		.007	10	22	.01	.01	.3	.02	13.7	58	15
HAMCHC LOAF					.14	.27	5.0	.18	3.6	186	140
CRACKERS	0	.000	0	0	.98	.53	2.8	.38	30.7	196	45
PEANUT BUT	1400		1400	23	.84	.06	5.2	.10	6.3	275	43
PINEA NUT CK	40		40		.11	.11	.9	.02	50.7	384	90
COFFEE INSTA				15		.01	.8	.00	2.2	9	3
CREAM SUB ND	0	.000	0	0	.00	.03	.0	.00	2.1	19	4
SUGAR						.00		.00	6.0	24	6
SUM	1440	.007	1450	60	2.07	1.02	15.0	.70	115.3	1151	345

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RECORD OF NUTRITIVE VALUES PORTION

MENU 3	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NACL (G)
BEAN TOMSCE	93.66	9.66	3.08	2.66	71	147	2.66	549	452	49	1.33
BEEF PAT	.37	16.42	14.48	1.46	8	130	2.04	336	218	16	.78
CRACKERS	1.69	4.66	6.03	1.89	139	48	2.02	600	70	10	1.37
CHEESE SPR	17.36	6.08	16.28	2.02	172	290	.24	592	28	6	.73
BROWN CHCV	3.60	3.83	15.95	.54	31	69	1.50	69	110	25	1.43
SP/GRAY BASE	.19	1.27	.21	3.22	5	28	.40	1203	78	6	.16
AVG CANDY	2.69	1.79	6.59	.47	35	42	.80	79	82	11	.00
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00
SUM	119.94	43.99	64.72	12.76	473	792	9.91	3446	1190	133	6.96

	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHO (G)	CALORIES	WEIGHT (G)
BEAN TOMSCE		.126	210	1	.13	.03	.7	.10	30.9	190	140
BEEF PAT			0	0	.03	.10	2.9	.14	1.3	201	34
CRACKERS		.000	0	0	.98	.53	2.8	.38	30.7	196	45
CHEESE SPR	2380		2380	25	.51	.08	.0	1.20	.8	174	43
BROWN CHCV	200		200	1	.27	.01	.3	.18	25.1	268	50
SP/GRAY BASE			190	3	.01	.04	1.0	.01	2.1	15	7
AVG CANDY	190		190	15	.11	.05	.1	.00	32.5	196	44
COFFEE INSTA			0	0	.01	.01	.8	.00	2.2	9	3
CREAM SUB ND	0	.000	0	0	.03	.03	.0	.00	2.1	19	4
SUGAR	0	.000	0	0	.00	.00	.0	.00	6.0	24	6
SUM	2770	.126	2980	45	2.04	.88	8.6	2.01	133.6	1293	375

RECORD OF NUTRITIVE VALUES PORTION

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MENU 4	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NACL (G)
PEACHES FRDH	.15	.73	.03	.34	4	15	.30	6	125	6	1.20
BEEF W/BOSC	93.80	22.12	9.94	2.38	31	151	2.94	468	465	32	1.37
CRACKERS	1.69	4.66	6.03	1.89	139	48	2.02	600	70	10	.50
PEANUT BUT	.26	12.49	22.23	1.26	28	159	.67	205	258	70	.14
COOKIES CHCV	.74	2.93	12.30	.48	28	70	.84	77	93	22	.16
AVG CANDY	2.69	1.79	6.59	.47	35	42	.80	79	82	11	.00
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.03
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.00
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00
SUM	99.71	45.00	58.22	7.31	276	524	7.82	1454	1245	161	3.41

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	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHO (G)	CALORIES	WEIGHT (G)
PEACHES FRDH		.061	100	3	.01	.02	.6	.01	13.7	58	15
BEEF W/BOSC		.364	610	1	.03	.20	3.6	.15	11.8	225	140
CRACKERS	0	.000	0	0	.98	.53	2.8	.38	30.7	196	45
PEANUT BUT	1400		1400	23	.84	.06	5.2	.10	6.3	275	43
COOKIES CHCV	220		220	1	.25	.06	.3	.17	26.1	227	43
AVG CANDY	190		190	3	.11	.05	.1	.01	32.5	196	44
COFFEE INSTA				15	.00	.01	.8	.00	2.2	9	3
CREAM SUB ND	0	.000	0	0	.00	.03	.0	.00	2.1	19	4
SUGAR					.00	.00	.0	.00	6.0	24	6
SUM	1810	.425	2520	47	2.21	.96	13.4	.82	131.3	1229	342

RECORD OF NUTRITIVE VALUES PORTION

01/27/85

MENU S	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NACL (G)
FRUIT MX DEH	.15	.43	.04	.18	6	8	.27	8	81	5	.00
BEEF STEW	99.82	19.88	5.60	2.24	18	130	2.66	540	321	27	1.27
CRACKERS	1.69	4.66	6.03	1.89	139	48	2.02	600	70	10	1.37
PEANUT BUT	.26	12.49	22.23	1.26	28	159	.67	205	258	70	.50
CHERRY NTCK	16.86	4.27	16.81	1.10	44	131	1.26	273	81	20	.50
COCOA BEV PD	.99	3.42	7.26	1.49	53	159	.64	138	386	24	.25
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00
SUM	120.13	45.43	59.06	8.64	300	674	7.77	1783	1348	165	3.93

	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHO (G)	CALORIES	WEIGHT (G)
FRUIT MX DEH		.003	10	47	.01	.01	.3	.01	14.2	59	15
BEEF STEW		.574	960	1	.03	.13	2.4	.15	12.5	180	140
CRACKERS	0	.000	0	0	.98	.53	2.8	.38	30.7	196	45
PEANUT BUT	1400		1400	23	.84	.06	5.2	.10	6.3	275	43
CHERRY NTCK					.09	.11	.8	.02	51.0	372	90
COCOA BEV PD	2860		2860	49	1.29	.11	.1	1.21	29.4	197	43
COFFEE INSTA				15	.00	.01	.8	.00	2.2	9	3
CREAM SUB ND	0	.000	0	0	.00	.03	.0	.00	2.1	19	4
SUGAR					.00	.00	.0	.00	6.0	24	6
SUM	4260	.577	5230	137	3.24	.99	12.4	1.87	154.3	1330	388

RECORD OF NUTRITIVE VALUES PORTION

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MENU 6	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NACL (G)
FRANKFURT	62.47	15.64	24.99	2.94	15	126	1.47	928	206	15	2.08
BEAN TOMSCE	93.66	9.66	3.08	2.66	71	147	2.66	549	452	49	1.33
CRACKERS	1.69	4.66	6.03	1.89	139	48	2.02	600	70	10	1.37
JELLY	9.70	.26	.05	.05	2	3	.11	13	11	2	.01
CATSUP	.65	.06	.30	.98	6	10	.12	221	134	4	.69
COCOA BEV PD	.99	3.42	7.26	1.49	53	159	.64	138	386	24	.25
AVG CANDY	2.69	1.79	6.59	.47	35	42	.80	79	82	11	.16
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00
SUM	172.22	35.76	49.39	10.96	332	573	8.08	2546	1493	124	5.93

	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHO (G)	CALORIES	WEIGHT (G)
FRANKFURT		.126	210	20	.07	.15	3.0	.12	.0	287	105
BEAN TOMSCE	0	.000	0	1	.13	.03	.7	.10	30.9	190	140
CRACKERS		.004	10	0	.98	.53	2.8	.38	30.7	196	45
JELLY		.009	10	1	.00	.00	.0	.00	18.3	75	28
CATSUP			3	3	.01	.01	.3	.02	5.0	23	7
COCOA BEV PD	2860		2860	49	1.29	.11	.1	1.21	29.4	197	43
AVG CANDY	190		190	3	.11	.05	.1	.01	32.5	196	44
COFFEE INSTA				15	.00	.01	.8	.00	2.2	9	3
CREAM SUB ND	0	.000	0	0	.00	.03	.0	.00	2.1	19	4
SUGAR				0	.00	.00	.0	.00	6.0	24	6
SUM	3050	.139	3280	93	2.59	.92	7.9	1.84	157.1	1216	424

RECORD OF NUTRITIVE VALUES PORTION

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MENU 7	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NACL (G)
TURK/GRAVY	103.04	27.30	6.16	1.96	11	204	1.32	466	286	25	1.02
POTATO PATT	.48	2.58	7.41	1.97	.14	73	.71	437	395	20	1.12
CRACKERS	1.69	4.66	6.03	1.89	139	48	2.02	600	70	10	1.37
JELLY	9.70	.26	.05	.05	2	3	.11	13	11	2	.01
MAPLE NUT CK	13.60	5.26	22.82	1.37	37	176	1.24	364	108	26	.67
COCOA BEV PD	.99	3.42	7.26	1.49	53	159	.64	138	386	24	.25
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00
SUM	129.86	43.76	50.83	9.22	268	701	6.30	2036	1407	116	4.49

	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHO (G)	CALORIES	WEIGHT (G)
TURK/GRAVY	0	.000	0	7	.03	.20	7.9	.25	1.5	171	140
POTATO PATT	0	.000	0	0	.09	.02	1.4	.16	21.6	163	34
CRACKERS	0	.004	10	1	.98	.53	2.8	.38	30.7	196	45
JELLY	30	.004	30	1	.00	.00	.0	.00	18.3	75	28
MAPLE NUT CK	2860	.004	2860	49	.12	.13	1.1	.03	46.9	414	90
GOGGA BEV PD	0	.000	0	15	1.29	.11	.1	1.21	29.4	197	43
COFFEE INSTA	0	.000	0	0	.00	.01	.8	.00	2.2	9	3
CREAM SUB ND	0	.000	0	0	.00	.03	.0	.00	2.1	19	4
SUGAR	0	.000	0	0	.00	.00	.0	.00	6.0	24	6
SUM	2890	.004	2900	72	2.51	1.02	14.1	2.03	158.7	1267	392

RECORD OF NUTRITIVE VALUES PORTION

01/27/86

MENU 8	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NACL (G)
BEAN TOMSCE	93.66	9.66	3.08	2.66	71	147	2.66	549	452	49	1.33
BEEF/GRAVY	101.50	27.02	5.88	2.10	14	197	3.08	503	351	27	1.18
CRACKERS	1.69	4.66	6.03	1.89	139	48	2.02	600	70	10	1.37
CHEESE SPR	17.36	6.08	16.28	2.02	172	290	.24	592	28	6	.73
BROWN CHCV	3.60	3.83	16.95	.54	31	69	1.50	69	110	25	.13
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	6	.00
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00
SUM	218.19	51.53	49.31	9.70	439	790	9.75	2330	1163	126	4.76

	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHO (G)	CALORIES	WEIGHT (G)
BEAN TOMSCE		.126	210	1	.13	.03	.7	.10	30.9	190	140
BEEF/GRAVY			0	0	.03	.24	4.9	.25	3.5	175	140
CRACKERS	0	.000	2380	25	.98	.53	2.8	.38	30.7	196	45
CHEESE SPR	2380		200	1	.51	.08	.0	1.20	.8	174	43
BROWN CHCV	200		200	15	.27	.01	.3	.18	25.1	268	50
COFFEE INSTA			0	0		.01	.8	.00	2.2	9	3
CREAM SUB ND			0	0	.00	.03	.0	.00	2.1	19	4
SUGAR			0	0	.00	.00	.0	.00	6.0	24	6
SUM	2580	.126	2790	42	1.92	.92	9.5	2.12	101.3	1055	430

RECORD OF NUTRITIVE VALUES PORTION

MENU 9	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NACL (G)
CHIC ALAKING	104.51	21.58	5.40	2.70	33	224	1.56	646	364	27	1.38
CRACKERS	1.69	4.66	6.03	1.89	139	48	2.02	600	70	10	1.37
CHEESE SPR	17.36	6.08	16.28	2.02	172	290	.24	592	28	6	.73
FRUITCAKE	16.54	4.10	14.24	1.13	38	122	1.36	229	167	23	.40
COCOA BEV PD	.99	3.42	7.26	1.49	53	159	.64	138	386	24	.25
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00
CREAM SUB ND	.30	.28	1.09	.11	7	28	.11	16	71	1	.03
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00
SUM	141.47	40.12	50.29	9.72	447	882	6.07	2223	1165	100	4.16

	A (IU)	CARDTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHO (G)	CALORIES	WEIGHT (G)
CHIC ALAKING	0	.071	120	0	.03	.21	7.4	.17	7.8	166	142
CRACKERS	2380	.000	0	25	.98	.53	2.8	.38	30.7	196	45
CHEESE SPR	40	.045	2380	49	.51	.08	.0	1.20	.8	174	43
FRUITCAKE	2860	.000	120	15	.06	.11	.8	.01	54.0	360	90
COCOA BEV PD	0	.000	2860	0	1.29	.11	.1	1.21	29.4	197	43
COFFEE INSTA	0	.000	0	0	.00	.01	.8	.00	2.2	9	3
CREAM SUB ND	5280	.116	0	89	.00	.03	.0	.00	2.1	19	4
SUGAR	0	.000	0	0	.00	.00	.0	.00	6.0	24	6
SUM	5280	.116	5480	89	2.87	1.07	12.0	2.97	133.0	1145	375

RECORD OF NUTRITIVE VALUES PORTION

01/27/86

MENU 10	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOSPHORUS (MG)	IRON (MG)	SODIUM (MG)	POTASSIUM (MG)	MAGNESIUM (MG)	NACL (G)
MTBAL W/BBQ	91.56	20.30	14.14	3.08	36	164	2.94	662	491	32	1.64
POTATO PATT	.48	2.58	7.41	1.97	14	73	.71	437	395	20	1.12
CRACKERS	1.69	4.66	6.03	1.89	139	48	2.02	600	70	10	1.37
JELLY	9.70	.26	.05	.05	2	3	.11	13	11	2	.01
CH NUT CAKE	12.57	5.14	22.57	1.37	33	176	1.41	316	139	36	.58
COCOA BEV PD	.99	3.42	7.26	1.49	53	159	.64	138	386	24	.25
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00
SUM	117.35	36.64	58.55	10.34	290	659	8.09	2184	1644	133	5.00

50

	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C. (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	CHO (G)	CALORIES	WEIGHT (G)
MTBAL W/BBQ		.322	540	3	.03	.22	3.5	.13	10.9	252	140
POTATO PATT		.000	0	7	.09	.02	1.4	.16	21.6	163	34
CRACKERS	0	.000	0	0	.98	.53	2.8	.38	30.7	196	45
JELLY		.004	10	1	.00	.00	.0	.00	18.3	75	28
CH NUT CAKE	30		30		.10	.13	1.0	.02	48.3	417	90
COCOA BEV PD	2860		2860	49	1.29	.11	.1	1.21	29.4	197	43
COFFEE INSTA				15		.01	.8	.00	2.2	9	3
CREAM SUB ND	0	.000	0	0	.00	.03	.0	.00	2.1	19	4
SUGAR						.00			6.0	24	6
SUM	2890	.326	3440	75	2.49	1.06	9.6	1.90	169.5	1352	392

APPENDIX C. Volunteer Agreement Form

HUMAN TEST VOLUNTEER AGREEMENT - DA PERSONNEL
(NRDC-M 70-4)

NOTICE REQUIRED BY THE PRIVACY ACT OF 1974 (5 U.S.C. 552a)

1. Authority: Section 301 of Title 5, U.S. Code; Sections 1071-1087 and 3012 of Title 44, U.S. Code; and Executive Order 9397.
2. Principal Purposes: To satisfy the scientific objectives of the study, to provide minimum information necessary to contact you later should it be in your best interests to do so, or should you require medical treatment for a condition resulting from your participation in this study.
3. Routine Uses: This information will be used as a record of your participation in this study, in analyzing the results of the study, and in reporting or publishing results of the study without identifying the individual participants. The information also may be used to implement health and communicable disease control programs including reporting of medical conditions as required by law to other federal, state, and local agencies, and to adjudicate claims and determine benefits.
4. Mandatory or Voluntary Disclosure and Effect on Individual Not Providing Information: Disclosure of requested information is voluntary. If requested information is not furnished, your participation in this study may be prevented or terminated.

A. VOLUNTEER AGREEMENT
(Please Print)

I, _____, having full capacity to consent, do hereby volunteer to participate in a research study entitled: A study of hypohydration in cold adapted troops during training in an extreme environment under the direction of Dr. Donald E. Roberts, Dr. Diane Engell, LTC Wayne Askew. The implications of my voluntary participation; the nature, duration, and purpose; the methods and means by which it is to be conducted; and the inconveniences and hazards which may reasonably be expected have been explained to me by: Dr. D. Engell, Dr. D. Roberts, LTC Askew and are set forth on the reverse and any additional pages of this Agreement, which I have initialed. I have been given an opportunity to read and to keep a copy of this Agreement and to ask questions concerning this study. Any such questions have been answered to my full and complete satisfaction. Should any further questions arise, I will be able to contact: Dr. Diane Engell at AV 256-5518.

I understand that I may revoke my consent and withdraw from the study at any time without prejudice. I may be required to undergo certain further examinations if, in the opinion of the attending physician, such examinations are necessary for my health or well-being.

I understand that medical treatment is available for any injury or illness which results from my participation in this study and that there are no provisions for payment or compensation specifically for such illness or injury. Further information on the rights of human subjects may be obtained from the Office of Chief Counsel, US Army Natick Research and Development Center (Natick R&D Center), ext. 4322.

Signature, Test Subject

Permanent Address

I was present during the explanation and question period referred to and have witnessed the signature above.

Witness' Signature

Date

(Continued, over)

B. DESCRIPTION OF STUDY
(by Responsible Investigator)

The purpose of this study is to evaluate the Arctic and MRE rations for use in a cold environment. This evaluation will require your use of one of these rations for 10 days during your winter warfare training in New Hampshire. Subject briefing and pretesting will occur at Ft. Devens just prior to field training. The post testing will occur at Ft. Devens following airlift or at Plymouth, NH in case of nonflying weather.

The pre and post measurements will include drawing a blood sample (1 ounce), a urine sample, body weight, skinfold- measurement, blood pressure measurement, and two muscle strength tests. During the post test, you will be required to fill out a questionnaire concerning ration and water acceptability and intake.

While you are in the field, the medic will collect a sample from your first urine of each day and measure specific gravity and ketone levels as indicators of fluid and nutritional status. You will be assigned to one of two groups. Group one will eat the Arctic Ration (4500 calories) and group two will eat the MRE ration (4800) calories. You will be issued these rations before deployment. You will be issued a daily log booklet to record ration acceptability and ration and water intake, and ziplock bags to retain your food wrappers and leftover food. You will be required to return the completed log booklets, ziplock bags, and any unopened rations to the investigators.

Muscle strength will be measured in two tests. The first is a lift strength test, and the second is a leg extension strength and endurance test. The lift test will require you to stand on a platform, grasp a lifting bar and lift it above your head. The rate of lifting is controlled and after 3 practice lifts, you will perform 3 lifts at 3 different speeds. The leg extension test involves sitting in a padded chair with restraining straps over thigh and waist. The right leg will be connected to a Cybex lever arm allowing the leg complete extension through 90 degrees. On command, you will forcefully extend your leg through a full range of motion. The mean of three trials will be the maximum strength, and the endurance portion will consist of 50 maximum strength contraction over 60 sec.

Blood samples will be drawn by trained technicians using aseptic techniques. There is a minimal chance of hematoma ("black and blue" bruise), phlebitis (inflammation of vein) or infection resulting from blood sampling. In the lift strength test, there is the possibility of pulling a muscle or possible injury to spinal discs. This test should not be performed if you have a history of back pain, back abnormality, hernia or circulatory disorder. Strength and fatigue testing with the Cybex has been widely used in testing both normal and rehabilitation groups, and no injuries have been reported.

This study is voluntary, and you may withdraw at any time. You will receive a copy of this consent form, and you may ask as many questions as you would like. You may request to see your own results or the final technical report of the field study.

(cont'd on attached sheet)

Signature of Responsible Investigator Organization

Initialed by test subject: _____

Natick Form 391-2

B. DESCRIPTION OF STUDY (cont'd)

All information about you that is collected during this study will be held in confidence. Your identity will not be presented in any of the test results. However, complete confidentiality cannot be promised because information bearing on your health may be reported to the appropriate medical staff. It is also possible that the Food and Drug Administration and the U.S. Army Medical Research and Development Command officials may inspect the records.

Signature of Responsible Investigator Organization

Initialed by test subject: _____

APPENDIX D. Consumption and Acceptability Forms

DAY 2

MRE RATION CONSUMPTION

Please circle the number that indicates how much of each item you ate today. If you ate more than the amounts listed, please write in the total amount consumed.

Please list the amount of water you added to each food or beverage item. Write in "0" if the item is not rehydrated.

ENTREES	CODE	AMOUNT CONSUMED (by package)					WATER (in canteen cups)	
Beef w/barbeque sauce	35	1/4	1/2	3/4	1	_____	_____	
Beef w/gravy	39	1/4	1/2	3/4	1	_____	_____	
Beef w/spiced sauce	43	1/4	1/2	3/4	1	_____	_____	
Beef patties	34	1/4	1/2	3/4	1	_____	_____	
Beef stew	36	1/4	1/2	3/4	1	_____	_____	
Chicken ala king	40	1/4	1/2	3/4	1	_____	_____	
Frankfurters	37	1/4	1/2	3/4	1	_____	_____	
Ham/chicken loaf	33	1/4	1/2	3/4	1	_____	_____	
Ham slices	42	1/4	1/2	3/4	1	_____	_____	
Meatballs w/barbeque sauce	41	1/4	1/2	3/4	1	_____	_____	
Pork sausage patties	32	1/4	1/2	3/4	1	_____	_____	
Turkey w/gravy	38	1/4	1/2	3/4	1	_____	_____	
STARCH								
Crackers	48	1/4	1/2	3/4	1	_____	_____	
Beans w/tomato sauce	46	1/4	1/2	3/4	1	_____	_____	
Potato patty	61	1/4	1/2	3/4	1	_____	_____	
SPREAD								
Cheese	31	1/4	1/2	3/4	1	_____	_____	
Jelly	73	1/4	1/2	3/4	1	_____	_____	
Peanut butter	47	1/4	1/2	3/4	1	_____	_____	
FRUIT								
Applesauce	57	1/4	1/2	3/4	1	_____	_____	
Mixed fruits	60	1/4	1/2	3/4	1	_____	_____	
Peaches	59	1/4	1/2	3/4	1	_____	_____	
Strawberries	58	1/4	1/2	3/4	1	_____	_____	
DESSERT								
Brownie	51	1/4	1/2	3/4	1	_____	_____	
Cherry nut cake	52	1/4	1/2	3/4	1	_____	_____	
Chocolate covered cookie	49	1/4	1/2	3/4	1	_____	_____	
Fruitcake	54	1/4	1/2	3/4	1	_____	_____	
Maple nut cake	53	1/4	1/2	3/4	1	_____	_____	
Orange nut cake	56	1/4	1/2	3/4	1	_____	_____	
Pineapple nut cake	50	1/4	1/2	3/4	1	_____	_____	
Chocolate nut cake	55	1/4	1/2	3/4	1	_____	_____	
BEVERAGE								
Cocoa Powder	63	1/4	1/2	3/4	1	_____	_____	
Coffee	64	1/4	1/2	3/4	1	_____	_____	
Cream substitute	30	1/4	1/2	3/4	1	_____	_____	
Sugar	74	1/4	1/2	3/4	1	_____	_____	
OTHER								
Catsup	62	1/4	1/2	3/4	1	_____	_____	
Gravy base (soup mix)	29	1/4	1/2	3/4	1	_____	_____	
Candy (all types)	76	1/4	1/2	3/4	1	_____	_____	
Gum	78	1/4	1/2	3/4	1	_____	_____	
Salt	77	1/4	1/2	3/4	1	_____	_____	

DAY 2

RATING OF FOOD

REASON FOR NOT EATING/FINISHING

Please circle the numbers that indicate how much you liked or disliked the ration item that you ate today.

Please write in the number of the primary reason that you didn't finish an item or did not eat the item at all. If your primary reason is not listed, Write it in.

FOOD CATEGORY	CODE	Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like/Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely	REASON FOR NOT EATING/FINISHING	
											DID NOT EAT	DID NOT FINISH
MEAT/POULTRY											1. Spilled	9. Unable to heat
beef w/barbeque sauce	35	1	2	3	4	5	6	7	8	9	2. Left behind	10. Not enough water
beef w/gravy	39	1	2	3	4	5	6	7	8	9	3. Feel full	11. Unfamiliar/strange food
beef w/spiced sauce	43	1	2	3	4	5	6	7	8	9	4. Tasted bad	12. Smelled bad
beef patties	34	1	2	3	4	5	6	7	8	9	5. Dieting	13. Too salty
beef stew	36	1	2	3	4	5	6	7	8	9	6. Looked bad	14. Saved for later meal
Chicken ala king	40	1	2	3	4	5	6	7	8	9	7. Too bland	15. Not enough time
Frankfurters	37	1	2	3	4	5	6	7	8	9	8. Traded	16. Too much trouble
Ham/chicken loaf	33	1	2	3	4	5	6	7	8	9		
Ham slices	42	1	2	3	4	5	6	7	8	9		
Meatballs w/barbeque sauce	41	1	2	3	4	5	6	7	8	9		
Pork sausage patties	32	1	2	3	4	5	6	7	8	9		
Turkey w/gravy	38	1	2	3	4	5	6	7	8	9		
BREAD												
Crackers	48	1	2	3	4	5	6	7	8	9		
Beans w/tomato sauce	46	1	2	3	4	5	6	7	8	9		
Potato patty	61	1	2	3	4	5	6	7	8	9		
BUTTER												
Cheese	31	1	2	3	4	5	6	7	8	9		
Jelly	73	1	2	3	4	5	6	7	8	9		
Peanut butter	47	1	2	3	4	5	6	7	8	9		
FRUIT												
Applesauce	57	1	2	3	4	5	6	7	8	9		
Mixed fruits	60	1	2	3	4	5	6	7	8	9		
Peaches	59	1	2	3	4	5	6	7	8	9		
Strawberries	58	1	2	3	4	5	6	7	8	9		
DESSERT												
Brownie	51	1	2	3	4	5	6	7	8	9		
Cherry nut cake	52	1	2	3	4	5	6	7	8	9		
Chocolate covered cookie	49	1	2	3	4	5	6	7	8	9		
Fruitcake	54	1	2	3	4	5	6	7	8	9		
Maple nut cake	53	1	2	3	4	5	6	7	8	9		
Orange nut cake	56	1	2	3	4	5	6	7	8	9		
Pineapple nut cake	50	1	2	3	4	5	6	7	8	9		
Chocolate nut cake	55	1	2	3	4	5	6	7	8	9		
BEVERAGE												
Cocoa Powder	63	1	2	3	4	5	6	7	8	9		
Coffee	64	1	2	3	4	5	6	7	8	9		
Cream substitute	30	1	2	3	4	5	6	7	8	9		
Sugar	74	1	2	3	4	5	6	7	8	9		
OTHER												
Catsup	62	1	2	3	4	5	6	7	8	9		
Gravy base (soup mix)	29	1	2	3	4	5	6	7	8	9		
Candy (all types)	76	1	2	3	4	5	6	7	8	9		
Gum	78	1	2	3	4	5	6	7	8	9		
Salt	77	1	2	3	4	5	6	7	8	9		

DAY 2

WATER CONSUMPTION

Circle the total amount of unflavored water that you drink or use during each period. Do not record flavored water such as tea, orange beverage, etc. here. If you drink or use more than two canteens during one period, write the total amount on the line provided.

DRINKING

During Breakfast (10) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

OTHER (washing, etc.)

(11) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

Between Breakfast and Lunch (20) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

(21) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

During Lunch (30) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

(31) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

Between Lunch and Dinner (40) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

(41) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

During Dinner (50) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

(51) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

Between Dinner and Breakfast (60) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

(61) $\frac{1}{2}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or _____
canteens

DRINKING

Daily Total (70) _____
canteens

OTHER

(71) _____
canteens

DAY 2

ARCTIC RATION CONSUMPTION

Circle the number that indicates how much of each item you ate today. The total amount of each item is shown in parentheses in bar or package (pkt) units. If you eat an amount that is not listed, write it on the line to the right. For example: If you eat 2 chicken stew bars, circle 2. If you eat 2 1/2 bars, write in 2 1/2. If you eat 5 bars, write in 5.

Please list the amount of water you added to each food or beverage item. Write in "0" if you did not add water to a food you ate.

FOOD ITEM	UNIT	CODE	AMOUNT CONSUMED				WATER (in canteen cups)	
ENTREES								
Oatmeal (Apple & Cinn.)	pkt (1)	12	1/4	1/2	3/4	1	_____	_____
Oatmeal (Maple & Brn Sugar)	pkt (1)	13	1/4	1/2	3/4	1	_____	_____
Oatmeal (Strawberry)	pkt (1)	14	1/4	1/2	3/4	1	_____	_____
Chicken Stew	bar (4)	03	1	2	3	4	_____	_____
Beef & Vegetable	bar (4)	04	1	2	3	4	_____	_____
Pork & Esc. Potato	bar (4)	05	1	2	3	4	_____	_____
Chicken Ala King	bar (4)	06	1	2	3	4	_____	_____
Spaghetti w/Meat Sauce	bar (4)	08	1	2	3	4	_____	_____
Chicken & Rice	bar (4)	07	1	2	3	4	_____	_____
DRINKS/SOUPS								
Lemon Tea	pkt (2)	23	1	2			_____	_____
Orange Beverage	bar (1)	22	1/4	1/2	3/4	1	_____	_____
Chicken Soup	pkt (1)	10	1/4	1/2	3/4	1	_____	_____
Fruit Soup Strawberry	pkt (1)	27	1/4	1/2	3/4	1	_____	_____
Fruit Soup Raspberry	pkt (1)	28	1/4	1/2	3/4	1	_____	_____
Cocoa	pkt (2)	01	1	2			_____	_____
Coffee	pkt (1)	24	1	2			_____	_____
Cream	pkt (1)	02	1				_____	_____
Sugar	pkt (1)	25	1				_____	_____
SNACKS								
Cookies, Choc. Cov.	pkt (1)	17	1/2	1			_____	_____
Brownie	bar (1)	19	1/4	1/2	3/4	1	_____	_____
Raisinut Crunch	pkt (2)	11	1/2	1	1 1/2	2	_____	_____
Granola	bar (2)	15	1/2	1	1 1/2	2	_____	_____
Oatmeal Cookie	bar (2)	16	1	2			_____	_____
Chocolate	bar (2)	26	1	2			_____	_____
Blueberry	bar (3)	18	1	2	3		_____	_____
Fig	bar (2)	20	1	2			_____	_____
Chewing gum	pkt (1)	75	1				_____	_____

RATING OF FOOD

Please circle the numbers that indicate how much you liked or disliked the ration item that you ate today.

DAY 2

REASONS FOR NOT EATING/FINISHING

Please write in the number of the primary reason that you didn't finish an item or did not eat the item at all. If your primary reason is not listed, write it in.

FOOD ITEM	CODE	Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like/Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely	REASONS FOR NOT EATING/FINISHING									
											1. Spilled	2. Left behind	3. Feel full	4. Tasted bad	5. Dieting	6. Looked bad	7. Too bland	8. Traded	9. Unable to heat	10. Not enough water
											DID NOT EAT				DID NOT FINISH					
FRUIT TREES																				
Oatmeal (Apple & Cinn.) (pkt)	12	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Oatmeal (Mpl & Brn Sgr) (pkt)	13	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Oatmeal (Strawberry) (pkt)	14	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Chicken Stew (bars)	03	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Beef & Vegetable (bars)	04	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Pork & Esc. Potato (bars)	05	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Chicken Ala King (bars)	06	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Paghetti w/Meat Sauce (bars)	08	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Chicken & Rice (bars)	07	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
DRINKS/SOUPS																				
Lemon Tea (pkt)	23	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Orange Beverage (bar)	22	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Chicken Soup (pkt)	10	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Fruit Soup Strawberry (pkt)	27	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Fruit Soup Raspberry (pkt)	28	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Cocoa (pkt)	01	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Coffee (pkt)	24	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Cream (pkt)	02	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Sugar (pkt)	25	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
SNACKS																				
Cookie, Choc. Cov. (each)	17	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Brownie (bar)	19	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Raisinut Crunch (pkg)	11	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Granola (bar)	15	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Oatmeal Cookie (bars)	16	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Chocolate (bars)	26	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Blueberry (bars)	18	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Fig (bars)	20	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Chewing Gum (pkt)	75	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
{Other}	79	1	2	3	4	5	6	7	8	9	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

DAY 2

WATER CONSUMPTION

Circle the total amount of unflavored water that you drink or use during each period. Do not record flavored water such as tea, orange beverage, etc. here. If you drink or use more than two canteens during one period, write the total amount on the line provided.

<u>DRINKING</u>		<u>OTHER (washing, etc.)</u>
During Breakfast	(10) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens	(11) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens
Between Breakfast and Lunch	(20) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens	(21) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens
During Lunch	(30) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens	(31) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens
Between Lunch and Dinner	(40) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens	(41) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens
During Dinner	(50) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens	(51) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens
Between Dinner and Breakfast	(60) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens	(61) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{3}{4}$ 2 or ____ canteens
Daily Total	(70) _____ canteens	(71) _____ canteens

APPENDIX E. Weather Data

WEATHER DATA *

<u>DAY</u>	<u>DATE</u>	<u>TEMPERATURE RANGE (F)</u>	<u>PRECIPITATION</u>	<u>SNOW DEPTH</u>
1	2/21/86	25 - 34	8.1" snowfall	18 - 26"
2	2/22/86	16 - 34	none	26"
3	2/23/86	10 - 32	trace snowfall	26"
4	2/24/86	16 - 32	trace snowfall	25"
5	2/25/86	12 - 31	none	25"
6	2/26/86	4 - 26	none	25"
7	2/27/86	3 - 31	none	24"
8	2/28/86	4 - 30	none	23"
9	3/1/86	8 - 35	none	20"
10	3/2/86	7 - 34	none	18"

* Source: New England Weather Service
 341 Highland Avenue
 Quincy, MA 02170

APPENDIX F. MRE Ration Posttest Questionnaire

MRE RATION QUESTIONNAIRE

U.S. Army Natick Research and Development Center
Natick, Massachusetts 01760

During the past ten days you ate the MRE Ration. We are interested in your honest reactions to this ration. Your responses to these questions are important to the development of this ration and are confidential.

Name _____ Number _____

1. How long have you been in the Armed Forces? _____ years, _____ months
2. What is your rank? _____ Age? _____
3. Before this exercise, have you been in the field with only operational rations to eat? _____ If so, how many times? _____ What was the average length of the exercise? _____
4. Please use the following scale to indicate how much you like or dislike each of the items in the MRE Ration by marking the number that best expresses your opinion.

NEVER TRIED	DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
0	1	2	3	4	5	6	7	8	9

a. Reef w/barbeque sauce	0	1	2	3	4	5	6	7	8	9
b. Beef w/gravy	0	1	2	3	4	5	6	7	8	9
c. Beef w/spiced sauce	0	1	2	3	4	5	6	7	8	9
d. Beef patties	0	1	2	3	4	5	6	7	8	9
e. Beef stew	0	1	2	3	4	5	6	7	8	9
f. Chicken ala king	0	1	2	3	4	5	6	7	8	9
g. Frankfurters	0	1	2	3	4	5	6	7	8	9
h. Ham/chicken loaf	0	1	2	3	4	5	6	7	8	9
i. Ham slices	0	1	2	3	4	5	6	7	8	9
j. Meatballs w/barbeque sauce	0	1	2	3	4	5	6	7	8	9
k. Pork sausage Patties	0	1	2	3	4	5	6	7	8	9
l. Turkey w/gravy	0	1	2	3	4	5	6	7	8	9
m. Crackers	0	1	2	3	4	5	6	7	8	9

n. Jelly	0	1	2	3	4	5	6	7	8	9
o. Peanut butter	0	1	2	3	4	5	6	7	8	9
p. Applesauce	0	1	2	3	4	5	6	7	8	9
q. Mixed fruits	0	1	2	3	4	5	6	7	8	9
r. Peaches	0	1	2	3	4	5	6	7	8	9
s. Strawberries	0	1	2	3	4	5	6	7	8	9
t. Brownie	0	1	2	3	4	5	6	7	8	9
u. Cherry nut cake	0	1	2	3	4	5	6	7	8	9
v. Chocolate covered cookie	0	1	2	3	4	5	6	7	8	9
w. Fruitcake	0	1	2	3	4	5	6	7	8	9
x. Maple nut cake	0	1	2	3	4	5	6	7	8	9
y. Orange nut cake	0	1	2	3	4	5	6	7	8	9
z. Pineapple nut cake	0	1	2	3	4	5	6	7	8	9
aa. Chocolate nut cake	0	1	2	3	4	5	6	7	8	9
bb. Cocoa powder	0	1	2	3	4	5	6	7	8	9
cc. Coffee	0	1	2	3	4	5	6	7	8	9
dd. Catsup	0	1	2	3	4	5	6	7	8	9
ee. Gravy base (soup mix)	0	1	2	3	4	5	6	7	8	9
ff. Candy (all types)	0	1	2	3	4	5	6	7	8	9
gg. Gum	0	1	2	3	4	5	6	7	8	9

5. Please rate how much you like or dislike eating the MRE Ration for breakfast, lunch and dinner. Circle one number for each of the three meals.

DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SOMEWHAT	NEITHER LIKE NOR DISLIKE	LIKE SOMEWHAT	LIKE MODERATELY	LIKE VERY MUCH
1	2	3	4	5	6	7

a. For breakfast	1	2	3	4	5	6	7
b. For lunch	1	2	3	4	5	6	7
c. For dinner	1	2	3	4	5	6	7

6. When did you eat? Circle one number.

- 1 - At specific meal times (imposed by command)
- 2 - At specific meal times (my choice)
- 3 - Throughout the day, as time permitted
- 4 - Both 1 and 3
- 5 - Both 2 and 3

7. How many meals did you usually eat a day? _____

8. On a typical day, at what times did you eat and drink meals and snacks?
 Under MEALS, check those time periods during which you usually ate meals.
 Under SNACKS, check those time periods when you usually ate snacks. Under
 BEVERAGES, check when you drank flavored drinks (coffee, cocoa, etc) Under
 WATER, check when you drank unflavored water.

	<u>MEALS</u>	<u>SNACKS</u>	<u>BEVERAGES</u>	<u>WATER</u>
0600 - 0800	—	—	—	—
0800 - 1000	—	—	—	—
1000 - 1200	—	—	—	—
1200 - 1400	—	—	—	—
1400 - 1600	—	—	—	—
1600 - 1800	—	—	—	—
1800 - 2000	—	—	—	—
2000 - 2200	—	—	—	—
2200 - 2400	—	—	—	—
2400 - 0200	—	—	—	—
0200 - 0400	—	—	—	—
0400 - 0600	—	—	—	—

9. Overall, did you get enough to eat or were you hungry? Circle one number.

- 1 - Got enough to eat
- 2 - Was sometimes hungry
- 3 - Was often hungry
- 4 - Was almost always hungry

- | | | | | | | | |
|---------------------------------------|---|---|---|---|---|---|---|
| a. Entrees (meat chicken) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| b. Starch (beans, potato, crackers) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| c. Dessert (cakes, cookies, brownies) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| d. Beverages (Cocoa, coffee) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| e. Fruit (applesauce, peaches, etc.) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

15. Please circle one number for each component of the ration.

- | VARIETY NOW
ENOUGH | SHOULD BE SOMEWHAT
MORE VARIETY | SHOULD BE MODERATELY
MORE VARIETY | SHOULD BE MUCH
MORE VARIETY |
|---------------------------------------|------------------------------------|--------------------------------------|--------------------------------|
| 1 | 2 | 3 | 4 |
| a. Entrees (meat, chicken) | | 1 | 2 3 4 |
| b. Starch (beans, potato, crackers) | | 1 | 2 3 4 |
| c. Dessert (cakes, cookies, brownies) | | 1 | 2 3 4 |
| d. Beverages (cocoa, coffee) | | 1 | 2 3 4 |
| e. Fruit (applesauce, peaches, etc.) | | 1 | 2 3 4 |

16. For what reasons did you NOT eat enough during this exercise? Circle ALL the reasons that apply to you. If you ALWAYS ate enough during this exercise, circle "k" only.

- a. Disliked the food in the MRE ration
- b. Not enough food provided in the MRE ration
- c. Not enough time to prepare ration
- d. Too much trouble to prepare ration
- e. Too cold to eat
- f. Not enough time to eat the ration
- g. No heat source to heat the ration
- h. Not enough water to prepare the ration
- i. Got "sick" of the food in the ration-not enough variety

j. Other -- please explain _____

k. Always ate enough during this exercise

17. If you circled more than one reason in the preceding question, what was the MOST FREQUENT reason you did not eat enough? Please write the letter from the list above. _____

18. 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

19. 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

20. 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

21. On the average, how many canteens (one canteen = 32 ounces = 1 quart) of water did you use each day for drinking, eating, and other uses such as washing? Circle one.

Drinking 1 2 3 4 5 6 canteens

Eating 1 2 3 4 5 6 canteens

Other 1 2 3 4 5 6 canteens

22. For what reasons did you not drink enough during the exercise? Circle ALL the reasons that apply to you. If you ALWAYS drank enough during this exercise, circle "i" only.

a. Too much trouble to melt snow and ice

b. Not enough time to melt snow and ice

- c. Stream water too far from site
- d. No equipment (pots, pans) to melt snow
- e. Not enough equipment to melt snow
- f. No heat source
- g. Not enough heat sources for the group
- h. Water in canteen kept freezing
- i. Always drank enough during exercise

23. If you circled more than one reason in the preceding question what was the MOST FREQUENT reason you did not drink enough? Please write in the letter from the list above. _____

24. How did you obtain water? Circle all the ways you obtained water.

- a. Melted snow
- b. Melted ice
- c. From an unfrozen stream
- d. From an unfrozen lake or pond
- e. Other _____

25. If you circled more than one way of obtaining water, which was the most frequent? Please write in the letter from above. _____

26. How many times did you have to melt snow or ice in order to obtain water? Please circle one.

NEVER	ONE TO THREE TIMES	FOUR TO NINE 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	8

27. If you had to melt snow or ice did you work alone or in teams? Circle one.

- a. alone
- b. one other person
- c. two other people
- d. more than two other people

28. If you melted snow or ice, did you do it by choice or were you commanded to melt it? Circle one.

- a. by choice b. by command c. other _____

29. What was the temperature of the plain water you normally drank (not coffee or cocoa)? Circle one number.

VERY HOT	HOT	WARM	NEUTRAL	COOL	COLD	VERY COLD
1.	2	3	4	5	6	7

30. How long did your water remain in your canteen after you obtained it?

LESS THAN AN HOUR	ONE HOUR	A FEW HOURS	ALL DAY
1	2	3	4

31. Did the water in your canteen freeze before you had time to obtain more?

NEVER	OCCASIONALLY	SOMETIMES	USUALLY	ALWAYS
1	2	3	4	5

32. How often did you use some kind of mix (coffee, cocoa, soup) with your water? Circle one.

NEVER	OCCASIONALLY	SOMETIMES	USUALLY	ALWAYS
1	2	3	4	5

33. After adding water to the ration items such as beef patty or fruit, did you usually wait, after adding water, before eating the food? Circle one.

- a. Yes, waited _____ minutes
 b. No, ate food immediately after adding water
 c. Never added water to the ration

34. Were the preparation instructions helpful? Circle one.

NOT AT ALL HELPFUL	SOMEWHAT HELPFUL	MODERATELY HELPFUL	VERY HELPFUL
.1	2	3	4

35. Please rate how EASY or DIFFICULT you found each of the following aspects of preparing the MRE Ration in the cold. Circle one number for each.

VERY EASY	MODERATELY EASY	SOMEWHAT EASY	NEITHER EASY NOR DIFFICULT	SOMEWHAT DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT
1	2	3	4	5	6	7
a. Understanding preparation instructions					1 2 3 4 5 6 7	
b. Opening the outer bags					1 2 3 4 5 6 7	
c. Locating a specific packet or item in the ration					1 2 3 4 5 6 7	
d. Obtaining enough water to prepare foods or drinks					1 2 3 4 5 6 7	
e. Opening an individual packet					1 2 3 4 5 6 7	
f. Heating water in order to prepare foods or drinks					1 2 3 4 5 6 7	
g. Mixing the right amount of water with the dry ration items					1 2 3 4 5 6 7	
h. Eating more than one item at a time					1 2 3 4 5 6 7	
i. Keeping hands warm					1 2 3 4 5 6 7	
j. Avoiding spilling package contents					1 2 3 4 5 6 7	

36. Which did you wear while preparing the MRE Ration outside? Circle ALL that apply.

- a. None
- b. Wool mitten insert with trigger finger
- c. Wool glove insert
- d. Black leather outer glove
- e. Other _____

37. How cold did your hands get while preparing or eating the MRE Ration outside? Circle one number.

NOT AT ALL COLD	SOMEWHAT COLD	MODERATELY COLD	VERY COLD
1	2	3	4

38. In the field, did you (circle one)

- a. carry the ration in the brown outer bags provided.
- b. open the brown outer bags and carry the contents separately.

39. You were issued four complete MRE rations per day. Did you bring ALL the items into the field? yes (go to #42) no (go to #40)

40. Primarily which items did you leave behind? Mostly (circle one)

- a. entrees (meat, chicken)
 - b. starch (beans, potato, crackers)
 - c. fruit (applesauce, peaches, etc.)
 - d. dessert (cakes, cookies, brownies)
 - e. beverage (cocoa, coffee)
 - f. spread (cheese, jelly, peanut butter)
 - g. some of everything
 - h. other (write in item of combination of items)
-

41. What was the main reason you did not take everything in the MRE Ration to the field? Circle only ONE answer.

- a. Disliked the look of some foods and drinks
- b. Wanted to reduce the SPACE the ration takes up
- c. Wanted to reduce the WEIGHT of the ration

42. Below is a list of possible ways of improving the MRE Ration. Please write the number "1" next to the improvement you think is MOST important, the number "2" next to the improvement you think is SECOND in importance, the number "3" next to the THIRD most important improvement, "4" next to the FOURTH, and "5" next to the FIFTH most important.

___ Make the rations taste better

___ Increase the variety of the rations

___ Make the rations easier to prepare

___ Include more breakfast foods in the rations

___ Make the portion sizes larger

___ Other (write in) _____

43. Do you have any other comments on the MRE Ration? _____

APPENDIX G. Arctic Ration Posttest Questionnaire

ARCTIC RATION QUESTIONNAIRE

U.S. Army Natick Research and Development Center
Natick, Massachusetts 01760

During the past ten days you ate a new Arctic Ration. We are interested in your honest reactions to this ration. Your responses to these questions are important to the development of this ration and are confidential.

Name _____ Number _____

1. How long have you been in the Armed Forces? _____ years, _____ months
2. What is your rank? _____ Age? _____
3. Before this exercise, have you been in the field with only operational rations to eat? _____ If so, how many times? _____ What was the average length of the exercise? _____
4. Please use the following scale to indicate how much you like or dislike each of the items in the Arctic Ration by marking the number that best expresses your opinion.

NEVER TRIED	DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY					
0	1	2	3	4	5	6	7	8	9					
a. Oatmeal(Apple & Cinn.)					0	1	2	3	4	5	6	7	8	9
b. Oatmeal(Maple & Brn Sugar)					0	1	2	3	4	5	6	7	8	9
c. Oatmeal(Strawberry)					0	1	2	3	4	5	6	7	8	9
d. Chicken Stew					0	1	2	3	4	5	6	7	8	9
e. Beef & Vegetable					0	1	2	3	4	5	6	7	8	9
f. Pork & Esc. Potato					0	1	2	3	4	5	6	7	8	9
g. Chicken Ala King					0	1	2	3	4	5	6	7	8	9
h. Spaghetti w/Meat Sauce					0	1	2	3	4	5	6	7	8	9
i. Chicken & Rice					0	1	2	3	4	5	6	7	8	9
j. Lemon Tea					0	1	2	3	4	5	6	7	8	9
k. Orange Beverage					0	1	2	3	4	5	6	7	8	9
l. Chicken Soup					0	1	2	3	4	5	6	7	8	9
m. Fruit Soup Strawberry					0	1	2	3	4	5	6	7	8	9

n. Fruit Soup Raspberry	0	1	2	3	4	5	6	7	8	9
o. Cocoa	0	1	2	3	4	5	6	7	8	9
p. Coffee	0	1	2	3	4	5	6	7	8	9
q. Cookies, Choc. Cov.	0	1	2	3	4	5	6	7	8	9
r. Brownie	0	1	2	3	4	5	6	7	8	9
s. Raisinut Crunch	0	1	2	3	4	5	6	7	8	9
t. Granola Bar	0	1	2	3	4	5	6	7	8	9
u. Oatmeal Cookie	0	1	2	3	4	5	6	7	8	9
v. Chocolate Bar	0	1	2	3	4	5	6	7	8	9
w. Blueberry Bar	0	1	2	3	4	5	6	7	8	9
x. Fig Bar	0	1	2	3	4	5	6	7	8	9
y. Chewing Gum	0	1	2	3	4	5	6	7	8	9

5. Please rate how much you like or dislike eating the Arctic Ration for breakfast, lunch and dinner. Circle one number for each of the three meals.

DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SOMEWHAT	NEITHER LIKE NOR DISLIKE	LIKE SOMEWHAT	LIKE MODERATELY	LIKE VERY MUCH	
1	2	3	4	5	6	7	
a. For breakfast	1	2	3	4	5	6	7
b. For lunch	1	2	3	4	5	6	7
c. For dinner	1	2	3	4	5	6	7

6. When did you eat? Circle one number.

- 1 - At specific meal times (imposed by command)
- 2 - At specific meal times (my choice)
- 3 - Throughout the day, as time permitted
- 4 - Both 1 and 3
- 5 - Both 2 and 3

7. How many meals did you usually eat a day? _____

8. On a typical day, at what times did you eat and drink meals and snacks?
 Under MEALS, check those time periods during which you usually ate meals.
 Under SNACKS, check those time periods when you usually ate snacks. Under
 BEVERAGES, check when you drank flavored drinks (tea, orange, etc.) Under
 WATER, check when you drank unflavored water.

	<u>MEALS</u>	<u>SNACKS</u>	<u>BEVERAGES</u>	<u>WATER</u>
0600 - 0800	—	—	—	—
0800 - 1000	—	—	—	—
1000 - 1200	—	—	—	—
1200 - 1400	—	—	—	—
1400 - 1600	—	—	—	—
1600 - 1800	—	—	—	—
1800 - 2000	—	—	—	—
2000 - 2200	—	—	—	—
2200 - 2400	—	—	—	—
2400 - 0200	—	—	—	—
0200 - 0400	—	—	—	—
0400 - 0600	—	—	—	—

9. Overall, did you get enough to eat or were you hungry? Circle one number.

1 - Got enough to eat

3 - Was often hungry

2 - Was sometimes hungry

4 - Was almost always hungry

10. Overall, did you get enough to drink or were you thirsty? Circle one.

1 - Got enough to drink

3 - Was often thirsty

2 - Was sometimes thirsty

4 - Was almost always thirsty

11. On a typical day, did you eat alone or in a group? Circle one.

a. alone

c. with two people

b. with one person

d. with more than two people

- | | | | | | | | |
|--------------------------|---|---|---|---|---|---|---|
| f. Soups (chicken) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| g. Candy | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| h. Nuts and raisin mixes | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

15. Please circle one number for each component of the ration.

- | VARIETY NOW
ENOUGH | SHOULD BE SOMEWHAT
MORE VARIETY | SHOULD BE MODERATELY
MORE VARIETY | SHOULD BE MUCH
MORE VARIETY | |
|---------------------------------|------------------------------------|--------------------------------------|--------------------------------|---|
| 1 | 2 | 3 | 4 | |
| a. Entree bars (chicken, etc.) | 1 | 2 | 3 | 4 |
| b. Breakfast (oatmeal) | 1 | 2 | 3 | 4 |
| c. Cookies and brownies | 1 | 2 | 3 | 4 |
| d. Beverages (cocoa, tea, etc.) | 1 | 2 | 3 | 4 |
| e. Soups (fruit) | 1 | 2 | 3 | 4 |
| f. Soups (chicken) | 1 | 2 | 3 | 4 |
| g. Candy | 1 | 2 | 3 | 4 |
| h. Nuts and raisin mixes | 1 | 2 | 3 | 4 |

16. For what reasons did you NOT eat enough during this exercise? Circle ALL the reasons that apply to you. If you ALWAYS ate enough during this exercise, circle "k" only.

- a. Disliked the food in the Arctic Ration
- b. Not enough food provided in the Arctic Ration
- c. Not enough time to prepare ration
- d. Too much trouble to prepare ration
- e. Too cold to eat
- f. Not enough time to eat the ration
- g. No heat source to heat the ration
- h. Not enough water to prepare the ration
- i. Got "sick" of the food in the ration-not enough variety

j. Other -- please explain _____

k. Always ate enough during this exercise

17. If you circled more than one reason in the preceding question, what was the MOST FREQUENT reason you did not eat enough? Please write the letter from the list above. _____

18. 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

19. 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

20. 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

21. On the average, how many canteens (one canteen = 32 ounces = 1 quart) of water did you use each day for drinking, eating, and other uses such as washing? Circle one.

Drinking 1 2 3 4 5 6 canteens

Eating 1 2 3 4 5 6 canteens

Other 1 2 3 4 5 6 canteens

22. For what reasons did you not drink enough during the exercise? Circle ALL the reasons that apply to you. If you ALWAYS drank enough during this exercise, circle "f" only.

a. Too much trouble to melt snow and ice

b. Not enough time to melt snow and ice

- c. Stream water too far from site
- d. No equipment (pots, pans) to melt snow
- e. Not enough equipment to melt snow
- f. No heat source
- g. Not enough heat sources for the group
- h. Water in canteen kept freezing
- i. Always drank enough during exercise

23. If you circled more than one reason in the preceding question what was the MOST FREQUENT reason you did not drink enough? Please write in the letter from the list above. _____

24. How did you obtain water? Circle all the ways you obtained water.

- a. Melted snow
- b. Melted ice
- c. From an unfrozen stream
- d. From an unfrozen lake or pond
- e. Other _____

25. If you circled more than one way of obtaining water, which was the most frequent? Please write in the letter from above. _____

26. How many times did you have to melt snow or ice in order to obtain water? Please circle one.

NEVER	ONE TO THREE TIMES	FOUR TO NINE 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	8

27. If you had to melt snow or ice did you work alone or in teams? Circle one.

- a. alone
- b. one other person
- c. two other people
- d. more than two other people

28. If you melted snow or ice, did you do it by choice or were you commanded to melt it? Circle one.

a. by choice b. by command c. other _____

29. What was the temperature of the plain water you normally drank (not tea, beverage bar, coffee, etc.)? Circle one number.

VERY HOT	HOT	WARM	NEUTRAL	COOL	COLD	VERY COLD
1.	2	3	4	5	6	7

30. How long did your water remain in your canteen after you obtained it?

LESS THAN AN HOUR	ONE HOUR	A FEW HOURS	ALL DAY
1	2	3	4

31. Did the water in your canteen freeze before you had time to obtain more?

NEVER	OCCASIONALLY	SOMETIMES	USUALLY	ALWAYS
1	2	3	4	5

32. How often did you use some kind of mix (cocoa, beverage bar, tea, soup, coffee) with your water? Circle one number.

NEVER	OCCASIONALLY	SOMETIMES	USUALLY	ALWAYS
1	2	3	4	5

33. After adding water to your Arctic Ration entree, did you usually wait, before eating the food? Circle one.

- a. Yes, waited _____ minutes
- b. No, ate entree immediately after adding water
- c. Never added water to the entree bar

34. Were the preparation instructions helpful? Circle one.

NOT AT ALL HELPFUL	SOMEWHAT HELPFUL	MODERATELY HELPFUL	VERY HELPFUL
.1	2	3	4

35. Please rate how EASY or DIFFICULT you found each of the following aspects of preparing the Arctic Ration in the cold. Circle one number for each.

	VERY EASY	MODERATELY EASY	SOMEWHAT EASY	NEITHER EASY NOR DIFFICULT	SOMEWHAT DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT				
	1	2	3	4	5	6	7				
a. Understanding preparation instructions					1	2	3	4	5	6	7
b. Opening the white outer bags					1	2	3	4	5	6	7
c. Locating a specific packet or item in the ration					1	2	3	4	5	6	7
d. Obtaining enough water to prepare foods or drinks					1	2	3	4	5	6	7
e. Opening an individual packet					1	2	3	4	5	6	7
f. Heating water in order to prepare foods or drinks					1	2	3	4	5	6	7
g. Mixing the right amount of water with the dry ration items					1	2	3	4	5	6	7
h. Eating more than one item at a time					1	2	3	4	5	6	7
i. Keeping hands warm					1	2	3	4	5	6	7
j. Crumbling the ration before adding water					1	2	3	4	5	6	7
k. Avoiding spilling package contents					1	2	3	4	5	6	7
l. Sealing entree bag with plastic closure					1	2	3	4	5	6	7

36. Which did you wear while preparing the Arctic Ration outside? Circle ALL that apply.

- a. None
- b. Wool mitten insert with trigger finger
- c. Wool glove insert
- d. Black leather outer glove
- e. Other _____

37. How cold did your hands get while preparing or eating the Arctic Ration outside? Circle one number.

NOT AT ALL COLD	SOMEWHAT COLD	MODERATELY COLD	VERY COLD
1	2	3	4

38. In the field, did you (circle one)

- a. carry the ration in the white outer bags provided.
- b. open the white outer bags and carry the contents separately.

39. You were issued one complete Arctic Ration per day. Did you bring ALL the items into the field? yes (go to #42) no (go to #40)

40. Primarily which items did you leave behind? Mostly (circle one)

- a. breakfast oatmeal
 - b. entrees (meat and chicken)
 - c. fruit soup
 - d. chicken soup
 - e. beverages (tea, cocoa, etc.)
 - f. desserts (cookies, brownies)
 - g. snacks (raisinut crunch, granola)
 - h. some of everything
 - i. other (write in item or combination of items)
-

41. What was the main reason you did not take everything in the Arctic Ration to the field? Circle only ONE answer.

- a. Disliked the look of some foods and drinks
- b. Wanted to reduce the SPACE the ration takes up
- c. Wanted to reduce the WEIGHT of the ration

42. Overall, how convenient was the Arctic Ration to use in the field?
Please circle one number.

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

43. Compare the convenience of the Arctic Ration with the MRE (Meal, Ready to Eat) if you have ever used the MRE. Please circle one number.

NEVER USED	MUCH MORE	SOMEWHAT MORE	SLIGHTLY MORE	NEUTRAL	SLIGHTLY WORSE	SOMEWHAT WORSE	MUCH WORSE
0	1	2	3	4	5	6	7

44. Compare the quality of the Arctic Ration with the MRE if you have used the MRE. Please circle one number.

NEVER USED	MUCH BETTER	SOMEWHAT BETTER	SLIGHTLY BETTER	NEUTRAL	SLIGHTLY WORSE	SOMEWHAT WORSE	MUCH WORSE
0	1	2	3	4	5	6	7

45. Below is a list of possible ways of improving the Arctic Ration. Please write the number "1" next to the improvement you think is MOST important, the number "2" next to the improvement you think is SECOND in importance, the number "3" next to the THIRD most important improvement, "4" next to the FOURTH, and "5" next to the FIFTH most important.

- ___ Make the rations taste better
- ___ Increase the variety of the rations
- ___ Make the rations easier to prepare
- ___ Include more breakfast foods in the rations
- ___ Make the portion sizes larger
- ___ Other (write in) _____

46. Do you have any other comments on the Arctic Ration? _____
