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FIELD EVALUATION OF IMPROVED MRE, MRE VII, AND MRE IV

by

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Previous field tests have demonstrated that early versions of the Meal, Ready-To-Eat (MRE's I-V) are not consumed in sufficient quantity when this ration is fed to troops as their sole source of subsistence. In an effort to improve consumption and consumer acceptance of the ration, a number of changes have been incorporated into two recent versions of the MRE, MRE VII and the Improved MRE. MRE VII contains larger entree portions than MRE's I-V in 7 out of 12 menus, an added fruit-flavored beverage powder in every menu and hot sauce in three menus. The Improved MRE contains nine entirely new entrees, including two breakfast entrees, two reformulated entrees, larger entree portions in 10 of the 12 menus, wet-pack fruit in place of dehydrated fruit, an oatmeal cookie bar in place of some cakes and cookies, new candies, and hot sauce in four menus.

In October/November 1986, an 11-day field test comparing MRE IV, MRE VII and Improved MRE was conducted on the Island of Hawaii with troops from the 25th Infantry Division, Light. Troops in each of the three participating companies were fed one version of the
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MRE as their sole source of food for the duration of the test. Data were collected on body weight, nutrient intake, water intake, hydration status (urine specific gravity) and food acceptance. Troops also filled out a detailed questionnaire about their perceptions of the version of the MRE they were fed. The results showed that troops fed the Improved MRE consumed more food, lost a lower percentage of their initial body weight, drank more fluid and liked the components of their ration better than troops fed either MRE VII or MRE IV. In addition, troops fed the Improved MRE or MRE VII (both of which contain fruit-flavored beverages) were better able to maintain their hydration than troops fed MRE IV.

These observations indicate that the changes incorporated into the Improved MRE result in a ration that is better from both the soldier's perspective and for his health and well-being. However, the challenge to the ration developer remains. Further improvements in consumption under field conditions are still required for this ration to meet <u>all</u> The Surgeon General's nutritional guidelines.

EXECUTIVE SUMMARY

Previous field tests have demonstrated that early versions of the Meal, Ready-To-Eat (MRE's I-V) are not consumed in sufficient quantity when this ration is fed to troops as their sole source of subsistence. In an effort to improve consumption and consumer acceptance of the ration, a number of changes have been incorporated into more recent versions of the MRE. These modifications are based on the results of previous testing. MRE VII, procured for FY87, contains 8-oz rather than 5-oz entrees in 7 of the 12 menus, a fruit-flavored beverage powder added to every menu and hot sauce added to three of the 12 menus. Feedback from the field and from Major Army Commands as well as efforts to reduce production problems have resulted in further changes leading to the Improved MRE. This ration contains nine entirely new entrees, including two breakfast entrees, two reformulated entrees, 8-oz entree portions in 10 of the 12 menus, wet-pack fruit in place of dehydrated fruit, an oatmeal cookie bar in place of some cakes and cookies, new candies, and hot sauce in four menus.

The question has arisen as to which version of the MRE should be procured for the FY88 Date of Pack (88 DOP). In the field test reported here three versions of the MRE were compared: MRE IV, MRE VII and Improved MRE. The central issue addressed by the test is whether the changes to MRE's I-V embodied in MRE VII and Improved MRE are effective in increasing consumption of the ration and lead to a ration that better meets the user's needs.

In October/November 1986 the Behavioral Sciences Division of the Science & Advanced Technology Directorate, U.S. Army Natick Research, Development & Engineering Center with support from the Heat Research Division, U.S. Army Research Institute of Environmental Medicine conducted an 11-day field test with troops from the 25th Infantry Division, Light which compared MRE IV, MRE VII and Improved MRE. Three rifle companies (Alpha, Bravo, Charlie) of the 4/87th Battalion served as test subjects, participating in a planned training exercise at the Captain Cook and Pohakuloa Training Areas on the Island of Hawaii. All the troops in each company were fed one version of the MRE as their sole source of food for the duration of the test. Measures of body weight and urine concentration as well as background demographic information were collected prior to the test. During the test, body weight, nutrient intake, water intake and urine concentration were measured 8 times over the course of the 11 days. Food acceptability ratings were gathered on three test days. On day 11, the troops in each company filled out a detailed questionnaire about their perceptions of the version of the MRE they were fed.

In general, troops fed the Improved MRE consumed more food, lost a lower percentage of their initial body weight, drank more fluid and found the components of their ration to be more acceptable than troops fed either MRE VII or MRE IV.

In addition, the three ration groups were compared in terms of their hydration status. Hydration status was indexed by the average urine specific gravities and by the incidence of urine specific gravities above 1.030, the standard criterion level above which less than optimal hydration is indicated. These measures showed that troops fed the Improved MRE and MRE VII (both of which contain fruit-flavored beverages) were better able to maintain their hydration than troops fed MRE IV.

One observation that bears further examination is that troops found the items in the Improved MRE to be highly acceptable yet consumed only 2842 calories per day. It is possible that the ration developer has achieved as tasty and appealing an operational ration as possible and that further improvements in consumption will emerge only when we fully understand the environmental and situational factors that affect consumption and incorporate this knowledge into training and field feeding procedures.

PREFACE

The objective of the field test reported here was to provide the data on which the US Army could base its decision as to which version of the Meal, Ready-to-Eat operational ration to procure for FY 88. The field test was conducted by the Behavioral Sciences Division, Science and Advanced Technology Directorate, US Army Natick Research, Development and Engineering Center (Natick), with support from Heat Research Division, the US Army Research Institute of Environmental Medicine (USARIEM).

The test, the data analysis, and the reporting of results were accomplished in the period from October 1986 to January 1987. Based on the results of this test and the recommendations of the materiel developer (US Army Materiel Command) and the independent evaluators (USARIEM and US Army Test and Evaluation Command), a General Officer In-Process Review unanimously approved the procurement of the Improved MRE for FY 88.

The authors are indebted to many individuals and organizations for their contributions to the project. A key element in the success of this test was the willing participation of the 25th Infantry Division (Light), under the command of MG James W. Crysel. The support provided by all levels of the Division was exemplary. Special thanks are owed to the participating troops themselves for their cooperation and to their company commanders, CPT Saul Grandinetti, CPT James Realini, and CPT Billy Buckner, for the leadership they provided in support of this test. At the battalion level, MAJ Hugh Klipp (XO) and MAJ Timothy Hassell (S3) played critical roles in coordinating the data collection efforts with the troops' activities.

The successful execution of a test of this complexity requires extensive planning. Mr. Jerry Wells, US Army Western Command, had the difficult task of coordinating the test support requirements with several organizations, on very short notice. His role in ensuring that all the necessary support was in place made this test happen. The value of his efforts on behalf of this project cannot be overemphasized.

Thanks are further due to the US Army Support Command, for providing the military vehicles used for transporting the data collectors, and to the Hawaii Army National Guard, for providing the space and facilities at the National Guard Armory, which became the center for the activities involved in entering and verifying the data.

At Natick, COL A.D. Rodgers, III, Commander, and Mr. Edward Levell, Technical Director, provided their full support to this project. Mr. Philip Brandler, Special Assistant for Program Integration, guided the project through an extensive series of briefings to senior Army leadership on the design, execution, and results of the test. Dr. Abner Salant, Director, Food Engineering Directorate, arranged that computers from his directorate were made available for use onsite in Hawaii for data entry. Dr. Robert W. Lewis, Director, Science and Advanced Technology Directorate, and Dr. Herbert L. Meiselman, Chief, Behavioral Sciences Division, provided guidance and encouragement on many occasions.

Special thanks are due to COL David Schnakenberg, Commander, USARIEM, for collecting and analyzing the data on hydration status and for providing technical personnel and computer resources required for the analysis of the food intake data. In addition, the authors benefited greatly from COL Schnakenberg's critical review of the draft of the final report. His extensive comments and valuable suggestions on the scientific aspects of the report contributed greatly to the quality of the final product.

The authors also wish to acknowledge the extraordinary performance of many Natick and USARIEM personnel in the conduct of this test, both at Natick and in the field. They were: Kathryn Rock, Nancy Drago, Deborah Jezior, Joanne Edinberg, MSG Leroy Peterson, SP4 Emmanuel Orejola, SP4 Carl Neidhardt, Charles Greene, Lynda Abusambra, Barbara Quigley, Joseph Laviana, SGT John Hodenpel and SGT Glenn Thomas. Charlene Slamin, the branch secretary, supported us in more than one role -- she doubled as data collector in addition to handling the staggering work load created by the preparation of survey instruments, administrative paperwork, and travel and transportation requirements.

Finally, for assistance in the data collection, we would like to recognize the personnel hired temporarily for that purpose. They are: Billy McGuire, Harriet Warner, Ellen Kramer, Cecilia Bennett, Ann Merritt, and Karen Kaiser. Their diligence and commitment to the task assured that the data were of the highest quality.

Project officer at Natick was Dr. Richard Popper. Project funding was provided under O&MA program element 728012.19.

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INTRODUCTION

The Meal, Ready-to-Eat (MRE) has replaced the Meal, Combat Individual (MCI) as the Army's operational ration. This ration is designed to be eaten by troops in the field when hot meals are not available. The Office of The Surgeon General (OTSG) recommends that this ration not be fed as the sole source of subsistence for longer than 10 days (OTSG letter 22 Sep 86). Current operational doctrine calls for up to seven days of exclusive MRE use, but the proposed Army Wartime Feeding Plan recommends extending the current operational use to the medical policy limit of 10 days. As hot meals become available, troops will initially be fed one hot meal and two MRE's per day and will then transition to two hot meals and one MRE, the current standard for field feeding.

The initial procurements of the MRE ration (MRE I - MRE V) included 12 menus which were composed of 30 food items, two beverages (coffee and cocoa), a cream substitute, assorted candies and a gravy base. Changes in the ration for these procurements consisted entirely of revising specifications to improve producibility.

Although the ration is formulated to meet the known nutritional requirements of healthy young adult males and provides 3600 calories per day in three MRE's, field tests with MRE's I-V as the sole source of food revealed that troops do not eat a sufficient amount of the food provided in the ration to maintain their body weight. This fact was first demonstrated in a 34-day field test conducted at the Pohakuloa Training Area, HI, in August/September 1983, with troops from the 25th Infantry Division [1]. Two intact combat support companies participated in this test during an extended field training exercise. One company was fed the MRE (three per day) as their sole source of subsistence for 34 days, the other company, the control group, was fed the usual series of field exercise rations-- A Ration breakfast, MRE lunch, and A Ration dinner. Daily caloric intake for the MRE group averaged 2189 kcal/man a day over 34 days, compared to 2950 kcal/man a day for the control group. The minimum Military Recommended Dietary Allowance (MRDA) for calorie intake is 2800 kcal/man a day, for moderately active men in temperate environments. The men of both companies lost weight on their respective diets, but those in the MRE company, whose average calorie intake fell below the MRDA, lost significantly more weight.

The inadequate consumption of the MRE has been replicated independently under two different conditions. Askew et al. [2] found that caloric intake averaged about 2400 kcal/man a day over 13 days in volunteer soldiers fed only MRE's. These volunteers ran a 9-11 mile cross-country course for seven consecutive days during the testing period. A similar level of energy intake was found in the 1985 Combat Field Feeding Test [3] during the first three days when troops subsisted solely on the MRE. Following this first test phase, troops continued to consume only about two thirds of the one or two MRE's provided each day in combination with other hot meals.

Troop responses to a detailed questionnaire administered at the end of the 34-day field test [1] revealed several aspects of the ration that might contribute to the low level of consumption under field conditions. The three major shortcomings of the ration from the troops' perspective were: 1) there were no breakfast items; 2) the entree portions (5-oz.) were too small; 3) there were no fruit-flavored beverages. The absence of a cold beverage may have contributed to the lower fluid intake in the MRE group in the 34-day field test compared to the control group. This, in turn, may have affected consumption, since it is well documented [4] that inadequate fluid intake leads to a reduction in food intake.

In an effort to improve consumption and consumer acceptance of the MRE, several changes have been introduced into more recent versions of the ration. MRE VII, procured for FY87, contains 8-oz entrees in 7 out of 12 menus, a fruit-flavored beverage powder in every menu and hot sauce in three menus. Further changes, which were based on feedback from the field and from Major Army Commands, or were undertaken in order to reduce production problems, have resulted in the Improved MRE. This ration contains nine entirely new entrees, including two breakfast entrees, two reformulated entrees, 8-oz entree portions in 10 out of 12 menus, wet pack fruit (similar to canned fruit) in place of the dehydrated fruit, an oatmeal cookie bar in place of some cakes and cookies, new commercial candies, and hot sauce in four menus. Table 1 summarizes the most important differences between MRE's I-V, MRE VII and the Improved MRE. Appendix A lists the individual menus and Appendix B the nutrient composition of each ration. It should be noted that the Improved MRE and MRE VII provide approximately 400 kcal more per day (based on three meals per day) than MRE IV.

The question has arisen as to which version of the MRE should be procured for the FY88 Date of Pack (88 DOP). Neither MRE VII nor the Improved MRE has undergone any previous field testing. The purpose of the field test reported here was to compare three versions of the MRE: MRE IV, MRE VII, and Improved MRE. (MRE IV was used instead of MRE V, because the latter was on medical hold at the time the test was conducted.) The central issue to be addressed by the test is whether the changes to MRE's I-V are effective in increasing consumption of the ration and lead to a ration that better meets the user's needs. The test results provide a data base for the Test and Evaluation Master Plan of the MRE Improvement Program [5]. This plan specifies the issues and criteria relevant to the evaluation of the three versions of the MRE (see Appendix C).

METHODOLOGY

Test Subjects

Three rifle companies (Alpha, Bravo, and Charlie) of the 4/87th Infantry Battalion, 25th Infantry Division (Light) (25th ID(L)) participated in the test. The battalion was engaged in a planned exercise, "Opportune Journey I-87," on the Island of Hawaii. Infantry troops were selected for this test because their training regimens entail the moderate to substantial energy expenditures that the rations were designed to meet.

TABLE 1

Comparison of Salient Features of Three MRE's Tested

IMPROVED MRE [a]	MRE VII [b]	MRE's I-V [c]
- 12 menus - 9 new and 2 reformulated entrees	- 12 menus, same entrees as V but 8 oz portions for 7 menus	- 12 menus
- 8 oz portions for 10 entrees	- fruit flavored beverages in all menus	- 2 beverages (coffee, cocoa)
- 2 breakfast entrees	- hot pepper sauce in 3 menus	
- fruit flavored beverages in all menus		
- wet pack fruits instead of dehydrated fruit		
- hot pepper sauce in 4 menus		
- commercial candies instead of military specification candies		

[a] Improved MRE tested was obtained through a limited R&D buy with 86 Date of Pack (DOP).

[b] MRE VII tested was a repackaged MRE VI (86 DOP) with fruit beverages and hot sauce added.

[c] Version tested was MRE IV drawn from normal stocks (84 DOP).

Training Sites

Troops trained at two general locations on the Island of Hawaii. The first training site, the Captain Cook training area, was located on the southwestern side of the Island of Hawaii and consisted of uneven, lightly wooded, grass-covered land. Troops trained at elevations of approximately 4,000 to 4,500 feet. Temperatures ranged from warm (70-80°F, 21-27°C) during the day to cool (35 to 45°F, 2-7°C) at night. Access to the training area entailed a five-mile ascent along a steeply inclined dirt road traversable only on foot, or by tactical or four-wheel drive vehicle.

The second training site, the Pohakuloa Training Area (PTA), was also remote. Located at approximately 6,000 feet, the terrain was rugged, dusty, and dry. Temperatures were similar to Captain Cook during the day, but somewhat cooler at night. Both training locations were well suited for the conduct of this test, because their remoteness minimized access to nonissued food, which troops were prohibited from consuming for the duration of the ration evaluation.

Test Design

Each company was issued one version of the MRE as their sole source of food for a duration of 11 days. At both training locations, the three companies were physically separate, thereby preventing the exchange of rations among the companies. The test duration was limited by the training schedule of the participating troops but was sufficient to test the rations as sole source of subsistence over the maximum duration the current OTSG guidance recommends (10 days).

Baseline Testing

Prior to the training exercise, the companies were briefed on the purpose of the test, the test procedures, and on the type of data to be collected. Volunteer consent forms were obtained from all members of each company, and a short questionnaire on respondent demographics was administered. On the day following the briefing, baseline measurements of body weight and urine specific gravity were taken (see below for detailed procedures).

For the companies assigned the Improved MRE and MRE VII, the briefing and baseline measurements were conducted on 15-16 October 1986, at Schofield Barracks, Oahu, where the 25th ID(L) is based. The company assigned MRE IV was also briefed on 15-16 October, except for part of one platoon, which was not available for briefing and baseline measurements until 16-17 October. The MRE IV company had been deployed to the Island of Hawaii ahead of the other companies in order to perform duties at Hilo airport, the Kawaihaie docks, and at PTA; therefore, the briefing and baseline measurements were conducted at those respective locations.

Initial Troop Deployments

The Improved MRE and MRE VII companies deployed to the Island of Hawaii starting in the early morning hours of 17 October and arrived at Captain Cook that same day. For 17 October, these two companies were

issued three MRE's (MRE IV) as part of the standard feeding procedure during deployment. The first day on test rations (MRE VII or Improved MRE) for these two companies was 18 October.

The MRE IV troops did not deploy to Captain Cook from their various locations on the Island of Hawaii until 20 October; their first full day on the test rations was 21 October. In this report, the first day on the test rations is referred to as Day 1 for all three companies, even though this day fell on a different calendar date for the MRE IV company than it did for the other two companies.

While on the Island of Hawaii and preceding their deployment to Captain Cook and the start of the test, the MRE IV company was issued two T Rations and one MRE per day. During this time, troops had access to other sources of food (snack bars, fast food restaurants, etc.) and availed themselves of these opportunities.

Test Schedule

Table 2 shows the schedule of data collection activities. Troops were contacted on data collection days in the morning between 6:30 and 7:00 a.m. Each company was assigned a data collection team, consisting of seven individuals; six individuals were responsible for the collection of body weight, food and water intake, and food acceptance; one individual was responsible for the collection of urine samples. Each of the six dietary data collectors was responsible for the collection of data from the same 20-25 individuals in the company for the duration of the test. Data collection in the field typically lasted one to two hours, depending on the type of data collected that morning.

Measurement Procedures

Body weight (Baseline and Days 1-3, 6-7, 10-12). The purpose of measuring body weight was to determine: 1) how much weight change was experienced by the groups subsisting on the different versions of the MRE and 2) whether troops were consuming sufficient calories to maintain energy balance and body weight.

Body weight was measured on SECA digital scales (Model 770). Plywood boards were used in order to provide a level, rigid surface for placement of the scales. Scale batteries were changed every two data collection days. Scale calibration was checked daily using calibrated weights. In addition, data collectors weighed themselves each morning before departing for the field and several times in the course of the weight data collection in order to ensure that scales remained in calibration.

Troops were weighed in the morning, prior to the breakfast meal, except on the baseline day, when they were weighed following breakfast. Troops completed a weight checklist (see Appendix D) on which they noted the type of boot, uniform, and other clothing items (sleepshirt, socks, etc.) worn at the time of the weighing. Weights were adjusted accordingly.

Urine specific gravity (Baseline and Days 1-3, 6-7, 10-12). The purpose of measuring urine specific gravity was to determine the hydration status of the three ration groups.

TABLE 2

Data Collection Schedule

	BASE-LINE	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10	DAY 11	DAY 12
BODY WEIGHT	X	X	X	X			X	X			X	X	X
URINE SPECIFIC GRAVITY	X	X	X	X			X	X			X	X	X
FOOD/WATER INTAKE		X	X	X			X	X		X	X	X	
FOOD ACCEPTANCE				X				X			X		
FINAL QUESTIONNAIRE												X	

Prelabelled, 25-cc polyethylene vials for collection of urine samples were distributed the day prior to sample collection. Troops were instructed to provide a first void, midstream urine sample on the following morning before they ate breakfast.

Samples were analyzed for specific gravity using American Optical temperature-compensated refractometers (Model 10400 A), which provided readings to the nearest 0.001.

Food and water intake (Days 1-3, 6-7, 9-11). The purpose of measuring food intake was to determine the calorie and nutrient intake of the three ration groups. Water intake was measured to evaluate and possibly explain any observed differences between the hydration status of the three groups.

Food and water intake were assessed by having troops complete a 24-hour dietary log (see Appendix D). Similar logs have been used successfully in the past.[2,3] The dietary data collectors reviewed the previous day's log each morning with the individual present in order to identify any omissions and to resolve any ambiguities in the record. In addition, each soldier collected his food waste (empty wrappers, left-overs) for each 24-hour dietary collection period in a plastic trash bag. The food waste was later compared to the food intake as reported on the dietary log. Any discrepancy between the two sources of food intake information was noted and resolved with the individual on the following day.

Food acceptance (Days 3, 7, 10). The purpose of measuring food acceptance was to determine the degree to which the items in each ration were liked or disliked by the troops.

Food acceptance was assessed using the standard nine-point hedonic rating scale, which ranges from 1=Dislike Extremely to 9=Like Extremely. On days that called for acceptance ratings (Days 3, 6, and 10), food intake cards had this scale printed next to each item (see Appendix D). Troops were instructed to rate only the items consumed during that 24-hour dietary data collection period.

Final questionnaire (Day 11). The purpose of administering a final questionnaire was to obtain troop opinions on general aspects of the rations and eating habits during the training exercise. The questionnaire also asked for acceptance ratings of each item in the ration.

The detailed final questionnaire (see Appendix D) was constructed in three versions in order to address both common and unique aspects of each ration.

Training Activities

Following the deployment to Captain Cook, the companies engaged in company- and platoon-level training with minimal interference by test personnel or test activities.

All three companies deployed from Captain Cook to the Pohakuloa Training Area on 27 October, simulating an air assault, and remained there for the remainder of the test. The deployment occurred on Day 10 for the Improved MRE and MRE VII groups, and on Day 7 for the MRE IV group.

One difference between companies in training activity was that the MRE VII group conducted night operations (reverse-cycle training) on Days 2-5 and 7-9, whereas the other companies did not.

Sources of Food During the Test

Sources of food other than the issued rations were forbidden for the duration of the test. The company commanders and their troops were thoroughly briefed on this point prior to the study. The remoteness of the training sites and the fact that the troops were without vehicles made access to outside food sources very difficult.

On two occasions, troops were issued rations other than the designated test rations. On Day 5, the MRE IV group was mistakenly issued a few cases of MRE VII by the battalion. The error was discovered during the morning meal and immediately corrected. According to the battalion commander, only one or two cases (12 meals per case) were involved in the mix-up.

On Day 11, the battalion discovered that it had run out of MRE VII, despite the fact that an adequate number of rations had been supplied by the developer (enough for 120 troops for 16 days). This shortage had two consequences: instead of MRE VII, the troops in the MRE VII group were issued MRE VI. MRE VI differs from MRE VII in that it lacks hot sauce and beverage powders; however, it does contain the larger entree portions. The time required to find a MRE VII substitute also delayed the distribution of rations; troops in the MRE VII group did not receive their rations until the end of the day.

Data Analysis

With the exception of data on the final questionnaire, data entry and validation were accomplished on-site in Hawaii using personal computers provided by Natick's Food Engineering Directorate and computer software developed by the U.S. Army Research Institute of Environmental Medicine (USARIEM) for the 1985 CFFS-FDTE [3]. Calculation of nutrient intakes utilized mainframe computer software developed by USARIEM.

The statistical approach consisted primarily of analysis of variance (F-ratio tests), followed by post hoc multiple comparisons (Student-Newman-Keuls) for the F-ratio tests that were significant. The criterion level of statistical significance was set at .05 for all tests. For the statistical analysis of data collapsed over days, data from an individual were first averaged; the analysis of variance was then performed on the averages.

RESULTS

Sample Demographics

Table 3 summarizes the demographic characteristics of the three companies in terms of average age, rank, height, length of service, ethnic group and region of origin. The three companies were very similar on these dimensions. The average age was about 23 years. Approximately 65% of the sample was white, about 20% black. The regions of origin were similar for the three companies. Over 96% of the sample were enlisted personnel, mostly E-2's.

Because of a concern that the number of dieters in the three groups might differ markedly, respondents were asked on the background questionnaire whether they were trying to lose weight; approximately 20% in each company reported that they were. The difference among the three companies in the proportion of dieters was not statistically significant (chi-square (2 d.f.) = 0.49, p = .78). A similar frequency of reported dieting was found during the 1985 CFFS-FDTE [3], where 26% of the males responded they were trying to lose weight.

Body Weight

A critical issue in this ration evaluation is whether the groups subsisting on the different versions of the MRE would be able to maintain their body weight during this field test.

The initial body weights (mean $\pm$ standard error) for the Improved MRE, MRE VII and MRE IV were 165.5 $\pm$ 2.15 lbs., 166.8 $\pm$ 2.42 lbs., and 164.1 $\pm$ 2.19 lbs., respectively. Figure 1 plots the average percent weight change, relative to baseline, as a function of test day for each of the three ration groups. Percent weight change from baseline is the preferred index of a change in body weight since it corrects for individual differences in baseline weight.

OTSG guidance suggests that troops should not lose more than 3% of their initial body weight during field operations. Figure 1 shows this criterion with a horizontal line at -3%. The Improved MRE group met this criterion throughout the test, with a cumulative weight loss on Day 12 of 2.28%. The other two groups were at or in excess of this 3% limit on Day 12.

Figure 1 shows that all companies start out on Day 1 with a weight loss of approximately 1.5% - 1.8%. Since Day 1 was the first day on test rations for all companies and the body weights were measured in the morning prior to breakfast, the weight difference between Day 1 and baseline does not reflect any effect of the specific test rations. The difference is partially due to the fact that baseline weights, unlike all subsequent weights, were collected after rather than before breakfast. In addition, the initial weight loss on Day 1 is indicative of the stress of deployment. On the preceding day (Day 0), all companies had been deployed to Captain Cook, a process which included marching for several miles carrying rucksacks.

TABLE 3

Demographics of MRE Groups

	IMPROVED MRE (N = 129)	MRE VII (N = 117)	MRE IV (N = 126)
AGE (YEARS)	22.8 (0.42)*	22.8 (0.43)	22.4 (0.36)
MONTHS OF SERVICE	34.9 (4.5)	32.6 (4.5)	30.4 (4.0)
HEIGHT (INCHES)	70.3 (0.27)	70.1 (0.25)	70.2 (0.28)
ETHNIC GROUP (%)			
AMERICAN INDIAN/ALASKAN NATIVE	1	2	2
ASIAN/PACIFIC ISLANDER	4	5	2
BLACK	20	23	23
HISPANIC	4	3	7
WHITE (NOT HISPANIC)	69	64	65
OTHER	2	3	0
REGION OF ORIGIN (%)			
NEW ENGLAND	2	2	3
MIDDLE ATLANTIC	14	10	15
SOUTH ATLANTIC	16	21	16
NORTH CENTRAL	26	18	24
SOUTH CENTRAL	25	22	13
MOUNTAIN	5	11	7
PACIFIC	11	13	20
OTHER	2	3	3
DISTRIBUTION OF ENLISTED RANKS (%)			
E-1	4	4	10
E-2	60	65	61
E-3	9	6	5
E-4	2	1	1
E-5	13	12	13
E-6	8	9	8
E-7	2	3	3
E-8	1	1	1
PERCENT DIETING	19%	21%	23%

* Numbers in parentheses are standard errors.

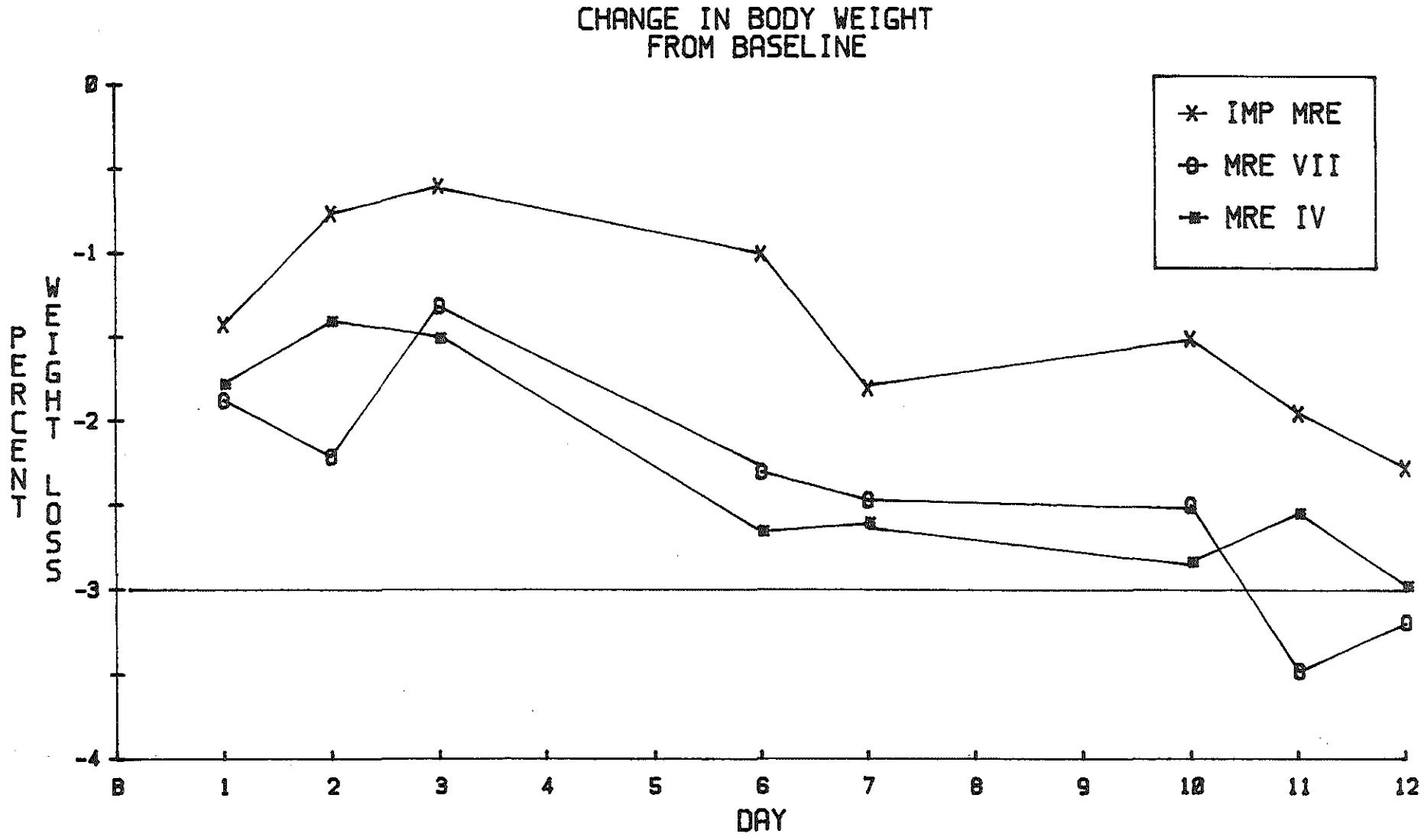

Figure 1. Changes in body weight from baseline for MRE groups.

Therefore, some of the body weight loss probably represents water loss. The Improved MRE and MRE IV groups recovered partially on Day 2; for the MRE VII group this recovery did not occur until Day 3. The continued drop in body weight from Day 1 to Day 2 in the MRE VII group is consistent with reports from the MRE VII company commander that water supply was inadequate on Day 1.

The stress of deployment is again evident in the body weight functions of the Improved MRE and MRE VII groups on Day 11. Both these companies deployed from Captain Cook to PTA on Day 10, conducting an air assault which lasted several hours. Both companies reported water shortages on Day 10, which continued through Day 11. The effect of deployment is not evident in the MRE IV function, because the MRE IV company deployed on Day 7 and no body weight data were collected on the next two days.

Table 4 lists the average percent loss in body weight, relative to baseline, along with the results of one-way analyses of variance (ANOVA's) conducted for each test day. Significant ANOVA's (F-tests) were followed by post hoc multiple comparisons (Student-Newman-Keuls). These analyses were conducted to determine if the three companies differed statistically in weight loss on any given day. The results indicate that the three ration groups did not differ significantly in weight loss on Day 1, prior to consumption of the rations. However, on each subsequent day, the weight loss of the Improved MRE group was significantly less than that of the MRE VII or MRE IV group. The MRE VII and MRE IV groups differed from each other only on Days 2 and 11, on which the weight loss of the MRE VII group exceeded that of the MRE IV group.

Individuals who reported on the background questionnaire that they were trying to lose weight lost an average of 3.1% over the course of the test, compared to 2.7% for the reported nondieters. This difference was not statistically significant ($F(1,284) = 1.8$, $p = 0.28$), indicating that reported intentions to lose weight did not result in a differential weight loss for these individuals.

Calorie and Nutrient Intake

Calorie and nutrient intake were computed on the basis of the food intake records and the known caloric and nutrient composition of the rations. Table 5 shows the daily energy intake and the energy intake averaged over days for each ration group. Figure 2 plots these values, along with the MRDA minimum recommended energy intake for moderately active male troops, indicated by a horizontal line at 2800 kcal.

Table 5 shows that the average daily intake for the Improved MRE group was 2842 kcal, for the MRE VII group 2517 kcal, and for the MRE IV group also 2517 kcal. A one-way ANOVA revealed that these differences were significant ($F(2,335) = 12.5$, $p < .001$). Post hoc comparisons (Student-Newman-Keuls, $p < .05$) indicated that the Improved MRE group consumed significantly more calories per day on average than did the MRE VII and MRE IV groups, which did not differ from each other significantly in calorie intake. These results are consistent with the results on the changes in body weight, which indicate that the Improved MRE group lost less weight than the other two groups.

TABLE 4

Average Loss of Body Weight by MRE Groups
(% Relative Baseline)

DAY	(1) IMP MRE	(2) MRE VII	(3) MRE IV	GROUP COMPARISONS (1)vs(2)	(1)vs(3)	(2)vs(3)	OVERALL F
1	1.43 (0.153)	1.82 (0.170)	1.78 (0.145)				not significant
2	0.77 (0.135)	2.22 (0.150)	1.41 (0.162)	*	*	*	24.2
3	0.61 (0.136)	1.32 (0.167)	1.54 (0.155)	*	*		10.6
6	1.01 (0.166)	2.31 (0.189)	2.66 (0.161)	*	*		26.5
7	1.81 (0.157)	2.48 (0.221)	2.61 (0.164)	*	*		6.0
10	1.52 (0.184)	2.51 (0.239)	2.84 (0.192)	*	*		11.7
11	1.96 (0.185)	3.49 (0.233)	2.55 (0.204)	*	*	*	14.2
12	2.28 (0.199)	3.20 (0.247)	2.98 (0.210)	*	*		5.1

NOTE:

Numbers in parentheses are standard errors.

Overall F based on one-way ANOVA. All F-ratios (except Day 1) significant at $p < .05$ or beyond.

Group comparisons based on Student-Newman-Keuls post hoc tests. * indicates significant difference at $p < .05$.

TABLE 5

Average Calorie Intake by MRE Groups
(In KCAL)

DAY	IMPROVED MRE	MRE VII	MRE IV
1	2978 (61)*	3072 (97)	2495 (102)
2	3044 (71)	2948 (71)	2789 (78)
3	3137 (68)	2483 (78)	2484 (88)
6	3038 (82)	2184 (94)	2813 (91)
7	2793 (64)	2684 (97)	2170 (96)
9	2967 (71)	2154 (97)	2582 (83)
10	2337 (88)	2464 (93)	2307 (92)
11	2507 (76)	1932 (88)	2442 (89)
Average daily intake	2842 (48)	2517 (53)	2517 (60)

* Numbers in parentheses are standard errors.

Figure 2 and Table 5 show a drop in consumption for the Improved MRE group on Days 10 and 11 of the study. The reduction in intake on Day 10 may reflect the effect of deployment. A similar effect is observed for the MRE IV company on Day 7, when they deployed to PTA. However, the MRE VII company, which deployed to PTA on Day 10, does not show a marked deployment effect.

Figure 2 and Table 5 also show a low level of consumption by the MRE VII group on Day 11. This low level is attributable to the fact that rations were delivered very late in the day, and many of the troops were too tired by that time to eat much. In addition, the ration issued to this company on Day 11 were MRE VI instead of MRE VII (see above for explanation) and lacked the calories contained in the fruit-flavored beverages.

Table 6 shows the average daily intakes of macronutrients, vitamins, and minerals, and the percentage of calories derived from protein, fat, and carbohydrates. The intakes can be compared to the MRDA requirements in cases where they have been specified. One-tailed t-tests ($p < .05$) were conducted in order to determine whether the average intakes differ statistically as well as numerically from the MRDAs. Significant differences from the MRDA criteria are indicated by asterisks. Detailed examination of the level of nutrient intakes relative to the MRDAs follows below.

Macronutrients. Intakes of energy, protein, and percent calories from fat are shown in Table 6 and are plotted in Figure 3 as percent of MRDA requirements. Table 6 and Figure 3 show that only the Improved MRE group met the 2800 kcal MRDA for energy intake; the MRE VII and MRE IV groups did not. The MRE IV group also fails to meet the required intake of protein, although the difference is slight and is not statistically significant.

The MRDA specifies that a maximum of 35% of the calories consumed in a ration should be derived from fat. Table 6 shows that the percentage of fat calories consumed by the Improved MRE group (32.6%) falls within MRDA limits, but that the other two ration groups exceed it, with values of 37.7% (MRE VII) and 42.1% (MRE IV). The differences in the percent calorie intake from fat reflect a shift in the composition of the rations (see Appendix B), which consists of a reduction in percent calories derived from fat in favor of an increase in percent calories derived from carbohydrates. Table 6 shows that the Improved MRE group derived 52.5% of their calories from carbohydrates, whereas the MRE VII and MRE IV groups derived 45.3% and 42.4% from this source, respectively.

Vitamins. Table 6 shows the intakes of Vitamin A, Thiamin, Riboflavin, Niacin, Vitamin B6 and Vitamin C, and Figure 4 plots these intakes expressed as a percent of MRDA. Due in part to the vitamin fortification of ration components, all ration groups met the minimum MRDA for the vitamins specified.

Sodium. Table 6 and Figure 5 show that all three ration groups fell within the MRDA limits on the maximum consumption of sodium (5500 mg). Sodium intakes include added salt from salt packets. However, all three rations exceeded the criterion of 1400-1700 mg of sodium per 1000 kcal established for garrison feeding. At present there is no established criterion for sodium intake per 1000 kcal in the field.

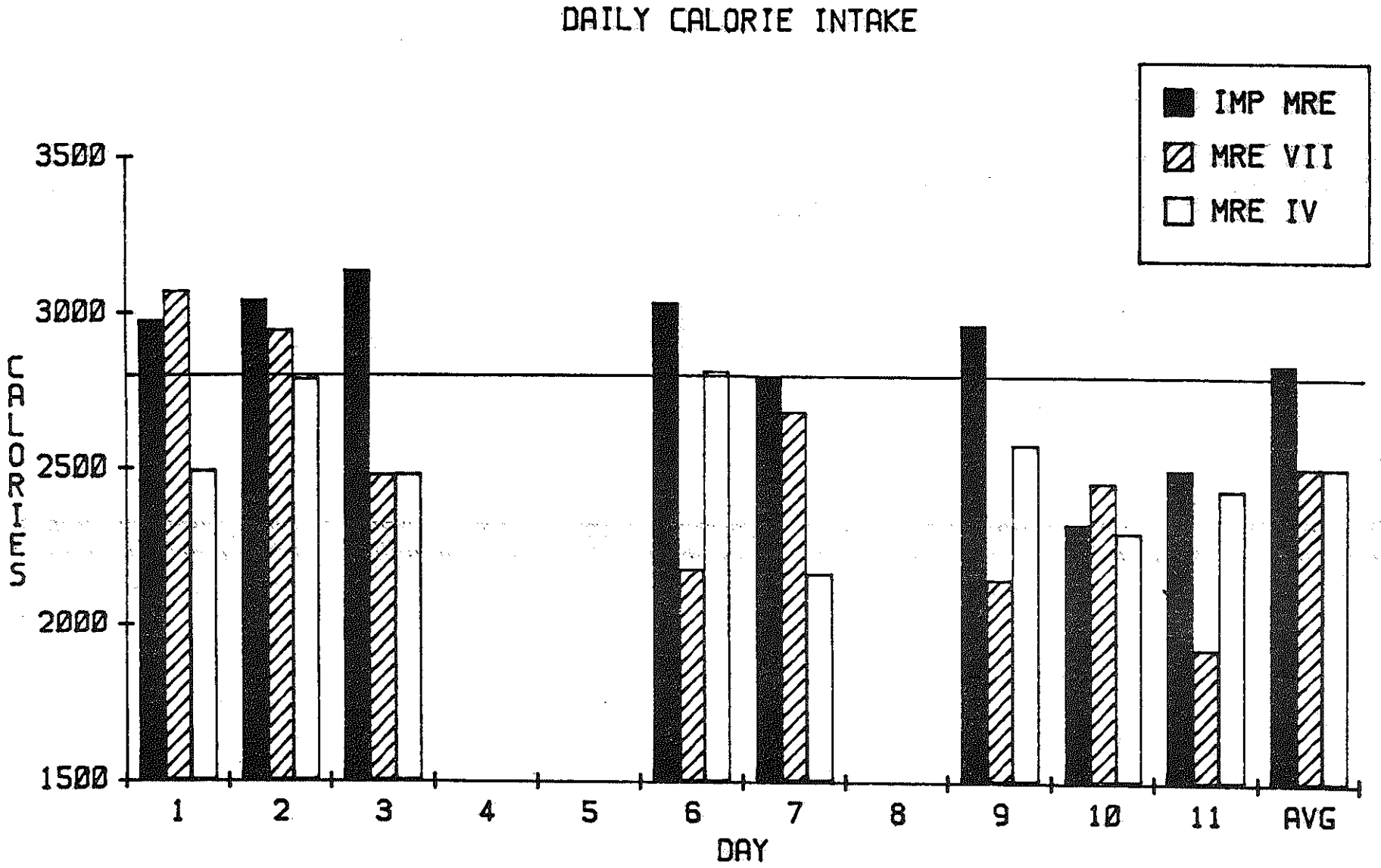

Figure 2. Daily caloric intake by MRE groups.

TABLE 6

Average Daily Nutrient Intakes by MRE Groups Compared to MRDA

NUTRIENT	IMPROVED MRE	MRE VII	MRE IV	MRDA
Energy (kcal)	2842	2517*	2517*	2800
Protein (g)	106	107	97	100
Fat (g)	104	106	118	---
Carbohydrate (g)	374	288	268	---
Vitamin A (mcg RE)	1439	1021	1538	1000
Thiamin (mg)	5.15	3.86	5.04	1.6
Riboflavin (mg)	2.73	2.07	2.07	1.9
Niacin (mg)	36.73	26.42	23.71	21
Vitamin B_6 (mg)	3.37	3.30	4.34	2.2
Vitamin C (mg)	146	133	140	60
Sodium (mg)	4966	4645	4904	5500 max.
Potassium (mg)	2783	2294	2551	---
Iron (mg)	17.1	16.3	15.7	10
Calcium (mg)	739*	648*	713*	800
Phosphorus (mg)	1564	1334	1491	800
Magnesium (mg)	249*	241*	266*	350
Protein Calories (%)	15.2	17.4	15.9	---
Fat Calories (%)	32.6	37.7*	42.1*	35% max.
CHO Calories (%)	52.5	45.3	42.4	---
Sodium (mg/1000 kcal)	1762*	1866*	1980*	1400-1700 max for garrison feeding

NOTE:

Nutrient intakes tested against MRDA using t-test, $p < .05$ (one-tailed).
* indicates nutrient for which MRDA is not met.

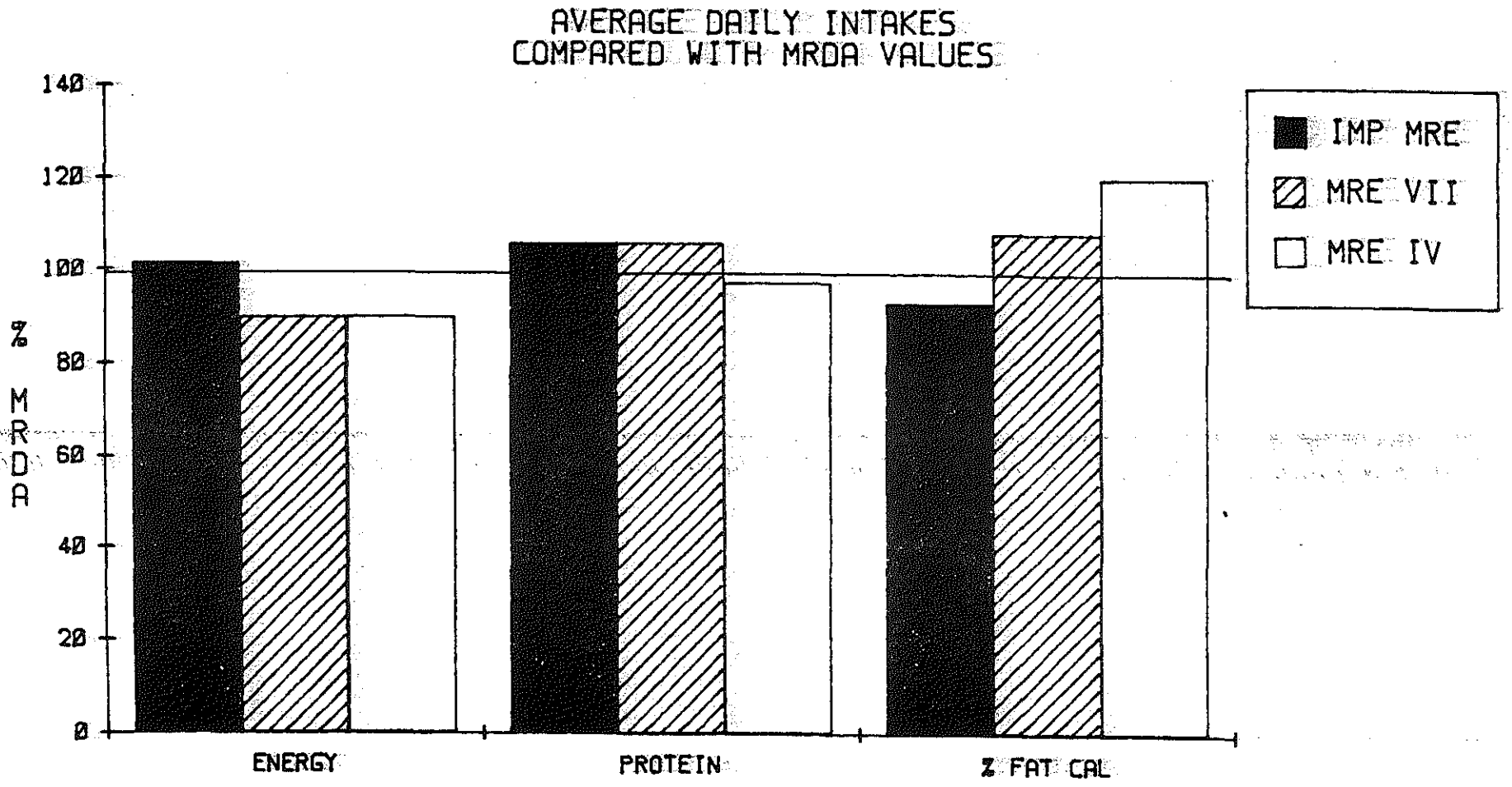

Figure 3. Average daily intakes by MRE groups compared with MRDA values.

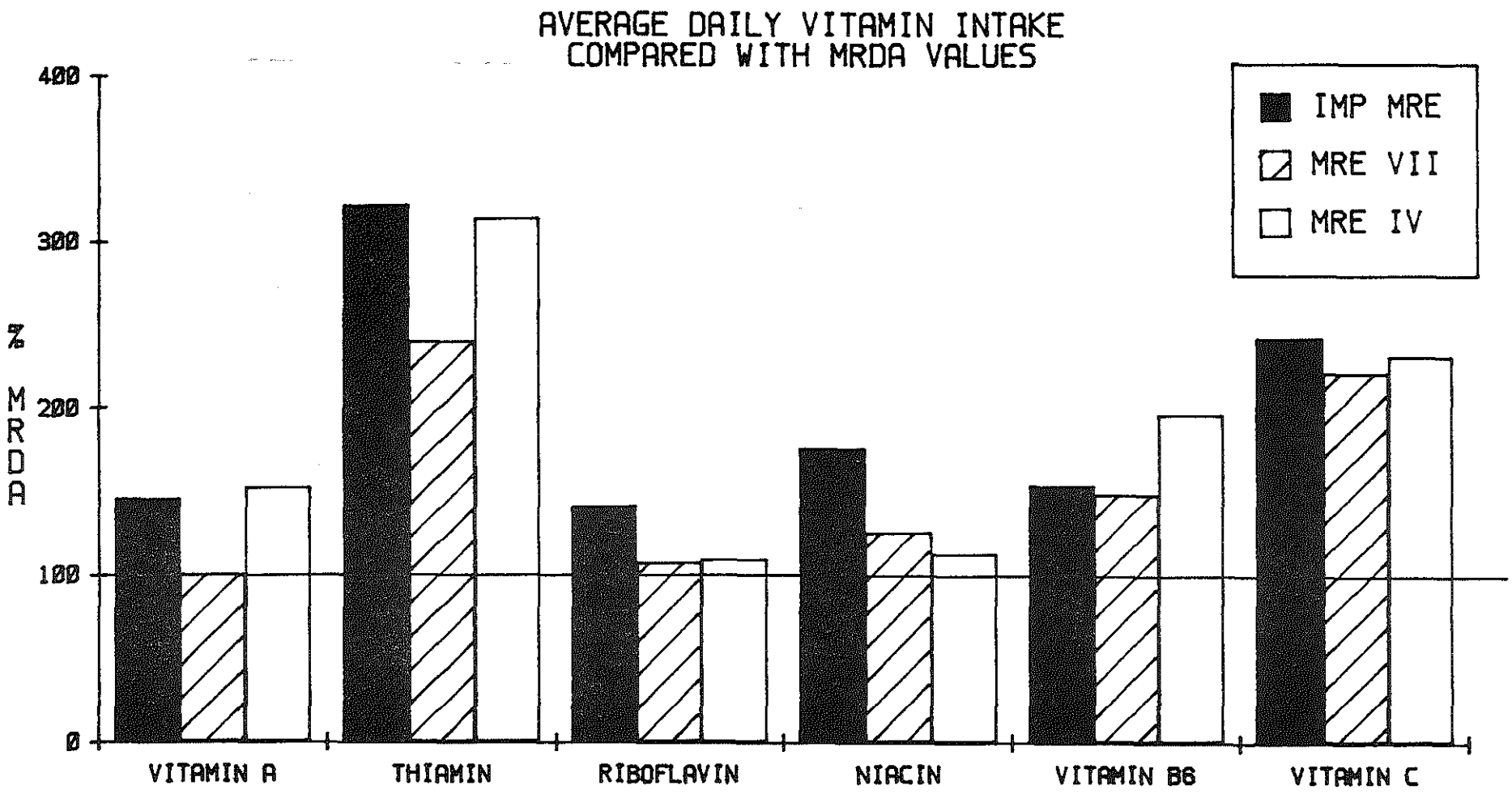

Figure 4. Average daily vitamin intakes by MRE groups compared with MRDA values.

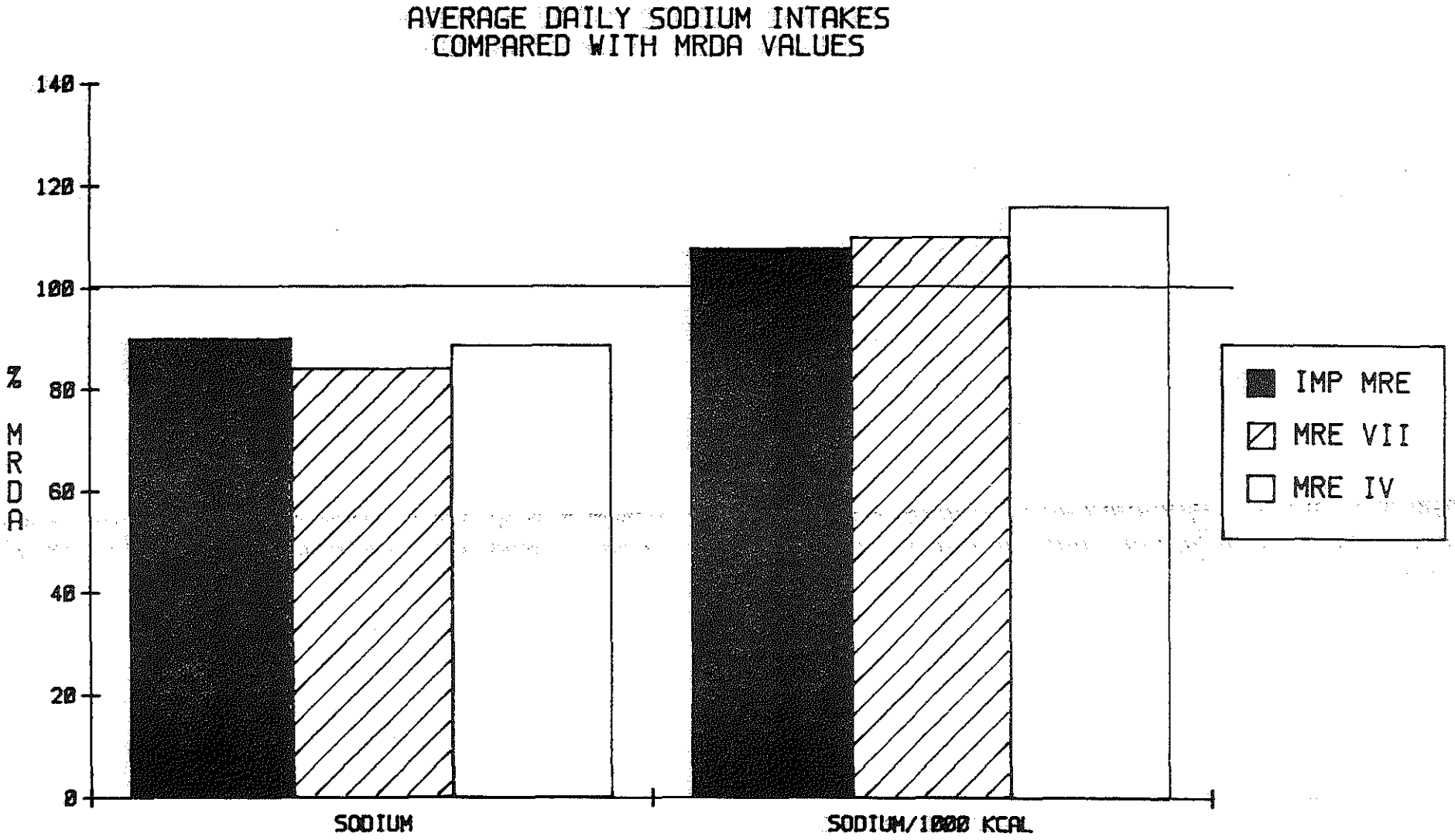

Figure 5. Average daily sodium intake by MRE groups compared with MRDA values.

Other minerals. Table 6 shows the intakes of iron, calcium, phosphorus, and magnesium. Figure 6 plots these values as percent of MRDA. All three rations met the required intake levels for iron and phosphorus, but failed to meet the intake requirements for magnesium and calcium. The latter deficiencies have been reported previously in field tests of the MRE I-V's.[1,2,3]

In addition to comparing the nutrient intakes to the MRDA, the nutrient intakes by the three ration groups were compared to each other. Table 7 shows the results of one-way ANOVA's conducted for each nutrient, followed by post hoc multiple comparisons (Student-Newman-Keuls, $p < .05$). A significant F-ratio was obtained for all but two nutrients. Table 7 shows, as reported above, that the energy consumption of the Improved MRE group was significantly above that of the other two groups, which did not differ from each other. Differences between the rations on the other nutrients reflect in part the differences in overall energy consumption and the differences in composition of the rations. Among the MRDA's, the percent calories from fat was the only criterion other than energy intake where the rations differed significantly and the Improved MRE clearly met the MRDA and the other rations did not.

Hydration Status

Hydration status reflects the balance between the amount of body water lost in sweat, urine, feces, and expired air and the total amount of water consumed from food, plain water and other beverages. Urine specific gravity is a measure of the concentration of electrolytes and other solutes in the urine, and is used as an indicator of hydration status. Specific gravities above 1.030 are considered elevated, indicating that the individual is not optimally hydrated. Variations in specific gravity below this criterion indicate changes in hydration status, but are considered within the normal range. Fully hydrated individuals have urine specific gravities in the range of 1.020 - 1.022.

Figure 7 plots the average urine specific gravities at baseline and during the test for each ration group. The figure shows that at no time during the study does the average specific gravity exceed the 1.030 criterion for any of the ration groups. However, on any given day, there were individuals who exceeded this criterion. Figure 8 plots the incidence of urine specific gravities that are above the criterion value of 1.030 for each day of the study.

Figures 7 and 8 show that the companies differed slightly in their urine specific gravity at baseline. An ANOVA ($F(2,313) = 3.2$, $p < .05$) showed that this difference for average specific gravity was statistically significant, although Student-Newman-Keuls post hoc tests showed that the only significant ($p < .05$) pairwise difference was between the Improved MRE and the MRE IV groups. It should be noted that at the time the baseline urine samples were taken, the MRE IV group had already been deployed to Hawaii and was subsisting on two T Rations and one MRE, along with other nonissued foods. The other two groups were still at Schofield Barracks and were subsisting on garrison rations or other foods. This difference may have contributed to the somewhat more concentrated urines noted in the MRE IV group at baseline.

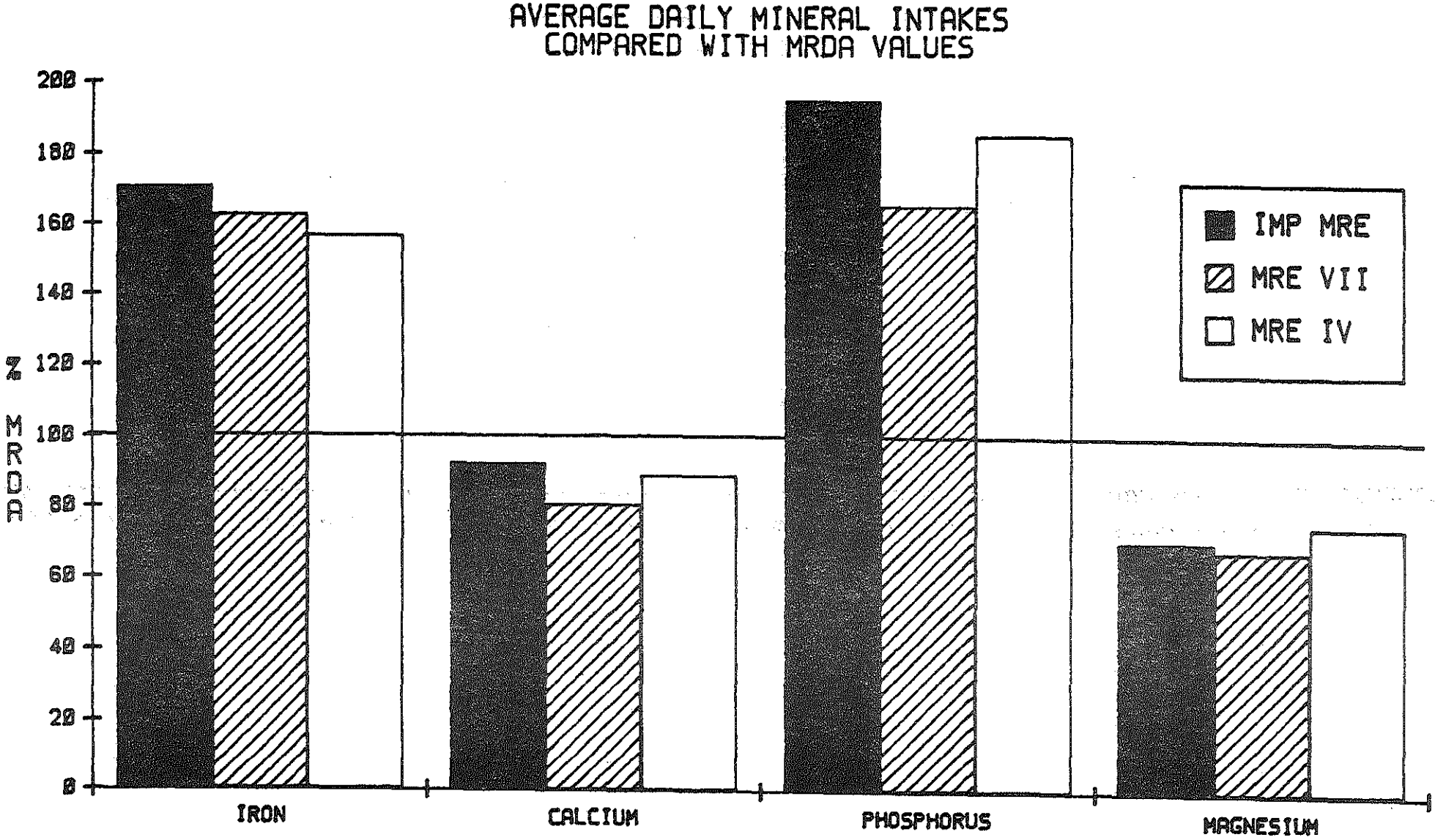

Figure 6. Average daily mineral intakes by MRE groups compared with MRDA values.

TABLE 7

Comparison's Between Ration Groups in Average Daily Nutrient Intakes

NUTRIENT	(1) IMP MRE	(2) MRE VII	(3) MRE IV	GROUP COMPARISONS (1)vs(2)	(1)vs(3)	(2)vs(3)	OVERALL F
Energy (kcal)	2842	2517	2517	*	*		12.5
Protein (g)	106	107	97		*	*	6.0
Fat (g)	104	106	118		*	*	9.9
Carbohydrate (g)	374	288	268	*	*	*	68.1
Vitamin A (mcg RE)	1439	1021	1538	*		*	31.9
Thiamin (mg)	5.15	3.86	5.04	*		*	27.0
Riboflavin (mg)	2.73	2.07	2.07	*	*		53.3
Niacin (mg)	36.73	26.42	23.71	*	*	*	97.0
Vitamin B_6 (mg)	3.37	3.30	4.34		*	*	23.4
Vitamin C (mg)	146	133	140				NS
Sodium (mg)	4966	4645	4904				NS
Potassium (mg)	2783	2294	2551	*	*	*	16.8
Iron (mg)	17.1	16.3	15.7		*		4.5
Calcium (mg)	739	648	713	*		*	6.6
Phosphorus (mg)	1564	1334	1491	*		*	12.6
Magnesium (mg)	249	241	266			*	4.0
Protein Calories (%)	15.2	17.4	15.9	*	*	*	25.5
Fat Calories (%)	32.6	37.7	42.1	*	*	*	204.5
CHO Calories (%)	52.5	45.3	42.4	*	*	*	177.7
Sodium (mg/1000kcal)	1762	1866	1980	*	*	*	10.3

NOTE:

Overall F based on one-way ANOVA. All F-ratios significant at $p < .05$ or beyond unless noted as not significant (NS). Group comparisons based on Student-Newman-Keuls post hoc tests. * indicates significant difference at $p < .05$.

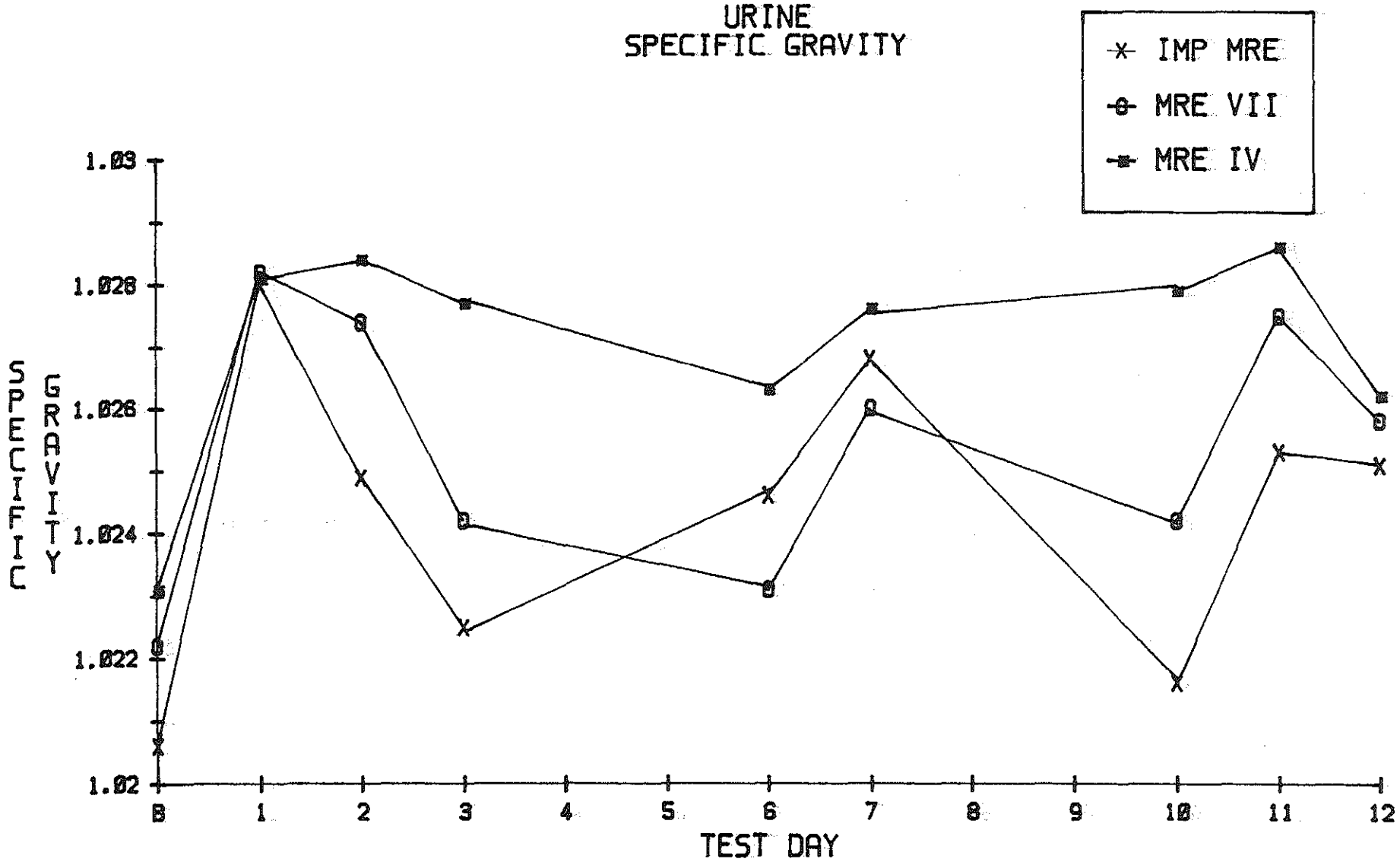

Figure 7. Average urine specific gravity for MRE groups.

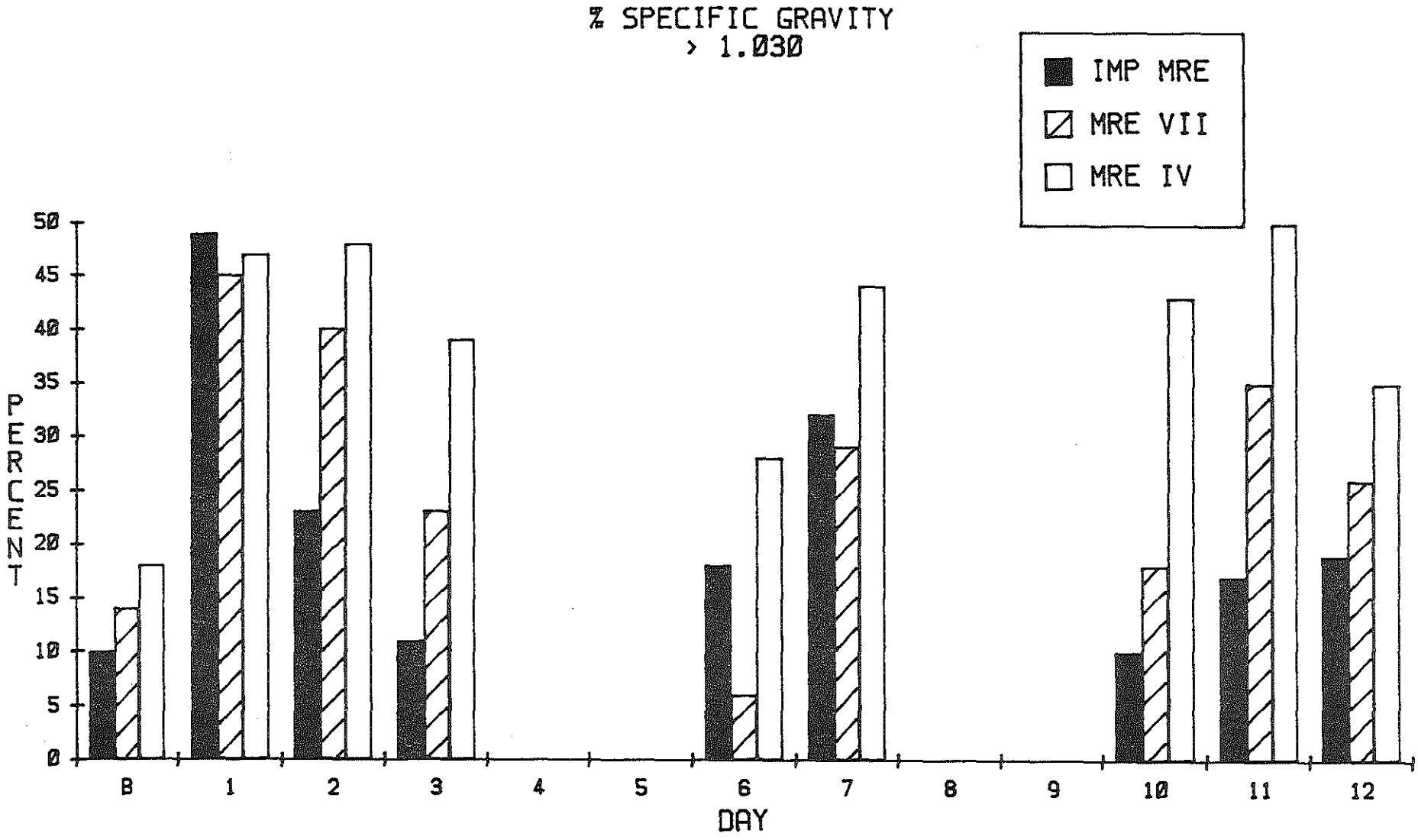

Figure 8. Incidence of urine specific gravity > 1.030 for MRE groups.

All three companies show a dramatic increase in urine specific gravity from baseline to Day 1, due to the effect of deployment. This sharp increase in urine concentrations may also be due to the fact that all three companies ate the MRE IV ration on the day of deployment. Figure 8 shows that on Day 1, approximately 50% of each ration group is above 1.030 in specific gravity. The effect of deployment is evident again in the increase from Day 10 to Day 11 in the average specific gravities for the Improved MRE and MRE VII groups, who deployed to PTA on Day 10. A similar effect for the MRE IV group is not evident in the data, since that MRE IV group deployed to PTA on Day 7 and urine samples were not collected on the immediately following days. (The reason for the increase in average specific gravity from Day 6 to 7 in all companies is not known.)

Figure 7 shows that the temporal pattern in the level of specific gravity of the MRE IV group differs from that of the other two groups. Following Day 1, the average specific gravity of the Improved MRE and MRE VII groups fluctuates up and down, whereas that of the MRE IV group remains elevated and at approximately the high level of Day 1.

Table 8 shows the incidence of urine specific gravities above 1.030, computed for the days on which this measure can be expected to show the effect of the test rations (Days 2, 3, 6, 7, 10, 11 and 12). Over this time period, 19% of the Improved MRE group and 25% of the MRE VII group were above the 1.030 criterion, compared to 41% of the MRE IV group. The differences in frequencies between MRE IV and the other two rations were highly significant ($p < .0001$), with chi-square values (1 d.f.) of 92.4 (Improved MRE vs. MRE IV) and 39.9 (MRE VII vs. MRE IV). The difference between the Improved MRE and MRE VII, although slight, was also significant (chi-square (1 d.f.) = 9.8, $p < .01$). Overall, these results indicate a greater incidence of elevated specific gravities and potential dehydration in the MRE IV group than in the other two groups.

In order to determine the extent to which differences in water intake can account for differences in hydration status, the total amount of water consumed by each person was computed. Total water intake for each person is composed of intake from three sources: the water contained in the food, the water added to the food or beverage powders in the ration, for purposes of rehydration, and the amount of plain water consumed. Table 9 shows the average daily water intake from each source and the total water intake, and Figure 9 plots the total water intake by day.

The group differences in water intake from each source are consistent with the differences between the rations. The Improved MRE contains more water than the MRE VII and MRE IV (see Appendix B), and Table 9 shows that this group derived more water from their food than the other two groups. The MRE IV group added the least amount of water to their food (MRE IV does not have the fruit-flavored beverages), but drank more plain water. A statistical analysis (ANOVA) of the differences among ration groups in total water intake resulted in an overall statistically significant F-ratio ($F(2,333) = 12.0$, $p < .0001$). Student-Newman-Keuls post hoc tests ($p < .05$) showed that the Improved MRE consumed significantly more water than either the MRE VII or MRE IV groups. The MRE VII and MRE IV groups did not differ significantly from each other.

TABLE 8

Incidence of Urine Specific Gravities Above and Below 1.030 by MRE Groups

	IMPROVED MRE	MRE VII	MRE IV
URINE SPECIFIC GRAVITY ≤ 1.030	81% (640)*	75% (532)	59% (443)
URINE SPECIFIC GRAVITY > 1.030	19% (146)	25% (181)	41% (309)

* Numbers in parentheses are frequencies.

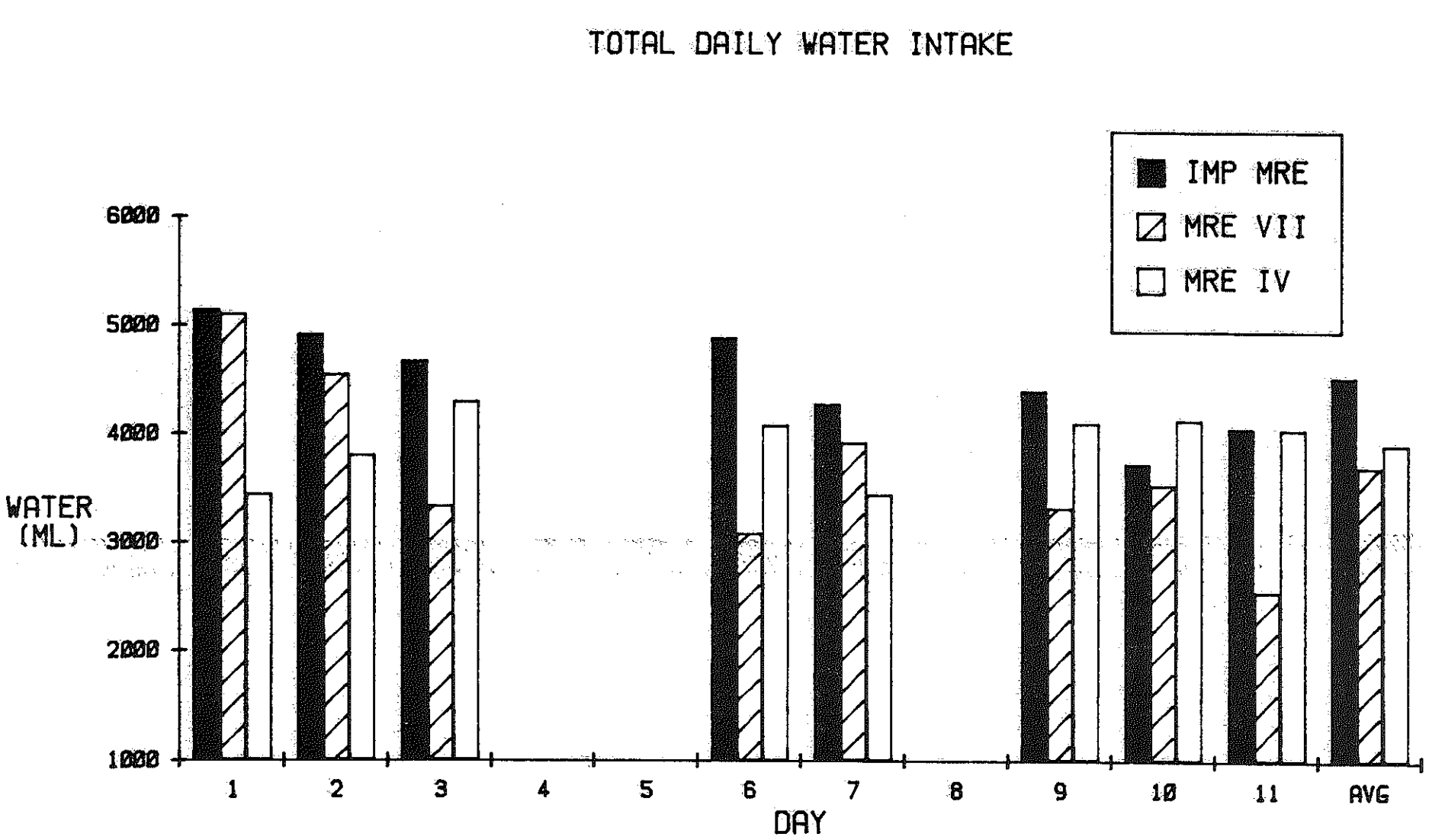

Figure 9. Total daily water intake (mL) by MRE groups.

TABLE 9

Average Daily Water Intake (mL) by MRE Groups

	IMPROVED MRE	MRE VII	MRE IV
WATER FROM FOOD	607 (12.2)*	365 (9.3)	305 (7.7)
WATER ADDED TO RATION	1257 (62)	864 (50)	576 (48)
PLAIN WATER INTAKE	2610 (108)	2502 (96)	3014 (105)
TOTAL WATER INTAKE	4474 (115)	3731 (118)	3895 (129)

* Numbers in parentheses are standard errors.

The total water intakes are somewhat inconsistent with the pattern of results on urine specific gravity. Since the Improved MRE and the MRE VII groups had similar urine specific gravities, one might have expected their total water intake to be more similar. However, the MRE VII group reported consuming less water than the Improved MRE or the MRE IV group.

Several factors may account for this apparent discrepancy. The MRE VII group, unlike the other two groups, conducted frequent night operations. Because it was cool at night, the MRE VII group probably lost less water through sweating and therefore needed to consume less water to maintain adequate hydration than the other two groups. Thus, even with lower water intake, the MRE VII group could have urine concentrations that were similar to those of a group consuming more water (Improved MRE) and dissimilar to those of a group consuming a very similar amount of water (MRE IV).

In addition, estimates of water consumption, in terms of the number of canteen cups of water added to the food or beverage base or the number of quarts of plain water consumed, are difficult to make under the best conditions. It is possible that this judgment is even more difficult to make at night; under these conditions, the MRE VII group may have underestimated their water intake or recorded it less faithfully.

Food Acceptance

Tables 10, 11, and 12 list the mean acceptance ratings of each ration item and the standard errors of the mean (SEM) for the Improved MRE, MRE VII and MRE IV, respectively. The averages reflect the acceptance of the items consumed on the days that acceptance ratings were solicited (Days 3, 7, and 10) and are based on data from all three days.

Table 10 shows that the items in the Improved MRE were uniformly rated highly by the troops. No item was rated below 6.0 on the 9-point scale. A rating of 6.0 indicates that the item was liked slightly. Examination of Tables 11 and 12 reveals that there were many items in both MRE VII and MRE IV that were rated below 6.0, and in the case of MRE IV some items were rated below 5.0, the neutral point of the scale.

In order to compare the acceptance ratings of the three rations more formally, the average acceptance ratings for the major food groups were computed and are shown in Table 13, along with the results of ANOVA's and post hoc analyses where appropriate. The average rating of entrees for the Improved MRE was 7.6, for MRE VII 6.8, and for MRE IV 5.7. An analysis of variance of the acceptance ratings of the entrees yielded a highly significant overall effect ($F(2,332) = 67.9$, $p < .0001$). Post hoc multiple comparisons (Student-Newman-Keuls, $p < .05$) indicated that the three averages all differed significantly from each other.

Table 10 shows that among the new entrees in the Improved MRE, several of the new meat/starch combinations, namely pork BBQ with rice, chicken with rice, and spaghetti with meat sauce received average ratings close to or greater than 8.0. The one fish item, tuna with noodles, was also very well received (average rating 8.1). The lowest rated entree in the Improved MRE was corned beef hash, one of the breakfast entrees (average rating 6.5). This result may reflect the item's reduced

TABLE 10

Acceptance Ratings of Improved MRE
(9-Pt. Scale, 9 = Like Extremely)

ENTREES	MEAN	SEM
PORK BBQ W/RICE*	8.4	0.12
CORNED BEEF HASH*	6.5	0.25
CHICKEN STEW*	7.4	0.21
HAM OMELET	7.1	0.22
SPAGHETTI W/MEAT SAUCE*	8.1	0.12
BEEF STEW*	7.2	0.20
CHICKEN A LA KING*	7.1	0.20
HAM SLICES	7.9	0.15
MEATBALLS W/RICE IN TOMATO SAUCE*	7.2	0.25
TUNA W/NOODLES*	8.1	0.12
CHICKEN W/RICE*	7.9	0.16
ESC. POTATOES W/HAM CHUNKS*	7.7	0.16
STARCHES		
CRACKERS	7.3	0.09
POTATOES AU GRATIN	7.7	0.17
SPREADS		
CHEESE SPREAD	7.8	0.10
JELLY	7.8	0.12
PEANUT BUTTER	7.3	0.14
FRUITS		
APPLESAUCE	8.2	0.10
FRUIT MIX	8.3	0.13
PEACHES	8.4	0.11
PEARS	8.4	0.13
PINEAPPLE	8.4	0.16
DESSERTS		
BROWNIE	7.6	0.15
CHERRY NUT CAKE	7.3	0.22
CHOCOLATE-COVERED COOKIE	8.0	0.12
MAPLE NUT CAKE	6.5	0.26
CHOCOLATE NUT CAKE	8.0	0.17
OATMEAL COOKIE BAR	7.3	0.17

TABLE 10

Acceptance Ratings of Improved MRE (Continued)

BEVERAGES	MEAN	SEM
COCOA	8.4	0.08
COFFEE	7.8	0.16
CHERRY FLAVORED BEVERAGE	8.4	0.13
GRAPE FLAVORED BEVERAGE	8.3	0.11
LEMON-LIME FLAVORED BEVERAGE	8.3	0.08
ORANGE FLAVORED BEVERAGE	8.3	0.12
CANDY		
TOOTSIE ROLL	8.7	0.09
VANILLA CARAMEL	8.2	0.18
M&M'S	8.9	0.08
OTHER		
HOT SAUCE	8.6	0.09

* 8-oz. entree

TABLE 11

Acceptance Ratings of MRE VII
(9-Pt. Scale, 9 = Like Extremely)

ENTREES	MEAN	SEM
BEEF W/BBQ SAUCE*	5.8	0.25
BEEF W/GRAVY*	6.4	0.28
BEEF W/SPICED SAUCE*	6.7	0.22
BEEF PATTIES	6.5	0.27
BEEF STEW*	7.6	0.22
CHICKEN A LA KING*	6.6	0.23
FRANKFURTERS	7.2	0.22
HAM/CHICKEN LOAF	4.9	0.39
HAM SLICES	7.7	0.21
MEATBALLS W/BBQ SAUCE*	6.5	0.24
PORK SAUSAGE PATTIES	6.6	0.25
TURKEY W/GRAVY*	7.6	0.17
STARCHES		
CRACKERS	7.2	0.09
BEANS W/TOMATO SAUCE	6.2	0.18
SPREADS		
CHEESE SPREAD	7.9	0.13
JELLY	7.5	0.17
PEANUT BUTTER	6.8	0.14
FRUITS		
APPLESAUCE	8.0	0.17
MIXED FRUITS	7.4	0.18
PEACHES	7.6	0.15
PEARS	7.7	0.15
DESSERTS		
BROWNIE	7.2	0.17
CHERRY NUT CAKE	7.4	0.22
CHOCOLATE-COVERED COOKIE	8.2	0.09
FRUITCAKE	7.2	0.25
MAPLE NUT CAKE	7.4	0.22
ORANGE NUT CAKE	5.0	0.40

TABLE 11

Acceptance Ratings of MRE VII (Continued)

BEVERAGES	MEAN	SEM
COCOA	7.6	0.17
COFFEE	8.3	0.31
CHERRY FLAVORED BEVERAGE	8.4	0.10
GRAPE FLAVORED BEVERAGE	8.3	0.09
LEMON-LIME FLAVORED BEVERAGE	7.9	0.12
ORANGE FLAVORED BEVERAGE	8.0	0.13
CANDY		
CARAMEL	8.5	0.15
VANILLA FUDGE BAR	7.3	0.25
OTHER		
HOT SAUCE	8.2	0.18

* 8 oz. entree

TABLE 12

Acceptance Ratings of MRE IV
(9-Pt. Scale, 9 = Like Extremely)

ENTREES	MEAN	SEM
BEEF W/BBQ SAUCE	6.2	0.28
BEEF W/GRAVY	6.0	0.27
BEEF PATTIES	6.2	0.29
BEEF STEW	6.2	0.22
CHICKEN A LA KING	4.4	0.31
FRANKFURTERS	5.8	0.24
HAM/CHICKEN LOAF OR CHICKEN LOAF	4.2	0.26
HAM SLICES	6.4	0.28
MEATBALLS W/BBQ SAUCE	6.1	0.26
PORK SAUSAGE PATTIES	6.3	0.25
TURKEY W/GRAVY	6.2	0.23
STARCHES		
CRACKERS	6.2	0.13
BEANS W/TOMATO SAUCE	5.8	0.19
POTATO PATTY	5.6	0.22
SPREADS		
CHEESE SPREAD	6.4	0.16
PEANUT BUTTER	6.4	0.18
JELLY	6.9	0.18
FRUITS		
APPLESAUCE	7.7	0.22
MIXED FRUITS	7.0	0.18
PEACHES	6.7	0.25
PEARS	7.1	0.26
DESSERTS		
BROWNIE	6.3	0.21
CHERRY NUT CAKE	5.7	0.26
CHOCOLATE-COVERED COOKIE	7.5	0.15
FRUITCAKE	5.6	0.36
MAPLE NUT CAKE	6.2	0.28
ORANGE NUT CAKE	5.0	0.38
CHOCOLATE NUT CAKE	7.7	0.21
PINEAPPLE NUT CAKE	5.4	0.42

TABLE 12

Acceptability Ratings of MRE IV (Continued)

BEVERAGES	MEAN	SEM
COCOA	7.9	0.11
COFFEE	7.3	0.22
CANDY		
CHOCOLATE FUDGE BAR	6.8	0.28
CARAMEL	7.3	0.58
VANILLA FUDGE	7.1	0.38
CHOCOLATE TOFFEE BAR	6.7	0.58

TABLE 13

Acceptance Ratings of MRE by Food Group
(9 Pt. Scale, 9 = Like Extremely)

	(1) IMP MRE	(2) MRE VII	(3) MRE IV	GROUP COMPARISONS (1)vs(2)	(1)vs(3)	(2)vs(3)	OVERALL F
ENTREES	7.6 (0.09)	6.8 (0.11)	5.7 (0.14)	*	*	*	67.9
STARCHES	7.4 (0.13)	7.0 (0.12)	6.0 (0.15)	*	*	*	27.2
SPREADS	7.7 (0.10)	7.4 (0.13)	6.6 (0.15)		*	*	19.6
FRUITS	8.3 (0.08)	7.5 (0.16)	6.9 (0.20)	*	*	*	23.3
DESSERTS	7.4 (0.14)	7.4 (0.11)	6.5 (0.15)		*	*	14.9
FRUIT BEVERAGES	8.3 (0.10)	8.2 (0.09)	X				NS
OTHER BEVERAGES	8.2 (0.12)	7.5 (0.20)	7.6 (0.14)	*	*		6.5
CANDY	8.6 (0.08)	7.8 (0.19)	6.8 (0.25)	*	*	*	30.2

NOTE:

Numbers in parentheses are standard errors. Overall F based on one-way ANOVA. All F ratios significant at $p < .05$ or beyond unless noted as not significant (NS). Group comparisons based on Student-Newman-Keuls post hoc tests. * indicates significant difference at $p < .05$.

acceptability when eaten cold. Heating of the ration was limited by lack of heat tabs and restrictions on open flames. The corned beef hash, when cold, contains chunks of congealed fat that may lower its acceptability.

The Improved MRE contained new "wet-pack" fruits. Table 13 shows that these fruits were well received (average rating = 8.3) and were rated significantly higher than the dehydrated fruits in the other two rations. The MRE VII and MRE IV contain the same fruit components and the difference in acceptance (7.5 vs. 6.9), though significant, is much smaller. Table 13 also shows that the fruit-flavored beverages, contained in MRE VII and MRE IV, were very well liked (average ratings of 8.3 and 8.2).

Tables 11 and 12 show the individual entree ratings for the MRE VII and MRE IV. While the entrees in the two rations are identical in name, in 7 out of 12 cases the portion sizes in MRE VII are larger than in MRE IV. The increase in portion size may have contributed to the higher acceptance of some entrees in the MRE VII compared to MRE IV. For the 8-oz. entrees in MRE VII, the average rating was 6.8 compared to the average rating of 5.9 for the equivalent 5-oz entrees in MRE IV. However, a similar difference in acceptance (6.7 vs. 5.7) distinguishes the entrees with identical portion sizes in the two rations, suggesting that portion size alone was not responsible for the difference in ratings.

There are several other factors that may have contributed to these differences. Changes in manufacturer or the difference in the age (months of storage) of an item may have affected the acceptability of entrees as well as other items. For example, a number of comments were made by soldiers in the MRE VII group about the improved quality of the crackers and the cheese spread compared to MRE IV. While the product specifications for these items have not changed, the supplier for the cheese has changed and the crackers are fresher. Troops appear to be quite sensitive to these differences. The same considerations apply in comparing ration items in the Improved MRE to items with the same names in the other MRE versions.

Finally, it should be noted that the acceptance ratings may reflect, in part, the troops' overall opinion of the ration, in addition to their acceptance of particular items. The successful modifications to MRE IV incorporated into the Improved MRE and MRE VII may have produced a "halo effect" that has increased the acceptance ratings of even those items that have changed little from MRE IV.

Food Consumption by Food Group

Table 14 shows the consumption rate and the calories derived from the consumption of each food group. Consumption rate is calculated by comparing the number of portions consumed to the number of portions issued. The number of portions issued was derived from estimates of the number of MREs supplied to each company and from the known frequencies with which food groups appear in the rations. Because the frequency of individual items in a food group was not known precisely in every case, the results are presented for food groups instead of for the items in a group.

TABLE 14

Consumption of Improved MRE, MRE VII, and MRE IV by Food Group

	IMPROVED MRE	MRE VII	MRE IV
ENTREES			
Consumption Rate*	.87	.78	.84
Calories (kcal)	769	650	510
STARCHES			
Consumption Rate	.72	.72	.67
Calories (kcal)	466	494	542
SPREADS			
Consumption Rate	.63	.60	.68
Calories (kcal)	297	333	351
FRUITS			
Consumption Rate	.86	.69	.73
Calories (kcal)	148	96	71
DESSERTS			
Consumption Rate	.80	.68	.71
Calories (kcal)	532	491	614
FRUIT BEVERAGES			
Consumption Rate	.73	.71	NA
Calories (kcal)	296	258	NA
OTHER BEVERAGES			
Consumption Rate	.32	.15	.39
Calories (kcal)	178	100	274
CANDY			
Consumption Rate	.72	.84	.58
Calories (kcal)	124	88	123

* Consumption rate = ratio of the number of portions consumed to the number of portions issued.

Large differences in energy intake among the three rations occur in the case of two food groups: fruit-flavored beverages and entrees. The Improved MRE and MRE VII derive 296 kcal and 258 kcal, respectively, from the consumption of fruit-flavored beverages. MRE IV contains no fruit-flavored beverages. However, the MRE IV group derived more calories from the other beverages than did the Improved MRE and MRE VII.

In the case of entrees, the Improved MRE group derived 769 kcal on average, compared to the 650 kcal for MRE VII and 510 kcal for MRE IV. It should be noted, however, that the consumption rate of entrees in the Improved MRE is approximately the same as that for MRE IV. Therefore, the difference in calories consumed between Improved MRE and MRE IV is primarily due to the difference in the size of the entree portions.

Increasing the portion size of the MRE IV entrees, as was done in 7 out of 12 menus of MRE VII, increased the calorie intake due to entrees somewhat (from 510 to 650). However, the lower consumption rate by the MRE VII group compared to the Improved MRE group prevented the calorie intake derived from entrees from reaching the Improved MRE level.

Troop Opinions of the Rations

Final questionnaires were received from 118 (Improved MRE), 109 (MRE VII) and 106 (MRE IV) respondents. Results were statistically analyzed using t-tests, chi-square tests, or ANOVA's followed by post hoc multiple comparisons (Student-Newman-Keuls). The level of statistical significance was set at .05 throughout.

Overall ratings of the rations. Table 15 shows the average ratings of the taste, appearance, amount, and variety of the three rations. On all aspects, the Improved MRE is rated highest, the MRE VII second, and the MRE IV lowest (ANOVA, followed by Student-Newman-Keuls). Average ratings of the MRE IV are significantly below 4.0 (by t-test), the "neutral" point of the scale, whereas the ratings of the other two versions of this ration were above the neutral point. The Improved MRE was rated at least one scale unit above MRE VII and two to three scale units above MRE IV.

Ratings of the amount of food in the rations. Respondents were asked whether they got enough to eat during the exercise or whether they were hungry. Table 16 shows the distribution of the responses for the three companies. In the Improved MRE group, 56% reported getting enough to eat; in the MRE VII and MRE IV groups, the percentages were 36% and 16%, respectively. Average 4-point scale ratings differed significantly between all three companies (ANOVA, followed by Student-Newman-Keuls).

Ratings of portion size by food group. Table 17 shows portion size ratings by food group. Respondents used a scale that ranged from 1 = "much too small" to 7 = "much too large". The entree portions of the Improved MRE were rated 3.8, which does not differ statistically from 4.0 (portion size "just right"); the entree portions of the MRE VII and MRE IV were rated 3.1 and 2.3, respectively, corresponding approximately to "somewhat too small" and "moderately too small". Average ratings of entree portion sizes differed significantly among the three companies (ANOVA, followed by Student-Newman-Keuls).

TABLE 15

Overall Ratings of MRE's
(7 Pt. Scale, 7 = Very Satisfied)

	IMPROVED MRE	MRE VII	MRE IV
TASTE	6.2	4.9	3.4
APPEARANCE	5.6	4.2	3.1
AMOUNT	5.9	4.3	2.9
VARIETY	5.4	3.6	3.0

TABLE 16

Ratings by MRE Groups of Degree of Hunger

	% RESPONDENTS		
	IMPROVED MRE	MRE VII	MRE IV
GOT ENOUGH TO EAT	56	36	16
WAS SOMETIMES HUNGRY	35	46	33
WAS OFTEN HUNGRY	5	12	25
WAS ALMOST ALWAYS HUNGRY	4	6	26

TABLE 17

Ratings of Portion Sizes in the MRE's
(7 Pt. Scale, 7 = Much Too Large)

	IMPROVED MRE	MRE VII	MRE IV
ENTREES	3.8	3.1	2.1
STARCHES	3.7	3.3	3.2
DESSERTS	3.2	2.5	2.7
FRUITS	3.3	2.8	2.4
SPREADS	3.5	2.8	2.8
DRINKS	3.4	3.1	2.1

The portion sizes of starches, desserts, fruits and spreads were rated more satisfactory in the Improved MRE than in the other two rations, which did not differ significantly from each other (ANOVA, followed by Student-Newman-Keuls). Many of the portion sizes of items in these food groups are the same in all three versions of the ration. The higher ratings by the Improved MRE group may therefore reflect the general perception that the Improved MRE is a better ration rather than differences in the portion sizes of these components.

The ratings of the amount of drinks did not differ statistically between the Improved MRE (average rating = 3.4) and MRE VII (average rating = 3.1), which both contained fruit-flavored beverages, but both ratings significantly exceeded the average rating of the MRE IV group (2.1). This indicates that the MRE IV group, which did not have fruit drinks, was less satisfied with the amount of beverages in their ration than the others. However, even the Improved and MRE VII groups indicated by their ratings a desire for more beverages. In fact, when the MRE VII and Improved MRE groups were asked their opinion of the number of fruit drinks in their ration, 61% in the MRE VII group thought there were too few, and 44% in the Improved MRE group also thought there were too few drinks.

Ratings of variety by food group. Respondents were asked how satisfied they were with the variety in each of several food groups. Table 18 shows the average ratings, based on a 4-point scale, where lower numbers indicate a greater satisfaction with existing variety (1 = "variety now enough, 4 = "should be much more variety"). The variety of entrees, desserts, fruits, and spreads was rated more satisfactory by the Improved MRE group than by the other two groups, whose menus have many items in common and which did not differ significantly in their ratings of the variety of these components (ANOVA, followed by Student-Newman-Keuls). Variety of drinks was rated differently by all three companies. The MRE IV group, which received only cocoa and coffee and no fruit drinks, indicated the strongest desire for more beverage variety. Ratings of variety of starches and condiments did not differ among the three groups.

Ratings of individual food items. Respondents were asked to rate, on a 9-point scale, the acceptability of each food and beverage in the ration they consumed. The average ratings for each item are shown in Tables 19, 20, and 21 for the Improved MRE, MRE VII and MRE IV, respectively.

These ratings tend to be lower than the ratings reported in Tables 10-12. One possible reason for this difference is that the ratings in Tables 10-12 were based on individuals who had chosen to consume the items they rated. On the final questionnaire, every person rated nearly every item, including those that he did not like and would not have consumed more than a few times.

Despite the differences in the overall levels of the ratings, the relative standings of items within a ration and the differences among rations are similar to those noted earlier. The entrees in the Improved MRE were rated significantly higher than the entrees in MRE VII and MRE IV (ANOVA, followed by Student-Newman-Keuls). The wet-pack fruits in the

The portion sizes of starches, desserts, fruits and spreads were rated more satisfactory in the Improved MRE than in the other two rations, which did not differ significantly from each other (ANOVA, followed by Student-Newman-Keuls). Many of the portion sizes of items in these food groups are the same in all three versions of the ration. The higher ratings by the Improved MRE group may therefore reflect the general perception that the Improved MRE is a better ration rather than differences in the portion sizes of these components.

The ratings of the amount of drinks did not differ statistically between the Improved MRE (average rating = 3.4) and MRE VII (average rating = 3.1), which both contained fruit-flavored beverages, but both ratings significantly exceeded the average rating of the MRE IV group (2.1). This indicates that the MRE IV group, which did not have fruit drinks, was less satisfied with the amount of beverages in their ration than the others. However, even the Improved and MRE VII groups indicated by their ratings a desire for more beverages. In fact, when the MRE VII and Improved MRE groups were asked their opinion of the number of fruit drinks in their ration, 61% in the MRE VII group thought there were too few, and 44% in the Improved MRE group also thought there were too few drinks.

Ratings of variety by food group. Respondents were asked how satisfied they were with the variety in each of several food groups. Table 18 shows the average ratings, based on a 4-point scale, where lower numbers indicate a greater satisfaction with existing variety (1 = "variety now enough," 4 = "should be much more variety"). The variety of entrees, desserts, fruits, and spreads was rated more satisfactory by the Improved MRE group than by the other two groups, whose menus have many items in common and which did not differ significantly in their ratings of the variety of these components (ANOVA, followed by Student-Newman-Keuls). Variety of drinks was rated differently by all three companies. The MRE IV group, which received only cocoa and coffee and no fruit drinks, indicated the strongest desire for more beverage variety. Ratings of variety of starches and condiments did not differ among the three groups.

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Despite the differences in the overall levels of the ratings, the relative standings of items within a ration and the differences among rations are similar to those noted earlier. The entrees in the Improved MRE were rated significantly higher than the entrees in MRE VII and MRE IV (ANOVA, followed by Student-Newman-Keuls). The wet-pack fruits in the

TABLE 18

Ratings of Variety in the MRE's
(4 Pt. Scale, 4 = Should be Much More Variety)

	IMPROVED MRE	MRE VII	MRE IV
ENTREES	2.3	2.9	2.9
STARCHES	2.5	2.8	2.6
DESSERTS	2.4	2.9	2.8
FRUITS	2.2	2.7	2.7
SPREADS	2.2	2.8	2.8
DRINKS	2.1	2.5	3.3
CONDIMENTS	2.4	2.5	2.5

TABLE 19

Acceptance Ratings of Improved MRE Based on Final Questionnaire
(9-Pt. Scale, 9 = Like Extremely)

	MEAN	SEM
ENTREES		
PORK BBQ W/RICE	7.5	0.18
CORNED BEEF HASH	4.6	0.26
CHICKEN STEW	6.9	0.19
HAM OMELET	6.3	0.22
SPAGHETTI W/MEAT SAUCE	7.6	0.16
BEEF STEW	6.6	0.22
CHICKEN A LA KING	5.6	0.26
HAM SLICES	7.4	0.16
MEATBALLS W/RICE IN TOMATO SAUCE	6.6	0.23
TUNA W/NOODLES	7.6	0.19
CHICKEN W/RICE	7.5	0.17
ESC. POTATOES W/HAM CHUNKS	6.9	0.21
STARCHES		
CRACKERS	7.3	0.17
POTATOES AU GRATIN	6.1	0.27
SPREADS		
CHEESE SPREAD	7.1	0.19
JELLY	7.5	0.18
PEANUT BUTTER	6.8	0.20
FRUITS		
APPLESAUCE	7.9	0.15
FRUIT MIX	8.2	0.13
PEACHES	8.3	0.12
PEARS	8.2	0.15
PINEAPPLE	7.9	0.17
DESSERTS		
BROWNIE	6.7	0.22
CHERRY NUT CAKE	6.2	0.26
CHOCOLATE-COVERED COOKIE	7.8	0.17
MAPLE NUT CAKE	6.0	0.24
CHOCOLATE NUT CAKE	7.4	0.20
OATMEAL COOKIE BAR	7.2	0.22

TABLE 19

Acceptance Ratings of Improved MRE Based on Final Questionnaire
(Continued)

	MEAN	SEM
BEVERAGES		
COCOA	8.3	0.13
COFFEE	6.9	0.25
CHERRY FLAVORED BEVERAGE	8.2	0.16
GRAPE FLAVORED BEVERAGE	8.3	0.13
LEMON-LIME FLAVORED BEVERAGE	8.1	0.14
ORANGE FLAVORED BEVERAGE	8.2	0.13
CANDY		
TOOTSIE ROLL	8.6	0.10
VANILLA CARAMEL	8.4	0.12
M&M'S	8.7	0.09

TABLE 20

Acceptance Ratings of MRE VII Based on Final Questionnaire
(9 Pt. Scale, 9 = Like Extremely)

	MEAN	SEM
ENTREES		
BEEF W/BBQ SAUCE	3.4	0.24
BEEF W/GRAVY	5.2	0.23
BEEF W/SPICED SAUCE	3.9	0.25
BEEF PATTIES	5.2	0.26
BEEF STEW	6.7	0.19
CHICKEN A LA KING	4.9	0.28
FRANKFURTERS	6.2	0.23
HAM/CHICKEN LOAF	2.4	0.21
HAM SLICES	6.7	0.23
MEATBALLS W/BBQ SAUCE	4.7	0.27
PORK SAUSAGE PATTIES	5.4	0.27
TURKEY W/GRAVY	7.0	0.21
STARCHES		
CRACKERS	7.1	0.16
BEANS W/TOMATO SAUCE	4.7	0.24
SPREADS		
CHEESE SPREAD	7.6	0.20
JELLY	6.6	0.22
PEANUT BUTTER	6.1	0.22
FRUITS		
APPLESAUCE	7.9	0.18
MIXED FRUITS	6.8	0.23
PEACHES	6.8	0.24
PEARS	7.0	0.30
DESSERTS		
BROWNIE	6.6	0.24
CHERRY NUT CAKE	5.6	0.28
CHOCOLATE-COVERED COOKIE	8.1	0.15
FRUITCAKE	4.5	0.28
MAPLE NUT CAKE	5.1	0.27
ORANGE NUT CAKE	3.3	0.26

TABLE 20

Acceptance Ratings of MRE VII Based on Final Questionnaire
(Continued)

	MEAN	SEM
BEVERAGES		
COCOA	6.7	0.21
COFFEE	5.8	0.29
CHERRY FLAVORED BEVERAGE	8.4	0.09
GRAPE FLAVORED BEVERAGE	8.2	0.11
LEMON-LIME FLAVORED BEVERAGE	7.6	0.17
ORANGE FLAVORED BEVERAGE	7.8	0.15
CANDY		
CARAMEL	7.8	0.17
VANILLA FUDGE BAR	7.0	0.23

TABLE 21

Acceptance Ratings of MRE IV Based on Final Questionnaire
(9 Pt. Scale, 9 = Like Extremely)

	MEAN	SEM
ENTREES		
BEEF W/BBQ SAUCE	5.2	0.22
BEEF W/GRAVY	5.1	0.23
BEEF PATTIES	5.3	0.24
BEEF STEW	5.2	0.22
CHICKEN A LA KING	2.6	0.20
FRANKFURTERS	5.1	0.24
HAM/CHICKEN LOAF	2.8	0.22
HAM SLICES	5.1	0.24
MEATBALLS W/BBQ SAUCE	6.0	0.23
PORK SAUSAGE PATTIES	5.4	0.28
TURKEY W/GRAVY	5.4	0.24
STARCHES		
CRACKERS	6.1	0.20
BEANS W/TOMATO SAUCE	4.9	0.23
POTATO PATTY	4.6	0.24
SPREADS		
CHEESE SPREAD	5.5	0.22
JELLY	6.9	0.18
PEANUT BUTTER	5.9	0.23
FRUITS		
APPLESAUCE	7.2	0.21
MIXED FRUITS	6.4	0.22
PEACHES	6.5	0.21
PEARS	7.0	0.23
DESSERTS		
BROWNIE	5.7	0.23
CHERRY NUT CAKE	4.4	0.24
CHOCOLATE-COVERED COOKIE	7.4	0.19
FRUITCAKE	4.0	0.25
MAPLE NUT CAKE	4.8	0.25
ORANGE NUT CAKE	3.3	0.23
CHOCOLATE NUT CAKE	6.7	0.21
PINEAPPLE NUT CAKE	4.3	0.27

TABLE 21

Acceptance Ratings of MRE IV Based on Final Questionnaire
(Continued)

	MEAN	SEM
BEVERAGES		
COCOA	7.6	0.15
COFFEE	5.9	0.26
CANDY		
CHOCOLATE FUDGE BAR	6.0	0.24
CARAMEL	7.2	0.19
VANILLA FUDGE	5.8	0.28
CHOCOLATE TOFFEE BAR	6.3	0.27

Improved MRE were rated significantly higher than the fruits in the MRE VII and MRE IV, and the fruit-flavored beverages, contained in the Improved MRE and MRE VII, were well liked.

Comments on the ration. Troops were asked to list foods, drinks, or condiments they would like added to the MRE. A wide range of items were mentioned, with little consensus except in two areas. Among the MRE IV group, 47% of the respondents mentioned that they would like a kind of fruit drink added to the ration. Although few comments on this point were made by the two groups already receiving the fruit drinks, it was noted earlier that both the MRE VII and Improved MRE groups indicated a desire for a greater number of drinks when asked directly about the amount of drinks.

A majority (59%) of the respondents in the MRE IV group mentioned that they would like hot sauce added to the ration. Among the MRE VII and Improved MRE groups, 17% and 10%, respectively, mentioned a desire for more hot sauce (hot sauce was included in three (MRE VII) or four (Improved MRE) menus). Another question on the final questionnaire asked these two groups directly about the quantity of hot sauce. Among the MRE VII group, 60% indicated that there was too little hot sauce, and among the Improved MRE group 45% indicated so also. In addition, pepper was a spice mentioned as a desirable additon by 38% (Improved MRE), 11% (MRE VII) and 16% (MRE IV) of the respondents.

When asked what items in the MRE should be dropped, a variety of items were mentioned. Table 22 lists the items in descending order of frequency of mention for each of the three ration groups. Items mentioned by fewer than 10% of the respondents are not listed.

Respondents were asked for any other comments on the MRE. Twenty-four percent of the Improved MRE group mentioned that the new MRE was an improvement over the old one. Comments praising MRE VII over the old MRE were made by only a few respondents.

Heating of ration components. Respondents were asked how often they heated the entree in the MRE. About 41% (Improved MRE), 86% (MRE VII), and 58% (MRE IV) of the respondents reported almost never heating their entree. One reason for the low frequency of heating is that the terrain in the Captain Cook training area contained an undergrowth that was very flammable, and therefore troops were warned against making a fire. The results on this question suggest that the MRE VII company commander may have been more concerned about the possibility of accidental fires than the others; he may also have limited the use of open flames for tactical reasons during the night operations conducted by his company.

The scarcity of heat tabs was perhaps the most significant factor in preventing heating of the entree. Troops in all three ration groups, when asked for comments on the MRE at the end of the questionnaire, suggested adding heat tabs to the ration. From the perspective of the troops, the facility to heat the food is an integral part of the ration. Present logistics handle heat tabs and rations separately, by direction of the OTSG.

TABLE 22

Items Respondents Wanted Dropped From the MRE's

A. IMPROVED MRE

ITEM	FREQUENCY	% MENTION
CHICKEN A LA KING	25	21
CORNED BEEF HASH	22	19

B. MRE VII

ITEM	FREQUENCY	% MENTION
HAM/CHICKEN LOAF	57	52
BEEF WITH BARBEQUE SAUCE	25	23
CHICKEN A LA KING	24	22
ORANGE NUT CAKE	17	16
MEATBALLS WITH BARBEQUE SAUCE	15	14
BEEF WITH SPICED SAUCE	13	12
PORK SAUSAGE PATTIES	13	12
BEEF PATTIES	12	11

C. MRE IV

ITEM	FREQUENCY	% MENTION
CHICKEN A LA KING	42	40
HAM/CHICKEN LOAF	40	38

Pouch stand. The Improved MRE contained a pouch stand for supporting a component packet during meal preparation and consumption. The Improved MRE group was nearly unanimous in rejecting the pouch stand as a useful item. Ninety-three percent said they almost never used the pouch stand, primarily because it did not seem worthwhile. Eighty-seven percent indicated that the pouch stand should not be included in the future.

DISCUSSION

The results of this study demonstrate that troops fed the Improved MRE consumed more food, lost a lower percentage of their initial body weight, drank more fluid, and found the components of their ration to be more acceptable than troops fed either MRE VII or MRE IV. In addition, troops fed the Improved MRE and MRE VII were better able to maintain their hydration status than troops fed MRE IV.

The energy intake of the Improved MRE group was approximately 325 kcal higher than that of the other two groups. However, this level of intake did not completely balance the troops' energy expenditure, and consequently even the Improved MRE group lost some weight.

Future changes to the Improved MRE may increase consumption beyond the level observed in this study. However, it is possible that the ration developer has reached the point of diminishing returns where additional improvements to the ration yield only small gains in consumption level.

A more promising approach to improving consumption calls for a more complete understanding of the factors which affect food intake in a field environment. Scrimshaw et al.[6] has shown that in a laboratory setting a group of student volunteers fed three MRE V's per day for 45 days did not lose weight and consumed nearly the same number of calories as a control group fed freshly prepared food. Average daily caloric intake for the MRE group in the laboratory was 3149 kcal, almost 1000 kcal above the level of troops eating MRE V for 34 days in the field.[1] In the laboratory study, students ate meals in a common dining room within scheduled time periods. Plates, glasses, and silverware were on the table prior to each meal. A microwave oven was available for heating components of the MRE, and hot and cold water were available for preparing beverages and rehydrating foods. The results of this study suggest that consumption in the field may be limited less by the nature of the ration than by the nature of the environment. Controlling the situational factors, for example by scheduling meal times and providing heating facilities, may have a greater impact on consumption in the field than any additional changes in ration attributes.

Situational factors should also be considered when comparing the calorie intake of troops subsisting solely on operational rations to the intake of troops fed either two A Rations and one MRE[1] or three A Rations.[7] In the latter study, troops on continuous operations for eight days consumed an average of 3713 kcal per day and gained about 1.7 lbs. When troops are fed A Rations, the food is prepared for them, served at a scheduled meal time, and served hot. The greater consumption of A Rations compared to operational rations may reflect as much the combined effect of several situational variables as any differences in the rations.

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APPENDICES

A. Menus and Components of Improved MRE, MRE VII and MRE I-V

B. Comparison of Nutrient Composition of Improved MRE, MRE VII and MRE I-V

C. Program Issues Specified by the Test and Evaluation Master Plan II for the Meal, Ready-To-Eat (MRE) Improvement Program

D. Data Collection Forms

MENUS AND COMPONENTS OF MEAL, READY-TO-EAT (MRE)
IMPROVED MRE

MENU 1	MENU 2	MENU 3	MENU 4	MENU 5	MENU 6	MENU 7	MENU 8	MENU 9	MENU 10	MENU 11	MENU 12
Pork w/Rice in BBQ	Corned Beef Hash	Chicken Stew	Ham Omlet	Spaghetti w/Meat Sauce	Chicken a la King	Beef Stew	Ham Slice	Meatballs w/rice	Tuna	Chicken w/rice	Ham Chunks w/Esc Pot
Applesauce	Pears	Peaches	Potato		Pineapple		Potato	Fruit Mix		Peaches	Applesauce
Jelly	Jelly	Peanut Butter	Cheese Spread	Cheese Spread	Peanut Butter	Peanut Butter	Jelly	Peanut Butter	Cheese Spread	Cheese Spread	Jelly
Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers
Candy	Oatmeal Cookie Bar	Candy	Oatmeal Cookie Bar	Maple Nut Cake		Cherry Nut Cake	Brownie	Choc Crvd Cookie	Chocolate Nut Cake	Choc Crvd Cookie	Brownie
Cocoa	Cocoa	Cocoa	Cocoa		Cocoa		Cocoa			Candy	Cocoa
Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd
Accessory Packet B	Accessory Packet A	Accessory Packet B	Accessory Packet A	Accessory Packet B	Accessory Packet A	Accessory Packet B	Accessory Packet A	Accessory Packet A	Accessory Packet A	Accessory Packet A	Accessory Packet A
Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon

ACCESSORY PACKET A		ACCESSORY PACKET B	
Coffee	Gum	Coffee	Hot Sauce
Cream Sub.	Matches	Cream Sub.	Gum
Sugar	Toilet Tissue	Sugar	Matches
Salt		Salt	Toilet Tissue

MENUS AND COMPONENTS OF MEAL, READY-TO-EAT (MRE)
MRE VII

Menu 1	Menu 2	Menu 3	Menu 4	Menu 5	Menu 6	Menu 7	Menu 8	Menu 9	Menu 10	Menu 11	Menu 12
Pork Patties	Ham & Chicken Loaf	Beef Patties	Beef Slices	Beef Stew	Frankfurters	Turkey Diced W/Gravy	Beef Dices in Gravy	Chicken a la King	Meatballs in BBQ Sauce	Ham Slices	Beef, Ground W/Spiced Sauce
Applesauce	Strawberries	Beans in Tomato Sauce	Peaches	Fruit Mix	Beans in Tomato Sauce	Strawberries	Peaches		Strawberries	Peaches	Strawberries
Cookies	Beans in Tomato Sauce	Brownies	Cookies	Cheery Nut Cake		Maple Nut Cake	Brownies	Fruitcake	Cookies	Orange Nut Cake	Cookies
Cheese Spread	Peanut Butter	Cheese Spread	Peanut Butter	Cheese Spread	Jelly	Jelly	Jelly	Cheese Spread	Peanut Butter	Cheese Spread	Peanut Butter
Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers
Cocoa					Cocoa	Cocoa	Cocoa	Cocoa	Cocoa	Cocoa	
Hot Pepper Sauce		Hot Pepper Sauce			Hot Pepper Sauce						
Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon
Accessory Packet D	Accessory Packet A	Accessory Packet B	Accessory Packet A	Accessory Packet A	Accessory Packet E	Accessory Packet A	Accessory Packet A	Accessory Packet A	Accessory Packet A	Accessory Packet A	Accessory Packet A
Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwd	Beverage Base, Pwed

ACCESSORY PACKETS

A	B	C	D	E
Coffee	Coffee	Coffee	Coffee	Coffee
Cream Subst	Cream Subst	Cream Subst	Cream Subst	Cream Subst
Sugar	Sugar	Sugar	Sugar	Sugar
Salt	Candy	Candy	Catsup	Candy
Chewing Gum	Soup & Gravy Base	Salt	Salt	Catsup
Matches	Salt	Chewing Gum	Chewing Gum	Salt
Toilet Tissue	Matches	Matches	Matches	Chewing Gum
	Toilet Tissue	Toilet Tissue	Toilet Tissue	Matches
				Toilet Tissue

Candies

Caramel Bar
Chocolate Fudge Bar
Chocolate W/Almonds
Vanilla Fudge Bar

MENUS AND COMPONENTS OF MEAL, READY-TO-EAT (MRE)
MRE IV

Menu 1	Menu 2	Menu 3	Menu 4	Menu 5	Menu 6	Menu 7	Menu 8	Menu 9	Menu 10	Menu 11	Menu 12
Pork Patties	Ham & Chicken Loaf	Beef Patties	Beef Slices	Beef Stew	Frankfurters	Turkey Diced W/Gravy	Beef Diced W/Gravy	Chicken a la King	Meatballs in BBQ Sauce	Ham Slices	Chicken Loaf Beef, Ground W/Spiced Sauce
Applesauce	Strawberries	Beans in Tomato Sauce	Peaches	Fruit Mix	Beans in Tomato Sauce	Potato Patties	Beans in Tomato Sauce		Potato Patties	Peaches	Strawberries
Cookies	Pineapple Nut Cake	Brownies	Cookies	Cherry Nut Cake		Maple Nut Cake	Brownies	Fruit Cake	Chocolate Nut Cake	Orange Nut Cake	Cookies
Cheese Spread	Peanut Butter	Cheese Spread	Peanut Butter	Peanut Butter	Jelly	Jelly	Cheese Spread	Cheese Spread	Jelly	Cheese Spread	Peanut Butter
Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers	Crackers
Cocoa Beverage Powder				Cocoa Beverage Powder	Cocoa Beverage Powder	Cocoa Beverage Powder		Cocoa Beverage Powder	Cocoa Beverage Powder	Cocoa Beverage Powder	
Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon	Spoon
Accessory Packet D	Accessory Packet A	Accessory Packet B	Accessory Packet C	Accessory Packet A	Accessory Packet E	Accessory Packet A	Accessory Packet A	Accessory Packet D	Accessory Packet A	Accessory Packet A	Accessory Packet C

ACCESSORY PACKETS

A	B	C	D	E	Candies
Coffee	Coffee	Coffee	Coffee	Coffee	Caramel Bar
Cream Subst	Cream Subst	Cream Subst	Cream Subst	Cream Subst	Chocolate Fudge Bar
Sugar	Sugar	Sugar	Sugar	Sugar	Chocolate W/Almonds
Salt	Candy	Candy	Catsup	Candy	Coconut Bar
Chewing Gum	Soup & Gravy Base	Salt	Salt	Catsup	Starch Nut Bars
Matches	Salt	Chewing Gum	Chewing Gum	Salt	Vanilla Fudge Bar
Toilet Tissue	Matches	Matches	Matches	Chewing Gum	
	Toilet Tissue	Toilet Tissue	Toilet Tissue	Matches	
				Toilet Tissue	

APPENDIX B

COMPARISON OF NUTRIENT COMPOSITION OF IMPROVED MRE, MRE VII AND MRE I-V

NUTRIENT	MEAN FOR 3 MEALS		
	IMPROVED MRE[a]	MRE VII[b]	MRE I-V[c]
Energy (kcal)	3939	4017	3669
Protein (gm)	135	152	130
Fat (gm)	146	162	167
Carbohydrate (gm)	522	487	412
Vitamin A (mcg RE)	2608	2068	2137
Thiamin (mg)	8.7	7.4	7.7
Riboflavin (mg)	3.9	3.1	3.0
Niacin (mg NE)	52	38	33
Vitamin B (mg)	6.3	5.7	5.8
Ascorbic Acid (mg)	267	297	228
Sodium (mg)	5853	6882	6516
Potassium (mg)	4092	4047	3846
Iron (mg)	26	25	23
Calcium (mg)	1062	1053	1053
Phosphorus (mg)	2244	2190	2130
Magnesium (mg)	387	405	393
Protein Calories (%)	14	15	14
Fat Calories (%)	33	36	41
CHO Calories (%)	53	49	45
Sodium (mg/1000 kcals)	1486	1905	1776
Water (ml)	732	496	394

[a] Natick Record of Nutrient Values 08/07/85

[b] Natick Record of Nutrient Values 09/09/85 plus beverage base added to each menu

[c] Natick Record of Nutrient Values 05/14/84

APPENDIX C

PROGRAM ISSUES SPECIFIED BY THE TEST AND EVALUATION MASTER PLAN II FOR THE MEAL, READY-TO-EAT (MRE) IMPROVEMENT PROGRAM

The MRE Improvement Program became an official recognized tasking in letters from the U.S. Army Troop Support Agency (22 June 1984) and the Office Deputy Chief of Staff, Logistics (31 July 1984). In October 1984, QMS was tasked by TRADOC to obtain concurrence from the Major Commands and Schools on the MRE Improvements identified below:

a. Increase number of menus from 12 to 18.

b. Increased entrees portion size.

c. Add a beverage pouch.

d. Increase weight a maximum of .28 pounds.

e. No duplication of menu items from other ration systems.

It should be noted that the major shortcoming of the currently fielded MRE (MRE I-V) is that troops do not eat a sufficient quantity of the food provided in the ration to maintain body weight. The following issues therefore are all critical:

a. Operational Issues:

O1 - Will troops engaged in similar activities and subsisting on only MRE VII or Improved MRE for 14-16 days consume more calories and lose less body weight than similar troops subsisting on only MRE I-V? Body weight is best maintained by which MRE ration?

Criteria: Troops subsisting on MRE VII or Improved MRE must consume more calories and lose less body weight ($p > 0.05$) than observed with MRE I-V.

O2 - Will troops engaged in similar activities and subsisting on only MRE I-V, MRE VII or Improved MRE for 14-16 days consume sufficient amounts of the rations to meet OTSG recommendations?

Criteria: Average daily nutrient consumptions of the MRE groups must satisfy the OTSG Military Recommended Dietary Allowances (MRDAs).

O3 - Will troops engaged in similar activities and subsisting on only MRE VII or Improved MRE for 14-16 days maintain a more satisfactory hydration status than similar troops subsisting on only MRE I-V? Hydration status is best maintained by which MRE ration?

Criteria: Troops subsisting on MRE VII or Improved MRE must consume more fluids and have lower urine specific gravities ($p < 0.05$) than observed with MRE I-V.

b. Technical Issues:

T1 - Will the addition of fruit-flavored beverage base to MRE VII and Improved MRE increase total daily fluid consumption? The total daily fluid consumption of the MRE VII and Improved MRE groups must be greater ($p > 0.05$) than the MRE I-V group.

T2 - Are the entree menu changes incorporated into Improved MRE effectively increasing calorie consumption from entrees?

Criteria: The selection rate, calorie consumption and hedonic ratings of entrees for Improved MRE must be greater ($p > 0.05$) than for the MRE I-V and MRE VII.

APPENDIX D

DATA COLLECTION FORMS

MRE TEST

Background Information

Please answer the following questions. Some of the information, such as name and social security number, is for our files. Other information, such as your age, ethnic group, and area you're from will be linked to questions we will ask you later about your food preferences. This information will then be used to help provide a combat ration that will meet everyone's needs as much as possible.

1. Your name: _____

2. Your social security number: _____

3. Your rank: E-_____ W-_____ O-_____

4. Your Company _____ Platoon _____

5. What was your age at your last birthday? _____

6. How long have you been in the Army? _____ years _____ months

7. What is your height? _____ ft _____ in

8. Are you currently trying to lose weight? Yes No

9. Which ethnic group do you belong to? (circle one number)

    1. American Indian/Alaskan Native
    2. Asian/Pacific Islander
    3. Black
    4. Hispanic
    5. White, not of Hispanic origin
    6. Other (please specify) _____

10. In what part of the country did you live the longest before age 16? (circle one number)

    1. New England (ME, NH, VT, MA, CT, RI)
    2. Middle Atlantic (NJ, NY, PA)
    3. South Atlantic (DE, MD, VA, WV, NC, SC, GA, FL, DC)
    4. North Central (OH, IN, IL, MI, WI, MN, IA, MO, ND, SD, NE, KS)
    5. South Central (KY, TN, AL, MS, AR, LA, OK, TX)
    6. Mountain (ID, WY, CO, MT, AZ, UT, NV)
    7. Pacific (WA, OR, CA, AK, HI)

WEIGHT CHECKLIST

PLEASE LEAVE BLANK
Code No.
Weight

NAME_____

SSN_____

In order to record your weight more accurately:

1. Please remove your equipment belt, helmet and ALL articles from your pockets (i.e. coins, keys, etc).

2. Please CHECK all items of clothing that you are NOW wearing. If you are wearing more than one of any of these items (i.e. 2 pairs of socks), please indicate HOW MANY.

Boots: Combat ____

Corcoran ____

Jungle ____

Socks: Wool ____ 1 pair ____ 2 pairs ____

Sport ____ 1 pair ____ 2 pairs ____

T-shirt ____

Shorts ____

BDU: Trousers ____

Shirt ____

Belt ____

Long John: Top ____

Bottom ____

Sleep shirt ____

Other: _____

_____

IMPROVED MRE

Day _____ Name _____ SSN _____ Code _____

RATION CONSUMPTION

Circle the number that indicates how much of each item you ate today. If you ate an amount that is not listed, write it on the line to the right.

ADDED WATER

How many canteen cups of water (1/4, 1/2, 3/4, 1, etc) did you add to each beverage you drank.

RATING OF FOOD

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

FOOD ITEM	CODE	AMOUNT CONSUMED						WATER	DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE/DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
ENTREES																	
Pork BBQ W/Rice	97	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Corned Beef Hash	98	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Chicken Stew	99	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Ham Omelet	100	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Spaghetti W/Meatsauce	101	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Chicken a la King	102	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Beef Stew	103	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Ham Slice	129	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Meatballs W/Rice in Tomato Sauce	104	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Tuna W/Noodle	105	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Chicken W/Rice	106	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Esc. Potatoes W/ Ham Chunks	107	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
FRUITS																	
Applesauce	117	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Fruit Mix	112	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Peaches	111	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Pears	109	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Pineapple	110	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
DESSERTS																	
Oatmeal Cookie Bar	130	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Maple Nut Cake	131	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Cherry Nut Cake	132	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Brownie	127	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Choc Covered Cookie	128	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Chocolate Nut Cake	133	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
STARCHES																	
Crackers	113	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Potatoes Au Gratin	108	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
SPREADS																	
Jelly	118	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Peanut Butter	125	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
Cheese	126	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9
BEVERAGES																	
Cocoa	119	0	1/4	1/2	3/4	ALL	____	_____	1	2	3	4	5	6	7	8	9
Coffee	121	0	1/4	1/2	3/4	ALL	____	_____	1	2	3	4	5	6	7	8	9
Cherry Flavored	145	0	1/4	1/2	3/4	ALL	____	_____	1	2	3	4	5	6	7	8	9
Grape Flavored	146	0	1/4	1/2	3/4	ALL	____	_____	1	2	3	4	5	6	7	8	9
Lemon/Lime Flavored	148	0	1/4	1/2	3/4	ALL	____	_____	1	2	3	4	5	6	7	8	9
Orange Flavored	144	0	1/4	1/2	3/4	ALL	____	_____	1	2	3	4	5	6	7	8	9
OTHER																	
Cream Substitute	123	0	1/4	1/2	3/4	ALL	____	_____									
Sugar	135	0	1/4	1/2	3/4	ALL	____	N/A									
Salt	138	0	1/4	1/2	3/4	ALL	____	N/A									
Gum	142	_____ pieces						N/A									
Candy (What kind?)																	
_____	___	0	1/4	1/2	3/4	ALL	____	N/A	1	2	3	4	5	6	7	8	9

PLEASE TURN THE PA

NOTE:

If there was something in the ration you ate or drank that was not listed on the front, or there was no room to write it in (for instance, if you ate a second candy bar) please tell us what it was, how much you had of it, and how you liked it.

ITEM	AMOUNT CONSUMED						RATING OF FOOD								
_____	0	1/4	1/2	3/4	ALL	____	1	2	3	4	5	6	7	8	9
_____	0	1/4	1/2	3/4	ALL	____	1	2	3	4	5	6	7	8	9

WATER CONSUMPTION

Please estimate the number of quarts of PLAIN water (nothing in it) you drank during each time period listed below. If you drank more than 2 quarts during any one time period, write in the total amount on the line to the right of the number "2."

TIME PERIOD	NUMBER OF QUARTS									
0400-1000	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____
1000-1500	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____
1500-2000	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____
2000-0400	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____

DAILY WATER USAGE

How many quarts of water did you use today for EVERYTHING (drinking, washing, mixing with ration items, etc)?

_____ quarts

Day _____ Name _____ SSN _____ Code MRE VII

RATION CONSUMPTION

Circle the number that indicates how much of each item you ate today. If you ate an amount that is not listed, write it on the line to the right.

ADDED WATER

How many canteen cups of water (1/4, 1/2, 3/4, 1, etc) did you add to each item you ate or drank. Write "0" if you didn't add water to an item you had.

RATING OF FOOD

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

FOOD ITEM	CODE	AMOUNT CONSUMED						WATER	DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE/DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
ENTREES																	
Pork Patties	53	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Ham/Chicken Loaf	54	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Beef Patties	55	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Beef W/BBQ Sauce	56	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Beef Stew	57	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Frankfurters	58	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Diced Turkey W/Gravy	59	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Diced Beef W/Gravy	60	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Chicken a la King	61	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Meatballs W/BBQ Sauce	62	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Ham Slices	63	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Ground Beef W/Spiced Sauce	64	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
FRUITS																	
Applesauce	69	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Fruit Mix	72	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Peaches	71	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Strawberries	70	0	1/4	1/2	3/4	ALL	___	_____									
DESSERTS																	
Brownie	76	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Cherry Nut Cake	77	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Choc Covered Cookie	74	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Fruitcake	79	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Maple Nut Cake	78	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Orange Nut Cake	81	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
STARCHES																	
Crackers	73	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Beans W/Tomato Sauce	65	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
SPREADS																	
Cheese Spread	90	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Jelly	91	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Peanut Butter	94	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
BEVERAGES																	
Cocoa	48	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Coffee	49	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Cherry Flavored	152	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Grape Flavored	153	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Lemon-Lime Flavored	155	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Orange Flavored	151	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
OTHER																	
Catsup	92	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Cream Substitute	50	0	1/4	1/2	3/4	ALL	___	_____									
Soup/Gravy Base	93	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Sugar	95	0	1/4	1/2	3/4	ALL	___	N/A									
Salt	137	0	1/4	1/2	3/4	ALL	___	N/A									
Hot Sauce	140	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Gum	89	_____ pieces						N/A									
Candy (What kind?) _____	__	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9

PLEASE TURN THE PAGE

NOTE:

If there was something in the ration you ate or drank that was not listed on the front, or there was no room to write it in (for instance, if you ate a second candy bar) please tell us what it was and how much you had of it.

ITEM	AMOUNT CONSUMED	
_____	0 1/4 1/2 3/4 ALL	____
_____	0 1/4 1/2 3/4 ALL	____

WATER CONSUMPTION

Please estimate the number of quarts of PLAIN water (nothing in it) you drank during each time period listed below. If you drank more than 2 quarts during any one time period, write in the total amount on the line to the right of the number "2."

TIME PERIOD	NUMBER OF QUARTS									
0400-1000	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____
1000-1500	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____
1500-2000	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____
2000-0400	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____

DAILY WATER USAGE

How many quarts of water did you use today for EVERYTHING (drinking, washing, mixing with ration items, etc)?

_____ quarts

Day _____ Name _____ SSN _____ Code _____ MRE IV

RATION CONSUMPTION

Circle the number that indicates how much of each item you ate today. If you ate an amount that is not listed, write it on the line to the right.

ADDED WATER

How many canteen cups of water (1/4, 1/2, 3/4, 1, etc) did you add to each item you ate or drank. Write "0" if you didn't add water to an item you had.

RATING OF FOOD

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

FOOD ITEM	CODE	AMOUNT CONSUMED						WATER	DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE/DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
ENTREES																	
Pork Patties	6	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Ham/Chicken Loaf	7	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Beef Patties	8	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Beef W/BBQ Sauce	9	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Beef Stew	10	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Frankfurters	11	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Diced Turkey W/Gravy	12	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Diced Beef W/Gravy	13	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Chicken a la King	14	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Meatballs W/BBQ Sauce	15	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Ham Slices	16	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Ground Beef W/Spiced Sauce	17	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
FRUITS																	
Applesauce	22	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Fruit Mix	25	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Peaches	24	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Strawberries	23	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
DESSERTS																	
Brownie	29	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Cherry Nut Cake	30	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Choc Covered Cookie	27	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Fruitcake	32	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Maple Nut Cake	31	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Orange Nut Cake	34	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Chocolate Nut Cake	33	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Pineapple Nut Cake	28	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
STARCHES																	
Crackers	26	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Beans W/Tomato Sauce	18	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Potato Patty	21	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
SPREADS																	
Cheese Spread	43	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Jelly	44	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
Peanut Butter	47	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9
BEVERAGES																	
Cocoa	1	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Coffee	2	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
OTHER																	
Catsup	45	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Cream Substitute	3	0	1/4	1/2	3/4	ALL	___	_____									
Soup/Gravy Base	46	0	1/4	1/2	3/4	ALL	___	_____	1	2	3	4	5	6	7	8	9
Sugar	134	0	1/4	1/2	3/4	ALL	___	N/A									
Salt	136	0	1/4	1/2	3/4	ALL	___	N/A									
Gum	42	_____ pieces						N/A									
Candy (What kind?) _____	__	0	1/4	1/2	3/4	ALL	___	N/A	1	2	3	4	5	6	7	8	9

PLEASE TURN THE PAGE

NOTE:

If there was something in the ration you ate or drank that was not listed on the front, or there was no room to write it in (for instance, if you ate a second candy bar) please tell us what it was, how much you had of it, and how you liked it.

ITEM	AMOUNT CONSUMED						RATING OF FOOD								
_____	0	1/4	1/2	3/4	ALL	____	1	2	3	4	5	6	7	8	9
_____	0	1/4	1/2	3/4	ALL	____	1	2	3	4	5	6	7	8	9

WATER CONSUMPTION

Please estimate the number of quarts of PLAIN water (nothing in it) you drank during each time period listed below. If you drank more than 2 quarts during any one time period, write in the total amount on the line to the right of the number "2."

TIME PERIOD	NUMBER OF QUARTS									
0400-1000	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____
1000-1500	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____
1500-2000	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____
2000-0400	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	____

DAILY WATER USAGE

How many quarts of water did you use today for EVERYTHING (drinking, washing, mixing with ration items, etc)?

_____ quarts

FINAL QUESTIONNAIRE

We would like to ask your final opinions about the MRE. Your opinions will be very important in determining any changes that will be made in the ration, so please answer the questions thoughtfully. Thank you.

1. Your name: _____

2. Your Social Security Number: _____

3. When did you eat your MREs? Circle one number.

   1. Usually at regular meal times
   2. Usually throughout the day (as time permitted)
   3. Half the time at regular meal times, half the time throughout the day

4. Overall, did you get enough to eat during this exercise, 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

5. Overall, did you get enough to drink during this exercise, or were you thirsty? Circle one number.

   1. Got enough to drink
   2. Was sometimes thirsty
   3. Was often thirsty
   4. Was almost always thirsty

6. Please use the following scale to rate how SATISFIED or DISSATISFIED you were with each of the following aspects of the MREs you ate during this exercise. Circle one number for each aspect.

VERY DISSATISFIED 1	MODERATELY DISSATISFIED 2	SOMEWHAT DISSATISFIED 3	NEITHER SATISFIED NOR DISSATISFIED 4	SOMEWHAT SATISFIED 5	MODERATELY SATISFIED 6	VERY SATISFIED 7

a.	How the food tastes	1 2 3 4 5 6 7
b.	How the food looks	1 2 3 4 5 6 7
c.	How much food there is in a meal (one MRE)	1 2 3 4 5 6 7
d.	How much variety there is from meal to meal	1 2 3 4 5 6 7

PLEASE TURN THE PAGE.

7. We would like to know how SATISFIED you were with the VARIETY in the MRE. 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 (for example, ham slices, chicken w/rice)	1	2	3	4
b.	Starches (crackers, potatoes)	1	2	3	4
c.	Desserts (cakes, cookies, brownies)	1	2	3	4
d.	Fruits	1	2	3	4
e.	Spreads (peanut butter, cheese, jelly)	1	2	3	4
f.	Drinks	1	2	3	4
g.	Condiments (hot sauce, salt)	1	2	3	4

8. We would like to know what you think of the amount of food provided in a single MRE. Were the PORTION SIZES too small, too large, or just right? Please circle one number for each component of the ration.

MUCH TOO SMALL	MODERATELY TOO SMALL	SOMEWHAT TOO SMALL	JUST RIGHT	SOMEWHAT TOO LARGE	MODERATELY TOO LARGE	MUCH TOO LARGE
1	2	3	4	5	6	7

a.	Entrees (for example, ham slices, chicken w/rice)	1	2	3	4	5	6	7
b.	Starches (crackers, potatoes)	1	2	3	4	5	6	7
c.	Desserts (cakes, cookies, brownies)	1	2	3	4	5	6	7
d.	Fruits	1	2	3	4	5	6	7
e.	Spreads (cheese, peanut butter, jelly)	1	2	3	4	5	6	7
f.	Drinks	1	2	3	4	5	6	7

9. Please indicate with a check mark your opinion of the NUMBER OF PACKETS of each item listed below. Is the number of packets just right, or are there too many, or too few?

		TOO FEW	JUST RIGHT	TOO MANY
a.	Cocoa	_____	_____	_____
b.	Coffee	_____	_____	_____
c.	Cream	_____	_____	_____
d.	Salt	_____	_____	_____
e.	Sugar	_____	_____	_____
f.	Toilet paper	_____	_____	_____
g.	Candy	_____	_____	_____
h.	Gum	_____	_____	_____
i.	Hot sauce	_____	_____	_____
j.	Fruit-flavored beverages	_____	_____	_____

10. Please rate how EASY or DIFFICULT you found each of the following aspects of preparing the MREs. Circle one number for each.

VERY DIFFICULT	MODERATELY DIFFICULT	SOMEWHAT DIFFICULT	NEITHER EASY NOR DIFFICULT	SOMEWHAT EASY	MODERATELY EASY	VERY EASY
1	2	3	4	5	6	7

a. Opening the outer bag (pouch)	1	2	3	4	5	6	7
b. Opening individual packets	1	2	3	4	5	6	7
c. Heating the entree	1	2	3	4	5	6	7
d. Mixing water into the beverages	1	2	3	4	5	6	7

11. What foods, drinks, or condiments (spices, sauces, etc.) would you like ADDED to the MREs? Please be realistic.

12. What foods or drinks in the MREs would you like DROPPED?

13. Did you consume any food or beverages during this exercise that were not MRE items? Please be honest. (We won't tell!)

YES NO (Circle one)

If YES, what did you eat and/or drink, and how often?

14. Below is a list of possible ways of improving the MRE. Please write the number "1" next to the one improvement that you think is MOST IMPORTANT, the number "2" next to the improvement you think is SECOND in importance, the number "3" next to the improvement you think is the THIRD in importance, the number "4" next to what is FOURTH, the number "5" next to the FIFTH in importance, and the number "6" next to what you think is SIXTH in importance.

_____ Make the rations taste better
_____ Increase the variety in the rations
_____ Make the rations easier to prepare
_____ Add more breakfast foods
_____ Make the entree portion sizes larger
_____ Add some different beverages to the ration

PLEASE TURN THE PAGE.

15. We would like your honest evaluation of the MRE items you ate during this exercise. Using the scale below, please circle the one number for each item that best expresses your opinion of that item.

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

1.	Pork BBQ W/Rice	0	1 2 3 4 5 6 7 8 9
2.	Corned Beef Hash	0	1 2 3 4 5 6 7 8 9
3.	Chicken Stew	0	1 2 3 4 5 6 7 8 9
4.	Ham Omelet	0	1 2 3 4 5 6 7 8 9
5.	Spaghetti W/Meat Sauce	0	1 2 3 4 5 6 7 8 9
6.	Beef Stew	0	1 2 3 4 5 6 7 8 9
7.	Chicken ala King	0	1 2 3 4 5 6 7 8 9
8.	Ham Slice	0	1 2 3 4 5 6 7 8 9
9.	Meatballs W/Rice in Tomato Sauce	0	1 2 3 4 5 6 7 8 9
10.	Tuna W/Noodles	0	1 2 3 4 5 6 7 8 9
11.	Chicken W/Rice	0	1 2 3 4 5 6 7 8 9
12.	Esc. Potatoes W/Ham Chunks	0	1 2 3 4 5 6 7 8 9
13.	Crackers	0	1 2 3 4 5 6 7 8 9
14.	Potatoes au gratin	0	1 2 3 4 5 6 7 8 9
15.	Cheese Spread	0	1 2 3 4 5 6 7 8 9
16.	Jelly	0	1 2 3 4 5 6 7 8 9
17.	Peanut Butter	0	1 2 3 4 5 6 7 8 9
18.	Applesauce	0	1 2 3 4 5 6 7 8 9
19.	Fruit Mix	0	1 2 3 4 5 6 7 8 9
20.	Peaches	0	1 2 3 4 5 6 7 8 9
21.	Pears	0	1 2 3 4 5 6 7 8 9
22.	Pineapple	0	1 2 3 4 5 6 7 8 9
23.	Brownie	0	1 2 3 4 5 6 7 8 9
24.	Cherry Nut Cake	0	1 2 3 4 5 6 7 8 9
25.	Chocolate-Covered Cookie	0	1 2 3 4 5 6 7 8 9
26.	Maple Nut Cake	0	1 2 3 4 5 6 7 8 9
27.	Chocolate Nut Cake	0	1 2 3 4 5 6 7 8 9
28.	Oatmeal Cookie Bar	0	1 2 3 4 5 6 7 8 9
29.	Cocoa	0	1 2 3 4 5 6 7 8 9
30.	Coffee	0	1 2 3 4 5 6 7 8 9
31.	Cherry flavored beverage	0	1 2 3 4 5 6 7 8 9
32.	Grape flavored beverage	0	1 2 3 4 5 6 7 8 9
33.	Lemon-lime flavored beverage	0	1 2 3 4 5 6 7 8 9
34.	Orange flavored beverage	0	1 2 3 4 5 6 7 8 9
35.	Tootsie Roll	0	1 2 3 4 5 6 7 8 9
36.	Vanilla Caramel	0	1 2 3 4 5 6 7 8 9
37.	M&Ms	0	1 2 3 4 5 6 7 8 9

16. How often did you HEAT the entree (main dish) in your ration? Circle one number.

1. Almost never
2. Sometimes
3. Often
4. Almost always

17. Please rate how much you LIKE or DISLIKE eating the MREs for breakfast, lunch, and dinner. Please use the scale below and 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
For breakfast		1 2 3	4	5 6 7		
For lunch		1 2 3	4	5 6 7		
For dinner		1 2 3	4	5 6 7		

18. How would you describe your level of physical activity during this field exercise? (Circle one number.)

1. Heavy daily physical activity
2. Moderate daily physical activity
3. Light daily physical activity
4. Mixed activity day-to-day

19. Did you usually have the breakfast entrees (ham omelet, corned beef hash) available for eating at breakfast time? YES NO

20. Please tell us how often you ate the following items for breakfast. Circle one number for each item. If you usually did not eat breakfast, indicate so below with a check.

	ALMOST NEVER 1	SOMETIMES 2	OFTEN 3	ALMOST ALWAYS 4
Breakfast entree (ham omelet or corned beef hash)	1	2	3	4
Dinner entree (for example, ham slices, chicken stew, etc.)	1	2	3	4
Fruit	1	2	3	4
Crackers	1	2	3	4
Spreads	1	2	3	4
Cake, cookie or brownie	1	2	3	4
Hot beverage	1	2	3	4
Cold beverage	1	2	3	4

___ DID NOT EAT BREAKFAST

PLEASE TURN THE PAGE.

21. How often did you use the pouch stand? (Circle one number.)

1. Almost always
2. Often
3. Sometimes
4. Almost never

22. If you had the pouch stand available, but did not use it, what were your reasons ? (Check all that apply.) If you almost always used it, check "e".

___a. Wasn't worth the trouble
___b. Wouldn't stand up
___c. Didn't feel like using it
___d. Got wet or damaged
___e. Almost always used the pouch stand

23. Where did you set up the pouch stand? (Check all that apply.)

___a. Inside a vehicle
___b. Outside, on the ground
___c. On the hood of a vehicle
___d. Other -- please explain: _____

24. Do you have any suggestions on how the pouch stand could be improved?

25. In the future, should a pouch stand be included in the MRE? YES NO

26. Do you have any other comments on the MRE?

FINAL QUESTIONNAIRE

We would like to ask your final opinions about the MRE. Your opinions will be very important in determining any changes that will be made in the ration, so please answer the questions thoughtfully. Thank you.

1. Your name: _____

2. Your Social Security Number: _____

3. When did you eat your MREs? Circle one number.

   1. Usually at regular meal times
   2. Usually throughout the day (as time permitted)
   3. Half the time at regular meal times, half the time throughout the day

4. Overall, did you get enough to eat during this exercise 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

5. Overall, did you get enough to drink during this exercise or were you thirsty? Circle one number.

   1. Got enough to drink
   2. Was sometimes thirsty
   3. Was often thirsty
   4. Was almost always thirsty

6. Please use the following scale to rate how SATISFIED or DISSATISFIED you were with each of the following aspects of the MREs you ate during this exercise. Circle one number for each aspect.

VERY DISSATISFIED 1	MODERATELY DISSATISFIED 2	SOMEWHAT DISSATISFIED 3	NEITHER SATISFIED NOR DISSATISFIED 4	SOMEWHAT SATISFIED 5	MODERATELY SATISFIED 6	VERY SATISFIED 7

a.	How the food tastes	1 2 3 4 5 6 7
b.	How the food looks	1 2 3 4 5 6 7
c.	How much food there is in a meal (one MRE)	1 2 3 4 5 6 7
d.	How much variety there is from meal to meal	1 2 3 4 5 6 7

PLEASE TURN THE PAGE.

7. We would like to know how SATISFIED you were with the VARIETY in the MRE. Please circle one number for each component of the ration.

	VARIETY NOW ENOUGH 1	SHOULD BE SOMEWHAT MORE VARIETY 2	SHOULD BE MODERATELY MORE VARIETY 3	SHOULD BE MUCH MORE VARIETY 4
a. Entrees (for example, ham slices, meatballs w/BBQ sauce)	1	2	3	4
b. Starches (crackers, beans)	1	2	3	4
c. Desserts (cakes, cookies, brownies)	1	2	3	4
d. Fruits	1	2	3	4
e. Spreads (peanut butter, cheese, jelly)	1	2	3	4
f. Drinks	1	2	3	4
g. Condiments (hot sauce, catsup, soup/gravy base)	1	2	3	4

8. We would like to know what you think of the amount of food provided in a single MRE. Were the PORTION SIZES too small, too large, or just right? Please circle one number for each component of the ration.

	MUCH TOO SMALL 1	MODERATELY TOO SMALL 2	SOMEWHAT TOO SMALL 3	JUST RIGHT 4	SOMEWHAT TOO LARGE 5	MODERATELY TOO LARGE 6	MUCH TOO LARGE 7
a. Entrees (for example, ham slices, meatballs w/BBQ sauce)	1	2	3	4	5	6	7
b. Starches (crackers, beans)	1	2	3	4	5	6	7
c. Desserts (cakes, cookies, brownies)	1	2	3	4	5	6	7
d. Fruits	1	2	3	4	5	6	7
e. Spreads (cheese, peanut butter, jelly)	1	2	3	4	5	6	7
f. Drinks							

9. Please indicate with a check mark your opinion of the NUMBER OF PACKETS of the items listed below. Is the number of packets just right, or are there too many, or too few?

	TOO FEW	JUST RIGHT	TOO MANY
a. Cocoa	_____	_____	_____
b. Coffee	_____	_____	_____
c. Cream	_____	_____	_____
d. Catsup	_____	_____	_____
e. Salt	_____	_____	_____
f. Sugar	_____	_____	_____
g. Toilet paper	_____	_____	_____
h. Candy	_____	_____	_____
i. Gum	_____	_____	_____
j. Soup/gravy base	_____	_____	_____
k. Hot sauce	_____	_____	_____
l. Fruit-flavored beverages	_____	_____	_____

10. Please rate how EASY or DIFFICULT you found each of the following aspects of preparing the MREs. Circle one number for each.

VERY DIFFICULT 1	MODERATELY DIFFICULT 2	SOMEWHAT DIFFICULT 3	NEITHER EASY NOR DIFFICULT 4	SOMEWHAT EASY 5	MODERATELY EASY 6	VERY EASY 7

a. Opening the outer bag (pouch)	1	2	3	4	5	6	7
b. Opening individual packets	1	2	3	4	5	6	7
c. Heating the entree	1	2	3	4	5	6	7
d. Mixing water into the dry components	1	2	3	4	5	6	7

11. What foods, drinks, or condiments (spices, sauces, etc.) would you like ADDED to the MREs? Please be realistic.

12. What foods or drinks in the MREs would you like DROPPED?

13. Did you consume any foods or beverages during this exercise that were not MRE items? Please be honest. (We won't tell!)

YES NO (Circle one)

If YES, what did you eat and/or drink, and how often?

14. Below is a list of possible ways of improving the MRE. Please write the number "1" next to the one improvement that you think is MOST IMPORTANT, the number "2" next to the improvement you think is SECOND in importance, the number "3" next to the improvement you think is the THIRD in importance, the number "4" next to what is FOURTH, the number "5" next to the FIFTH in importance, and the number "6" next to what you think is SIXTH in importance.

_____ Make the rations taste better
_____ Increase the variety in the rations
_____ Make the rations easier to prepare
_____ Include breakfast foods
_____ Make the entree portion sizes larger
_____ Add some different beverages to the ration

PLEASE TURN THE PAGE.

15. We would like your honest evaluation of the MRE items you ate during this exercise. Using the scale below, please circle one number for each item that best expresses your opinion of that item.

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

1.	Beef w/Barbeque Sauce	0	1 2 3 4 5 6 7 8 9
2.	Beef w/Gravy	0	1 2 3 4 5 6 7 8 9
3.	Beef w/Spiced Sauce	0	1 2 3 4 5 6 7 8 9
4.	Beef Patties	0	1 2 3 4 5 6 7 8 9
5.	Beef Stew	0	1 2 3 4 5 6 7 8 9
6.	Chicken Ala King	0	1 2 3 4 5 6 7 8 9
7.	Frankfurters	0	1 2 3 4 5 6 7 8 9
8.	Ham/Chicken Loaf	0	1 2 3 4 5 6 7 8 9
9.	Ham Slices	0	1 2 3 4 5 6 7 8 9
10.	Meatballs w/ Barbeque Sauce	0	1 2 3 4 5 6 7 8 9
11.	Pork Sausage Patties	0	1 2 3 4 5 6 7 8 9
12.	Turkey w/Gravy	0	1 2 3 4 5 6 7 8 9
13.	Crackers	0	1 2 3 4 5 6 7 8 9
14	Beans w/Tomato Sauce	0	1 2 3 4 5 6 7 8 9
15.	Cheese Spread	0	1 2 3 4 5 6 7 8 9
16.	Jelly	0	1 2 3 4 5 6 7 8 9
17.	Peanut Butter	0	1 2 3 4 5 6 7 8 9
18.	Applesauce	0	1 2 3 4 5 6 7 8 9
19.	Mixed Fruits	0	1 2 3 4 5 6 7 8 9
20.	Peaches	0	1 2 3 4 5 6 7 8 9
21.	Strawberries	0	1 2 3 4 5 6 7 8 9
22.	Brownie	0	1 2 3 4 5 6 7 8 9
23.	Cherry Nut Cake	0	1 2 3 4 5 6 7 8 9
24.	Chocolate-Covered Cookie	0	1 2 3 4 5 6 7 8 9
25.	Fruitcake	0	1 2 3 4 5 6 7 8 9
26.	Maple Nut Cake	0	1 2 3 4 5 6 7 8 9
27.	Orange Nut Cake	0	1 2 3 4 5 6 7 8 9
28.	Cocoa	0	1 2 3 4 5 6 7 8 9
29.	Coffee	0	1 2 3 4 5 6 7 8 9
30.	Cherry Flavored Beverage	0	1 2 3 4 5 6 7 8 9
31.	Grape Flavored Beverage	0	1 2 3 4 5 6 7 8 9
32.	Lemon-Lime Flavored Beverage	0	1 2 3 4 5 6 7 8 9
33.	Orange Flavored Beverage	0	1 2 3 4 5 6 7 8 9
34.	Chocolate Fudge Bar	0	1 2 3 4 5 6 7 8 9
35.	Chocolate-covered Coconut Bar	0	1 2 3 4 5 6 7 8 9
36.	Caramel	0	1 2 3 4 5 6 7 8 9
37.	Vanilla Fudge Bar	0	1 2 3 4 5 6 7 8 9
38.	Starch Jelly Bar	0	1 2 3 4 5 6 7 8 9
39.	Chocolate Toffee Bar	0	1 2 3 4 5 6 7 8 9
40.	Chocolate Almond Bar	0	1 2 3 4 5 6 7 8 9

16. How often did you HEAT the entree (main dish) in your ration? Circle one number.

1. Almost never
2. Sometimes
3. Often
4. Almost always

17. Please rate how much you LIKE or DISLIKE eating the MREs for breakfast, lunch, and dinner. Please use the scale below and 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

For breakfast	1	2	3	4	5	6	7
For lunch	1	2	3	4	5	6	7
For dinner	1	2	3	4	5	6	7

18. How would you describe your level of physical activity during this field exercise? (Circle one number.)

1. Heavy daily physical activity
2. Moderate daily physical activity
3. Light daily physical activity
4. Mixed activity day-to-day

19. Please tell us how often you ate the following items for breakfast. Circle one number for each item. If you usually did not eat breakfast, indicate so below with a check.

	ALMOST NEVER 1	SOMETIMES 2	OFTEN 3	ALMOST ALWAYS 4
Entree	1	2	3	4
Fruit	1	2	3	4
Crackers	1	2	3	4
Spreads	1	2	3	4
Cake, cookie or brownie	1	2	3	4
Hot beverage	1	2	3	4
Cold beverage	1	2	3	4

___ DID NOT EAT BREAKFAST

PLEASE TURN THE PAGE.

20. How often did you mix water into the dry components of your ration? Please circle one number for each component.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
a. Dehydrated entree (beef patty, pork sausage patty)	1	2	3	4
b. Dehydrated fruit	1	2	3	4

21. Do you have any other comments on the MRE?

FINAL QUESTIONNAIRE

We would like to ask your final opinions about the MRE. Your opinions will be very important in determining any changes that will be made in the ration, so please answer the questions thoughtfully. Thank you.

1. Your name: _____

2. Your Social Security Number: _____

3. When did you eat your MREs? Circle one number.

   1. Usually at regular meal times
   2. Usually throughout the day (as time permitted)
   3. Half the time at regular meal times, half the time throughout the day

4. Overall, did you get enough to eat during this exercise, 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

5. Overall, did you get enough to drink during this exercise, or were you thirsty? Circle one number.

   1. Got enough to drink
   2. Was sometimes thirsty
   3. Was often thirsty
   4. Was almost always thirsty

6. Please use the following scale to rate how SATISFIED or DISSATISFIED you were with each of the following aspects of the MREs you ate during this exercise. Circle one number for each aspect.

VERY DISSATISFIED 1	MODERATELY DISSATISFIED 2	SOMEWHAT DISSATISFIED 3	NEITHER SATISFIED NOR DISSATISFIED 4	SOMEWHAT SATISFIED 5	MODERATELY SATISFIED 6	VERY SATISFIED 7

   a. How the food tastes 1 2 3 4 5 6 7
   b. How the food looks 1 2 3 4 5 6 7
   c. How much food there is in a meal (one MRE) 1 2 3 4 5 6 7
   d. How much variety there is from meal to meal 1 2 3 4 5 6 7

7. We would like to know how SATISFIED you were with the VARIETY in the MRE. Please circle one number for each component of the ration.

VARIETY NOW ENOUGH 1	SHOULD BE SOMEWHAT MORE VARIETY 2	SHOULD BE MODERATELY MORE VARIETY 3	SHOULD BE MUCH MORE VARIETY 4

a.	Entrees (for example, ham slices, meatballs w/BBQ sauce)	1 2 3 4
b.	Starches (crackers, beans, potatoes)	1 2 3 4
c.	Desserts (cakes, cookies, brownies)	1 2 3 4
d.	Fruits	1 2 3 4
e.	Spreads (peanut butter, cheese, jelly)	1 2 3 4
f.	Drinks	1 2 3 4
g.	Condiments (salt, catsup, soup/gravy base)	1 2 3 4

8. We would like to know what you think of the amount of food provided in a single MRE. Were the PORTION SIZES too small, too large, or just right? Please circle one number for each component of the ration.

MUCH TOO SMALL 1	MODERATELY TOO SMALL 2	SOMEWHAT TOO SMALL 3	JUST RIGHT 4	SOMEWHAT TOO LARGE 5	MODERATELY TOO LARGE 6	MUCH TOO LARGE 7

a.	Entrees (for example, ham slices, meatballs w/bbq sauce)	1 2 3 4 5 6 7
b.	Starches (crackers, beans, potatoes)	1 2 3 4 5 6 7
c.	Desserts (cakes, cookies, brownies)	1 2 3 4 5 6 7
d.	Fruits	1 2 3 4 5 6 7
e.	Spreads (cheese, peanut butter, jelly)	1 2 3 4 5 6 7
f.	Drinks	1 2 3 4 5 6 7

9. Please indicate with a check mark your opinion of the NUMBER OF PACKETS of each item listed below. Is the number of packets just right, or are there too many, or too few?

		TOO FEW	JUST RIGHT	TOO MANY
a.	Cocoa	_____	_____	_____
b.	Coffee	_____	_____	_____
c.	Cream	_____	_____	_____
d.	Catsup	_____	_____	_____
e.	Salt	_____	_____	_____
f.	Sugar	_____	_____	_____
g.	Toilet paper	_____	_____	_____
h.	Candy	_____	_____	_____
i.	Gum	_____	_____	_____
j.	Soup/gravy base	_____	_____	_____

10. Please rate how EASY or DIFFICULT you found each of the following aspects of preparing the MREs. Circle one number for each.

VERY DIFFICULT 1	MODERATELY DIFFICULT 2	SOMEWHAT DIFFICULT 3	NEITHER EASY NOR DIFFICULT 4	SOMEWHAT EASY 5	MODERATELY EASY 6	VERY EASY 7

a. Opening the outer bag (pouch)	1	2	3	4	5	6	7
b. Opening individual packets	1	2	3	4	5	6	7
c. Heating the entree	1	2	3	4	5	6	7
d. Mixing water into the dry components	1	2	3	4	5	6	7

11. What foods, drinks, or condiments (spices, sauces, etc.) would you like ADDED to the MREs? Please be realistic.

12. What foods or drinks in the MREs would you like DROPPED?

13. Did you consume any foods or beverages during this exercise that were not MRE items? Please be honest. (We won't tell!)

YES NO (Circle one)

If YES, what did you eat and/or drink and how often?

14. Below is a list of possible ways of improving the MRE. Please write the number "1" next to the one improvement that you think is MOST IMPORTANT, the number "2" next to the improvement you think is SECOND in importance, the number "3" next to the improvement you think is the THIRD in importance, the number "4" next to what is FOURTH, the number "5" next to the FIFTH in importance, and the number "6" next to what you think is SIXTH in importance.

_____ Make the rations taste better
_____ Increase the variety in the rations
_____ Make the rations easier to prepare
_____ Include breakfast foods
_____ Make the entree portion sizes larger
_____ Add some different beverages to the ration

PLEASE TURN THE PAGE.

15. We would like your honest evaluation of the MRE items you ate. Using the scale below, please circle one number for each item.

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

1.	Beef w/Barbeque Sauce	0	1 2 3 4 5 6 7 8 9
2.	Beef w/Gravy	0	1 2 3 4 5 6 7 8 9
3.	Beef w/Spiced Sauce	0	1 2 3 4 5 6 7 8 9
4.	Beef Patties	0	1 2 3 4 5 6 7 8 9
5.	Beef Stew	0	1 2 3 4 5 6 7 8 9
6.	Chicken Ala King	0	1 2 3 4 5 6 7 8 9
7.	Frankfurters	0	1 2 3 4 5 6 7 8 9
8.	Ham/Chicken Loaf	0	1 2 3 4 5 6 7 8 9
9.	Ham Slices	0	1 2 3 4 5 6 7 8 9
10.	Meatballs w/ Barbeque Sauce	0	1 2 3 4 5 6 7 8 9
11.	Pork Sausage Patties	0	1 2 3 4 5 6 7 8 9
12.	Turkey w/Gravy	0	1 2 3 4 5 6 7 8 9
13.	Crackers	0	1 2 3 4 5 6 7 8 9
14	Beans w/Tomato Sauce	0	1 2 3 4 5 6 7 8 9
15.	Potato Patty	0	1 2 3 4 5 6 7 8 9
16.	Cheese Spread	0	1 2 3 4 5 6 7 8 9
17.	Jelly	0	1 2 3 4 5 6 7 8 9
18.	Peanut Butter	0	1 2 3 4 5 6 7 8 9
19.	Applesauce	0	1 2 3 4 5 6 7 8 9
20.	Mixed Fruits	0	1 2 3 4 5 6 7 8 9
21.	Peaches	0	1 2 3 4 5 6 7 8 9
22.	Strawberries	0	1 2 3 4 5 6 7 8 9
23.	Brownie	0	1 2 3 4 5 6 7 8 9
24.	Cherry Nut Cake	0	1 2 3 4 5 6 7 8 9
25.	Chocolate-Covered Cookie	0	1 2 3 4 5 6 7 8 9
26.	Fruitcake	0	1 2 3 4 5 6 7 8 9
27.	Maple Nut Cake	0	1 2 3 4 5 6 7 8 9
28.	Orange Nut Cake	0	1 2 3 4 5 6 7 8 9
29.	Chocolate Nut Cake	0	1 2 3 4 5 6 7 8 9
30.	Pineapple Nut Cake	0	1 2 3 4 5 6 7 8 9
31.	Cocoa	0	1 2 3 4 5 6 7 8 9
32.	Coffee	0	1 2 3 4 5 6 7 8 9
33.	Chocolate Fudge Bar	0	1 2 3 4 5 6 7 8 9
34.	Chocolate covered Coconut Bar	0	1 2 3 4 5 6 7 8 9
35.	Caramel	0	1 2 3 4 5 6 7 8 9
36.	Vanilla Fudge	0	1 2 3 4 5 6 7 8 9
37.	Starch Jelly Bar	0	1 2 3 4 5 6 7 8 9
38.	Chocolate Toffee Bar	0	1 2 3 4 5 6 7 8 9
39.	Chocolate /Almond Bar	0	1 2 3 4 5 6 7 8 9

16. How often did you HEAT the entree (main dish) in your ration? Circle one number.

1. Almost never
2. Sometimes
3. Often
4. Almost always

17. Please rate how much you LIKE or DISLIKE eating the MREs for breakfast, lunch, and dinner. Please use the scale below and circle one number for each of the three meals.

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

18. How would you describe your level of physical activity during this field exercise? (Circle one number.)

1. Heavy daily physical activity
2. Moderate daily physical activity
3. Light daily physical activity
4. Mixed activity day-to-day

19. Please tell us how often you ate the following items for breakfast. Circle one number for each item. If you usually did not eat breakfast, indicate so below with a check.

ALMOST NEVER 1	SOMETIMES 2	OFTEN 3	ALMOST ALWAYS 4
Entree (main dish)			1 2 3 4
Fruit			1 2 3 4
Crackers			1 2 3 4
Spreads			1 2 3 4
Cake, cookie or brownie			1 2 3 4
Hot beverage			1 2 3 4

___ DID NOT EAT BREAKFAST

PLEASE TURN THE PAGE.

20. How often did you mix water into the dry components of your ration? Please circle one number for each component.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
a. Meat patties	1	2	3	4
b. Potato patty	1	2	3	4
c. Fruit	1	2	3	4

21. Did you use any hot sauce with your MREs? YES NO

22. Do you have any other comments on the MRE?