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EVALUATION OF MEAL, READY-TO-EAT VIII AT MARKET SQUARE II

BY

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) The first production run of the Meal, Ready-to-Eat (MRE) VIII operational ration was evaluated at a field training exercise (Market Square II) with troops of the 82nd Airborne Division. Two companies participated in the evaluation. One company was issued MRE VIII as part of their ration cycle, the other company was issued MRE V and MRE VII as planned for this exercise. During the exercise, two focus groups were conducted with each company; approximately twelve individuals participated in each group. Following the exercise, a comprehensive questionnaire was administered to each company. The questionnaire and focus group results indicate that the MRE VIII was viewed as a significant improvement over the older versions of the ration. Soldiers especially liked the new entrees, the larger entree size, the commercial candies, the beverage powders, and the hot sauce. When asked to compare MRE VIII to previous versions of the MRE or to the Meal, Combat Individual ("C-rations"), most soldiers stated a preference for MRE VIII. Soldiers comments also suggest that a rotation of menus every few years and the addition of some supplemental items are needed to maintain the high acceptability of the new ration.			
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PREFACE

In July 1987 MG Skeen, CDR, TROSCOM and MG Stiner, CDR, 82d Airborne Division decided that the first production run of MRE VIII would be evaluated by soldiers at Fort Bragg. The U.S. Army Natick Research, Development and Engineering Center (Natick) was tasked to conduct the MRE VIII evaluation during Market Square II, an 82d ABN Div training exercise. The evaluation was conducted 29 April thru 9 May 1988. Focus groups were run in the field, and a questionnaire was administered at the completion of the training exercises.

The authors of this report would like to thank several people who were instrumental to the success of the MRE evaluation. Thanks are extended to Mr. Robert Cox, U.S. Army Natick Liaison Office, Fort Bragg, for his efforts in support of the test. Special thanks are also extended to MAJ William D. Ivey, 1st Battalion, 504th Infantry, 82d Airborne Division, for coordinating Natick's test plan within the confines of the battalion's mission. Kristen Gray is also thanked for typing the report.

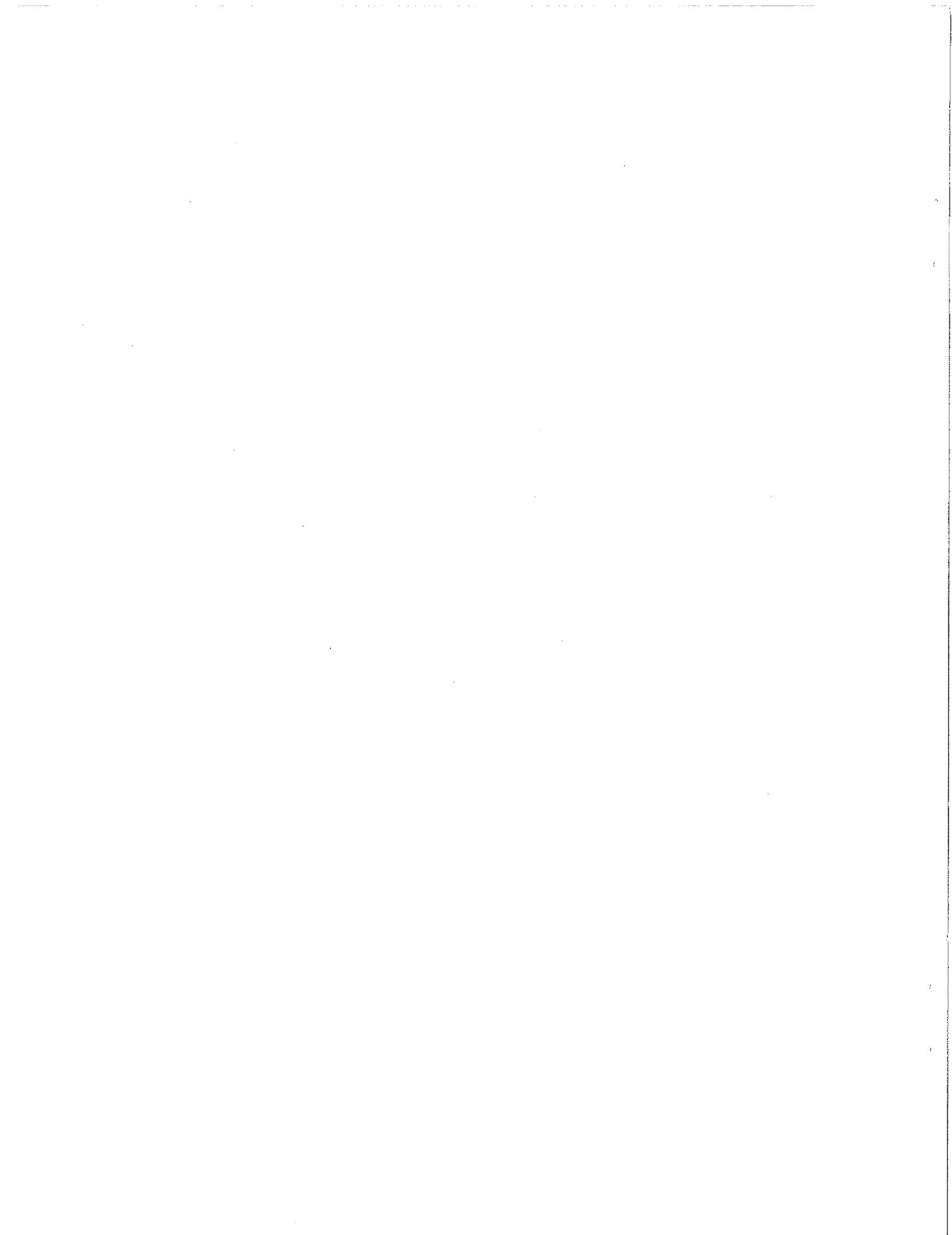
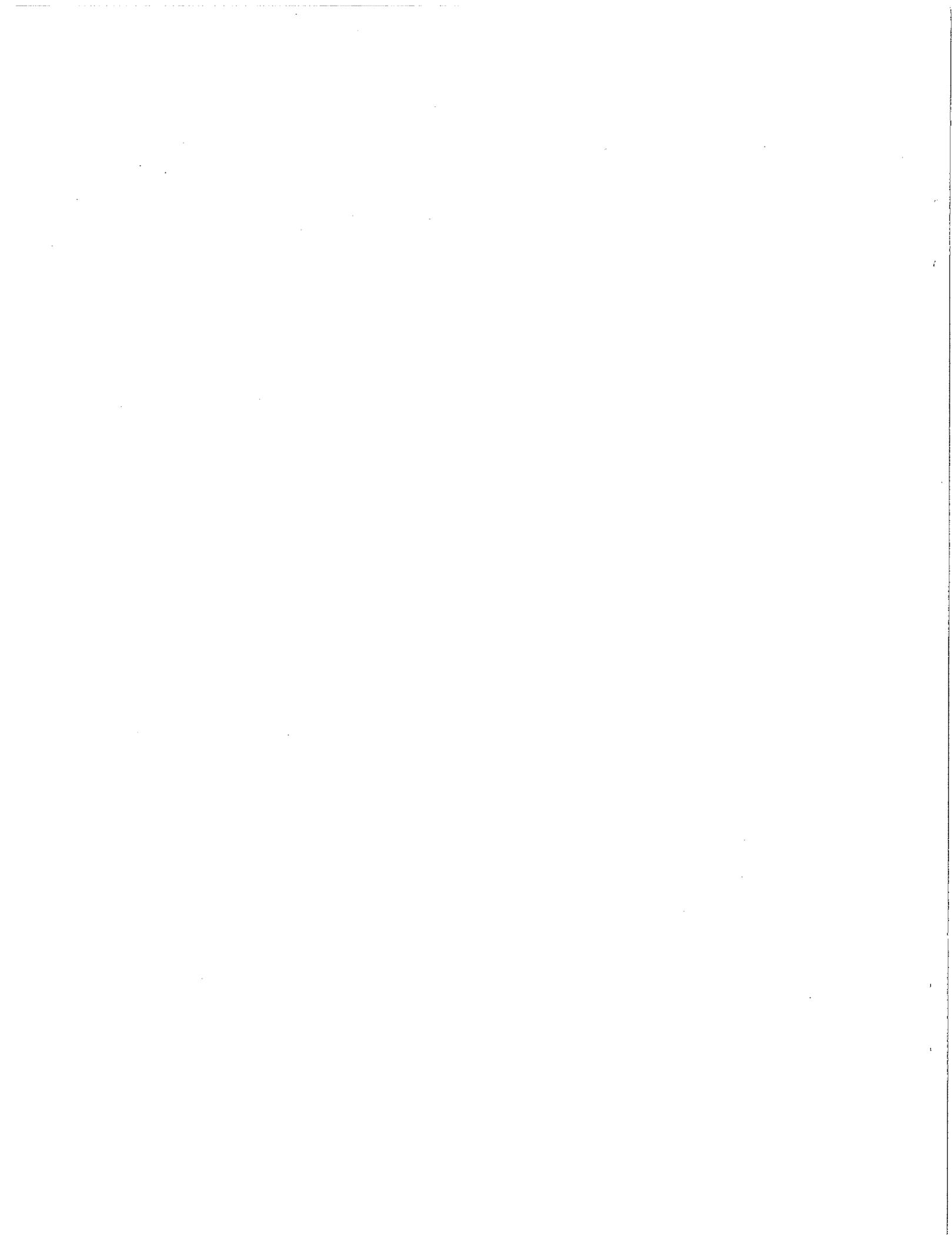


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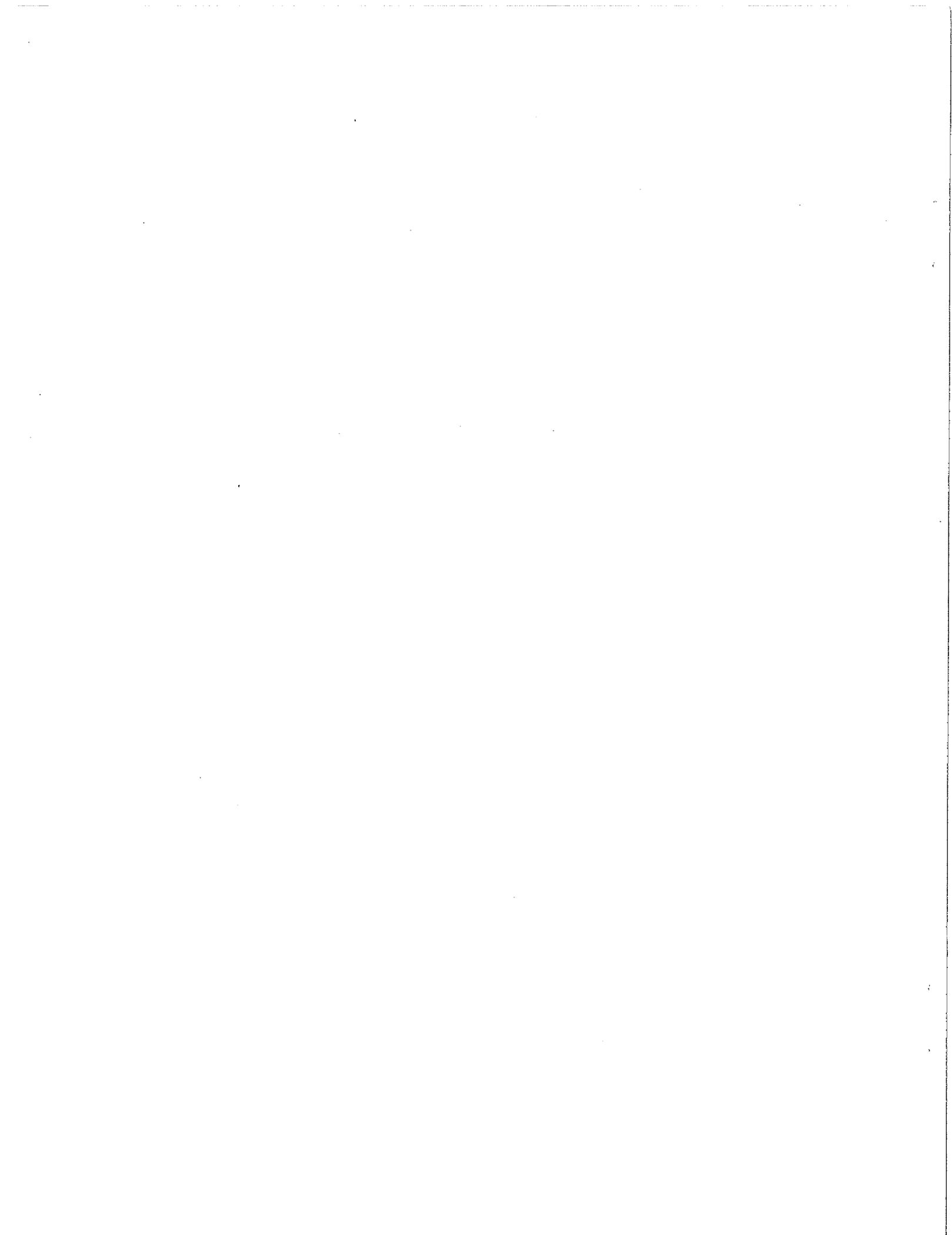


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EVALUATION OF MRE VIII AT MARKET SQUARE II

INTRODUCTION

The Meal, Ready-to-Eat (MRE) was type-classified in 1975 and was first available to troops in the field in 1983 when war reserves of the Meal, Combat, Individual (MCI or C ration) became depleted. The MRE was designed to be issued to troops in the field when resupply was possible, but operational conditions precluded preparation of A or B rations. The initial versions of the MRE (MRE I to V) consisted of 12 menus that included 30 food items, two beverages (coffee and cocoa), a cream substitute, assorted candies, and gravy base or catsup. Each menu was packaged in plastic retort pouches and provided on the average 1215 calories, 13.5% from protein, 39.5% from fat, and 47% from carbohydrate (1).

When the MRE was developed it was considered to be an improvement over the MCI because it was eight ounces lighter than the MCI; the quality was better due to decreased heat processing time; more variety was available because there were more components; it had a potentially longer shelf life; and it had better resistance to damage due to the durability of the retort pouch. Although the MRE has proved to be an improvement over the MCI for the aforementioned reasons, a number of field tests have shown that when MRE I to V was fed to troops as their sole source of subsistence, troops did not eat sufficient quantities to met the Military Recommended Dietary Allowance for calories and selected minerals (2,3,4).

Some of the reasons for the inadequate consumption of the MRE were elicited from soldiers in a questionnaire that was administered at the completion of one field study (2). Analysis of this questionnaire revealed that troops were not satisfied with the MRE (I to V) because there were no breakfast entrees, the 5-oz entree portions were too small, and there were no fruit-flavored powders to make cold drinks. In response to this feedback from the troops, several changes were made to the MRE. The MRE VI included larger, 8-oz entrees in seven menus, and the MRE VII included in addition to the larger entrees fruit-flavored beverage powders in all menus and hot pepper sauce in three of the menus.

Major improvements to the MRE were introduced in MRE VIII. This MRE contains nine new entrees, including two breakfast-like entrees and two reformulated entrees. Ten of the entrees are the larger 8-oz size in place of the original 5-oz entree. Commercial candies have replaced the military specification candies, and moist towelettes have been added. An oatmeal cookie bar has replaced some of the cakes, and hot sauce is in four menus. The MRE VIII is still packaged the same way as previous versions. On the average the MRE VIII provides 1298 calories, 15.0% from protein, 35.0% from fat, and 50.0% from carbohydrate. More calories are provided than in earlier versions, with carbohydrate and protein contributing relatively more to the overall energy than before. Table 1 summarizes the improvements that have been made to the original version of the MRE (MRE I to V). Menus and nutrient content of the various MREs can be found in Appendix A and B, respectively.

TABLE 1

Comparison of MREs Tested

MRE VIII	MRE VII	MRE V & VI
<ul style="list-style-type: none"> ● 12 entrees - 9 new including 2 breakfast entrees 10 entrees are 8 oz 	<ul style="list-style-type: none"> ● 12 entrees, same as I-V, but 7 entrees are 8 oz. 	<ul style="list-style-type: none"> ● 12, 5-oz. entrees
<ul style="list-style-type: none"> ● hot pepper sauce in 4 menus 	<ul style="list-style-type: none"> ● hot pepper sauce in 3 menus 	
<ul style="list-style-type: none"> ● fruit flavored beverages in all meals 	<ul style="list-style-type: none"> ● fruit flavored beverages in all meals 	
<ul style="list-style-type: none"> ● commercial candies instead of military specification candies 		

The preproduction version of MRE VIII (referred to as Improved MRE) was evaluated in October 1986 during an 11-day field study in which the Improved MRE was compared to the MRE VII and the MRE IV (5). The purpose of the 1986 test was to determine if the improvements that were made to the MRE were effective in terms of enhancing acceptability and consumption of the ration. The results from the field test indicated that the troops consuming the Improved MRE ate more food, drank more water, and found components of the ration to be more acceptable than troops consuming the MRE VII or MRE IV.

In July 1987, MG Skeen, CDR, TROSCOM and MG Stiner, CDR, 82d Airborne Division decided to issue the first production run of MRE VIII to the 82d ABN Div during a scheduled exercise, Market Square II, and to have the troops evaluate the MREs. Although the Improved MRE had been extensively tested in the field study in 1986, this exercise provided the opportunity to get troop feedback on the first production run of MRE VIII. Both

qualitative and quantitative data were collected by running focus groups during the field training exercise (FTX) and administering a questionnaire at the completion of the FTX. Nutritional and hydration status were not addressed in this evaluation, but these data are available from the 1986 field test (5).

METHOD

Test Subjects:

The soldiers who participated in the evaluation were from the 1st Battalion, 504th Infantry, 82d Airborne Division. Two companies were involved in the evaluation. Alpha Company consumed MRE VIII and Bravo Company consumed MRE V, VI and VII during the FTX. Most of the soldiers who participated in the focus groups were E-1s to E-4s. The rank and age of the soldiers who completed the questionnaire can be found in Table 2.

TABLE 2

Rank and Age of Questionnaire's Respondents

Rank	Percent	Age	Percent
E-1	6	18-24	77
E-2	4	25-34	20
E-3	27	35-44	3
E-4	37		
E-5	13		
E-6	7		
E-7	2		
O-1 & O-2	4		

Procedure:

During Market Square II, the 1/504 Infantry was in the field for eight days. The ration cycle for the batallion for those days is shown in Table 3. The level of activity varied from day to day. On the first day they participated in an airborne operation that included a movement to contact (heading toward an objective). On the second morning they underwent an armor attack and responded with their anti-armor capability. The exercise continued similarly for the next two days. On the fifth day there was an air attack. Later that day they were transported by helicopter to a new location. The next day was relatively quiet for the soldiers, so we had the opportunity to conduct four focus groups in the field on the sixth day (see 6, for a description of focus group methodology). Two focus groups were conducted with Alpha company, and two focus groups were conducted with Bravo company. About 12 soldiers were in each group. All of the focus groups were videotaped, and a summary videotape of the focus groups is available for briefing purposes (7). The seventh day saw a lot of physically demanding tactical activity, e.g., a lot of

TABLE 3
Ration Cycle

<u>Day</u>	<u>Breakfast</u>	<u>Lunch</u>	<u>Dinner</u>
1	MRE	MRE	MRE
2	MRE	MRE	MRE
3	MRE	MRE	MRE
4	MRE	MRE	T Ration
5	MRE	MRE	T Ration
6	MRE	MRE	A Ration
7	MRE	MRE	T Ration
8	MRE	MRE	---

movement and a lot of "digging in." The last day, Day 8, the battalion completed its mission and left the field by convoy. The post-test questionnaires (see Appendix C) were administered to Alpha and Bravo Companies in their respective day rooms. Almost all who participated in the FTX completed the questionnaires; 65 from Alpha company and 72 from Bravo company.

RESULTS

The MRE VIII and MRE V to VII groups rated each item in the ration on a 9-point scale where 1 corresponds to "dislike extremely," 9 corresponds to "like extremely," and 5 corresponds to "neither like nor dislike." The mean acceptance scores for individual items in MRE VIII and MRE V to VII are shown in Tables 4 and 5, respectively. Most of the MRE VIII entrees were very well accepted. The most popular entrees were the chicken with rice, spaghetti and meat sauce, and ham slices, which all got ratings of about 7 on the 9-point scale. The least popular entrees were beef stew, chicken a la king, and meatballs with rice, which nonetheless all got at least neutral ratings on the hedonic scale. All of the desserts, fruits, spreads, starches, beverages and candies were very well received; the exception is the brownie that received a mean score of only 4.3 and the crackers that were rated only 4.9.

These results are not consistent with the results reported by an 82d ABN Div memorandum (8). According to the 82d ABN Div report (9), the BBQ sauce meals and dehydrated items were most disliked. BBQ pork with rice is the only barbeque sauce item in MRE VIII, and it received a mean rating

TABLE 4

MRE VIII Acceptability Ratings*

<u>Item</u>	<u>Mean</u>	<u>SD</u>
Chicken with Rice	7.2	1.8
Spaghetti with Meat Sauce	7.0	1.8
Ham Slice	6.9	2.2
Potatoes with Ham Chunks	6.5	2.2
Ham Omelet	6.4	2.4
Chicken Stew	6.4	2.2
Corned Beef Hash	6.1	2.5
Tuna with Noodles	6.1	2.4
Pork BBQ with Rice	6.0	2.2
Meatballs with Rice in Tomato Sauce	5.8	2.3
Chicken a la King	5.0	2.5
Beef Stew	4.8	2.5
Potatoes au Gratin	5.6	2.8
Crackers	4.9	2.4
Cheese Spread	7.0	2.2
Jelly	6.1	2.0
Peanut Butter	6.1	1.9
Strawberries	7.7	1.6
Applesauce	7.6	1.4
Peaches	6.9	1.7
Fruit Mix	6.8	1.8
Pears	6.8	1.8
Oatmeal Cookie Bar	7.7	1.9
Chocolate Nut Cake	7.5	2.0
Chocolate-Covered Cookie	7.4	1.8
Cherry Nut Cake	5.2	2.8
Maple Nut Cake	5.2	2.9
Brownie	4.3	2.7
Grape flavored beverage	8.2	1.0
Orange flavored beverage	8.1	1.2
Lemon-lime flavored beverage	8.1	1.3
Cherry flavored beverage	7.9	1.6
Cocoa	7.0	1.8
Coffee	5.8	2.3
M&Ms	8.8	0.7
Vanilla Caramel	8.3	1.1
Charms	8.2	1.2
Hot Sauce	7.9	1.8

*The scale range is from 1 (dislike extremely) to 9 (like extremely).
The neutral point is 5.

TABLE 5

MRE V, VI, and VII Acceptability Ratings*

<u>Item</u>	<u>Mean</u>	<u>SD</u>
Pork Sausage Patties	6.7	2.5
Ham Slices	6.2	2.5
Beef Patties	6.2	2.3
Turkey w/ Gravy	6.0	2.1
Frankfurters	5.3	2.4
Beef Stew	5.0	2.1
Chicken a la King	4.5	2.5
Beef w/ Spiced Sauce	4.0	2.2
Meatballs w/ Barbeque Sauce	3.9	2.4
Beef w/ Gravy	3.7	2.0
Beef w/ Barbeque Sauce	3.0	1.9
Ham/Chicken Loaf	1.8	1.7
Crackers	6.9	1.7
Potato Patty	4.1	2.4
Beans w/ Tomato Sauce	4.0	2.2
Cheese Spread	6.7	2.3
Jelly	6.6	1.8
Peanut Butter	5.2	2.1
Applesauce	7.9	1.6
Peaches	7.0	2.0
Mixed Fruits	6.9	1.9
Strawberries	4.9	2.6
Chocolate-Covered Cookie	7.6	1.8
Chocolate Nut Cake	6.8	2.7
Brownie	5.0	2.6
Cherry Nut Cake	5.0	2.6
Maple Nut Cake	4.6	2.5
Pineapple Nut Cake	4.3	2.8
Fruitcake	4.2	2.7
Orange Nut Cake	3.7	2.7
Cocoa	7.1	1.9
Coffee	5.5	2.5
Caramel	7.0	2.5
Chocolate Toffee Bar	6.3	2.4
Jelly Candy Bar	5.9	3.0
Chocolate Covered Coconut Bar	5.7	2.9
Chocolate Fudge Bar	5.4	2.6
Vanilla Fudge	5.4	2.7
Chocolate/Almond Bar	5.3	3.4
Orange flavored beverage	7.5	2.0
Lemon-lime flavored beverage	6.5	2.3
Cherry flavored beverage	6.2	2.9
Grape flavored beverage	6.2	2.9

*The scale range is from 1 (dislike extremely) to 9 (like extremely).
The neutral point is 5.

of 6 on the Natick questionnaire; the dehydrated fruits (the only dehydrated items in MRE VIII) received about a 7 on the 9-point scale. The scores on the Natick questionnaire indicate that these products are very acceptable. While the 82d ABN Div memorandum states that coffee is still unacceptable, it was rated 5.8 on the Natick MRE VIII questionnaire indicating that those who drank the coffee (about 70% of respondents) liked it "slightly."

It should be noted that the Natick results are based on answers from almost the entire company that was consuming MRE VIII (N=65); the sample size for the 82d ABN Div questionnaire may not be as large or complete. The questions that were used on the Natick questionnaire have been used successfully in the past and were found to be reliable and valid; reliability and validity data for the 82d ABN Div questionnaire are not available.

When the MRE VIII component ratings are compared to ratings that were collected in a similar final questionnaire administered to the 25th Infantry Division following the 1986 field study in Hawaii (5), the outcome is remarkable. Of the 28 MRE components rated, 24 were rated lower by the 82d ABN Div. There are at least two explanations for this finding. One is that the products tested by the 25th Infantry Division were better than the products tested by the 82d ABN Div. This is quite possible since the products evaluated by the 25th Infantry Division were made during a production test (one-day production) and those evaluated at Fort Bragg were from the first production run. This is probably the reason behind the low scores for crackers and brownies. The products were

apparently different in the two tests. Soldiers in the focus groups said that they did not like the new crackers because they were dense and there was no surface salt. They did not like the brownie because it was dry. One soldier even said that the brownie was worthless because he could not even trade it! The brownie was rated 6.7 on the 9-point hedonic scale in Hawaii, while it was rated only 4.3 at Fort Bragg.

Another reason for the overwhelming prevalence of lower scores in the present test compared to those collected in 1986 is that it is well known that the Commander of the XVIII Airborne Corps has been an outspoken opponent of the MRE, and his opinion may have been communicated indirectly to the troops. Another negative influence may have been the questionnaire that was developed and administered by the 82d ABN Div during the week at Market Square II. This questionnaire had some negatively biased questions. In addition, asking soldiers to rate the MRE VIII repeatedly during the week may have influenced ratings on the final questionnaire.

Although the scores on 24 of the 28 MRE components were lower than the scores from the 1986 test, overall the MRE VIII received good ratings. The mean rating on the 9-point scale for entrees was 6.2; for spreads, 6.4; for starches, 5.3; for candy, 8.4; and for beverages, 7.5. When average scores for MRE VIII entrees, desserts, candy, spreads, starches, and fruits were compared to the average scores for similar MRE V to VII items, the MRE VIII entrees, desserts, and candy were found to be significantly higher ($p < 0.001$). Table 6 shows the average scores and standard deviations for these food categories.

TABLE 6
RATION ACCEPTABILITY

	<u>MRE V to VII</u>		<u>MRE VIII</u>	
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>
Entrees*	4.7	(1.2)	6.2	(1.4)
Desserts*	5.2	(1.8)	6.3	(1.5)
Candy*	6.1	(1.9)	8.4	(0.8)
Spreads	6.1	(1.5)	6.4	(1.5)
Starches	5.1	(1.4)	5.3	(2.0)
Fruit	7.0	(1.4)	7.4	(1.5)

* Statistically significant, $p < 0.001$.
The scale range is from 1 (dislike extremely) to 9 (like extremely)
The neutral point is 5.

Soldiers in both ration groups (MRE VIII vs MRE V to VII) were also asked to rate the MRE overall for breakfast, lunch and dinner. For all cases, the MRE VIII was significantly better than MRE VII ($p < 0.001$), as shown in Figure 1.

Discussion in the focus groups supported the results from the questionnaire data. Soldiers in the MRE VIII group were very positive about the new entrees and appreciated the addition of the breakfast entrees. However, many of the soldiers said that breakfast was still a problem because there were still only a few breakfast entrees available in each case of MREs. Soldiers in the MRE V to VII focus groups complained about the quality of the entrees, especially the amount of fat and gristle in the various meat with gravy or sauce entrees.

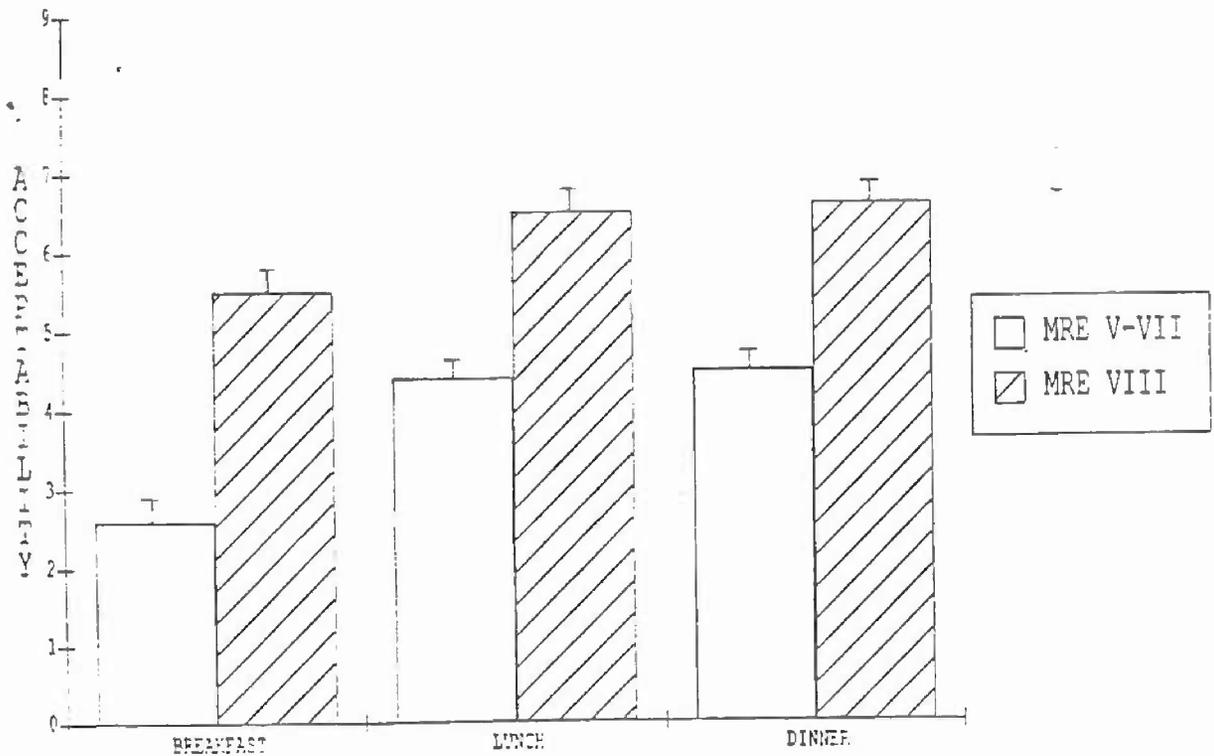


Figure 1. Comparison of average hedonic ratings of MRE for breakfast, lunch, and dinner. The scale ranged from 1(dislike extremely) to 9(like extremely). The neutral point is 5.

When candy was discussed in the focus groups, some soldiers in the MRE V to VII group said that the chocolate quality was poor and waxy. One individual said, "It's like they don't care enough ... to make decent chocolate." In the MRE VIII groups, the commercial candy got rave reviews which are reflected in the exceptionally high scores on the questionnaire (the mean candy score was 8.4 on the 9-point scale). The commercial candy was also seen as a morale boost by the soldiers.

The issue of morale was probed in one of the focus groups. The soldiers described the psychological lift they got when they got an MRE meal that they perceived as good. One soldier said that when he received a good MRE in the morning he felt good the entire day. The inclusion of commercial products contributed substantially to troop morale. Many

soldiers said that commercial products were better quality, and they trusted the familiar product packaging. Just seeing the commercial packaging made soldiers feel good because it reminded them of being home. The addition of more commercial products that are already available in small packages such as coffee, cocoa, soup, oatmeal, and nut-raisin snacks would probably serve to further improve the MRE.

Soldiers in both ration groups were asked to rate the MRE that they had consumed during Market Square II in terms of how the food tastes, looks, the quantity and variety of food, and the ease of preparation. These characteristics were rated on a 7-point scale where 1 corresponded to "very dissatisfied," 4 corresponded to a neutral point, and 7

TABLE 7
SOLDIER SATISFACTION*

	<u>MRE V to VII</u>		<u>MRE VIII</u>	
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>
how the food tastes	3.5	(1.6)	5.6	(1.3)
how the food looks	3.3	(1.5)	4.9	(1.3)
quantity of food	3.3	(1.7)	4.9	(1.4)
variety in one meal	3.6	(1.6)	5.3	(1.4)
ease of preparation	4.4	(1.7)	5.1	(1.4)
variety meal to meal	3.4	(1.8)	5.3	(1.4)

* All comparisons between groups statistically significant, $p < 0.01$.
 The scale range is from 1 (very dissatisfied) to 7 (very satisfied).
 The neutral point is 4.

corresponded to "very satisfied." Table 7 shows that the MRE VIII group was satisfied on all accounts. The MRE V to VII group was dissatisfied in all cases except ease of preparation which received a neutral rating. When scores were compared by ration group, all differences were statistically significant ($p < 0.01$). MRE VIII was rated better than MREs V to VII in terms of taste, looks, quantity, variety, and ease of preparation.

TABLE 8

Comparison of MRE consumed during Market Square II to previous versions.*

<u>Attribute</u>	<u>MRE VIII</u>		<u>MRE V-VII</u>	
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>
How food tastes	5.9	(1.1)	4.3	(1.0)
How food looks	5.1	(1.1)	4.1	(0.8)
Amount of food in one meal	5.6	(1.0)	4.3	(0.9)
Size of entrees (main dish)	5.6	(1.1)	4.6	(0.9)
Number of beverages	6.1	(0.9)	4.6	(1.3)
Number of breakfast foods	5.1	(1.2)	3.7	(1.0)
Variety	6.0	(1.2)	4.1	(1.0)
Quality of food	6.0	(1.0)	4.1	(1.0)
Packaging	4.9	(1.1)	4.2	(0.8)

*The scale range is from 1 (last week's MRE much worse) to 7 (last week's MRE much better). The neutral point (no difference between MRE consumed during the week and previous versions) is 4. Differences between groups are all significant ($p < 0.01$).

Soldiers in both groups were also asked to compare the MREs they consumed during the week to MREs they had consumed in the past (see Table 8). The results from this question clearly indicate that MRE VIII is considered a significant improvement over previous versions. It is considerably better in terms of taste, looks, variety, quality, packaging, amount of food, portion size, and number of beverage and breakfast items. The fact that soldiers in the MRE V to VII group responded that there was no difference between the MRE they consumed during Market Square II and previous versions is a good indicator of the questionnaire's validity, since most of the MREs were the same as they had consumed during previous FTXs. A statistically significant difference was found between MRE VIII and MRE V to VII ration groups on all ration attributes ($p < 0.01$). When asked which ration they would prefer, the MRE they consumed during Market Square II or previous versions, 89% of the MRE VIII group said they preferred the MRE they consumed during Market Square II, 3% said they preferred previous versions, and 8% had no preference (see Figure 2).

When asked to compare last week's MRE to a C ration, MRE VIII was rated slightly better than the C ration by those soldiers who had eaten a C ration before (about 43% of Alpha company) (see Table 9). Given the choice between a C ration and MRE VIII, 52% of those who had eaten a C ration before said that they preferred MRE VIII. The C ration was preferred by 33%, and no preference was expressed by 15% (see Figure 3).

MRE VIII vs PREVIOUS MRES

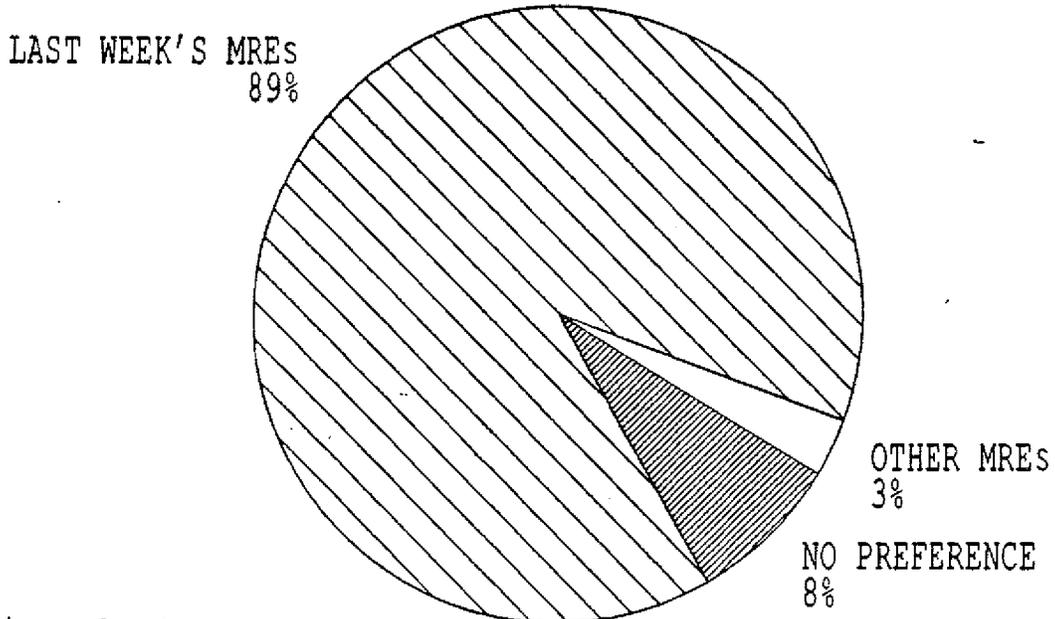


Figure 2. Percent of soldiers in the MRE VIII group who prefer MRE VIII and previous MRE versions.

TABLE 9

MRE VIII vs C RATION*

<u>Subject</u>	<u>Mean</u>	<u>SD</u>
How food tastes	4.6	1.5
How food looks	4.7	1.6
Amount of food in one meal	5.0	1.7
Size of entrees (main dish)	5.1	1.6
Number of beverages	5.6	1.6
Number of breakfast foods	4.6	1.6
Variety	5.1	1.6
Quality of food	4.6	1.8
Packaging	5.2	1.8

*The scale range is from 1 (last week's MRE much worse) to 7 (last week's MRE much better). The neutral point (no difference between MRE VIII and C Ration) is 4.

MRE VIII vs C RATIONS

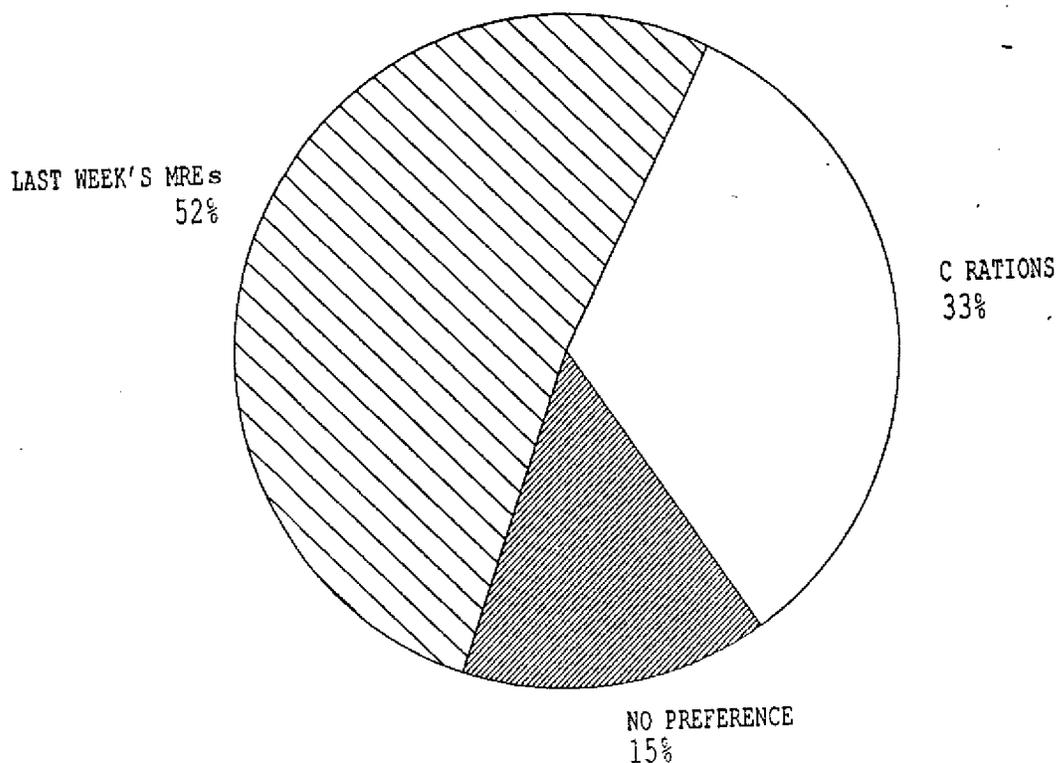


Figure 3. Percent of soldiers in the MRE VIII group who prefer MRE VIII and C rations.

Results from the questionnaire also indicate that MRE VIII has been improved in terms of variety. When entrees, starches, desserts, spreads, hot drinks, cold drinks, and condiments were rated for variety, MRE VIII was significantly better ($p < 0.01$) than MRE V to VII for entrees, desserts, fruits, cold drinks, and condiments. Scores, however, indicate that soldiers would still like to see somewhat more variety in the ration.

The notion of variety was discussed at length in the focus groups. The soldiers from Alpha Company said that there definitely was more variety in MRE VIII. One soldier said that in previous MREs it seemed as if all the entrees were alike — a few loaves and patties and chunked beef in different sauces. The MRE VIII entrees, he said, were much different: some sliced meat, some stews, some dishes with pasta, noodles, or rice. Soldiers in all focus groups agreed that even an improved ration would after time (maybe 1 or 2 years depending on frequency of usage) become dull and boring. The military may want to consider rotating different menus into the system every couple of years. In this way, acceptability would remain high when the products are initially well accepted. Research shows that even the best products become monotonous and lose acceptability with repeated servings (10).

Portion size was rated by soldiers in both groups on a scale that ranged from 1 (much too small) to 7 (much too large) with 4 corresponding to the portion size being just right. In all cases, entrees, starches, desserts, fruits, spreads, hot drinks, cold drinks, and condiments were scored about a 3, which corresponds to slightly too small. When groups' scores were compared, ratings of MRE VIII entrees and condiment portion sizes were found to be rated statistically larger than MRE V-VII portions ($p < 0.01$). (The larger 8-oz entrees in 10 meals and addition of the hot sauce to 4 menus are responsible for this finding.) However, these MRE VIII items were still considered somewhat too small.

When asked to list what items they would like added to MRE VIII, about 57% listed spices, about 13% mentioned jerky and beef or pork patties, about 16% said more candy. Adding a heat source was also requested by 17% of the MRE VIII group. The list of items that soldiers wanted dropped from MRE VIII included the brownie and beef stew which were the two lowest rated items and the nut cakes which got variable ratings depending on type (see Table 4). About 45% of the MRE V to VII group also asked that spices be added to the ration. Other items to be added to MRE V to VII included more drinks, fruit, and candy; these items have already been added to the MRE VIII. The need for a heat source was also listed by 21% of the MRE V to VII group. Deletions from MRE V to VII included loaves (50% of the respondents), beef entrees (26% of the respondents), and nut cakes (22% of the respondents).

Soldiers were asked to rank order the five most important improvements from a list of possible improvements to the MRE (see Appendix C). The five most important improvements in each ration group are shown in Table 10. Including a heat source is one of the five most important improvements according to 70% of the MRE VIII group and 64% of the MRE V to VII group. The fact that a considerable number of soldiers still think MRE VIII needs improvement in taste and variety indicates that the product still needs some improvement. However, when the MRE VIII and MRE V to VII group lists are compared, it is evident that MRE VIII is an improvement over MRE V to VII. For example, 51% of the MRE V to VII group thought that increasing the entree size was one of the five most important improvements, while only 38% of the MRE VIII group thought so. Similarly, 63% of the MRE V to VII group indicated that it was very important to

TABLE 10

FIVE MOST IMPORTANT IMPROVEMENTSMRE VIII GROUP

1. include heat source	70%
2. peanut butter & jelly together	65%
3. increase variety	48%
4. improve taste	44%
5. increase entree size	38%

MRE V - VII GROUP

1. increase variety	68%
2. include heat source	64%
3. improve taste	63%
4. include more breakfast foods	56%
5. increase entree size	51%
package ration in cans	5%

improve the taste while 44% of the MRE VIII group responded that taste improvement was very important. Only 5% of each ration group felt that packaging the ration in cans was one of the five most important improvements.

Some human factors issues were addressed in the questionnaires. The only major problem was not having a heat source. When asked about how they heated their MRE in the field during Market Square II, about 63% of the MRE VIII and 67% of the MRE V to VII group said that they had no heat source to heat their MRE. Some used heat tabs, and a few had canteen cup

stands. Opening the outer bag was also described as being slightly difficult by some soldiers. Spilling rations was considered to be a bigger problem in the MRE V-VII group than in the MRE VIII group ($p < 0.01$); however, spilling food or beverage was not described as a serious problem. A longer 7-inch spoon will replace the 5-inch spoon that is currently in the MRE pending a supply source; the longer spoon may help in the area of MRE preparation.

CONCLUSIONS AND RECOMMENDATIONS

The MRE VIII was shown to be a significant improvement over earlier versions of the MRE. Average hedonic ratings for MRE VIII entrees, desserts, and candy were significantly higher than average scores for similar MRE V to VII items. Soldiers especially liked the larger entree sizes, commercial candies, beverage powders, hot pepper sauce, and new entrees such as chicken with rice and spaghetti. When asked to compare MRE VIII to previous versions of the MRE or C rations, most soldiers stated a preference for MRE VIII.

Although most MRE VIII items were well received, the data indicate that a few of the products need improvement. Two entrees, chicken a la king and beef stew received mediocre scores and should probably be replaced with other entrees rather than improved, since these entrees are duplicated in the Tray Pack ration that is also used in the field when MREs are issued. The other unacceptable products were the brownie and crackers. The brownie needs to be reformulated or replaced with another product. The problem with the cracker appears to be its dense texture

and the removal of the surface salt. A packaged bread is currently being developed by the Food Engineering Directorate (FED). Initial testing indicates that it will be a good alternative to crackers in some MRE meals.

Although a few breakfast entrees have been added to MRE VIII, breakfast is still a problem with the MRE. Only four entrees (ham slices, potatoes with ham chunks, ham omelet, and corned beef hash) per case of twelve could be considered to be breakfast entrees; this means that two-thirds of the soldiers are still getting non-breakfast entrees for breakfast. Packaging cases of "breakfast MREs" exclusively would eliminate this problem. Another possibility is adding a package of oatmeal to some MREs. FED is currently developing two new thermo processed breakfast entrees, a cheese omelet and french toast. Packages of dry cereal (Oatmeal and Cream of Wheat) are also being considered by FED.

A major problem with the MRE is that soldiers are not issued a heating source with the ration. The canteen cup stand and trioxane heat tablets are both type classified and thus can be ordered by commanders for their troops. This, however, does not seem to be the rule. Almost all of the soldiers did not have a way to heat their MREs in the field. Packaging heat tablets in the same case as the MREs could alleviate the problem.

Commercial packaging was found to be a considerable morale boost in the field. Commercial packaging gave troops a psychological lift because

they thought the addition of commercial products meant that the Army cared more about them. They also said that the commercial products reminded them of home. The MRE VIII can be further improved by the addition of more commercial foods that are already available in individual packages such as more candy, coffee, nut and raisin mixes, "Rahmen" noodles, oatmeal, soup, and cocoa. Some of these products such as the raisin and nut mixes and oatmeal are available in the Ration, Cold Weather. The addition of a spice packet such as "Mrs. Dash" and condiments would also be appreciated by the soldiers.

Finally, soldiers stated that even with the improved MRE they thought that after a while, it would become dull and unacceptable. Research has shown that very acceptable products become unacceptable if eaten repeatedly over time (10). In order to maintain the high acceptability observed in this test and the previous test of MRE VIII (5), it may be necessary to rotate the menus every couple of years.

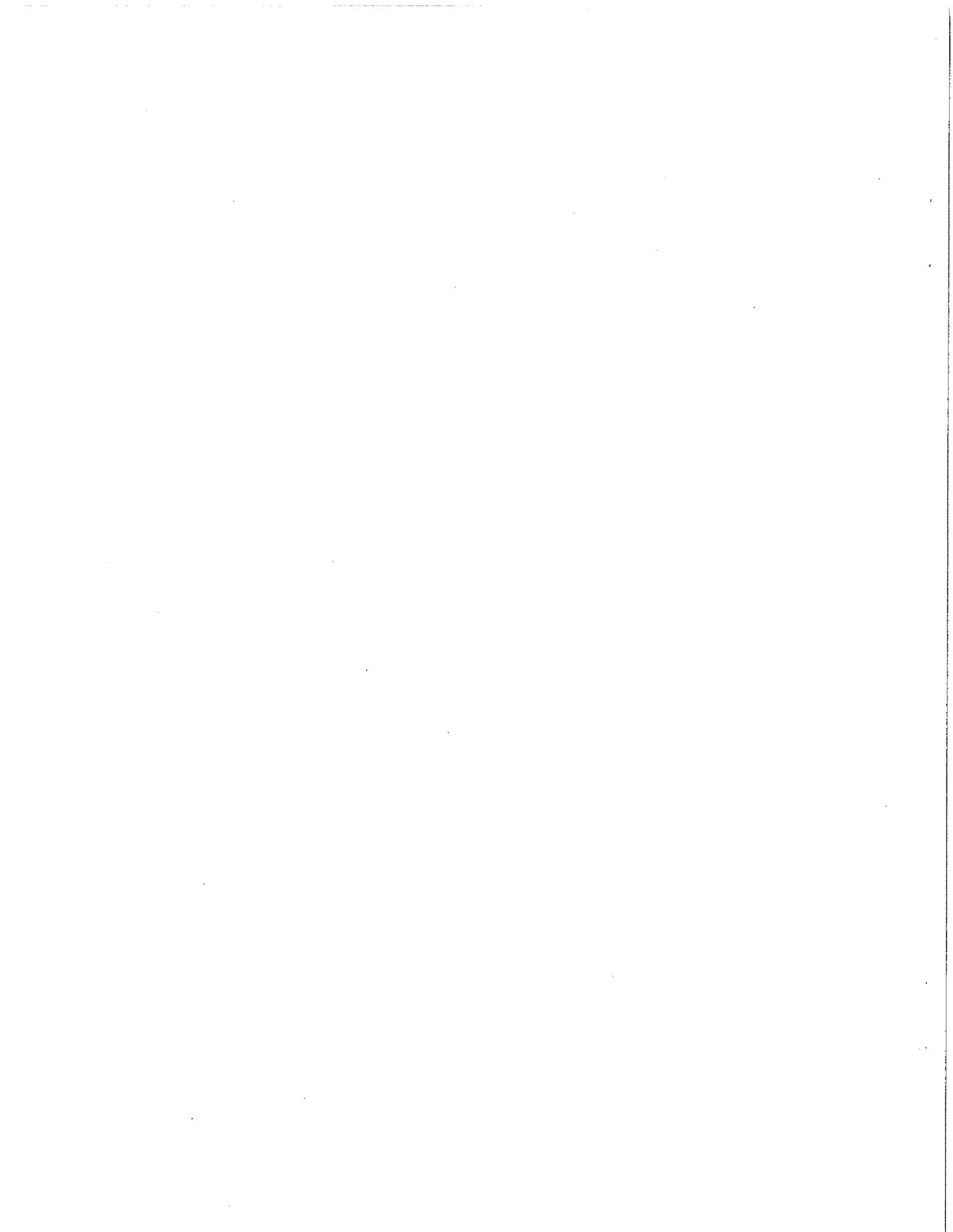
This document reports research undertaken at the US Army Natick Research, Development and Engineering Center and has been assigned No. NATICK/TR-88/078 in the series of reports approved for publication.

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APPENDIX A

RECORD OF NUTRITIVE VALUES MD: VIII

05/01/87

TOTALS	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	CHOLE (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
2													
NR.													
1	257.97	47.06	48.44	8.64	475	571	6.86	1369	1688	123	3.20	4.59	79
2	172.53	44.78	36.25	7.91	436	506	12.77	1422	1348	128	3.09	6.85	85
3	179.53	45.89	52.57	9.00	493	829	4.33	1396	1877	188	2.91	2.27	43
4	262.55	46.52	39.53	11.50	704	1386	11.97	2484	1450	137	4.68	1.70	388
5	204.88	43.37	55.02	9.18	600	696	6.66	2067	1012	168	4.55	3.17	98
6	174.76	53.34	50.37	8.00	445	715	4.97	1603	1548	170	3.21	2.27	84
7	188.91	57.03	55.90	8.37	413	574	6.92	1773	1219	160	3.89	.90	138
8	211.02	44.13	45.92	10.82	515	1125	5.29	2457	1524	128	5.13	2.88	107
9	149.96	55.96	56.60	9.54	413	644	7.86	1922	1484	172	4.35	7.38	66
10	206.50	51.48	56.11	6.90	548	716	5.27	1538	624	106	3.01	.90	111
11	187.67	51.43	55.06	8.11	568	787	5.75	1893	1003	109	3.76	2.69	130
12	290.45	38.09	41.63	8.72	435	757	5.51	1714	1498	177	3.62	2.82	66
MEAN	207.23	48.34	51.11	8.98	504	793	7.06	1802	1356	138	3.78	3.20	116

MEAL REQUIREMENTS

1/3 AR 40-25	33.33	53.3	267	267	6.0	1867	2334	625	1825	133		5.0	
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A (IU)	CAROTENF (MG)	TOTAL A (IU)	C (MG)	R1 (MG)	R2 (MG)	NIACIN (MG)	RG (MG)	FDIACIN (MCG)	R12 (MCG)	E (MG)	CHD (G)	CALORIES	WEIGHT (G)
1	2930	.004	2940	91	2.66	10.6	1.84	49	.86	4.51	205.42	1446	558
2	5480	.007	5500	91	2.99	16.8	3.96	71	1.09	2.65	185.64	1248	347
3	4630	2.007	7980	165	3.23	18.7	1.84	123	1.09	4.29	182.75	1391	471
4	9320	.051	9410	116	4.12	15.8	5.26	70	.92	3.87	151.23	1327	531
5	2910	.578	3870	69	2.17	10.5	2.06	61	.79	6.41	143.35	1242	456
6	4630	.234	5020	135	3.21	16.5	1.77	71	.86	3.55	131.09	1191	419
7	1710	1.267	3820	78	2.03	12.9	.75	74	1.70	6.74	145.82	1314	456
8	3800	.055	3900	91	3.02	10.4	2.06	25	.76	4.33	162.07	1238	473
9	2200	.023	2240	152	2.38	16.2	.99	72	1.02	8.80	146.30	1318	418
10	3510	.000	3510	67	2.19	11.9	2.01	55	.56	5.96	129.84	1230	451
11	3400	.059	3500	113	2.47	17.3	2.44	116	.33	3.92	163.44	1355	466
12	3660	.004	3670	92	3.07	11.5	2.19	61	.63	3.44	186.29	1272	565
MEAN	4015	.357	4513	105	2.79	14.1	2.26	71	.88	4.87	161.10	1298	477

MEAL REQUIREMENTS

1/3 AR 40-25	1670	20	0.50	0.73	8.0(N.F.)	133	0.73	1.0	3.3	146.7	1200	
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PERCENT OF CALORIES FROM: PROTEIN - 15 PERCENT
 FAT - 35 PERCENT
 CHD - 50 PERCENT

RECORD OF NUTRITIVE VALUES MPT-VIII

05/01/87

MENU 1	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
PORK BBO/RCE	143.68	32.27	25.13	3.81	30	288	3.57	828	796	48	2.06	4.54	79
APPLESAUCE	100.27	.23	.23	.18	5	9	.44	4	77	4		.05	
JELLY	9.70	.26	.05	.05	2	3	.11	13	11	2	.01		
CRACKERS	.95	4.43	5.58	1.29	263	52	.72	184	72	12	.44		
CANDY AVER	1.78	4.20	6.43	.62	53	53	.73	106	90	15	.22		
COCOA BEV PD	1.10	2.80	6.95	1.94	67	196	.81	211	487	34	.43		
BEVERAGE RSE	.12	2.48	2.99	.22	36	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUR ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
TABASCO SCE	.00	.10	.00					2	0	0			
SUM	257.97	47.06	48.44	8.64	475	671	6.86	1369	1688	123	3.20	4.59	79

A	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	FOLACIN (MCG)	B12 (MCG)	E (MG)	CHO (G)	CALORIES	WEIGHT (G)
PORK BBO/RCE				.34	.32	6.4	.27	41	.45	2.49	21.91	443	227
APPLESAUCE		10	3	.01	.04	.2	.04	1			25.10	103	126
JELLY	.004	10	1	.00	.00	0	.00				18.29	75	28
CRACKERS	.000	0	0	.98	.53	2.8	.38	0	.11	.91	32.75	199	45
CANDY AVER				.02	.08	.1	.01	2		.80	34.32	212	47
COCOA BEV PD		2920	48	1.31	.11	.2	1.13	5	.30	.30	29.69	192	43
BEVERAGE BSE			25								28.19	150	34
COFFEE INSTA			15		.01	.8	.00				2.19	9	3
CREAM SUR ND			0	.00	.03	.0	.00				2.11	19	4
SUGAR	.000	0	0	.00	.00	.0	.00				5.97	24	6
TABASCO SCE						.0					4.90	20	5
SUM	.004	2940	91	2.66	1.12	10.6	1.84	49	.85	4.51	205.42	1446	568

PERCENT OF NUTRITIVE VALUES MPF-VIII

05/01/87

MENU 2	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
C BEEF HASH	157.56	29.78	13.06	3.06	25	181	3.40	878	445	34	2.15	6.80	86
PEARS DFHY	.42	.18	.04	.15	4	7	.13	9	71	5	.02	.04	
JELLY	9.70	.26	.05	.05	2	3	.11	13	11	2	.01		
CRACKERS	.95	4.43	5.58	1.29	251	52	.72	184	72	12	.44		
GRANDOLA BAR	2.38	4.57	6.49	.66	29	97	7.22	106	108	32			
COCOA BEV PD	1.10	2.80	6.95	1.99	67	196	.81	211	487	34	.43		
BEVERAGE RSE	.12	2.48	2.99	.22	36	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUR ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
SUM	172.59	44.78	36.25	7.91	436	605	12.77	1422	1348	128	3.09	6.85	86

	A (IU)	CAROTENE (MG)	TOTAL A (IU)	A	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	R6 (MG)	FOLACIN (MCG)	B12 (MCG)	E (MG)	CHO (G)	CALORIES	WEIGHT (G)
C BEEF HASH		.003	10	2	.02	.20	.32	5.2	.32	66	.68	.68	23.34	330	227
PEARS DFHY		.004	10	1	.01	.02	.01	.1	.01	0	.19	.19	14.22	58	15
JELLY		.000	0	0	.00	.00	.00	.0	.00	0	.11	.11	18.29	75	28
CRACKERS		.000	0	0	.98	.53	.38	2.8	.38	0	.91	.91	32.75	199	45
GRANDOLA BAR	2560		2560	48	.67	.46	2.12	7.6	2.12	5	.57	.57	28.90	192	43
COCOA BEV PD	2920		2920	25	1.31	.11	1.13	.2	1.13	5	.30	.30	29.69	192	43
BEVERAGE RSE				15		.01	.00	.8	.00				28.19	150	34
COFFEE INSTA				0	0	.03	.00	.0	.00				2.11	9	3
CREAM SUR ND		.000	0	0	.00	.00	.00	.0	.00				2.11	19	4
SUGAR				0									5.97	24	6
SUM	5480	.007	5500	91	2.99	1.37	3.96	16.8	3.96	71	1.09	2.65	185.64	1248	447

RECORD OF NUTRITIVE VALUES MPF VEST

05/01/87

MENU #	WATER (G)	PROTEIN (G)	FAT (G)	ACID (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
CHIX STEW	174.30	19.28	10.23	2.72	41	297	1.27	635	671	43	1.29	2.27	43
PEACHES FRDH	.36	.70	.07	.30	3	13	.31	9	113	5	.01	.00	
PEANUT BUT	.55	12.61	19.19	1.38	18	147	.71	218	289	70	.42		
CRACKERS	.95	4.43	5.58	1.29	261	52	.72	184	72	12	.44		
CANDY AVER	1.78	4.20	6.43	.62	53	53	.73	106	90	15	.22		
COCOA BEV PD	1.10	2.80	6.95	1.99	67	196	.81	211	487	34	.43		
BEVERAGE BSE	.12	2.48	2.99	.22	36	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUR ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
TABASCO SCE	.00	.10	.00	.00	0	0	0	2	0	0			
SUM	179.53	46.89	52.53	9.00	492	829	4.93	1386	1877	188	2.91	2.27	43

MENU #	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	R1 (MG)	R2 (MG)	NIACIN (MG)	B6 (MG)	FOACIN (MCG)	R12 (MCG)	E (MG)	CHO (G)	CALORIES	WEIGHT (G)
CHIX STEW		1.948	3250		.05	.18	9.5	.23	86	.68	.45	20.28	250	227
PEACHES FRDH		.059	100	44	.01	.02	.5	.01	3		.42	13.56	58	15
PEANUT BUT	1710		1710	33	.87	.04	4.7	.08	27		1.40	8.79	258	43
CRACKERS	0	.000	0	0	.98	.53	2.8	.38	0	.11	.91	32.75	199	45
CANDY AVER					.02	.08	.1	.01	2		.80	34.32	212	47
COCOA BEV PD	2920		2920	48	1.31	.11	.2	1.13	5	.30	.30	29.69	192	43
BEVERAGE BSE				25								28.19	150	34
COFFEE INSTA				15			.8	.00				2.19	9	3
CREAM SUB ND				0			.03	.00				2.11	19	4
SUGAR	0	.000	0	0	.00	.00	.0	.00				5.97	24	6
TABASCO SCE				0			.0	.00				4.90	20	5
SUM	4530	2.007	7980	165	3.23	1.00	18.7	1.84	123	1.09	4.29	182.75	1391	471

MENU 4	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESTUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
HAM OMELET	127.86	22.59	13.00	3.21	44	362	2.28	935	332	25	1.99	1.70	338
POT AU GRAT	111.59	3.69	7.65	2.03	95	373	.37	587	272	14	1.13	.00	10
CHEESE SPR	18.17	5.68	15.77	1.72	158	235	.20	441	25	10	.65	.00	39
CRACKERS	.95	4.43	5.58	1.29	261	52	.72	184	72	12	.44		
GRANOLA BAR	2.38	4.57	6.49	.56	29	97	7.22	105	108	32	.43		
COCOA BEV PO	1.10	2.80	6.95	1.99	67	196	.81	211	487	34		.00	
BEVERAGE BSE	.12	2.48	2.99	.22	35	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUR ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
SUM	262.55	46.52	59.52	11.60	704	1386	11.97	2484	1450	137	4.68	1.70	388

A (TU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	B6 (MG)	FOLACIN (MCG)	B12 (MCG)	E (MG)	CHO (G)	CALDRIES	WEIGHT (G)
500	.051	500	1	.24	.39	3.4	.19	51	.51	1.02	3.44	221	170
430	.051	520	1	.04	.11	1.0	.06	10	.85	.85	16.80	151	142
2910	.000	2910	27	.88	.07	.0	1.38	4	.21	.21	1.19	169	43
0	.000	0	0	.98	.53	2.8	.38	0	.11	.91	32.75	199	45
2560	.000	2560	48	.67	.45	7.6	2.12	5	.30	.57	28.90	192	43
2920	.000	2920	25	1.31	.11	.2	1.13	5	.30	.30	29.69	192	43
	.000	0	15	.01	.01	.8	.00				28.19	150	34
	.000	0	0	.03	.03	.0	.00				2.19	9	3
	.000	0	0	.00	.00	.0	.00				2.11	19	4
	.000	0	0	.00	.00	.0	.00				5.97	24	6
9320	.051	9410	115	4.12	1.73	15.8	5.26	70	.92	3.87	151.23	1327	531

RECORD OF NUTRITIVE VALUES MPT VIII

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MTNU 5	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
SPAG/MT SCE	171.37	23.45	7.19	4.29	77	211	3.70	1095	635	48	2.81	2.27	27
CHEESE SPR	18.17	5.68	15.77	1.72	158	235	.20	441	26	10	.65		39
CRACKERS	.95	4.43	5.58	1.29	261	52	.72	184	72	12	.44		
MAPLE NUT CK	13.90	6.97	22.40	1.18	56	128	1.67	325	125	30	.61	.90	32
BEVERAGE BSE	.12	2.48	2.99	.22	36	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
TABASCO SCE	.00	.10	.00	.00	0	0	.00	2	0	0	.00		
SUM	204.88	43.39	55.02	9.18	600	626	6.66	2067	1012	108	4.55	3.17	98

A (TU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	R1 (MG)	R2 (MG)	NIACIN (MG)	B6 (MG)	FOLACIN (MCG)	B12 (MCG)	F (MG)	CHO (G)	CALORIFS	WEIGHT (G)
SPAG/MT SCE	.578	960	2	.14	.27	5.2	.27	41	.68	2.49	20.50	241	227
CHEESE SPR	2910	2910	27	.88	.07	.0	1.38	4	.21	.21	1.19	169	43
CRACKERS	0	0	0	.98	.53	2.8	.38	0	.11	.91	32.75	199	45
MAPLE NUT CK				.17	.19	1.6	.03	16		2.79	45.55	412	90
BEVERAGE BSE			25								28.19	150	34
COFFEE INSTA			15		.01	.8	.00				2.19	9	3
CREAM SUB ND			0	.00	.03	.0	.00				2.11	19	4
SUGAR	0	.000	0	.00	.00	.0	.00				5.97	24	6
TABASCO SCE					.00	.0	.00				4.90	20	5
SUM	2910	3870	69	2.17	1.10	10.5	2.06	61	.79	6.41	143.35	1242	456

RECORD OF NUTRITIVE VALUES MPT VIII

05/21/97

MENU 6	WATER (G)	PROTEIN (G)	FAI (G)	AGH (G)	CA(CIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
CHIC ALAKING	171.52	30.03	14.41	3.27	34	220	1.84	965	415	34	1.82	2.27	84
STRAWBR SW	.13	.70	.16	.37	17	70	.51	5	131	11	.01		
PEANUT BUT	.55	12.61	19.19	1.38	18	147	.71	218	289	70	.48		
CRACKERS	.05	4.43	5.58	1.24	261	52	.72	184	72	12	.44		
COCOA BEV PD	1.10	2.80	6.95	1.99	67	196	.81	211	487	34	.43		
BEVERAGE BSE	.12	2.48	2.99	.22	36	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUR ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
SUM	174.76	53.34	50.37	9.00	445	715	4.97	1603	1548	170	3.21	2.27	84

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	A (IU)	CAROTENE (MG)	TOTAL (IU)	A (MG)	C (MG)	R1 (MG)	R2 (MG)	NTACIN (MG)	B6 (MG)	FOLACTN (MCG)	R12 (MCG)	E (MG)	CHO (G)	CALORIES	WFIQHT (G)
CHIC ALAKING	.227	.007	380	.05	.27	7.7	.16	.32	.45	.68	7.76	281	227		
STRAWBR SW			10	.01	.01	.3	.02	7		.25	13.63	59	15		
PEANUT BUT	1710		1710	.87	.04	4.7	.08	27		1.40	8.79	258	43		
CRACKERS	0	.000	0	.98	.53	2.8	.38	0	.11	.91	32.75	199	45		
COCOA BEV PD	2920		2920	1.31	.11	.2	1.13	5	.30	.30	29.69	192	43		
BEVERAGE RSE			25								28.19	150	34		
COFFEE INSTA			15			.8	.00				2.19	9	3		
CREAM SUR ND	0	.000	0	.00	.03	.0	.00				2.11	19	4		
SUGAR				.00	.00	.0	.00				5.97	24	6		
SUM	4630	.234	5020	3.21	1.01	16.5	1.77	71	.86	3.55	131.09	1191	419		

RECORD OF NUTRITIVE VALUES MRF VIII

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MENU 7	WATER (G)	PROTEIN (G)	FAT (G)	ASU (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
BEEF STEW	169.05	30.51	10.08	3.00	34	207	3.54	1044	599	43	2.41		116
CRACKERS	.95	4.43	5.58	1.29	261	52	.72	184	72	12	.44		
PEANUT BUT	.55	12.61	19.19	1.38	18	147	.71	218	289	70	.48		
CHERRY NICK	17.86	6.62	16.96	1.09	51	104	1.57	304	105	26	.52	.90	23
BEVERAGE BSE	.12	2.48	2.90	.22	76	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
TARASCO SCF	.00	.10	.00	.00	0	0	.00	2	0	0	.00		
SUM	188.91	57.03	55.90	8.37	413	579	6.92	1773	1219	160	3.89	.90	138

A	CARDENE (MG)	TOTAL A (IU)	C (MG)	R1 (MG)	R2 (MG)	NIACIN (MG)	RR (MG)	FOLACIN (MCG)	R12 (MCG)	E (MG)	CHO (G)	CALORIES	WEIGHT (G)
BEEF STEW	1.267	2110	5	.05	.25	3.4	.27	34	1.59	1.82	13.46	267	227
CRACKERS	.000	0	0	.98	.53	2.8	.38	0	.11	.91	32.75	199	45
PEANUT BUT	1710	1710	33	.87	.04	4.7	.08	27		1.40	8.79	258	43
CHERRY NICK				.13	.14	1.2	.02	13		2.61	47.46	369	90
BEVERAGE BSE			25								28.19	150	34
COFFEE INSTA			15		.01	.8	.00				2.19	9	3
CREAM SUR ND	0	0	0	.00	.03	.0	.00				2.11	19	4
SUGAR	.000	0	0	.00	.00	.0	.00				5.97	24	6
TARASCO SCF						.0					4.90	20	5
SUM	1.267	3820	78	2.03	1.01	12.9	.75	74	1.70	6.74	145.82	1314	456

RECORD OF NUTRITIVE VALUES MPF VIII

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MENU B	WATER (G)	PROTEIN (G)	FAI (G)	ASH (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	FOLATE (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOL.FESTROL (MG)
HAM SLICES	84.07	26.22	5.32	4.21	7	359	1.46	1364	407	27	2.92	2.38	81
POT AU GRAT	111.53	3.69	7.65	2.03	96	373	.37	587	272	14	1.13	.00	10
JELLY	9.70	.26	.05	.05	2	3	.11	13	11	2	.01		
CRACKERS	.95	4.43	5.58	1.29	261	52	.72	184	72	12	.44		
BROWN CHCV	3.12	3.97	16.29	.54	34	72	1.44	78	121	30	.16	.50	16
COCOA BEV PD	1.10	2.80	6.95	1.99	67	186	.81	211	487	34	.43		
BEVERAGE BSE	.12	2.48	2.99	.22	36	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
SUM	211.02	44.13	45.92	10.82	515	1125	5.29	2457	1524	128	5.13	2.88	107

A	CAROTENE (MG)	TOTAL A (IU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	P5 (MG)	FOLACIN (MCG)	B12 (MCG)	E (MG)	CHO (G)	CALORIES	WEIGHT (G)
HAM SLICES				.29	.26	5.1	.21	5	.36	.71	.00	153	119
POT AU GRAT	.051	520	1	.04	.11	1.0	.06	10		.85	16.80	151	142
JELLY	.004	10	1	.00	.00	.0	.00				18.29	75	28
CRACKERS	.000	0	0	.98	.53	2.8	.38	0	.11	.91	32.75	199	45
BROWN CHCV		450	1	.40	.09	.4	.27	6		1.55	26.08	267	50
COCOA BEV PD		2920	48	1.31	.11	.2	1.13	5	.30	.30	29.69	192	43
BEVERAGE BSE			25								28.19	150	34
COFFEE INSTA			15		.01	8	.00				2.19	9	3
CREAM SUB ND			0	.00	.03	.0	.00				2.11	19	4
SUGAR	.000	0	0	.00	.00	.0	.00				5.97	24	6
SUM	.055	3900	91	3.02	1.15	10.4	2.06	25	.76	4.33	162.07	1238	473

RECORD OF NUTRITIVE VALUES MPY VIII

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MENU 9	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
MEATBLS/RICE	146.81	32.64	15.45	5.40	48	283	4.79	1399	776	52	3.20	6.80	54
FRUIT MX DEH	.42	.49	.13	.23	9	12	.27	6	104	7	.01	.15	
PEANUT BUT	.55	12.61	19.19	1.38	18	147	.71	218	289	70	.48		
CRACKERS	.95	4.43	5.58	1.28	261	52	.72	184	72	12	.44		
COOKIES CHCV	.74	3.03	12.17	.53	29	70	.99	94	90	22	.17	.43	11
BEVERAGE BSE	.12	2.48	2.89	.22	36	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
SUM	149.96	55.96	56.60	9.54	413	644	7.86	1922	1484	172	4.35	7.38	66

	A (IU)	CAROTENE (MG)	TOTAL A (IU)	A (MG)	C (MG)	R1 (MG)	R2 (MG)	NIACIN (MG)	PG (MG)	FOLACIN (MCG)	R12 (MCG)	E (MG)	CHD (G)	CALORIFS	WEIGHT (G)
MEATBLS/RICE		.023	40	.07	.27	7.3	.25	.32	.25	.32	.91	5.44	26.51	376	227
FRUIT MX DEH				.01	.02	.3	.01	.6	.01	.6		.15	13.73	58	15
PEANUT BUT	1710		1710	.87	.04	4.7	.08	.27	.08	.27		1.40	8.79	258	43
CRACKERS	0	.000	0	.98	.53	2.8	.38	0	.38	0	.11	.91	32.75	199	45
COOKIES CHCV	490		490	.45	.08	.3	.27	.7	.27	.7		.89	26.06	226	43
BEVERAGE BSE						.8	.00		.00				28.19	150	34
COFFEE INSTA						.0	.00		.00				2.19	9	3
CREAM SUB ND	0	.000	0	.00	.03	.0	.00	.0	.00	.03		2.11	19	4	4
SUGAR						.0	.00		.00			5.97	24	24	6
SUM	2200	.023	2240	2.38	.98	16.2	.99	72	.99	72	1.02	8.80	146.30	1318	418

RECORD OF NUTRITIVE VALUES MRI VIII

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MENU ID	WATER (G)	PROTEIN (G)	TAT (G)	ASH (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
TUNA/NOODLES	172.10	26.04	8.89	2.02	29	229	2.00	603	220	39	1.36	.00	41
CRACKERS	.95	4.43	5.58	1.29	261	59	.72	184	79	12	.44		
CHEESE SPR	18.17	5.68	15.77	1.72	158	235	.20	441	26	10	.65		39
CH NUT CAKE	14.79	12.57	21.79	1.17	51	130	1.98	290	152	37	.52	.90	31
BEVERAGE BSE	.12	2.48	2.99	.22	36	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUB ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
SUM	206.50	51.48	56.11	6.90	548	716	5.27	1538	624	106	3.01	.90	111

A (TU)	CAROTENE (MG)	TOTAL A (TU)	C (MG)	B1 (MG)	B2 (MG)	NIACIN (MG)	FE (MG)	FDIACIN (MG)	B12 (MCG)	F (MG)	CHO (G)	CALORIFS	WEIGHT (G)
TUNA/NOODLES	600	600	0	.18	.14	6.8	.23	34	.45	2.04	17.76	255	227
CRACKERS	0	0	0	.98	.53	2.8	.38	0	.11	.91	32.75	199	45
CHEESE SPR	2910	2910	27	.88	.07	0	1.38	4		.21	1.19	169	43
CH NUT CAKE				.14	.14	1.4	.02	17		2.79	39.68	405	90
BEVERAGE BSE			25			.8	.00				28.19	150	34
COFFEE INSTA			15		.01	.03	.00				2.19	9	3
CREAM SUB ND	0	0	0	.00	.00	.0	.00				2.11	19	4
SUGAR					.00	.0	.00				5.97	24	6
SUM	3510	3510	67	2.19	.92	11.9	2.01	55	.56	5.96	129.84	1230	451

RECORD OF NUTRITIVE VALUES MRF VIII

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MENU 11	WATER (G)	PROTEIN (G)	FAT (G)	ASH (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
CHIX/RICE	165.18	30.62	10.95	2.95	16	293	2.43	1039	458	36	2.22	2.27	79
PEACHES FRDH	.36	.70	.07	.30	3	13	.31	9	113	5	.01	.00	
CRACKERS	.95	4.43	5.58	1.29	261	52	.72	184	72	12	.44		
CHEESE SPR	18.17	5.68	15.77	1.72	158	235	.20	441	26	10	.65		39
COOKIES CHCV	.74	3.03	12.17	.53	29	70	.99	94	90	22	.17	.43	11
CANDY AVER	1.78	4.20	6.43	.62	53	53	.73	106	90	15	.22		
BEVERAGE BSE	.12	2.48	2.99	.22	35	33	.12	2	2	0	.00	.00	
COFFEE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUR ND	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
SUM	187.67	51.43	55.06	8.11	568	787	5.75	1893	1003	109	3.76	2.69	130

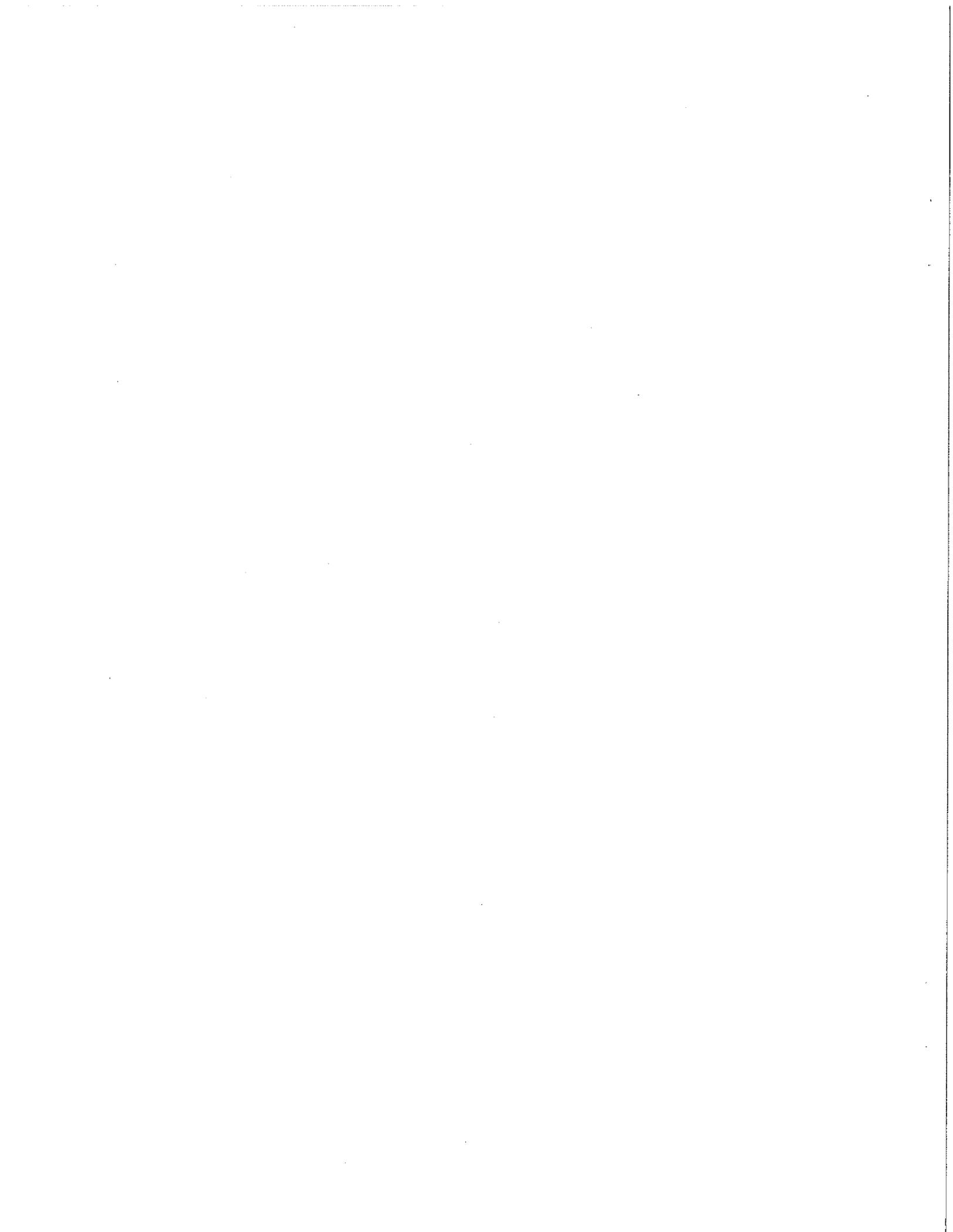
	A (IU)	CAROTENE (MG)	TOTAL A (IU)	C (MG)	R1 (MG)	R2 (MG)	NIACIN (MG)	B6 (MG)	FOLACIN (MCG)	B12 (MCG)	E (MG)	CHO (G)	CALORIES	WEIGHT (G)
CHIX/RICE		.059	100	44	.14	.20	12.7	.39	100	.23	.68	17.10	289	227
PEACHES FRDH		.000	0	0	.01	.02	.5	.01	3	.11	.42	13.56	58	15
CRACKERS	0	.000	2910	27	.98	.53	2.8	.38	0		.91	32.75	199	45
CHEESE SPR	2910		490	2	.88	.07	0	1.38	4		.21	1.19	169	43
COOKIES CHCV	490				.45	.08	.3	.27	7		.89	26.06	226	43
CANDY AVER				25	.02	.08	.1	.01	2		.80	34.32	212	47
BEVERAGE BSE				15		.01	.8	.00				28.19	150	34
COFFEE INSTA						.03		.00				2.19	9	3
CREAM SUR ND	0	.000	0	0	.00	.00	.0	.00				2.11	19	4
SUGAR	0	.000	0	0	.00	.00	.0	.00				5.97	24	6
SUM	3400	.059	3500	113	2.47	1.02	17.3	2.44	116	.33	3.92	163.44	1355	466

RECORD OF NUTRITIVE VALUES MPT-VIII

05/01/87

MENU 12	WATER (G)	PROFITM (G)	FAT (G)	ASIT (G)	CALCIUM (MG)	PHOS (MG)	IRON (MG)	SODIUM (MG)	POTASS (MG)	MAGNESIUM (MG)	NACL (G)	ZINC (MG)	CHOLESTROL (MG)
HAM/POTATOPS	174.82	23.63	8.46	3.97	18	356	1.61	1704	576	36	2.54	2.27	50
APPLESAUCE	100.27	.23	.23	18	5	9	.44	4	77	4		.05	
CRACKERS	.95	4.43	5.58	1.29	261	52	.72	184	72	12	.44		
JELLY	9.70	.26	.05	.05	3	3	.11	13	11	2	.01		
BROWN CHCV	3.12	3.97	16.29	.54	34	72	1.44	78	121	30	.16	.50	16
COCCA BEV PD	1.10	2.80	6.95	1.97	67	196	.81	211	487	34	.43		
BEVERAGE BSE	.12	2.48	2.93	.22	36	33	.12	2	2	0	.00	.00	
COFFE INSTA	.06	.00	.00	.24	4	10	.14	2	81	8	.00		
CREAM SUB NO	.30	.28	1.09	.22	7	28	.11	16	71	1	.03		
SUGAR	.00	.00	.00	.03	0	0	.01	0	0	0	.00		
SUM	290.45	38.09	41.63	8.72	435	757	5.51	1714	1498	127	3.62	2.82	66

	A (TU)	CAROTENE (MG)	TOTAL A (TU)	C (MG)	R1 (MG)	R2 (MG)	NIACIN (MG)	B6 (MG)	FOLACIN (MCG)	B12 (MCG)	E (MG)	CHO (G)	CALORIES	WEIGHT (G)
HAM/POTATOPS	280		280		.36	.25	7.0	.36	50	.23	.68	15.92	234	227
APPLESAUCE	10		10	3	.01	.04	.2	.04	1			25.10	103	126
CRACKERS	0	.000	0	0	.38	.53	2.8	.38	0	.11	.91	32.75	199	45
JELLY	0	.004	10	1	.00	.00	.0	.00	0			18.29	75	28
BROWN CHCV	450		450	1	.40	.09	.4	.27	6		1.55	26.08	267	50
COCCA BEV PD	2920		2920	48	1.31	.11	.2	1.13	5	.30	.30	29.69	192	43
BEVERAGE BSE				25								28.19	150	34
COFFE INSTA				15			.8	.00				2.19	9	3
CREAM SUB NO	0	.000	0	0	.00	.00	.0	.00				2.11	19	4
SUGAR	0	.000	0	0	.00	.00	.0	.00				5.97	24	6
SUM	3660	.004	3670	92	3.07	1.06	11.5	2.19	61	.53	3.44	186.29	1272	545



APPENDIX B

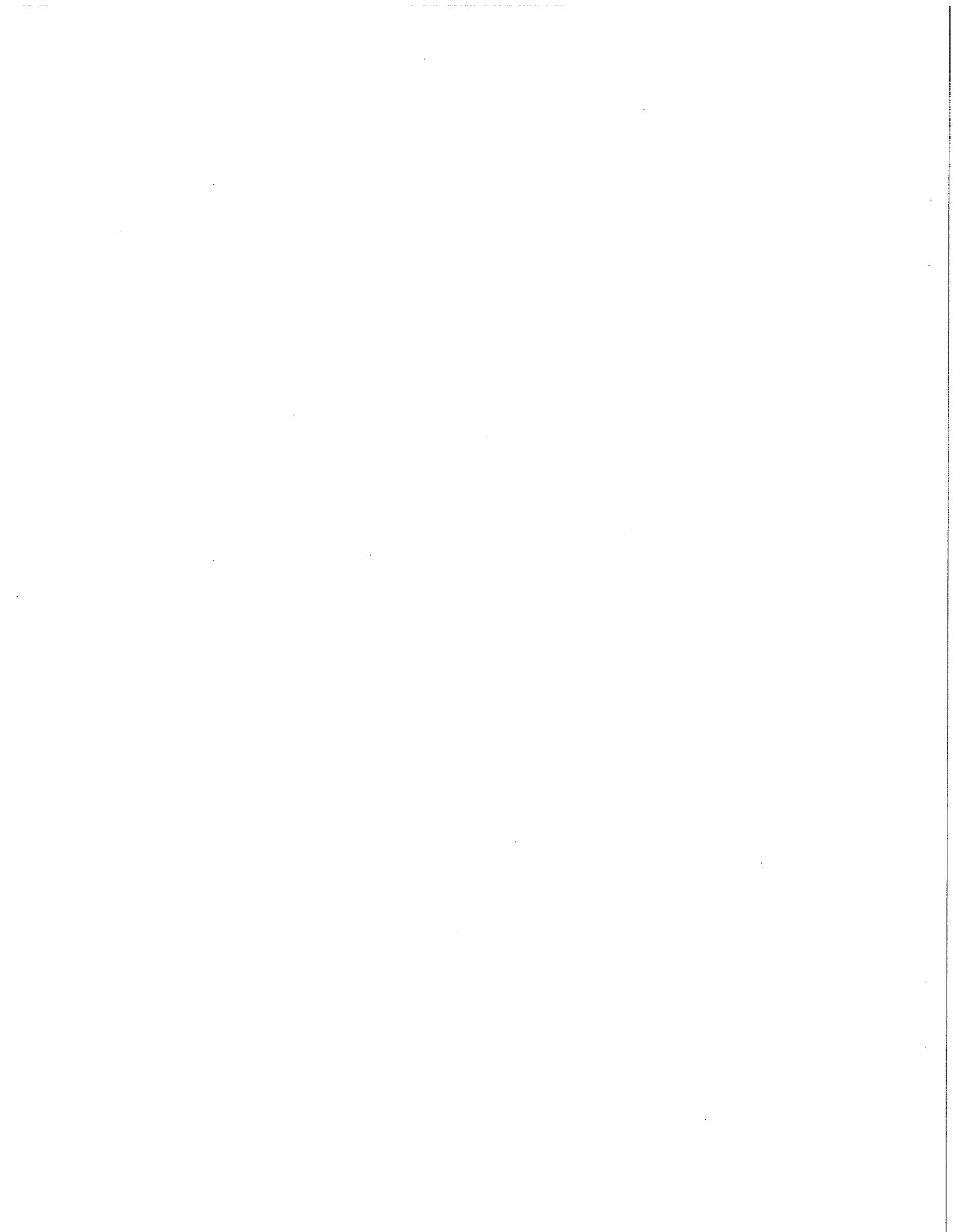
COMPARISON OF NUTRIENT COMPOSITION OF MRE VIII, MRE VII AND MRE I-V

NUTRIENT	MEAN FOR 3 MEALS		
	MRE VIII ^a	MRE VII ^b	MRE I-V ^c
Energy (kcal)	3894	4017	3669
Protein (gm)	145	152	130
Fat (gm)	153	162	167
Carbohydrate (gm)	483	487	412
Vitamin A (mcg RE)	2768	2068	2137
Thiamin (mg)	8.4	7.4	7.7
Riboflavin (mg)	3.4	3.1	3.0
Niacin (mg NE)	42	38	33
Vitamin B (mg)	6.8	5.7	5.8
Ascorbic Acid (mg)	315	297	228
Sodium (mg)	5406	6882	6516
Potassium (mg)	4068	4047	3846
Iron (mg)	21	25	23
Calcium (mg)	1512	1053	1053
Phosphorus (mg)	2379	2190	2130
Magnesium (mg)	414	405	393
Protein Calories (%)	15	15	14
Fat Calories (%)	35	36	41
CHO Calories (%)	50	49	45
Sodium (mg/kcals)	1388	1905	1776
Water (ml)	622	496	394

^aNatick Record of Nutrient Values 05/01/87

^bNatick Record of Nutrient Values 09/09/85 plus beverage base added to each menu

^cNatick Record of Nutrient Values 05/14/84



FINAL QUESTIONNAIRE

We would like your opinion about the MRE's that you ate this past week. Base your answers on the MRE's that you ate last week. Do not base your answers on past experience with the MRE. Your answers will be kept confidential.

Use a number two pencil when filling in the circles. Completely erase any changes or stray marks. Thank you.

1. What is your rank?

	1	2	3	4	5	6	7	8	9
E	<input type="checkbox"/>								
O	<input type="checkbox"/>								
WO	<input type="checkbox"/>								

2. What is your age?

under 18
 18-24
 25-34
 35-44
 45-54
 55+

3. What is your height? _____ ft _____ in Your weight? _____ lbs

4. Have you ever eaten the MRE before this last week? YES NO

5. Estimate how many MRE meals you have eaten during this past year: _____

6. We would like your honest evaluation of the MRE items you ate last week. Using the scale below, please fill in the circle below the number that best describes your opinion for each item. If you didn't try any item, fill in "0".

DIDN'T TRY	DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
					LIKE NOR DISLIKE				
0	1	2	3	4	5	6	7	8	9

1. Pork BBQ W/Rice
2. Corned Beef Hash
3. Chicken Stew
4. Ham Omelet
5. Spaghetti W/Meatsauce
6. Beef Stew
7. Chicken Ala King
8. Ham Slice
9. Meatballs W/Rice in Tomato Sauce
10. Tuna W/Noodles
11. Chicken W/Rice
12. Potatoes W/Ham Chunks
13. Crackers
14. Potatoes au gratin
15. Cheese Spread
16. Jelly
17. Peanut Butter

	0	1	2	3	4	5	6	7	8	9
1.	<input type="checkbox"/>									
2.	<input type="checkbox"/>									
3.	<input type="checkbox"/>									
4.	<input type="checkbox"/>									
5.	<input type="checkbox"/>									
6.	<input type="checkbox"/>									
7.	<input type="checkbox"/>									
8.	<input type="checkbox"/>									
9.	<input type="checkbox"/>									
10.	<input type="checkbox"/>									
11.	<input type="checkbox"/>									
12.	<input type="checkbox"/>									
13.	<input type="checkbox"/>									
14.	<input type="checkbox"/>									
15.	<input type="checkbox"/>									
16.	<input type="checkbox"/>									
17.	<input type="checkbox"/>									

○

		DISLIKE			NEITHER							
DIDN'T TRY	DISLIKE	VERY	DISLIKE	DISLIKE	LIKE	LIKE	LIKE	LIKE	LIKE	LIKE	LIKE	LIKE
0	EXTREMELY	MUCH	MODERATELY	SLIGHTLY	NOR	SLIGHTLY	MODERATELY	MODERATELY	MODERATELY	MODERATELY	MODERATELY	EXTREMELY
	1	2	3	4	5	6	7	8	9	9	9	9

	0	1	2	3	4	5	6	7	8	9
18. Applesauce	<input type="radio"/>									
19. Fruit Mix	<input type="radio"/>									
20. Peaches	<input type="radio"/>									
21. Pears	<input type="radio"/>									
22. Strawberries	<input type="radio"/>									
23. Brownie	<input type="radio"/>									
24. Cherry Nut Cake	<input type="radio"/>									
25. Chocolate-Covered Cookie	<input type="radio"/>									
26. Maple Nut Cake	<input type="radio"/>									
27. Chocolate Nut Cake	<input type="radio"/>									
28. Oatmeal Cookie Bar	<input type="radio"/>									
29. Cocoa	<input type="radio"/>									
30. Coffee	<input type="radio"/>									
31. Cherry flavored beverage	<input type="radio"/>									
32. Grape flavored beverage	<input type="radio"/>									
33. Lemon-lime flavored beverage	<input type="radio"/>									
34. Orange flavored beverage	<input type="radio"/>									
35. Charms	<input type="radio"/>									
36. Vanilla Caramel	<input type="radio"/>									
37. M&Ms	<input type="radio"/>									
38. Hot sauce	<input type="radio"/>									

7. Do you think any foods, drinks, or condiments (spices, sauces, etc.) should be ADDED to this MRE? YES NO

If yes, list the item(s). Please be realistic.

8. Do you think that any foods or drinks should be DROPPED from this MRE? YES NO

If yes, list the items(s).

9. Compare the MRE's that you ate last week to the MRE's that you've eaten in the past. Fill in a circle for each line. If you have not eaten MRE's before this last week, fill in this circle and skip to the next question.

COMPARED TO MRE'S YOU HAVE EATEN IN THE PAST:

LAST WEEK'S MRE			NO DIFFERENCE BETWEEN MRE'S	LAST WEEK'S MRE		
MUCH WORSE	MODERATELY WORSE	SLIGHTLY WORSE		SLIGHTLY BETTER	MODERATELY BETTER	MUCH BETTER
1	2	3	4	5	6	7

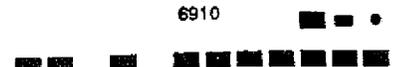
	1	2	3	4	5	6	7
How food taste	<input type="radio"/>						
How food looks	<input type="radio"/>						
Amount of food in one meal	<input type="radio"/>						
Size of entrees (main dish)	<input type="radio"/>						
Number of beverages	<input type="radio"/>						
Number of breakfast foods	<input type="radio"/>						
Variety	<input type="radio"/>						
Quality of food	<input type="radio"/>						
Packaging	<input type="radio"/>						

10. Compare the MRE's that you ate last week to C Rations (canned rations) that you have eaten in the past. Fill in a circle for each line. If you have not eaten C Rations before, fill in this circle and skip to the next question.

COMPARED TO C RATIONS (CANNED):

LAST WEEK'S MRE			NO DIFFERENCE BETWEEN MRE'S	LAST WEEK'S MRE		
MUCH WORSE	MODERATELY WORSE	SLIGHTLY WORSE		SLIGHTLY BETTER	MODERATELY BETTER	MUCH BETTER
1	2	3	4	5	6	7

	1	2	3	4	5	6	7
How food taste	<input type="radio"/>						
How food looks	<input type="radio"/>						
Amount of food in one meal	<input type="radio"/>						
Size of entrees (main dish)	<input type="radio"/>						
Number of beverages	<input type="radio"/>						
Number of breakfast foods	<input type="radio"/>						
Variety	<input type="radio"/>						
Quality of food	<input type="radio"/>						
Packaging	<input type="radio"/>						



11. Compare the MRE's that you ate last week to Tray Packs. Fill in a circle for each line. If you have not eaten Tray Packs before, fill in this circle and skip to the next question.

LAST WEEK'S MRE			NO DIFFERENCE BETWEEN MRE'S	LAST WEEK'S MRE		
MUCH WORSE	MODERATELY WORSE	SLIGHTLY WORSE		SLIGHTLY BETTER	MODERATELY BETTER	MUCH BETTER
1	2	3	4	5	6	7

	1	2	3	4	5	6	7
How food taste	<input type="radio"/>						
How food looks	<input type="radio"/>						
Amount of food in one meal	<input type="radio"/>						
Size of entrees (main dish)	<input type="radio"/>						
Number of beverages	<input type="radio"/>						
Number of breakfast foods	<input type="radio"/>						
Variety	<input type="radio"/>						
Quality of food	<input type="radio"/>						
Packaging	<input type="radio"/>						

12. Given the choice between last week's MRE's and the MRE's you have eaten before, which do you prefer?

- Last week's MRE's
- MRE's I ate before last week
- No Preference
- Have never eaten MRE's before last week

13. Given the choice between last week's MRE's and C Rations (canned ration) which ration do you prefer?

- Last week's MRE's
- C Ration
- No Preference
- Have never eaten C Rations

14. Given the choice between last week's MRE's and Tray Packs, which ration do you prefer?

- Last week's MRE
- Tray Pack
- No Preference
- Have never eaten Tray Packs



15. 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. Fill in the circle that best describes your opinion for each aspect.

VERY DISSATISFIED	MODERATELY DISSATISFIED	SOMEWHAT DISSATISFIED	NEITHER SATISFIED NOR DISSATISFIED	SOMEWHAT SATISFIED	MODERATELY SATISFIED	VERY SATISFIED
1	2	3	4	5	6	7
How the food taste						
How the food looks						
How much food there is in one meal (one MRE)						
Variety in one meal						
How easy the ration is to prepare						
Variety meal to meal						

16. We would like to know how satisfied you were with the VARIETY in the MRE that you ate during this exercise. Please fill in the circle under the number which best expresses your opinion for each food group in the MRE. Number 1 means that the amount of variety is sufficient. The other numbers (2-4) represents how much more variety you think there should be.

HAS ENOUGH VARIETY	NEEDS SOMEWHAT MORE VARIETY	NEEDS MODERATELY MORE VARIETY	NEEDS MUCH MORE VARIETY
1	2	3	4
Entrees (main dishes)			
Starches (crackers, potatoes)			
Desserts (cakes, cookies, brownies)			
Fruits			
Spreads (peanut butter, cheese, jelly)			
Hot drinks			
Cold drinks			
Condiments (spices, sauces)			

17. Please rate how much you LIKED or DISLIKED eating LAST WEEK'S MRE's for breakfast, lunch, and dinner. Please use the scale below and fill in the circle under one number for each of the three meals.

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

18. We would like to know what you think of the amount of food in each portion in the MRE you ate last week. Were the PORTION SIZES too small, too large, or just right? Please fill in the circle under the number that best expresses your opinion for each food group in the MRE.

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

	1	2	3	4	5	6	7
Entrees (main dishes)	<input type="radio"/>						
Starches (crackers, potatoes)	<input type="radio"/>						
Desserts (cakes, cookies, brownies)	<input type="radio"/>						
Fruits	<input type="radio"/>						
Spreads (peanut butter, cheese, jelly)	<input type="radio"/>						
Hot drinks	<input type="radio"/>						
Cold drinks	<input type="radio"/>						
Condiments (spices, sauces)	<input type="radio"/>						

19. How often did you eat the following MRE items for breakfast? Fill in a circle for each item. If you ate only T-rations for breakfast fill in the circle here .

NEVER	SOMETIMES	OFTEN	VERY OFTEN	ALWAYS
1	2	3	4	5

<u>MREs</u>	1	2	3	4	5
Breakfast entree (omlet, corned beef hash, ham slices, etc.)	<input type="radio"/>				
Other Entrees (beef stew, meatballs, etc.)	<input type="radio"/>				
Fruit	<input type="radio"/>				
Crackers	<input type="radio"/>				
Spreads	<input type="radio"/>				
Cake, cookie or brownie	<input type="radio"/>				
Hot beverage	<input type="radio"/>				
Cold beverage	<input type="radio"/>				

20. Please rate how EASY or DIFFICULT you found each of the following aspects of preparing the MRE's. Fill in one circle for each aspect.

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

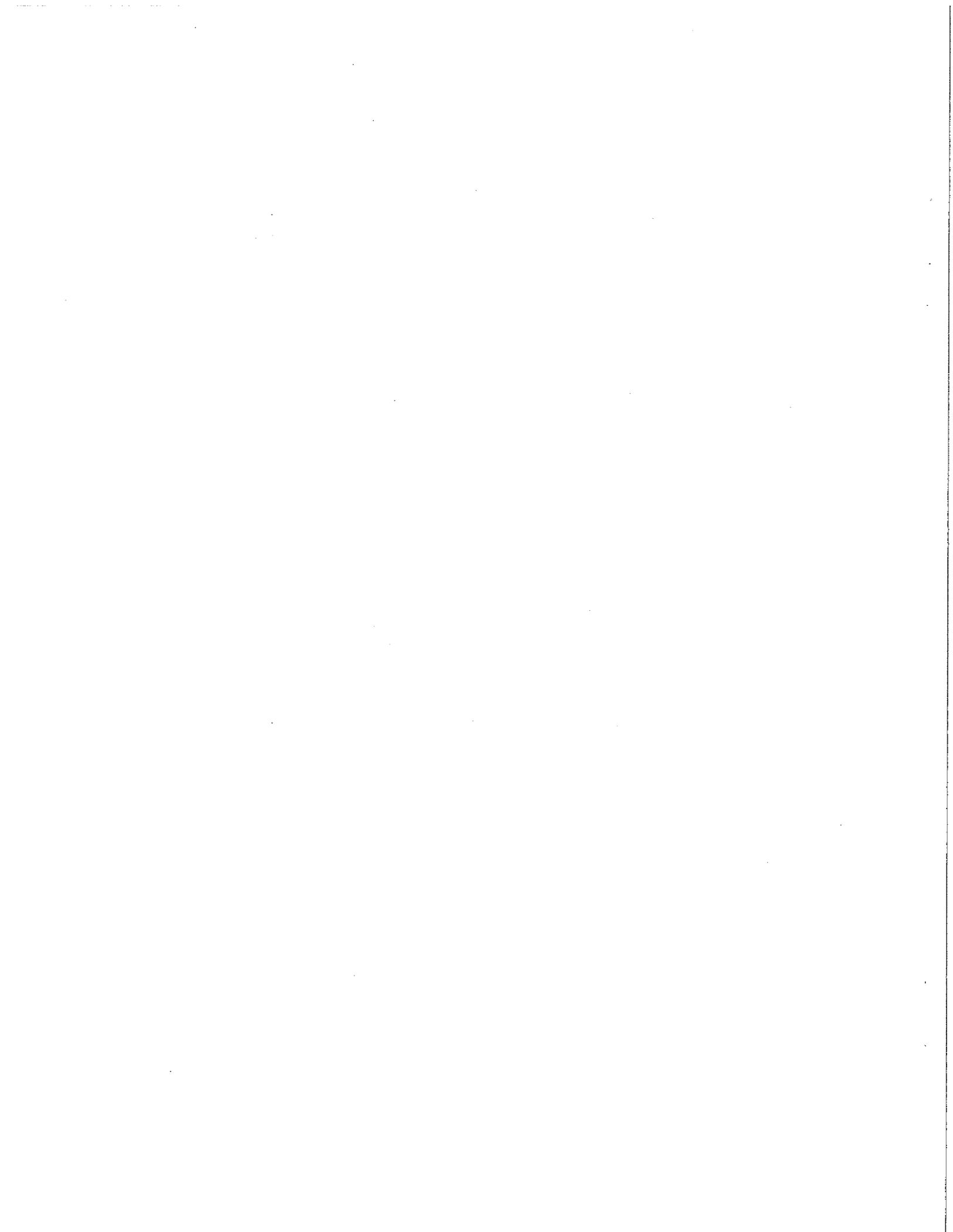
21. How did you heat your MRE? Please fill in the circle next to all that apply?

- did not heat ration in the field
- canteen cup stand, heat tabs, & canteen cup w/water
- just heat tabs and canteen cup w/water
- just heat tabs
- MRE heat pads, zestotherm heat pads, etc.
- squad stove
- Yukon stove
- mounted vehicle heater
- sterno
- on engine block of vehicle
- exhaust pipe of vehicle
- personal stove (please describe) _____
- other (please describe) _____

22. Below is a list of possible ways of improving the MRE. Only check FIVE ways that you think the MRE that you ate last week can be improved. If you check more than five, we cannot include your answer in the analysis.

- No improvement necessary
- Increase the variety in the ration
- Make the ration easier to prepare
- Make the entree portion sizes larger
- Add more beverages to the ration
- Put peanut butter & jelly in the same MRE meal
- Include a disposable container to mix beverages
- Make the ration taste better
- Include a heating system
- Include more breakfast foods
- Package the ration in cans
- Other _____

23. Do you have any additional comments on the MRE ration?



FINAL QUESTIONNAIRE

We would like your opinion about the MRE that you ate this past week. Base your answers on the MRE's that you ate last week. Do not base your answers on past experience with the MRE. Your answers will be kept confidential.

Use a number two pencil when filling in the circles. Completely erase any changes or stray marks. Thank you.

1. What is your rank?

	1	2	3	4	5	6	7	8	9
E	<input type="radio"/>								
O	<input type="radio"/>								
WO	<input type="radio"/>								

2. What is your age?

under 18
 18-24
 25-34
 35-44
 45-54
 55+

3. What is your height? _____ ft _____ in Your weight? _____ lbs

4. Have you ever eaten the MRE before this last week? YES NO

5. Estimate how many MRE meals you have eaten during this past year: _____

6. We would like your honest evaluation of the MRE items you ate last week. Using the scale below, please fill in the circle below the number that best describes your opinion for each item. If you didn't try any item, fill in "0".

DIDN'T TRY	DISLIKE				NEITHER	LIKE			LIKE	
	EXTREMELY	VERY MUCH	MODERATELY	SLIGHTLY	LIKE NOR DISLIKE	SLIGHTLY	MODERATELY	VERY MUCH	EXTREMELY	
0	1	2	3	4	5	6	7	8	9	

1. Beef w/Barbeque Sauce
2. Beef w/Gravy
3. Beef w/ Spiced Sauce
4. Beef Patties
5. Beef Stew
6. Chicken Ala King
7. Frankfurters
8. Ham/Chicken Loaf
9. Ham Slices
10. Meatballs w/Barbeque Sauce
11. Pork Sausage Patties
12. Turkey w/Gravy
13. Crackers
14. Beans w/Tomato Sauce
15. Potato Patty
16. Cheese Spread
17. Jelly

	0	1	2	3	4	5	6	7	8	9
1.	<input type="radio"/>									
2.	<input type="radio"/>									
3.	<input type="radio"/>									
4.	<input type="radio"/>									
5.	<input type="radio"/>									
6.	<input type="radio"/>									
7.	<input type="radio"/>									
8.	<input type="radio"/>									
9.	<input type="radio"/>									
10.	<input type="radio"/>									
11.	<input type="radio"/>									
12.	<input type="radio"/>									
13.	<input type="radio"/>									
14.	<input type="radio"/>									
15.	<input type="radio"/>									
16.	<input type="radio"/>									
17.	<input type="radio"/>									

○

		DISLIKE			NEITHER				LIKE	
DIDN'T TRY	DISLIKE EXTREMELY	VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY	
0	1	2	3	4	5	6	7	8	9	

	0	1	2	3	4	5	6	7	8	9
18. Peanut Butter	○	○	○	○	○	○	○	○	○	○
19. Applesauce	○	○	○	○	○	○	○	○	○	○
20. Mixed Fruits	○	○	○	○	○	○	○	○	○	○
21. Peaches	○	○	○	○	○	○	○	○	○	○
22. Strawberries	○	○	○	○	○	○	○	○	○	○
23. Brownie	○	○	○	○	○	○	○	○	○	○
24. Cherry Nut Cake	○	○	○	○	○	○	○	○	○	○
25. Chocolate-Covered Cookie	○	○	○	○	○	○	○	○	○	○
26. Fruitcake	○	○	○	○	○	○	○	○	○	○
27. Maple Nut Cake	○	○	○	○	○	○	○	○	○	○
28. Orange Nut Cake	○	○	○	○	○	○	○	○	○	○
29. Chocolate Nut Cake	○	○	○	○	○	○	○	○	○	○
30. Pineapple Nut Cake	○	○	○	○	○	○	○	○	○	○
31. Cocoa	○	○	○	○	○	○	○	○	○	○
32. Coffee	○	○	○	○	○	○	○	○	○	○
33. Chocolate Fudge Bar	○	○	○	○	○	○	○	○	○	○
34. Chocolate Covered Coconut Bar	○	○	○	○	○	○	○	○	○	○
35. Caramel	○	○	○	○	○	○	○	○	○	○
36. Vanilla Fudge	○	○	○	○	○	○	○	○	○	○
37. Jelly Candy Bar	○	○	○	○	○	○	○	○	○	○
38. Chocolate Toffee Bar	○	○	○	○	○	○	○	○	○	○
39. Chocolate/Almond Bar	○	○	○	○	○	○	○	○	○	○
40. Cherry flavored beverage	○	○	○	○	○	○	○	○	○	○
41. Grape flavored beverage	○	○	○	○	○	○	○	○	○	○
42. Lemon-lime flavored beverage	○	○	○	○	○	○	○	○	○	○
43. Orange flavored beverage	○	○	○	○	○	○	○	○	○	○

7. Do you think any foods, drinks, or condiments (spices, sauces, etc.) should be ADDED to this MRE? YES NO

If yes, list the item(s). Please be realistic.

8. Do you think that any foods or drinks should be DROPPED from this MRE? YES NO

If yes, list the items(s).

9. Compare the MRE's that you ate last week to the MRE's that you've eaten in the past. Fill in a circle for each line. If you have not eaten MRE's before this last week, fill in this circle and skip to the next question.

COMPARED TO MRE'S YOU HAVE EATEN IN THE PAST:

LAST WEEK'S MRE			NO DIFFERENCE BETWEEN MRE'S	LAST WEEK'S MRE		
MUCH WORSE	MODERATELY WORSE	SLIGHTLY WORSE		SLIGHTLY BETTER	MODERATELY BETTER	MUCH BETTER
1	2	3	4	5	6	7

	1	2	3	4	5	6	7
How food taste	<input type="radio"/>						
How food looks	<input type="radio"/>						
Amount of food in one meal	<input type="radio"/>						
Size of entrees (main dish)	<input type="radio"/>						
Number of beverages	<input type="radio"/>						
Number of breakfast foods	<input type="radio"/>						
Variety	<input type="radio"/>						
Quality of food	<input type="radio"/>						
Packaging	<input type="radio"/>						

10. Compare the MRE's that you ate last week to C Rations (canned rations) that you have eaten in the past. Fill in a circle for each line. If you have not eaten C Rations before, fill in this circle and skip to the next question.

COMPARED TO C RATIONS (CANNED):

LAST WEEK'S MRE			NO DIFFERENCE BETWEEN MRE'S	LAST WEEK'S MRE		
MUCH WORSE	MODERATELY WORSE	SLIGHTLY WORSE		SLIGHTLY BETTER	MODERATELY BETTER	MUCH BETTER
1	2	3	4	5	6	7

	1	2	3	4	5	6	7
How food taste	<input type="radio"/>						
How food looks	<input type="radio"/>						
Amount of food in one meal	<input type="radio"/>						
Size of entrees (main dish)	<input type="radio"/>						
Number of beverages	<input type="radio"/>						
Number of breakfast foods	<input type="radio"/>						
Variety	<input type="radio"/>						
Quality of food	<input type="radio"/>						
Packaging	<input type="radio"/>						

11. Compare the MRE's that you ate last week to Tray Packs. Fill in a circle for each line. If you have not eaten Tray Packs before, fill in this circle and skip to the next question.

COMPARED TO TRAY PACKS:						
LAST WEEK'S MRE			NO DIFFERENCE BETWEEN MRE'S	LAST WEEK'S MRE		
MUCH WORSE	MODERATELY WORSE	SLIGHTLY WORSE		SLIGHTLY BETTER	MODERATELY BETTER	MUCH BETTER
1	2	3	4	5	6	7

	1	2	3	4	5	6	7
How food taste	<input type="radio"/>						
How food looks	<input type="radio"/>						
Amount of food in one meal	<input type="radio"/>						
Size of entrees (main dish)	<input type="radio"/>						
Number of beverages	<input type="radio"/>						
Number of breakfast foods	<input type="radio"/>						
Variety	<input type="radio"/>						
Quality of food	<input type="radio"/>						
Packaging	<input type="radio"/>						

12. Given the choice between last week's MRE's and the MRE's you have eaten before, which do you prefer?

- Last week's MRE's
- MRE's I ate before last week
- No Preference
- Have never eaten MRE's before last week

13. Given the choice between last week's MRE's and C Rations (canned ration) which ration do you prefer?

- Last week's MRE's
- C Ration
- No Preference
- Have never eaten C Rations

14. Given the choice between last week's MRE's and Tray Packs, which ration do you prefer?

- Last week's MRE
- Tray Pack
- No Preference
- Have never eaten Tray Packs



15. 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. Fill in the circle that best describes your opinion for each aspect.

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

How the food taste	<input type="radio"/>						
How the food looks	<input type="radio"/>						
How much food there is in one meal (one MRE)	<input type="radio"/>						
Variety in one meal	<input type="radio"/>						
How easy the ration is to prepare	<input type="radio"/>						
Variety meal to meal	<input type="radio"/>						

16. We would like to know how satisfied you were with the VARIETY in the MRE that you ate during this exercise. Please fill in the circle under the number which best expresses your opinion for each food group in the MRE. Number 1 means that the amount of variety is sufficient. The other numbers (2-4) represents how much more variety you think there should be.

HAS ENOUGH VARIETY	NEEDS SOMEWHAT MORE VARIETY	NEEDS MODERATELY MORE VARIETY	NEEDS MUCH MORE VARIETY
1	2	3	4

Entrees (main dishes)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starches (crackers, potatoes)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Desserts (cakes, cookies, brownies)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spreads (peanut butter, cheese, jelly)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hot drinks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cold drinks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Condiments (spices, sauces)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. Please rate how much you LIKED or DISLIKED eating LAST WEEK'S MRE's for breakfast, lunch, and dinner. Please use the scale below and fill in the circle under one number for each of the three meals.

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

For breakfast	<input type="radio"/>								
For lunch	<input type="radio"/>								
For dinner	<input type="radio"/>								

18. We would like to know what you think of the amount of food in each portion in the MRE you ate last week. Were the PORTION SIZES too small, too large, or just right? Please fill in the circle under the number that best expresses your opinion for each food group in the MRE.

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

	1	2	3	4	5	6	7
Entrees (main dishes)	<input type="radio"/>						
Starches (crackers, potatoes)	<input type="radio"/>						
Desserts (cakes, cookies, brownies)	<input type="radio"/>						
Fruits	<input type="radio"/>						
Spreads (peanut butter, cheese, jelly)	<input type="radio"/>						
Hot drinks	<input type="radio"/>						
Cold drinks	<input type="radio"/>						
Condiments (spices, sauces)	<input type="radio"/>						

19. How often did you eat the following MRE items for breakfast? Fill in a circle for each item. If you ate only T-rations for breakfast fill in the circle here .

NEVER	SOMETIMES	OFTEN	VERY OFTEN	ALWAYS
1	2	3	4	5

<u>MREs</u>	1	2	3	4	5
Breakfast entree (omlet, corned beef hash, ham slices, etc.)	<input type="radio"/>				
Other Entrees (beef stew, meatballs, etc.)	<input type="radio"/>				
Fruit	<input type="radio"/>				
Crackers	<input type="radio"/>				
Spreads	<input type="radio"/>				
Cake, cookie or brownie	<input type="radio"/>				
Hot beverage	<input type="radio"/>				
Cold beverage	<input type="radio"/>				

20. Please rate how EASY or DIFFICULT you found each of the following aspects of preparing the MRE's. Fill in one circle for each aspect.

VERY DIFFICULT	MODERATELY DIFFICULT	SOMEWHAT DIFFICULT	NEITHER EASY NOR DIFFICULT	SOMEWHAT EASY	MODERATELY EASY	VERY EASY				
1	2	3	4	5	6	7				
				1	2	3	4	5	6	7
				<input type="radio"/>						
				<input type="radio"/>						
				<input type="radio"/>						
				<input type="radio"/>						
				<input type="radio"/>						
				<input type="radio"/>						
				<input type="radio"/>						
				<input type="radio"/>						

21. How did you heat your MRE? Please fill in the circle next to all that apply?

- | | |
|---|--|
| <input type="radio"/> did not heat ration in the field | <input type="radio"/> mounted vehicle heater |
| <input type="radio"/> canteen cup stand, heat tabs, & canteen cup w/water | <input type="radio"/> sterno |
| <input type="radio"/> just heat tabs and canteen cup w/water | <input type="radio"/> on engine block of vehicle |
| <input type="radio"/> just heat tabs | <input type="radio"/> exhaust pipe of vehicle |
| <input type="radio"/> MRE heat pads, zestotherm heat pads, etc. | <input type="radio"/> personal stove (please describe) |
| <input type="radio"/> squad stove | <input type="radio"/> other (please describe) |
| <input type="radio"/> Yukon stove | |

22. Below is a list of possible ways of improving the MRE. Only check FIVE ways that you think the MRE that you ate last week can be improved. If you check more than five, we cannot include your answer in the analysis.

- | | |
|--|---|
| <input type="radio"/> No improvement necessary | <input type="radio"/> Include a disposable container to mix beverages |
| <input type="radio"/> Increase the variety in the ration | <input type="radio"/> Make the ration taste better |
| <input type="radio"/> Make the ration easier to prepare | <input type="radio"/> Include a heating system |
| <input type="radio"/> Make the entree portion sizes larger | <input type="radio"/> Include more breakfast foods |
| <input type="radio"/> Add more beverages to the ration | <input type="radio"/> Package the ration in cans |
| <input type="radio"/> Put peanut butter & jelly in the same MRE meal | <input type="radio"/> Other _____ |

23. Do you have any additional comments on the MRE ration?

