

2

SUSTAINABILITY

SURVIVABILITY

SUPPORTABILITY



TECHNICAL REPORT
NATICK/TR-85/010

AD _____

AD-A160 290

EATING IN COMBAT: A SURVEY OF HOW MUCH AND WHAT FOODS U.S. MARINES EAT IN ACTION

BY
R. D. POPPER
G. J. SMITS
H. L. MEISELMAN
J. MOY
AND
H. B. MASOR

FINAL REPORT - 1982

JUNE 1984

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED

DTIC
ELECTE
OCT 16 1985
S D E

DTIC FILE COPY

UNITED STATES ARMY NATICK
RESEARCH AND DEVELOPMENT CENTER
NATICK, MASSACHUSETTS 01760-5000

SCIENCE & ADVANCED TECHNOLOGY LABORATORY

85 10 15 630

Disclaimers

The findings contained in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Citation of trade names in this report does not constitute an official endorsement or approval of the use of such items.

DESTRUCTION NOTICE

For classified documents, follow the procedures in DoD 5200.1-R, Chapter IX or DoD 5220.22-M, "Industrial Security Manual," paragraph 19. For unclassified documents, destroy by any method which precludes reconstruction of the document.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NATICK/TR-85/010	2. GOVT ACCESSION NO. AD-A160290	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) EATING IN COMBAT: A SURVEY OF HOW MUCH AND WHAT FOODS U.S. MARINES EAT IN ACTION	5. TYPE OF REPORT & PERIOD COVERED Final, 1982	
	6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s) R.D. Popper, G.J. Smits, H.L. Meiselman, J. Moy and H.B. Masor	8. CONTRACT OR GRANT NUMBER(s)	
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Natick R&D Center Science & Advanced Technology Laboratory ATTN: STRNC-YBH Natick, MA 01760-5020	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Project 1L162724AH99	
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Natick R&D Center Kansas Street Natick, MA 01760-5000	12. REPORT DATE June 1984	
	13. NUMBER OF PAGES 33	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report) Unclassified	
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Eating Military Operations Combat Food Preparation Marine Corps Operational Rations Military Personnel Surveys Rations		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A survey of U.S. Marines with combat experience was conducted in order to assess eating habits in combat. The questionnaire included questions on how much and what was eaten during a Marine's first and second combat experience, as well as general questions concerning eating in combat. The final sample consisted of responses from 475 individuals. Marines reported eating less than usual during the first three days of their first and second combat situation. Combat activity was mentioned		

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

most often as the reason for eating less, although fear was a partial determinant on the first day, declining in importance on subsequent days. Among desirable properties of operational rations, ease of carrying and preparing foods were mentioned most frequently.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

SUMMARY

A survey of U.S. Marines with combat experience was conducted in order to assess eating habits under combat. Questionnaires were mailed to 1000 Marines; the final sample consisted of responses from 475 individuals. The questionnaire included questions on how much and what was eaten during a Marine's first and second combat experience, as well as general questions concerning eating in combat.

Marines reported eating between 58% and 78% of the amount they usually ate during the first three days of their first and second combat situation. Across the first three days of each combat situation, there was a statistically significant increase in the amount reported eaten.

Combat activity was mentioned most often as the reason for eating less during combat, indicating that troops lacked sufficient opportunity during combat to prepare and consume a meal. Fear was the second most important reason for eating less on the first day of the first combat situation, but declined in importance on subsequent days of the first and second combat situation.

The lack of time to prepare food and the lack of time to eat it were the two factors rated most highly as determinants of how much is eaten during combat. Among desirable properties of operational rations, ease of carrying and preparing foods were mentioned most frequently.

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	



PREFACE

The U.S. Marine Corps, under Service Requirement M79-4, tasked the Directorate of Systems Analysis and Concept Development (DSACD) of the U.S. Army Natick Research and Development Center (NRDC) to conduct a systems analysis of the types of rations needed to support amphibious operations. DSACD requested the Behavioral Sciences Division (BSD) of the Science and Advanced Technology Laboratory (SATL) at NRDC to provide behavioral sciences support to the project.

The present report contains the results of a survey of Marine veterans conducted by BSD in support of M79-4. The SATL work unit number was AA-094.

The authors wish to thank Headquarters, U.S. Marine Corps, Washington, DC for providing the names and addresses of the Marines contacted in this survey and wish to express their gratitude to the Marines for responding to the survey and providing many comments on the problems of sustaining the soldier under combat conditions.

The authors thank DSACD and the DSACD project officer, Mr. Paul Short, for the support of this research.

TABLE OF CONTENTS

	Page
SUMMARY	iii
PREFACE	v
LIST OF FIGURES	ix
LIST OF TABLES	ix
INTRODUCTION	1
SAMPLE SELECTION AND RESPONSE RATE	1
DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE	2
RESULTS	2
Amount Eaten During Combat	2
Reasons for Eating More or Less	6
What Food Was Provided and What Was Eaten	11
Ratings of What Determines How Much is Eaten in Combat	11
Comments on Feeding in Combat	15
DISCUSSION	16
REFERENCES	19
APPENDIX A. Letter of Solicitation	21
APPENDIX B. Survey Form	22
APPENDIX C. Definitions of Coding Categories for Responses to the Question "If You Ate More or Less, Please Explain Why."	31
APPENDIX D. Definitions of Coding Categories for Responses to the Question "Do You Have Any Comments on How and What Troops Should Be Fed in Combat?"	33

LIST OF FIGURES

Figure	Page
1. The Change During the First Combat Situation In the Percentage Reporting Eating Less Than Usual and In the Percentage Mentioning Fear As A Reason for Eating Less Than Usual.	9
2. The Change During the Second Combat Situation In the Percentage Reporting Eating Less Than Usual and In the Percentage Mentioning Fear As A Reason for Eating Less Than Usual.	10

LIST OF TABLES

Table	
1. Demographic Characteristics Of Survey Sample At Time Of Combat and Combat Situation Characteristics	3
2. Amount Of Food In Relation To Usual Amount That Respondents (%) Reported Eating during Combat	4
3. Respondents (%) Who Reported Eating Less Than Usual During Combat	5
4. Average Amount Reported Eaten During Combat In Relation To Usual Amount	5
5. Reasons For Eating Less Than Usual During Combat Mentioned By Respondents (%)	8
6. Respondents (Average %) Who Were Provided Various Rations Or Specific Foods During Combat	12
7. Respondents (Average %) Who Ate Various Rations Or Specific Foods During Combat	13
8. Mean Rating (Seven Point Scale) Of Reasons Important To The Amount Eaten During Combat, And The Respondents (%) Rating The Reason "5" (Somewhat Important) Or Above	14
9. General Properties Of Combat Rations Respondents (%) Mentioned As Desirable	16

**EATING IN COMBAT:
A SURVEY OF HOW MUCH AND WHAT FOODS U.S. MARINES EAT IN ACTION**

INTRODUCTION

In developing combat rations, it is important to consider the experience of those who have used operational rations under combat conditions. However, no previous survey concerned with combat feeding has been designed to sample the opinions of this particular population. A survey of U.S. Marines with combat experience was therefore conducted to study eating in combat. Questionnaires were mailed to 1000 U.S. Marines who had served in combat; the final sample consisted of responses from 475 individuals.

The survey included questions on whether Marines ate more or less than usual during combat and if so, for what reasons. Marines were also asked what food they were provided and what they ate. The questions on what and how much was eaten made specific reference to the first three days of a Marine's first and second combat experience. In the final section of the questionnaire, respondents were asked to rate the importance of several factors in determining how much they ate during combat; they were also given the opportunity to comment on how and what they thought troops should be fed in combat.

SAMPLE SELECTION AND RESPONSE RATE

A request was made to USMC headquarters to obtain a sample of Marines who had served in combat. To obtain a broad sample, the names of 500 active duty and 500 retired Marines were drawn from USMC files by headquarters personnel. Within each of these groups, half were enlisted and half were officers. The records of enlisted personnel were coded to indicate combat experience; for officers, however, no such code existed, so combat experience was inferred by corps.

Individually signed letters with personalized salutation (see Appendix A) were sent to the 1000 individuals identified by the USMC. An "Eating in Combat" questionnaire was enclosed (see Appendix B), along with a franked and addressed return envelope. A total of 475 completed questionnaires were returned in sufficient time to be coded, keypunched, and analyzed. Twelve completed questionnaires were returned after analysis had begun; 12 questionnaires were returned incomplete with an explanation that the respondent lacked or had only limited combat experience. Twenty-four letters were returned undelivered. The number of nonrespondents was 477. The response rate based on the number of delivered surveys was 51%, which compares favorably with the response rates typically obtained in mail surveys.¹

DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE

The present age of the 475 respondents ranged from 27 to 77; the mean age was 45.6 (standard deviation = 10.3). The average number of years in duty was 20.3 (standard deviation = 5.4). Nearly 52% of the respondents were currently on active duty, indicating about equal representation in the sample of retired and active duty personnel. Geographical distribution was assessed by asking respondents what state they lived in longest before entering the Marine Corps. In the sample, 59% had lived the longest in the state of New York, and another 25% were distributed among Pennsylvania, Massachusetts, Virginia and New Jersey. The geographical emphasis in the sample on eastern and northeastern states is the result of the procedure used by USMC headquarters to sample its files.

Table 1 describes selected demographic characteristics of the sample at the time of the first and second combat situations. The average age at the time of combat was 24.6 (first combat experience) and 27.7 (second combat experience). The percentage of officers in the sample was 53% and 65%, respectively. Table 1 also shows the location and duration of combat. Sixty-eight percent of the first combat situations took place in Vietnam, and 76% of the second combat situations occurred there. Approximately 50% of the combat situations lasted 15 days or longer.

RESULTS

Amount Eaten During Combat

Respondents were asked how much they ate on the first three days of their first and second combat situations. The response alternatives were "more than usual," "about the same as usual," "about 3/4 of what I usually ate," "about 1/2 of what I usually ate," "about 1/4 of what I usually ate," and "nothing". The response frequencies, in percent, are shown in Table 2. The bottom row (N) indicates the number of individuals who responded to the question. This number varies across columns, since not every individual experienced two combat situations or combat situations extending over three days.

Table 3 shows the percentage of respondents who reported eating less than usual; this table is derived from Table 2 by summing the responses that indicate reduced food intake. Table 3 shows that a substantial percentage of the sample reported eating less than usual. The percentage ranges from 68%, on the first day of the first combat situation, to 45% on the third day of the second combat situation.

The relative amount of food respondents reported eating during combat was computed by the following method: eating the usual amount was coded 1, eating less than usual was coded by the indicated amount (0 to 3/4 of the usual amount), and eating more than usual was coded 1.25. This coding results in equal one-quarter spacing among all response alternatives, which is clearly justified except at the top of the scale. Considering the small percentage of respondents who reported eating more than usual (see Table 2), the

TABLE 1

Demographic Characteristics Of Survey Sample At Time
Of Combat And Combat Situation Characteristics

Characteristic	First Combat Situation	Second Combat Situation
Age At Time Of Combat		
Mean, Std. Dev.	24.6, 5.0 yr. (N = 472)	27.7, 6.3 yr. (N = 348)
Rank At Time Of Combat		
	RESPONDENTS (%)	
E1 - E9, W1 - 3	47 %	35 %
01 - 05	53 (N = 470)	65 (N = 345)
Combat Location		
	RESPONDENTS (%)	
Vietnam	68 %	76 %
Santo Domingo	2	<1
Korea	12	10
WW 2 PAC	16	14
WW 2 EUR	<1	--
Middle East	1	--
	(N = 472)	(N = 349)
Combat Duration		
	RESPONDENTS (%)	
1 Day	16 %	19 %
2 Days	8	8
3 Days	6	6
4-14 Days	22	20
15 Days Or Longer	48	46
	(N = 476)	(N = 322)

TABLE 2

Amount Of Food In Relation To Usual Amount
That Respondents (%) Reported Eating During Combat

	First Combat Situation			Second Combat Situation		
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
MORE THAN USUAL	3%	5%	5%	2%	2%	4%
ABOUT THE SAME AS USUAL	29	35	41	45	49	51
ABOUT 3/4 OF USUAL	6	11	13	10	16	13
ABOUT 1/2 OF USUAL	28	33	31	23	20	17
ABOUT 1/4 OF USUAL	25	14	9	13	12	11
NOTHING	9	1	<1	7	2	4
RESPONDENTS (N)	447	350	286	330	243	213

TABLE 3**Respondents (%) Who Reported Eating
Less Than Usual During Combat**

	DAY 1	DAY 2	DAY 3
FIRST COMBAT SITUATION	68 % (N = 447)	59 % (N = 350)	53 % (N = 286)
SECOND COMBAT SITUATION	53 % (N = 330)	50 % (N = 243)	45 % (N = 213)

TABLE 4**Average Amount Reported Eaten During Combat
In Relation To Usual Amount****(0 = NOTHING, 1 = USUAL AMOUNT)**

	DAY 1	DAY 2	DAY 3
FIRST COMBAT SITUATION	0.58 (N = 447)	0.70 (N = 350)	0.75 (N = 286)
SECOND COMBAT SITUATION	0.71 (N = 330)	0.77 (N = 243)	0.78 (N = 213)

consequence of any distortion is likely to be minimal. Table 4 shows the average relative amounts eaten each day. On the first day of the first combat situation, the amount eaten was about half the usual amount. The amount increased to about three-fourths by the third day of the second combat situation.

An analysis of variance with repeated measures was performed in order to test for a significant linear and quadratic trend in the amount eaten. The two combat situations were analyzed separately, because the time between them varied among respondents, and only those respondents were included who experienced three days of combat.

The average amounts eaten for the restricted samples were 0.54, 0.71, and 0.76 for the three days of the first combat situation (N = 281); for the second combat situation, the averages were 0.69, 0.75, and 0.78 (N = 210). Both the linear and quadratic trends were significant (for the first combat situation linear $F(1,280) = 118.15$, $p < .001$, quadratic $F(1,280) = 25.71$, $p < .001$; for the second combat situation linear $F(1,209) = 19.03$, $p < .001$, quadratic $F(1,209) = 4.35$, $p < .05$). These results show that the amount eaten increased significantly across the first three days of a combat situation. However, the increase from the second to the third day was significantly smaller than the increase from the first to the second day. The amount eaten appears to reach a maximum at approximately three-quarters of the usual amount.

Tables 3 and 4 also suggest that eating is especially inhibited on the very first day in combat. The onset of the second combat experience does not seem to affect eating to the same degree.

Reasons for Eating More or Less

Respondents who reported eating more or less than usual during combat were asked to explain why. The stated reasons were classified as falling in one of 14 response categories, which were derived from a review of the range of answers provided. Appendix C lists the 14 response categories along with examples of answers falling in each category. In the statistical summary, one response category, "too thirsty," was dropped, because it was mentioned less than 1% of the time as a reason for eating less on any one day. Several response categories were combined on account of their semantic similarity. Thus, the categories "nervous or tense" and "scared" were treated as one category ("fear"); reasons relating to an individual's ill-being (feeling "sick" or "tired") were combined, as were the responses relating to the inconvenience of carrying or preparing food and its interference with carrying equipment or ammunition.

Only a small percentage of respondents (see Table 2) ever stated eating more than usual during combat. Two reasons were reported for doing so: fear and previous or anticipated food deprivation. The first may be an example of stress-induced overeating.² In the second case, respondents were either very hungry or were stocking up, because they anticipated not eating for some time.

Table 5 provides a breakdown of the reasons for eating less than usual on each day of the first and second combat situations. The reasons are listed in the order of the average percent of mention across the six days of the two combat situations (see the last column of Table 5). Note that the percentages in any one column sum to more than 100%, since respondents were free to state more than one reason for eating less.

Table 5 shows that the most frequently mentioned reason for eating less was "engaged in combat," indicating that there was insufficient opportunity during combat to eat. Examples of responses in this category are "too busy for chow," "under constant attack" and "on patrol all day and night so there was lack of opportunity to eat." "Fear" was mentioned as a reason 32% of the time on the first day of the first combat situation. Sample responses are "tense," "anxiety," "more than a little scared," and "bundles of nerves." The percentage of "fear" responses declined markedly over the subsequent two days of the first combat situation and over the three days of the second situation. "Not hungry" was mentioned between 14% and 17% of the time. Next in frequency of mention were "supplies not available" ("shortage of rations," "only issued one meal"), "weather" ("temperature was higher than I was used to," "oppressive heat made appetite subside") and "tired, sick" ("diarrhea," "too exhausted to prepare food"). Respondents also mentioned that they ate less because of the quality of food ("bad," "tasteless," "contaminated"), and the inconvenience of preparing or carrying rations ("food too heavy to carry," "could not carry much food because it interfered with carrying ammunition").

In order to investigate the time trends in the reasons for eating less, an analysis of variance with repeated measures was performed, based on those individuals for whom data on three days of a combat situation were available. The two combat situations were analyzed separately. The dependent variable was the mention or nonmention of a particular reason. The following response categories were examined: "engaged in combat," "fear," and "not hungry." There was a statistically significant linear decrease during the three days of the first combat situation in the frequency of mention of "fear" ($F(1, 114) = 18.02, p < 0.001$). The decrease during the second combat situation was not statistically significant. The only other statistically significant trend among those examined was the linear decrease during the second combat situation in the frequency of mention of "engaged in combat" ($F(1, 66) = 4.75, p < 0.05$). Thus, during the first combat situation, the importance of "fear" as a reason for eating less declined significantly across the three days. A smaller, but nonetheless significant, decline was observed in the importance of combat activity as a reason for eating less during the second combat situation.

The decrease in the percentage of the respondents mentioning "fear" as a reason for eating less parallels the decrease in the overall proportion of respondents that reported eating less than usual. This parallelism is shown in Figures 1 and 2, for the first and second combat situations, respectively. The similar rates of decline suggest that the decrease in the percentage eating less than usual may be due mainly to a reduction in the level of fear among the combatants. On the basis of the present data, this hypothesis can

TABLE 5

**Reasons For Eating Less Than Usual During Combat
Mentioned By Respondents (%)**

REASON	FIRST COMBAT SITUATION			SECOND COMBAT SITUATION			AVERAGE
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	
ENGAGED IN COMBAT	59 %	53 %	58 %	71 %	71 %	66 %	63 %
FEAR (NERVOUS, TENSE, SCARED)	32	22	13	20	11	8	18
NOT HUNGRY	17	15	14	17	14	14	15
SUPPLIES NOT AVAILABLE	11	9	10	8	12	14	11
WEATHER	7	9	13	6	6	8	8
TIRED, SICK	3	4	10	3	6	8	6
FOOD BAD	4	4	5	5	5	7	5
FOOD NOT IMPORTANT	7	4	3	2	4	1	4
FOOD INCONVENIENT, INTERFERED W/ EQUIPMENT	3	4	5	3	4	2	4
RESPONDENTS (N)	288	191	134	157	105	84	

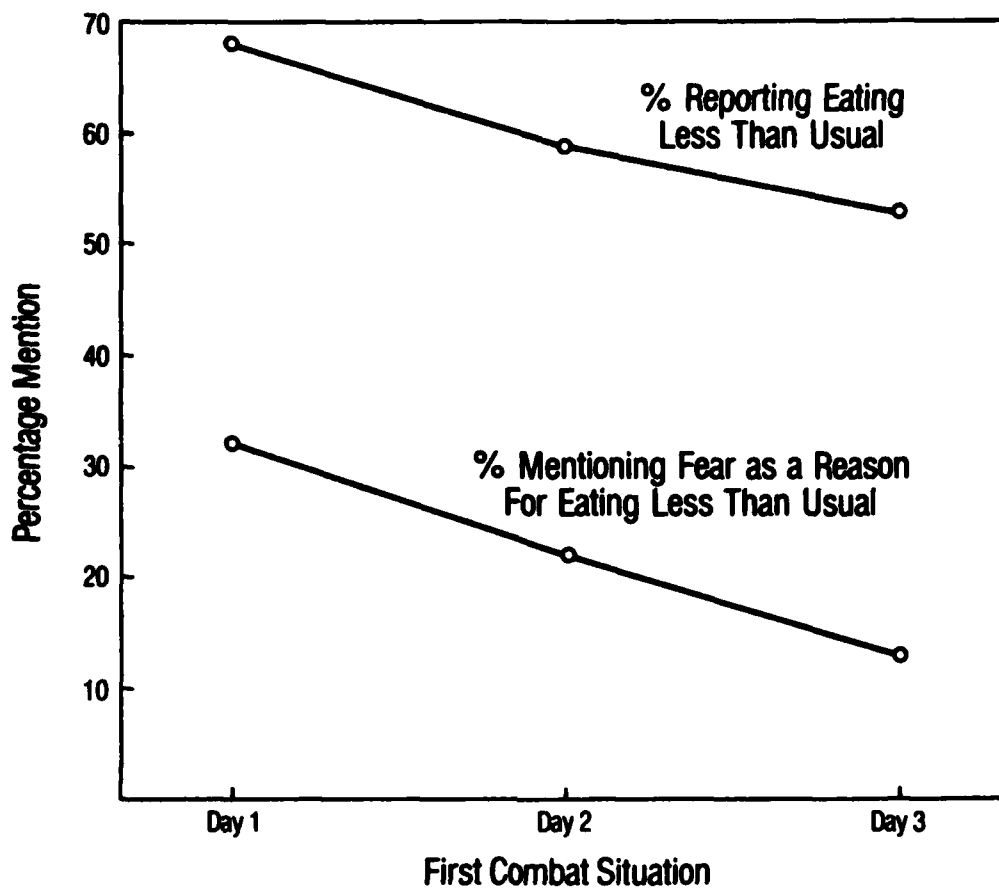


FIGURE 1.

The Change During The First Combat Situation In The Percentage Reporting Eating Less Than Usual And In The Percentage Mentioning Fear As A Reason For Eating Less Than Usual.

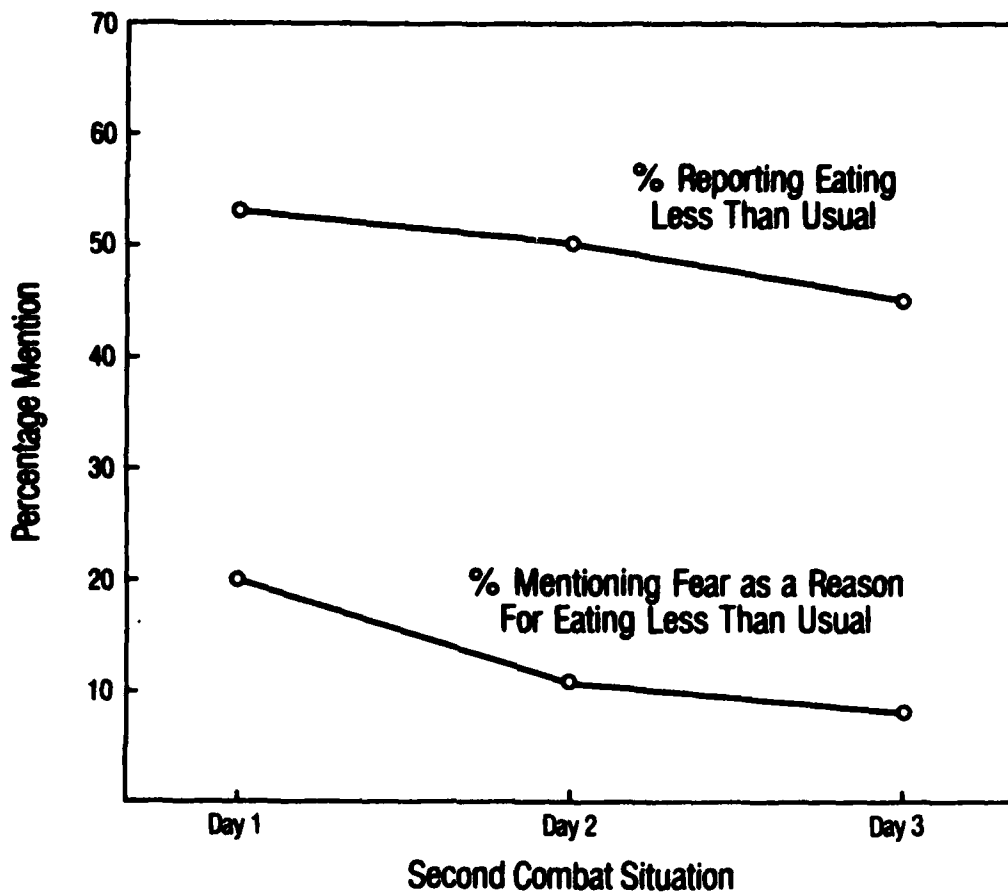


FIGURE 2.

The Change During The Second Combat Situation In The Percentage Reporting Eating Less Than Usual And In The Percentage Mentioning Fear As A Reason For Eating Less Than Usual.

be proposed only tentatively, since it is not known how afraid those respondents felt who ate normal amounts. Those individuals did not report their emotional states.

What Food Was Provided and What Was Eaten

Tables 6 and 7 show a breakdown of what food respondents reported was provided and what they reported eating. Respondents either named a particular ration or specified particular foods (or both). The percentages in Tables 6 and 7 are calculated on the basis of the number of respondents who answered the question in one way or the other. Since the percentages were similar across the days of the first and second combat situation, the tables show the average percentages across all six days. Table 6 shows that, on the average, 77% of the respondents were provided C rations* to eat. A direct comparison between what was eaten and what was provided is not possible on the basis of these data because respondents tended to give only the name of the ration in answering the question about what was provided, but tended to list specific foods in answering the question about what was eaten.

Ratings Of What Determines How Much Is Eaten In Combat

Respondents were asked to rate the importance of several factors in determining how much they ate during combat. A seven-point scale was provided, with scale steps ranging from 1 = very unimportant to 7 = very important. The mean ratings are shown in Table 8, along with the percentage of respondents rating a factor "5" (somewhat important) or higher. An asterisk identifies the mean ratings that are significantly greater than "4" (neutral), as determined by t-tests.

Table 8 shows that the two most highly rated factors in determining how much was eaten during combat were the lack of time to prepare food and the lack of time to eat it. This result agrees with the answers to the open-ended question, in which "engaged in combat" was mentioned most often as the reason for eating less than usual. Both findings demonstrate the importance of time in determining how much is eaten in combat. Other factors of importance are a lack of appetite, the condition of the weather, and the quality of the food. These factors were also mentioned as reasons for eating less in the earlier part of the questionnaire.

*The term "C-rations," as used by these respondents, refers both to the ration in use during the post World War II and Korean periods (Ration, Individual, Combat), as well as to the ration that replaced it, the Meal Combat Individual (MCI).

TABLE 6

**Respondents (Average %) Who Were Provided
Various Rations Or Specific Foods During Combat**

RATIONS PROVIDED	RESPONDENTS
B-Rations	2 %
C-Rations	77
LRP	2
A-Line	13
Local	3
Nothing	1
 SPECIFIC FOODS PROVIDED	
Soup	1 %
Fruit/Veg Juice	< 1
Cold Drinks	2
Hot Drinks	3
Drink Unspecified	1
Eggs	3
Breakfast Meats	2
Meats	7
Extended Meats	3
Short Order Sandwiches	2
Potato/Potato Substitute	8
Vegetables	4
Fruit	3
Cookies/Brownies/Cake	1
Pudding/Desert/Pie	1
Candy/Chocolate	2
Cheese	2
Jam/Peanut Butter	1
Bread/Crackers	4
Salad	< 1

TABLE 7

Respondents (Average %) Who Ate Various
Rations Or Specific Foods During Combat

RATIONS EATEN	RESPONDENTS
B-Rations	2 %
C-Rations	43
LRP	1
A-Line	4
Local	3
Nothing	3
SPECIFIC FOOD EATEN	
Soup	2 %
Fruit/Veg Juice	1
Cold Drinks	6
Hot Drinks	15
Drink Unspecified	1
Eggs	9
Breakfast Meats	8
Meats	23
Extended Meats	12
Short Order Sandwiches	8
Potato/Potato Substitute	20
Vegetables	12
Fruit	16
Cookies/Brownies/Cake	3
Pudding/Desert/Pie	1
Candy/Chocolate	9
Cheese	5
Jam/Peanut Butter	4
Bread/Crackers	20
Salad	1

TABLE 8

Mean Rating (Seven Point Scale) Of Reasons Important
To The Amount Eaten During Combat, And The Respondents
(%) Rating The Reason "5" (Somewhat Important) Or Above

Reason	Rating (Mean)	Respondents (%) Rating "5" Or Above	Respondents (N)
NOT ENOUGH TIME TO PREPARE FOOD	4.97***	65 %	442
NOT ENOUGH TIME TO EAT FOOD	4.96***	67	440
DID NOT FEEL HUNGRY	4.45***	52	436
BAD WEATHER	4.38**	54	441
BAD FOOD	4.31**	47	439
NO FOOD AVAILABLE	4.25*	47	430
WAS EXHAUSTED	4.21*	49	443
TOO MUCH TROUBLE TO PREPARE FOOD	4.10	47	440
WAS SCARED	3.93	39	441
FOOD WAS COLD	3.72	37	442
DID NOT FEEL WELL	3.40	26	438

Significantly greater than "4" (Neutral)

* $p < .05$

** $p < .01$

*** $p < .001$

Comments On Feeding In Combat

The final section of the questionnaire provided respondents with the opportunity to comment on how and what troops should be fed in combat. Respondents commented on general aspects of operational rations as well as on particular rations. The response categories used to classify the general comments and examples of comments are contained in Appendix D. Table 9 shows that 50% of the respondents mentioned that rations should be easy to prepare. Examples of comments in this category are "quick to fix," "foods that need no preparation - can be eaten when time permits" and "packages that open easily." Thirty-four percent mentioned the need for rations to be easy to carry. Some of the comments were "combat rations should be compact so they take up little space," "do away with cans so man is able to carry more food with him" "we need items that can be easily stored in pockets and are not bulky."

The importance of convenience in operational rations has emerged repeatedly in the present study. Other comments on the ease of preparing and carrying rations concerned the need to simplify the packaging, to reduce the number of components and make the refuse easy to dispose. Frequently, respondents mentioned that combat rations should be consumable hot or cold. Several comments concerning the problems of heating food with equipment involving open flames, which had to be avoided because of risk of detection by the enemy. Heat tabs were frequently in short supply or did not heat food properly. Several noted that with heavy rations any excess food was discarded, and only the minimal amount was carried. Others expressed their desire for ration components they thought best suited for eating on the run, such as "quick energy" granola bars, beef jerky and the like, which can be eaten in stages over a period of time when the situation allows, especially on the first day of combat. Freeze dried and compressed components were praised for their convenience and taste (see below), but frequently the lack of sufficient water for rehydration was seen as detracting from the usefulness of these ration components. One Marine, for example, wrote "I'm concerned that freeze dried or dehydrated foods (are) not a proper substitute for canned foods--there are many days that I found the availability of water lacking--without canned fruit my company, on one occasion, would have been in terrible shape." Others mentioned the need for rations to be tailored to the climate in which combat is fought and to the type of combat (slow or fast moving, front line vs. rear support, etc.).

Table 9 shows further that the desire for tasty food was mentioned by 25%, and the need for hot meals by 22% of the respondents. Frequently, Marines mentioned wanting at least one hot meal per day (preferably mess-type), and commented on the importance of a hot meal for morale. However, in hot climate, some respondents felt there was less of a need for hot, than for palatable, cold rations. Several respondents suggested that the inclusion of additional spices, such as hot sauce, soy sauce, mustard, and pepper, would help to overcome the blandness of the rations.

TABLE 9

**General Properties Of Combat Rations
Respondents (%) Mentioned As Desirable**

	Respondents (N = 412)
EASY TO PREPARE	50 %
EASY TO CARRY	34
TASTY	25
HOT MEALS	22
CALORIES, ENERGY	16
NUTRITIOUS	13
VARIETY IN MEALS	12

Other desirable aspects of operational rations mentioned (see Table 9) were high caloric content (frequency of mention = 16%), high level of nutrients (13%) and variety in meals (12%). Some of the comments on variety were made by respondents who reported eating C-rations for many weeks. Under those conditions, some Marines reported reducing food intake and losing weight.

Relatively few positive or negative comments were made about particular rations. The Long Range Patrol (LRP) ration was mentioned positively by 10% of the respondents (N = 412), C-rations received 6% positive and 5% negative comments. The LRP was considered convenient and light weight, but several commented negatively on the problem of securing adequate water for rehydration. C-rations were criticized for being heavy, containing too much fat, leading to constipation, and being monotonous (over many weeks of use). However, others mentioned C-rations as being "adequate" combat rations. Among specific foods, no foods were mentioned that were desired in lesser amounts. Fruit was mentioned most frequently (by 13% of respondents) as the food that was desired in greater amounts. The preference for fruit has been noted in other surveys of ration acceptability.³

DISCUSSION

The most stringent test of the acceptability of a combat ration is obtained under conditions of actual combat. However, in developing and evaluating operational rations it is usually necessary to rely on known preferences of individuals in the population and on experience gained in field exercises. The present survey is unique in that it is addressed to the final customer of the operational ration -- the individual engaged in combat.

The goal of this survey was not to assess the adequacy of any one particular ration system or concept, but to address general questions of how much troops eat during combat and what factors determine how much they eat. The present results suggest that during the first day of combat, troops eat considerably less than their normal amount. While troops tend to eat more on successive days, the trend in how much they eat indicates a leveling off in the amount at a point corresponding to three-quarters of the usual amount.

The reduced level of consumption is not the result of an inadequate food supply. Lack of supplies was mentioned as a reason for eating less only by 10% (on the average) of the respondents. The principal reason for reduced consumption is the lack of time to prepare and to eat food. Respondents mentioned "engaged in combat" most frequently as a reason for eating less and "not enough time to prepare food" and "not enough time to eat food" were rated the most important reasons in determining how much was eaten. Finally, in commenting on how and what troops should be fed in combat, the most frequent comment, made by 50% of the sample, was that rations should be easy to prepare; 34% mentioned the need for rations to be easy to carry. Clearly, the ease of preparing, eating, and carrying food is the most critical factor for this sample in determining how much is eaten during combat.

The present sample consisted entirely of U.S. Marines, and the type of combat encountered by Marines may differ from that experienced by other sections of the Armed Forces. In particular, Marine units are highly mobile and often encounter unconventional combat situations. The survey results may reflect the emphasis that these troops place on mobility and on the ability to "eat on the run." In designing an optimal ration system for such troops, convenience needs to receive special attention. An operational ration that is easy to prepare and carry will maximize the probability that the soldier will find the time to consume the meal and will therefore help ensure that he receives adequate nourishment.

This document reports research undertaken at the US Army Natick Research and Development Command and has been assigned No. NATICK/TR-65/010 in the series of reports approved for publication.

REFERENCES

1. Yu, J., and H. Cooper. A quantitative review of research design effects on response rates to questionnaires. Journal of Marketing Research, 20, 36-44, (1983).
2. Robbins, T.W., and P.J. Fray. Stress-induced eating: fact, fiction or misunderstanding? Appetite, 1, 103-133, (1980).
3. Meiselman, H., L. Symington, E. Smutz, H. Moskowitz, T. Nichols, and T. Eggemeier. Field feeding: behavioral sciences studies. U.S. Army Natick Research and Development Laboratories, Technical Report 76-3-FSL, January 1965 (AD A018 521).

APPENDIXES

- A. LETTER OF SOLICITATION
- B. SURVEY FORM
- C. DEFINITIONS OF CODING CATEGORIES FOR RESPONSES TO THE QUESTION, "IF YOU ATE MORE OR LESS, PLEASE EXPLAIN WHY."
- D. DEFINITIONS OF CODING CATEGORIES FOR RESPONSES TO THE QUESTION, "DO YOU HAVE ANY COMMENTS ON HOW AND WHAT TROOPS SHOULD BE FED IN COMBAT."

APPENDIX A

Letter of Solicitation

DRDNA-YBH

Dear

The U.S. Army Natick R & D Labs has obtained your name from U.S. Marine Corps Headquarters in Washington, D.C. At the Natick Labs, we are working to develop new and improved ways of feeding soldiers in future combat situations. The rations developed here are used by all branches of the the service.

In order to develop operational rations, it is important that we hear from people like yourself who have actually served in combat. We are particularly interested in your opinions, as the type of combat operation typically conducted by Marines in the past is most like what is envisioned for future operations. We would appreciate it if you would take a few moments to complete the inclosed questionnaire.

We realize that it may be difficult to remember events that occurred a number of years ago, but try to be as accurate as possible when filling out the inclosed questionnaire. If you simply cannot recall the answer to a question, please write, "cannot recall" by that question.

To assure your privacy, we request that you not use your name. No information given will be associated with you personally. Please take this questionnaire seriously; your answers will be taken seriously.

When you have completed the inclosed questionnaire, please return it in the envelope provided. No postage is necessary. Again, thank you for your help.

Sincerely,

GERARD J. SMITS
CPT, MSC

APPENDIX B

SURVEY FORMS

EATING IN COMBAT SITUATIONS: A SURVEY OF MARINES

U.S. ARMY NATICK RESEARCH & DEVELOPMENT LABORATORIES
Natick, MA 01760

BACKGROUND INFORMATION

1. What is your present age? _____ YEARS
2. Are you now retired? (CIRCLE ONE) YES NO
3. Were you drafted into the Marine Corps? (CIRCLE ONE)
YES NO
4. What years were you active duty in the Marine Corps?
19__ to 19__
5. What state did you live in longest before entering the Marine Corps?

FIRST COMBAT SITUATION

THE FOLLOWING QUESTIONS RELATE TO THE FIRST COMBAT SITUATION YOU WERE INVOLVED IN (BY "COMBAT SITUATION" WE MEAN ANY SITUATION IN WHICH YOU WERE UNDER DIRECT OR INDIRECT ENEMY FIRE).

1. What was your age at that time? _____ YEARS
2. What was your rank at that time? _____
3. In which country did the combat take place? _____
4. How many days did this combat situation last? _____ DAYS

5. On the FIRST day of combat, I ate: (CHECK ONE)

- more than usual
- about the same as usual
- about 3/4 of what I usually ate
- about 1/2 of what I usually ate
- about 1/4 of what I usually ate
- nothing

6. If you ate more or less on the FIRST day, please explain why:

7. To the best of your recollection, what was provided for you to eat on the FIRST day?

8. To the best of your recollection, exactly what did you eat on the FIRST day?

IF THIS FIRST COMBAT SITUATION LASTED ONLY ONE DAY, PLEASE PUT A LINE THROUGH QUESTIONS 9-16 AND GO TO SECOND COMBAT SITUATION.

9. On the SECOND day of combat, I ate: (CHECK ONE)

- more than usual
- about the same as usual
- about 3/4 of what I usually ate
- about 1/2 of what I usually ate
- about 1/4 of what I usually ate
- nothing

10. If you ate more or less on the SECOND day, please explain why:

11. To the best of your recollection, what was provided for you to eat on the SECOND DAY?

12. To the best of your recollection, exactly what did you eat on the SECOND day?

IF THIS FIRST COMBAT SITUATION LASTED ONLY TWO DAYS, PLEASE PUT A LINE THROUGH QUESTIONS 13-16 AND GO TO SECOND COMBAT SITUATION.

13. On the THIRD day of combat, I ate: (CHECK ONE)

- more than usual
- about the same as usual
- about 3/4 of what I usually ate
- about 1/2 of what I usually ate
- about 1/4 of what I usually ate
- nothing

14. If you ate more or less on the THIRD day, please explain why:

15. To the best of your recollection, what was provided for you to eat on the THIRD day?

16. To the best of your recollection, exactly what did you eat on the THIRD day?

SECOND COMBAT SITUATION

IF YOU TOOK PART IN A SECOND COMBAT SITUATION, PLEASE ANSWER THE FOLLOWING QUESTIONS REGARDING THIS SECOND SITUATION. (IF YOU WERE NOT INVOLVED IN A SECOND COMBAT SITUATION, PLEASE PUT A LINE THROUGH THIS SECTION AND GO TO GENERAL QUESTIONS ABOUT EATING IN A COMBAT SITUATION.

1. What was your age at that time? _____ YEARS
2. What was your rank at that time? _____
3. In which country did the combat take place? _____
4. How many days did this combat situation last? _____ DAYS
5. On the FIRST day of combat, I ate: (CHECK ONE)
 more than usual
 about the same as usual
 about 3/4 of what I usually ate
 about 1/2 of what I usually ate
 about 1/4 of what I usually ate
 nothing

6. If you ate more or less on the FIRST day, please explain why:

7. To the best of your recollection, what was provided for you to eat on the FIRST day?

8. To the best of your recollection, exactly what did you eat on the FIRST day?

IF THIS SECOND COMBAT SITUATION LASTED ONLY ONE DAY, PLEASE PUT A LINE THROUGH QUESTIONS 9-16 AND GO TO GENERAL QUESTIONS.

9. On the SECOND day of combat, I ate: (CHECK ONE)

- more than usual
- about the same as usual
- about 3/4 of what I usually ate
- about 1/2 of what I usually ate
- about 1/4 of what I usually ate
- nothing

10. If you ate more or less on the SECOND day, please explain why:

11. To the best of your recollection, what was provided for you to eat on the SECOND day?

12. To the best of your recollection, exactly what did you eat on the SECOND day?

IF THIS COMBAT SITUATION LASTED ONLY TWO DAYS, PLEASE PUT A LINE THROUGH QUESTIONS 13-16 AND GO TO GENERAL QUESTIONS.

13. On the THIRD day of combat, I ate: (CHECK ONE)

- more than usual
- about the same as usual
- about 3/4 of what I usually ate
- about 1/2 of what I usually ate
- about 1/4 of what I usually ate
- nothing

14. If you ate more or less on the THIRD day, please explain why:

15. To the best of your recollection, what was provided for you to eat on the THIRD day?

16. To the best of your recollection, exactly what did you eat on the THIRD day?

GENERAL QUESTIONS ABOUT EATING IN A COMBAT SITUATIONS

HOW IMPORTANT IS EACH OF THE FOLLOWING IN AFFECTING HOW MUCH FOOD YOU ATE WHILE IN COMBAT. USE THE FOLLOWING 7-POINT SCALE.

VERY UNIMPORTANT	MODERATELY UNIMPORTANT	SOMEWHAT UNIMPORTANT	NEUTRAL	SOMEWHAT IMPORTANT	MODERATELY IMPORTANT	VERY IMPORTANT
1	2	3	4	5	6	7

(CIRCLE ONE)

Not enough time to prepare food.....	1	2	3	4	5	6	7
Bad food.....	1	2	3	4	5	6	7
Food was cold.....	1	2	3	4	5	6	7
Not enough time to eat food.....	1	2	3	4	5	6	7
Was scared.....	1	2	3	4	5	6	7
No food available.....	1	2	3	4	5	6	7
Did not feel hungry.....	1	2	3	4	5	6	7
Too much trouble to prepare food.....	1	2	3	4	5	6	7
Did not feel well.....	1	2	3	4	5	6	7
Was exhausted.....	1	2	3	4	5	6	7
Bad weather (heat, cold, rain, etc.).....	1	2	3	4	5	6	7

Do you have any comments on how and what troops should be fed in combat?

APPENDIX C

Definitions of coding categories for responses to the question
"If you ate more or less, please explain why."

- (1) **ENGAGED IN COMBAT.** Respondents reported that the task and the environment/situation provided them with little opportunity to eat. Examples: "too busy for chow," "constantly on the move," "under constant attack," "engaged in combat," "on patrol all day and night so there was lack of time and opportunity to eat."
- (2) **SCARED.** Respondents reported being frightened. Examples: "too scared to eat," "fear," and "anxious."
- (3) **NERVOUS/TENSE.** Respondents reported feelings of nervousness or tension. Examples: "tense," "nervous," "apprehension," "anxiety," "keyed up," "inability to relax," "bundles of nerves," "excited."
- (4) **NOT HUNGRY.** Respondents reported a lack of appetite. Examples: "not being hungry," "no desire to eat," "loss of appetite."
- (5) **SUPPLIES WERE NOT AVAILABLE.** Respondents reported that food was not available. Examples: "no chow was available-only what was left from the previous day," "only issued one meal," "they could not get rations to us," "they did not give us much," "shortage of rations."
- (6) **WEATHER.** Respondents reported that they ate less food than usual because of the weather. Examples: "temperature was higher than I was used to," "intense heat and humidity," "oppressive heat made appetite subside."
- (7) **TIRED.** Respondents reported feeling tired. Examples: "too tired to eat," "too exhausted to prepare food," "no sleep yesterday."
- (8) **SICK.** Respondents reported being sick. Examples: "dysentery," "diarrhea," "upset stomach," "sickness."
- (9) **FOOD WAS BAD.** Respondents reported that the food was bad or unappetizing. Examples: the food was "bad," "cold," "tasteless," "contaminated," and "not appealing."

APPENDIX C (CONT'D)

- (10) FOOD WAS NOT IMPORTANT. Respondents reported that food was a low priority. Examples: "I was more concerned with the situation than with the food," "food was the farthest thing from my mind," "occupied with other concerns."
- (11) INCONVENIENCE OF FOOD. Respondents reported that it was not convenient to prepare or carry rations. Examples: "food was too heavy to carry," "carried the lightest food that I could-cookies, coffee, crackers and jam," "carried less than full rations to save weight," "not able to prepare food when on the move," "took too long to heat food with heat tabs."
- (12) INTERFERED WITH COMBAT EQUIPMENT. Respondents reported that carrying food interfered with carrying combat equipment. Examples: "could not carry much food because it interfered with carrying ammunition," "we eliminated the junk food portions of C's to allow us to carry more ammo."
- (13) PREVIOUS DEPRIVATION OR ANTICIPATED FUTURE DEPRIVATION. Respondents reported that they recently had nothing or little to eat or that they anticipated, because of future combat, having nothing or little to eat. Examples: "nothing to eat the first day," "I did not know when I would have a chance to eat so I stocked up," "a tendency to bulk up for the future."
- (14) TOO THIRSTY. Respondents reported being very thirsty. Examples: "too thirsty."

APPENDIX D

Definitions of coding categories for responses to the question
"Do you have any comments on how and what troops should be fed in combat?"

- (1) EASY TO PREPARE. Respondents reported that combat rations should be easy and quick to prepare. Examples: "easy to prepare," "quick to fix," "easy to heat dry rations," "foods that need no preparation-can be eaten when time permits," "packages that open easily," "meals that require no water," "I'd like segmented meals," "leave out foods that need water and have to be heated - it takes too much time."
- (2) EASY TO CARRY. Respondents reported that combat rations should be light-weight and easy to carry. Examples: "compact rations which do not burden us with excess weight," "combat rations should be compact so they take up little space," "do away with cans so man is able to carry more food with him," "we need items that can be easily stored in pockets that are not bulky."
- (3) TASTY. Respondents reported that the food should be tasty and appetizing. Examples: "tasty food," "palatable chow," "meals that taste good even if eaten cold."
- (4) HOT MEALS. Respondents reported that they should receive hot meals. Examples: "Troops should be fed hot chow if possible," "one hot meal per day, at least."
- (5) CALORIES/ENERGY. Respondents reported that food should be high in calories and energy. Examples: "high in calories," "high in energy - like granola type bars," "food that has a good energy source - like peanut butter."
- (6) NUTRITIOUS. Respondents reported that the food should contain the necessary nutrients. Examples: "highly nutritious," "chow should provide necessary amount of nutrients," "balanced diet type foods," "foods high in protein and essential nutrients," "minimum fat content."