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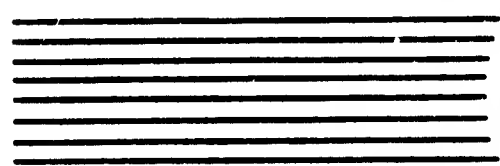
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UNITED STATES ARMY COMBAT DEVELOPMENTS COMMAND

SUBSISTENCE AND FOOD SERVICE FOR THE ARMY IN THE FIELD

USACDC ACTION CONTROL NUMBER 2330

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UNITED STATES ARMY
COMBAT DEVELOPMENTS COMMAND

FINAL STUDY

SUBSISTENCE AND FOOD SERVICE FOR THE ARMY IN THE FIELD

USACDC ACTION CONTROL NUMBER 2330

JULY 1966

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ACKNOWLEDGMENTS

This Combat Developments Command Study was prepared in response to paragraph 1620bw, Combat Development Objectives Guide. It is considered a completed study for use as a reference document for planning purposes. This study will be used as approved guidance within the command for the preparation of future specific studies, and the formulation of combat development objectives and concepts relative to U. S. Army participation in subsistence and food service for the Army in the field during the 1966-1970 period.

Conclusions and recommendations of the study are those of the Commanding General, United States Army Combat Developments Command, and are based upon information gathered, and analysis performed, primarily by the USACDC ~~Quartermaster~~ ^{Supply} Agency.

In the development of the study, considerable information was obtained from a number of Department of Defense and Department of the Army agencies by means of liaison visits, meetings, interviews, and letters. The USACDC Infantry Agency made a major contribution to the study in the form of a complete annex covering the anticipated field subsisting situations. The US Army Natick Laboratories is to be credited for virtually all of the information contained in this study regarding the state-of-the-art of new subsistence developments. A one-day conference hosted by the Defense Supply Agency and attended by representatives of key agencies of the various services provided valuable guidance and excellent source contacts for needed technical data. Document research was expedited by help received from the Office of Chief of Research and Development, Department of the Army. Likewise, the US Army Test and Evaluation Command's US Army General Equipment Test Activity furnished pertinent reports of field tests and made staff members available for professional consultations. Recognition also must be given to the advice and certain technical material contained herein which was obtained by correspondence from the USACDC Medical Service Agency and the former Defense Subsistence Supply Center.

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ABSTRACT

SUBSISTENCE AND FOOD SERVICE FOR THE ARMY IN THE FIELD

The study determines operational and organizational concepts to meet subsistence and food service requirements for the army in the field during the period 1965-1970. Based upon evaluation of data from many sources, a field food system is developed, keyed to tactical and logistical concepts of the RODAC-70 and TASTA-70 studies. This system is capable of immediate implementation and evolutionary improvement taking advantage of technological developments as they occur. The study considers application of the field food system in various levels of conflict from cold war to general war and special US Army subsistence responsibilities in a theater of operations.

SUMMARY

SUBSISTENCE AND FOOD SERVICE FOR THE ARMY IN THE FIELD

The purpose of this study is to determine operational and organizational concepts to meet food service requirements of the army in the field during the 1965-1970 period. The scope of the study includes analysis of the future battlefield environment to derive the various probable situations under which troops will be subsisted; within this framework, requirements for types of subsistence and food service equipment also are determined. Methodology involved collection, evaluation and synthesis of data obtained from document research, interviews, correspondence, conferences, and informal map exercises.

The proposed field food system is keyed to RODAC-70 and TASTA-70 operational and organizational concepts. In accordance with these concepts, the study foresees that the present system will be modified by evolutionary changes during the period to take maximum advantage of technological developments. For example, foods processed by new dehydration techniques, now assuming commercial significance, promise acceptability equal to or closely approaching that of fresh food counterparts while permitting substantial reductions in weight and cube.

The three traditional types of subsisting situations are seen as continuing to prevail within a theater of operations, viz., the large group (company size or larger), small group (platoon or squad size), and individual situations. Subsisting in large groups will be the normal practice; however, from brigade forward to the FEBA, a higher percentage of troops will be subsisted on the small group and individual basis. The

organic unit mess still offers the most efficient means of preparing meals for large groups, supplemented with fresh bread baked and supplied by combat service support elements. Individual, nonexpendable eating utensils and equipment, except for canteen and canteen cup, will be supplied from the unit mess along with meals. Small groups and individuals will be subsisted in one of the two following ways: (1) food prepared by unit messes will be transported in food distribution equipment to dispersed troops, or (2) packaged operational meals containing disposable messing utensils will be furnished which require minimal preparation. In this connection, military training should include some practical instruction in the preparation and use of small group/individual operational meals. Sundries will be supplied gratuitously until sales outlets become established.

The various types of operational subsistence to be employed will consist of the most acceptable, available nonperishable components, unitized for issue on a meal basis. This type packaging and packing will facilitate functionalized supply operations, will simplify supply management activities to include maintaining balanced stocks, and will reduce skill level and training requirements for supply handling personnel. Moreover, refrigeration will not be required. Until the national industrial/commercial base has a capability to produce the new dehydrated foods in abundance, decisions will be necessary regarding priority for their introduction into various types of operational subsistence. Large group type subsistence appears to warrant top priority since its use throughout the army in the field will predominate; maximum operational and corollary benefits will accrue from improving the characteristics of this type subsistence.

Increased use of dehydrated foods in operational subsistence will cause an increase in potable water requirements, but anticipated increases will be well within the projected capabilities for field water supply during this period. Dehydrated items included in individual type subsistence should consist only of beverage products to simplify preparation requirements and associated water distribution problems in forward areas.

Unitized operational subsistence will minimize problems associated with contamination under CBR operations. Guidance for subsisting in or around CBR contaminated areas, however, is considered to be inadequate.

The proposed system contains all elements necessary to provide subsistence for specialized operations, e.g., operations in extreme climatic environments, airmobile operations, cold war, limited war, and unconventional warfare. With certain modifications and augmentations, the system also can satisfy special U. S. Army subsistence responsibilities in a theater of operations for support of other U. S. military and civilian personnel, allied forces, PW's, host country labor, refugees, and displaced persons.

When the operational situation permits, adjustment or conversion readily can be made to use field rations containing perishable foods.

It is concluded that:

The proposed field food system can be implemented using currently available types of processed foods and standard field food service equipment.

The system will be improved through introduction of subsistence items and food service equipment due to become available during 1965-1970.

Optimum functioning of the future field food system depends upon attainment of the CDOG approved and proposed qualitative materiel requirements for food and food service equipment specifically identified within this study.

The study recommends that:

Products of new food processing technologies which offer improved military characteristics for operational subsistence be phased into current Army field rations as they become available from industrial/commercial sources.

A program of positive and continuing government procurement of freeze-dried foods, suitable for use in Army field rations be initiated to motivate expansion of the present industrial/commercial base.

All types of operational subsistence be packaged on a meal module basis, using: (1) a 25-man modular case for large group meals; (2) a 6-man module for small group meals, overpacked four 6-man modules per case; and (3) the current modular packaging for individual meals, i.e., 12 meals per case.

Action be taken to develop specifications for procurement of the standard B ration in unitized modules of 25 meals per case; actual procurement of this type subsistence be based on requirements for support of emergency or mobilization planning in CONUS and oversea commands.

Action also be taken to convert the packaging specifications for present standard small group subsistence (i.e., the Ration, Small Detachment, 5-Persons) from the 5-man ration to the 6-man meal basis.

Priority for military utilization of freeze-dried foods be assigned to the large group (B-type) subsistence.

Present doctrine be expanded to provide more detailed guidance on procedures and techniques for unit mess operations and subsisting the individual soldier in or around CBR contaminated areas.

Army Training Programs provide for integrated training in the

preparation and use of small group and individual types of operational subsistence.

Individual messing equipment and utensils, except for the canteen and canteen cup, be provided as nonexpendable, organic equipment of units and as expendable items in small group and individual operational subsistence.

Relative to qualitative materiel requirements: (1) The proposed requirement for the modular, mobile field kitchen be approved and developmental effort be expedited to make this equipment available for highly mobile field army units; (2) the approved requirement for the Meal, Ready-to-Eat, Individual (CDOG paragraph 1439f(16)) be revised to restrict dehydrated components to beverage type items only; and (3) all references to the 25-man meal module size be deleted from the requirement for the Meal, Quick-Serve (CDOG paragraph 1439f(15)).

A small development requirement be prepared for a suitable holding device (pliers, tongs, dip basket, or hook) to permit total sanitization (complete immersion in hot water) of nonexpendable mess trays.



**HEADQUARTERS
UNITED STATES ARMY COMBAT DEVELOPMENTS COMMAND
FORT BELVOIR, VIRGINIA**

CDCCD-C

10 April 1964

SUBJECT: Combat Developments Study Directive: Subsistence and Food Service for the Army in the Field

**TO: Commanding General
US Army Combat Developments Command
Combat Service Support Group
Fort Lee, Virginia 23801**

1. General. It is desired that you undertake a study pertaining to subsistence and food service for the army in the field during the period 1965-1970.

2. Objective and Scope.

a. The objective of the study is to determine operational and organizational concepts to meet food service requirements of the army in the field during the 1965-1970 period.

b. The scope of the study will analyze the operational environment envisioned for the future battlefield to derive the various probable situations under which troops will be subsisted. Requirements for meals, types of subsistence and food service equipment, including that for bread baking purposes, will be ascertained.

3. Assumptions.

a. The operational and organizational environment in the army during the 1965-1970 time frame will be essentially as described in the RODAC-70, TASTA-70, CO-STAR II and ATMRB study reports.

b. Subsistence and food service equipment items presently under development will be available in accordance with current availability projections.

c. The intensity of combat and dispersed, mobile operations will require the use of simplified food service systems and rations not practiced in recent conflicts.

CDCCD-C

SUBJECT: Combat Developments Study Directive: Subsistence and Food Service for the Army in the Field

4. Guidance.

a. The primary purpose of a food service program is to provide the soldier with nutritionally adequate, palatable, well balanced and properly prepared meals. To achieve this purpose and thus enhance morale, consideration will be given to the degree of acceptability by the soldier of the system devised and the typerations recommended.

b. The overall concept will be sufficiently comprehensive to provide for the feeding of Army personnel and Army supported personnel such as Navy, Marine, Air Force, allied troops, and US and other civilian personnel and prisoners of war. Primary emphasis will be on the field army food service system; however, requirements in the COMZ and COMZ support in the supply of subsistence will be considered sufficiently to insure an overall integrated concept for the theater of operations.

c. The study will be approached on the requirements for general combat operations in the temperate zone. Modifications to the basic system will also be indicated to adapt the system to limited war and to the severe climatic conditions of the tropical and the arctic regions.

d. The various types of feeding situations which are expected to prevail in the field army should be determined, to include their respective importance in terms of probable percentages of troops typically involved in specific feeding situations (e.g., large group, small group, and individual feeding situations) at any given time.

e. The necessity for refrigeration will be eliminated, if practicable.

f. Equipment used in food preparation, serving, and distribution must be flexible, applicable to the various feeding situations expected, and compatible with the food items and mode of transportation.

g. New food processing and preservation techniques applicable for the army field feeding system will be evaluated for practicality of application based upon domestic commercial production capability and potential.

h. Considerations of potable water will be limited to its provision for food preparation, mess sanitation, and drinking purposes.

CDCCD-C

10 April 1964

SUBJECT: Combat Developments Study Directive: Subsistence and Food Service for the Army in the Field

i. Determination will be made as to whether bread should be furnished as a component or as a supplement with each type ration employed in the feeding system to be proposed.

j. Areas which should be given specific attention in developing the study are:

(1) The extent to which significant reductions can be achieved in weight and cube of subsistence items and rations to reduce transportation requirements thereby enhancing the mobility of the Army.

(2) Possibilities for reduction in the number of line items in the supply system through unitization or other means.

(3) Possibilities for reduction in training times, consolidation of MOS's or other means for reducing training requirements for food service personnel.

(4) The respective merits of providing conventional types of mess gear as either individual or organization equipment versus disposable equipment furnished as components of operational rations.

k. The supply system will be examined from front to rear, in the light of the anticipated feeding situations and types of subsistence and food service equipment required, to ascertain any special requirements which must be recognized and satisfied.

l. The effects of CBR warfare on subsistence items, mess equipment, and feeding situations, including necessary protective measures, will be pointed out.

m. Any additions, deletions, or modifications required for QMDO or QMR will be specifically included in the study recommendations.

n. The overall system will be developed to possess sufficient flexibility to meet changing requirements of tactical formations and evolving organizational structures.

5. References. A listing of basic references is attached as inclosure 1.

CDCCD-C

SUBJECT: Combat Developments Study Directive: Subsistence and Food Service for the Army in the Field

6. Administration.

a. Coordination.

- (1) Initial draft with all USACDC agencies.
- (2) Final draft with USACDCCAG.
- (3) Coordination with major CONUS and oversea commands will be effected by HQ, USACDC.

b. Suspense Dates.

- (1) Initial draft for coordination with USACDC agencies - November 1964.
- (2) Final draft for coordination with USACDCCAG - February 1965.
- (3) Final coordinated draft study to HQ, USACDC - March 1965.

c. Information concerning combat feeding situations anticipated within the field army will be obtained from CG, USACDCCAG.

d. The overall study will be unclassified. Any classified material considered essential to the study will be submitted in the form of a separate annex or supplement.

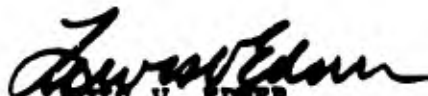
e. Administrative format of the study will be as prescribed in USACDC Regulations Number 71-3, 1 July 1963, "Combat Developments Study Program" with C1.

f. A recommended distribution list will be submitted with the final draft study for approval.

g. The study is assigned project number USACDCQMA 65-7 and will be recommended for inclusion in paragraph 1620bu of Combat Development Objectives Guide.

FOR THE COMMANDER:

1 Incl
as


LEWIS V. EDNER
Major, QMC
Acting Asst Adj Gen

DISTRIBUTION:
"K"

REFERENCES

1. DA, "Combat Developments Objectives Guide (U)."
2. DA (OCRD) "Long Range Technological Forecast," 1963, Part One, Sections I and II and Part Two, Section I.
3. Study, "Reorganization Objectives, Division, Army and Corps - 1970 (U)," USACDCCARMSA, 15 November 1963.
4. Study, "Visualization of the RODAC Battlefield (U)," CDOG USACDCCARMSA Project No. CAG 63-2, 15 April 1963.
5. Study, "The Administrative Support, Theater Army 1965-1970 (TASTA-70) (U)," USACDCCSSG.
6. Study, "Combat Service Support for Airmobile Operations (U)," USACDCCSSG Project No. 63-3, 13 May 1963.
7. Study, "Combat Service to the Army (COSTAR II)," 2d Revision, USACDCCSSG.
8. USACDC Regulations No. 71-3, "Combat Developments Study Program."
9. US Army Tactical Mobility Requirements Board Final Report (U), 20 August 1962.
10. Study, "Visualization of Theater of Operations (U)," USAWC 60-2, 25 May 1961 (Revised 1 June 1962).
11. ST 54-2-1 (as changed), "Air Assault Division, Combat Service Support and the Support Command."
12. ST 61-100-1, "The Division, Air Assault Division Supplement," December 1962, revised.
13. ST 100-70-1, "Reorganization Objectives, Division, Army and Corps - 1970 (U)."

Inclosure 1

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SUBSISTENCE AND FOOD SERVICE FOR THE ARMY IN THE FIELD

I. PURPOSE.

The purpose of the study is to determine operational and organizational concepts to meet food service requirements of the army in the field during the period 1965-1970.

II. SCOPE.

The scope of the study will analyze the operational environment envisioned for the future battlefield to derive the various probable situations under which troops will be subsisted. Requirements for types of subsistence and food service equipment, including that for bread baking purposes, will be ascertained.

III. ASSUMPTIONS.

1. The operational and organizational environment in the army in the field during the 1965-1970 time frame will be essentially as described in the RODAC-70, TASTA-70, CO-STAR II and ATMRB study reports.

2. Subsistence and food service equipment items presently under development will be available in accordance with availability projections.

3. The intensity of combat and dispersed, mobile operations will require the use of simplified food service and a level of subsisting austerity not practiced in recent conflicts.

IV. DISCUSSION.

1. Anticipated Field Subsisting Situations (see Annex A). The operational environment in which U. S. Army forces may be employed during the 1965-1970 period includes cold war, limited war, and general war.

Regardless of the type of conflict involved, the manner in which soldiers will be subsisted will depend mainly upon the particular operational environment at the moment. The environment, an aggregate of the physical as well as tactical conditions, will determine the size groupments feasible for subsisting purposes. The group sizes will, in turn, influence the types of operational subsistence, the food service equipment, and the food service personnel that can be employed effectively.

a. Subsisting Situations. The specific types of subsisting situations which are anticipated in the future are those which have been traditional in the past, namely:

(1) Large Group. This type situation will be employed when centralized food preparation is desirable because the operational environment and time permit, and field kitchen equipment and trained food service personnel are available. Meals so prepared may be consumed at the preparation site or distributed to small groups.

(2) Small Group. The small group situation, a counterpart to the large group situation, will be employed when operational conditions restrict or prevent massing, when time for food preparation and eating is limited, or when neither field kitchen equipment nor food service personnel are available. Meals prepared in this situation will normally be consumed at the preparation site.

(3) Individual. When large or small groupments are neither feasible nor practicable, subsisting will have to be accomplished on an individual basis.

b. Frequency of Occurrence in the Combat Zone. Table 1 shows

the anticipated frequency of the various subsisting situations in terms of daily percentages. These percentage figures represent overall averages developed in the following manner. A type field army model was positioned in tactical formation. Beginning at the forward edge of the battle area and proceeding rearward, units and elements of units were examined according to type of unit, location of the unit in relationship to the enemy, and mission or activity being performed by the unit. Different tactical situations were considered which included attack, defense, retrograde, pursuit, and exploitation. Within this framework, professional judgment was applied in developing an analysis of the frequency of various subsisting situations. The results of this analysis are summarized in Table 1 according to the following zones:

(1) Zones I and II. Combined, these two zones extend a distance of between seven and twelve kilometers in either direction from the line of contact. These are the areas of greatest vulnerability, fluidity, and changing action. Combat units in contact with the enemy, and artillery, armor, and engineer units in immediate support of combat units in contact are located here. Patrol actions and reconnaissance probes into unsecured and hostile areas occur in these zones. The tactical disposition of troops is by dispersed units prepared for all type operations. Battalion reserves are in Zone II.

(2) Zone III. Zone III contains a large portion of the general support units which function in immediate support of the combat units in contact. Generally, the rear of this zone coincides with brigade rear. Also, Zone III includes the brigade reserve and field trains.

TABLE 1

FREQUENCY OF FIELD ARMY SUBSISTING SITUATIONS
(SHOWN IN PERCENT OF THE DAILY FIELD ARMY TOTAL)

TYPE SUBSISTING SITUATION	ZONE I	ZONE II	ZONE III	ZONE IV	TOTAL ALL ZONES
LARGE GROUP	1.78	6.09	6.72	49.25	63.84
SMALL GROUP	2.85	4.41	4.06	12.51	23.83
INDIVIDUAL	3.24	1.47	1.54	5.08	12.33
ALL SITUATIONS	7.87	11.97	12.32	67.84	100.00

(3) Zone IV. The remainder of the field army is dispersed throughout Zone IV.

c. Subsisting Situations in COMMZ. Practically all units in COMMZ will be subsisted in company or consolidated messes. Some troops will be in the small group and individual subsisting situations at any given meal time, but, in comparison with the combat zone, the numbers will be negligible.

2. The System For Subsisting in the Field (See Annex B). Current objectives of the Army Food Program are to provide good quality, nutritionally adequate food, prepared and served according to the highest standard attainable, within reasonable costs, in order to maintain health, combat efficiency and high morale throughout the Army. The subsisting system proposed in this study is in keeping with these objectives.

a. General. The field subsisting system will incorporate standards, as follows:

(1) Individuals will be served three hot meals per day or, when this is operationally impossible, be furnished meals which can be prepared readily in a heated state or eaten cold if necessary.

(2) Subsistence will consist of a balanced diet of common American food items requiring no refrigeration but possessing acceptability equal to or closely approaching the acceptability of their fresh food counterparts. Dependence upon refrigeration facilities can be overcome without materially sacrificing the palatability of meals through application, where practicable, of foods processed by new technologies such as improved dehydration in conjunction with continued use of conventional types of processed foods of proven acceptability. When the operational situation

will permit introduction of perishable foods, adjustment or conversion will be made to employ a modified B or A type field ration.

(3) Foods will be supplied in a menu cycle consisting of a sufficient number of menus to preclude development of monotony.

b. The Field Army. The subsisting system for a field army engaged in combat during the 1965-1970 time frame will resemble that employed in World War II and Korea with the principal differences being: elimination of military refrigeration through the use of nonperishable subsistence, improved packaged operational-type subsistence capable of being consumed over extended periods of time without marked loss of acceptability or development of monotony, and simplifications and improvements in the area of subsistence supply (a separate topic of discussion in paragraph 3, below).

(1) Organic Messes. Troops will normally be subsisted on meals prepared in organizational messes. Proven and self-evident advantages of the organic mess over a system in which individuals or multiple small groups prepare their own meals are: less personnel and man-hours are involved in preparing meals, less breakdowns of rations are required with a consequent decrease in personnel and distribution requirements, increased efficiency is obtained in food preparation activities, more economic utilization of food is achieved, kitchen-prepared meals contribute to maintaining high troop morale (experience has shown that acceptance of individual and small group packaged operational subsistence by soldiers decreases when they know that kitchen-prepared food could be

provided), and food prepared by skilled cooks is more savory and acceptable than food prepared by untrained individuals. Although food prepared and consumed centrally in unit messes will be the norm, a substantial number of troops, particularly those in the forward area will have to be subsisted in the small group and individual subsisting situations. Individuals in these latter two types of subsisting situations will be fed in one of the two following ways, whichever is the most practicable under the prevailing tactical situation: centralized preparation and decentralized consumption - food prepared in unit messes will be placed in insulated containers, transported, and served to dispersed troops; decentralized preparation and consumption - packaged operational subsistence which will require minimal preparation prior to consumption will be furnished to dispersed troops.

(2) Types of Subsistence. (This topical area is also discussed in paragraph 3, below.)

(a) For Organized Messes. The subsistence for unit messes will consist of all nonperishable articles and require no refrigeration. Each food item will equal or closely approach its A-ration counterpart in acceptability. To optimize flexibility of use, this type subsistence should be unitized into meal modules, such as 25-in-1, suitable for issue to company or larger size groups; unitizing large group subsistence on a meal module basis will facilitate use of other types of operational subsistence (e.g., small group and individual) during any one ration cycle. The menu cycle should cover, as a minimum objective, at least a 10-day period and consist of 10 breakfast menus and 20 interchangeable dinner-supper menus. At the beginning of the 1965-1970 time period, the large

group subsistence will consist of current standard B ration components. Progressively throughout this period, present standard heat processed (canned, wet-pack) B ration components will be replaced by new types of processed foods, such as freeze dehydrated foods, as they become available. These new items will reduce weight and bulk of the meal module. To the extent practicable, light-weight, space-saving, flexible type packaging also will be used to replace conventional cans. Maximum use will be made of "convenience-type" foods to reduce meal preparation time and skill level requirements. The ultimate large group type meal is stated in CDOG paragraph 1439b(14) as a qualitative materiel requirement for "Meal, Uncooked, 25-Man."

(b) For Dispersed Small Groups. This type subsistence will be suitable for preparation by personnel untrained in food service operations. Basically, it should be designed for consumption as a hot meal--the individual meal can be used when time and circumstances require a meal to be eaten cold. Preparation only will require opening containers and packages, adding appropriate amounts of unheated water to those packages of dehydrated foods to be eaten cold, and heating the meal components which are more palatable in a hot state. In connection with heating, conventionally heat processed (canned, wet-pack) foods can be heated as is, whereas dehydrated foods will be prepared by adding specified amounts of hot water to the container holding the dehydrated food. A 10-day menu cycle should be provided. In the initial portion of the 1965-1970 period, small group operational subsistence requirements probably will be satisfied with

the standard Ration, Small Detachment, 5-Persons. Conversion from the ration basis to the meal module basis is desirable at the earliest practicable date. As development and the commercial industrial base permit, precooked, freeze dehydrated components in flexible packaging will be phased into the small group subsistence replacing the more bulky canned, heat processed counterparts. The type small group subsistence visualized for attainment is contained as a materiel requirement in paragraph 1439f(15) for the "Meal, Quick-Serve, 6-Man."

(c) For Individuals. An individual meal will be used under several circumstances such as: when the individual is performing sentry duty, patrolling, positioned in a foxhole, and when dispersed groups must eat while on the move or while stopping for only a brief interval. Under these conditions, the individual meal will generally be consumed in a cold state. There will be occasions, however, when time and circumstances will permit heating before consumption. Thus, it is desirable for the individual meal to be acceptable in either the hot or cold state. It should be available in a minimum of 10 different menus to preclude monotony. This meal should require no preparation other than opening of packages, heating if desired, and only adding of hot or cold water to prepare a beverage. During the time frame under consideration in this study, this type meal will probably be the present Meal, Combat, Individual. The packaging may transcend from cans to flexible barrier materials. In a later time frame, a qualitative materiel requirement for

a "Meal, Ready-to-Eat, Individual, set forth in CDOG paragraph 1439f(16), and envisioning incorporation of irradiated components is expected to become available. Although not a meal, a need is also seen for a light-weight food packet of high caloric content to meet subsistence needs of situations such as initial assault stages, patrols, etc. Major food items in this packet will require no preparation prior to consumption. A qualitative materiel requirement for this item is in CDOG paragraph 1439f(17), "Food Packet, Individual, Combat." However, only an interim item known as the "M" packet, which does not fully meet the CDOG requirements, probably will be available through 1970.

(d) Provision of Bread. It is generally recognized that bread is an important item in the diet of the soldier. Therefore, the best available product should be provided. For serving with meals prepared in field kitchens, two types of bread which are suitable are conventional bread and bread made by using instant bread mix. Bread of the latter type offers many advantages including short production time, reduction in the need for highly skilled personnel, and requirement for a minimum of equipment. Because of its many advantages, it is especially practicable for bread made under field conditions. Instant bread mix is a standard item and a qualitative materiel requirement for a "Bakery System Continuous" to process the instant bread mix is contained in CDOG paragraph 1439f(19). Until this new bakery equipment is developed, standardized and procured, the conventional type bread will be baked in the field using present standard field bakery equipment. Baking bread using standard

field bakery equipment and the standard bread premix could be an interim solution. Also, it may be practicable to bake bread products at the unit level, using the standard bread premix and presently authorized TOE food service equipment, thereby eliminating the need for centralized field bakery facilities. For the packaged operational (small group and individual) subsistence, types of bread available currently or in the foreseeable future, in the order of desirability, are pasteurized bread in the form of a two or three-ounce roll in a flexible package, canned bread, and bread-type substitutes (crackers and cookies). It will be practicable to include pasteurized or canned bread only as an integral component of the small group meal. The low density characteristic of bread will necessitate the use of bread-type substitutes in the individual meal.

(e) Accessory and Sundry Items. Accessories consist of: (1) utility items which are used in conjunction with and which contribute to the effectiveness of preparing and consuming packaged operational subsistence such as a can opener, spoon, and matches, and (2) items essential to the welfare and daily personal needs of the soldier, such as toilet paper and other welfare items. These types of accessories will be packaged with both the small group and individual types of subsistence; accessory items for preparation and consumption of the large group-type subsistence will not be required to be packed with this food since these types of items will be included in TOE equipment; accessories for personal needs and welfare of troops will be supplied separately rather than as components of the unitized large group

subsistence. Sundries, which are the types of items of a luxury nature contributing to the soldiers' morale, comfort, and well being, will be unitized into composite packs for separate, gratuitous issue through the direct support echelon until such time as sales outlets are established.

(3) Food Service Equipment. Conventional field-type food service equipment can be used for organic field mess operations. Improvements in the efficiency and reductions in weight and maintenance of this equipment would enhance utility characteristics. A more desirable answer, particularly for highly mobile field army units, is seen in the qualitative materiel requirement for a mobile field kitchen which has been developed and presently is undergoing staff review. An efficient heating device will be required for preparation of the small group meal; standard items which are available and prototypes in various stages of development have not, as yet, been found fully satisfactory for meeting this requirement. Inclusion of a heating material, as a component of the individual meal, will eliminate the need to furnish separately any food service equipment when this type subsistence is employed.

(4) Messing Equipment. Messing equipment will be included as part of the food service equipment in organization TOE's. Since the types of subsistence other than that prepared in field kitchens (the small group and individual meals) will contain disposable messing equipment, no requirement will exist for individual mess equipment, except the canteen and canteen cup. A simple holding device for sanitizing (completely immersing) nonexpendable trays should be provided to unit messes.

c. The Communications Zone. Due to its distance from the combat area, as well as the nature of its operations, the COMMZ subsistence system

will be similar but somewhat more conventional than in the field army. Practically all COMMZ troops will be fed kitchen-prepared meals; some subsistence of the individual and small group types will be used but the amount will be negligible. The large group type subsistence will be the same as that supplied for preparation in field army messes. Should CONUS unitization capabilities become insufficient following initial stages in tactical development of the theater of operations, priority for unitized subsistence should be established in favor of the field army(s). COMMZ would be furnished the same components forming the unitized subsistence, but on a bulk basis. The additional burden of handling and issuing bulk components would be more suitably absorbed in COMMZ where normally operating conditions will be more stable and non-US labor more prevalent than in the combat zone. To the extent that local refrigeration facilities are available for military purposes, they will be used for locally procured perishables. Conventional bread or bread produced from instant mix will be used; determining factors will be whether adequate commercial type bakery facilities and non-US labor are available and whether military personnel and equipment for producing bread of either the conventional or premix type are needed. As in the field army, sundries should be supplied gratuitously in composite packs until they become available in sales outlets.

d. Specialized Operations. Specialized operations consist principally of operations in extreme environments, airmobile operations, cold war/limited war, and unconventional warfare. In Arctic areas the standard Ration, Individual, Trail, Frigid may be used in lieu of the standard Meal, Combat, Individual or its developmental counterpart. Otherwise, the various types of operational subsistence discussed in

preceding paragraphs for general use in the temperate zone will adequately support average operations both in the Arctic and tropical environments without supplementation. The operational subsistence proposed for general operations also will effectively support airmobile operations. Such subsistence will, in fact, facilitate present concepts and tentative doctrine for Class I support of airmobile operations which place emphasis upon the desirability of employing scheduled supply, unitized supply, modular packaging, and nonperishable subsistence. Subsisting requirements in limited war are relatively the same as those in general war, and present no specialized requirements. In this connection, modularized operational subsistence, as proposed in this study, will be most applicable for limited war usage where initial deployment of forces and escalation of hostilities may be quite rapid; receipt and maintenance of balanced subsistence stocks will be assured and specially trained personnel will not be required for handling and moving subsistence through supply channels. U. S. forces engaged in counterinsurgency operations, the typical military activity in cold war, normally are supported in a host country in a manner which parallels post, camp, and station support in CONUS. However, the various types of operational subsistence proposed herein for the army in the field are ideally suited for emergency subsistence reserves for stockage in-country, as appropriate. In unconventional warfare, Special Forces personnel will depend primarily upon indigenous subsistence obtained in guerrilla warfare operational areas. However, a certain amount of subsistence support is

likely to be required, particularly when special forces detachments are located where local food supplies are scarce. The general purpose types of packaged operational subsistence, particularly the developmental types, described in this study, will satisfy these requirements. Composite food packages conforming to national, ethnic, or religious customs, as well as sundries (PX-type items) packs for barter purposes, also may be required.

d. Summary. The types of subsistence which will be required in support of the 1965-1970 field subsisting system are shown in Chart I according to organizational area and forecasted extent of usage.

3. Subsistence Supply (See Annex C).

a. The 1965-1970 Supply System. Improved organizational and operational concepts of the supply system for 1965-70 are being developed in a study entitled, "The Administrative Support, Theater Army, 1965-1970 (TASTA-70)" The study has reached a stage in development where significant features of the supply system can be identified. Functionalization of supply support, begun at the direct support level in the ROAD organization, and extended to the general support level of the field army by the CO-STAR organization, will be further expanded under the concepts of TASTA-70. Although certain highly specialized supplies such as POL and ammunition may continue to be supplied through separate channels, TASTA-70 concepts, in general, visualize the functionalization of supply organizations at all echelons within a theater of operations. Additional concepts of the TASTA-70 organization include the following key features:

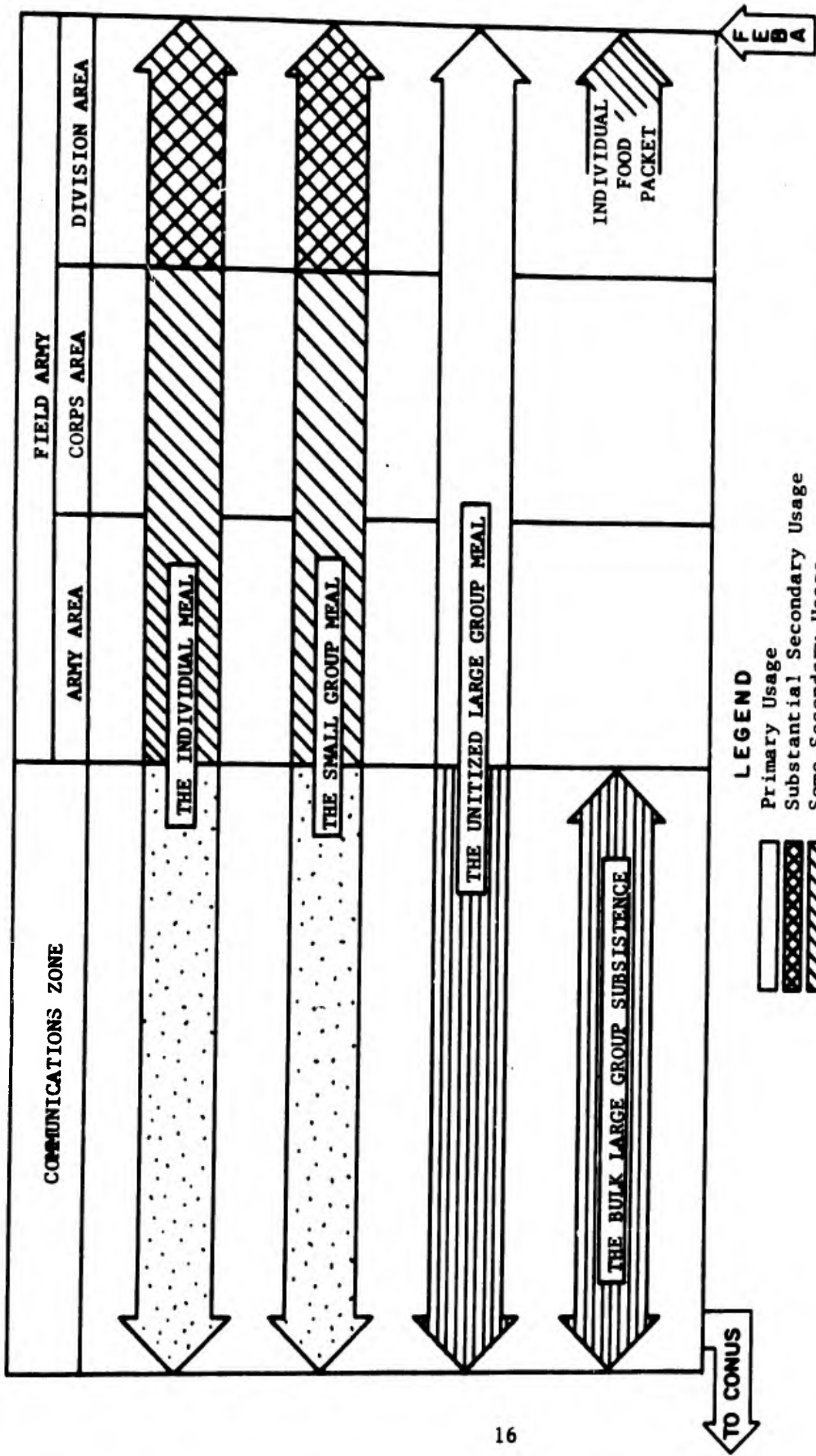


CHART I - SUBSISTENCE FOR THE 1965-70 FIELD FOOD SYSTEM

(1) The establishment of automated systems for stock control and supply management at support brigade, field army, and theater army levels.

(2) The automation of both supply control activities and movement control activities for rapid coordination at all levels.

(3) Direct support supply elements to provide a single source for supplies except medical, ammunition, repair parts and cryptographic supplies.

(4) Direct support supply elements to be the same for all non-divisional organizations in both the field army and COMMZ.

(5) General support supply elements to be employed in either a general support role in the field army or in a field depot in COMMZ.

(6) The system to be capable of accepting any new developments in automation, unitization, supply scheduling, and throughput of supplies.

b. Compatibility of Subsistence Supply. The subsistence system outlined in this study will be fully compatible with the significant features of the 1965-1970 supply system discussed in paragraph a, above. Further, the following features will facilitate the operations of such a supply system.

(1) Unitization. The proposed unitization of all meals to be used in the field army will reduce the number of line items in the field army supply system with the resultant effect of simplifying supply operations. Compared to the conventional bulk method, unitized subsistence can be moved from the rear to desired points in forward areas by the most effective

means without lost motion or delay with intransit transfer operations employing up-to-date materials handling methods. Also, the packing of components for the meal in a single package insures balanced subsistence supply. Such packing and packaging can be accomplished back in the Zone of Interior where the job can be organized and mechanized by modern industrial techniques. Recognized disadvantages to unitized meals are more standardization of menus, slight increases in cubage for some types of meals, and some overissue. In view of the gross simplification of subsistence handling, breakdown, and issue, throughout the entire theater of operations, as well as the acceleration in logistic mobility which would be obtained with unitized meals, these disadvantages appear to be acceptable sacrifices.

(2) Reductions in Weight and Cube. The possible overall reduction in the daily tonnage and cube of subsistence for the 1965-1970 field army is mainly dependent upon the degree to which dehydrated foods are used in place of conventionally processed foods; maximum use of flexible packaging materials instead of rigid cans also will have an influence. Based upon the percentages of the various types of subsistence anticipated to be required daily in the field army (as shown in Table 1, above) and maximum use of dehydrates, as contemplated in the several types of subsistence presently in advanced stages of development, the overall daily decrease in the tonnage of subsistence for the field army would be nearly 50 percent. With respect to cubage, the decrease would almost equal 20 percent.

(3) Unit of Issue. The unit of issue for subsistence traditionally has been the ration - food for one man for one day.

However, the meal as the unit of issue has a number of important advantages which in recent years have come into increasing recognition. Individual subsistence, the Meal, Combat, Individual, is already packaged for issue on a meal basis. Subsistence for the small group which will be standardized in the near future, the Meal, Quick-Serve, likewise is designed with the meal as the unit of issue. For both individuals and small groups, packaging on the meal basis permits a more accurate, precise issue of subsistence to individuals and eliminates requirements to over-issue, i.e., the necessity for issuing a ration when one or two meals are all that is needed. For large group-type subsistence, packaging for issue on a meal basis appears to have even greater advantages. The problems at each breakdown echelon of breaking packages, repacking, and distributing are minimized or eliminated. The problem of assuring "balanced" stocks of subsistence, which plagued supply officers in World War II, would also be overcome since all components for each meal are in a single package. In comparison to bulk B-rations, field tests of the current B-ration, packaged in 25-man meal modules, indicate a saving of between 50-75 percent in handling time and paperwork from the depot through the division distributing point. Overissue was not significant. The Meal, Uncooked, 25-man (CDOG para 1439f(14)) is the objective for large group type subsistence. Until this meal becomes available, however, the current B-ration, unitized in 25-man modules, should be the basis for theater reserve stockage.

(4) Packaging and Packing Multiples. The 25-man meal module for large group subsistence is a CDOG objective of relatively long standing.

As discussed in paragraph (3) above, the suitability of the 25-man meal package has been demonstrated convincingly. Use of dehydrated food items in place of conventionally heat processed (canned) items will further improve the characteristics of this meal module. The current B ration, unitized in 25-man meal packages, averages about 50 pounds per package; prototypes of the Meal, Uncooked, 25-man weigh slightly less than 20 pounds per package. The effect of such weight reduction on supply handling operations at all echelons will be readily appreciated. For small group subsistence, both a 6-man module and a 25-man module previously have been CDOG objectives. In response to this objective, the Meal, Quick-Serve, 6-man and the Meal, Quick-Serve, 25-man have been developed. The need for both of these modular sizes repeatedly has been questioned by various DA agencies. Investigation of requirements during the course of this study reveals that only the 6-man module of the Quick-Serve Meal is needed. By overpacking four 6-man modules in one unit (package), any contingencies requiring 24 or more small group-type meals at one location can be readily satisfied.

(5) Local Procurement. Local procurement of foodstuffs, including that of perishable subsistence, will be accomplished in conformance with theater policy in order to supplement the normal supply of subsistence. This policy will not be inconsistent for application with the proposed feeding system, as locally procured items will be capable of ready assimilation into the COMMZ portion of the system. It is expected that due to devastation and operational conditions existent

in the field army area, locally available subsistence will be negligible. A more ample supply may be obtainable in the communications zone.

c. Industrial/Commercial Capabilities. For most types of subsistence, little doubt exists concerning the capability of the national industrial/commercial base to provide items and quantities needed for any emergency condition. However, both the Meal, Uncooked, 25-man and the Meal, Quick-Serve, 6-man require freeze-dehydrated components. Freeze-drying is a new and expanding industry. Projections for this industry indicate that by 1970 about 120/150 million pounds of processed food will be produced annually, In comparison to this capability, a field army, using the Meal, Uncooked, 25-man and the Meal, Quick-Serve, 6-man would consume in excess of 45 million pounds - more than a third of the total, projected industrial capability for 1970. Two additional problem areas affect the capability of the industry to provide freeze-dehydrated products in sufficient quantities: (1) the Meal, Quick-Serve, 6-man requires cooked freeze-dehydrated components while the industry is expected to be concentrated primarily in producing commercially acceptable uncooked products; (2) military requirements for flexible packaging in both the durability of packages and for the automation of packaging facilities exceed normal commercial requirements. Development or conversion of commercial facilities to satisfy military requirements involves major investments by food producers. It appears that this industry will need to be stimulated by extensive and continuing

military procurements in order to insure the availability of sufficient types and quantities of freeze-dried products.

4. Water Requirements (See Annex D). In subsisting troops, potable water is required for drinking, food preparation, and mess sanitation. Potable water also is essential for bakery operations. During the 1965-1970 period, the only innovation foreseen which will affect the quantity of potable water needed is increased use of dehydrated foods in the field food system. The extent of increase in potable water requirements will depend upon the degree to which the new type dehydrated foods replace the conventional heat processed (canned, wet-pack) components presently used. Based upon the application of comparative water data collected in various field tests and experiments of standard and developmental subsistence, as applied to a type field army positioned in tactical formation, operational subsistence making maximum use of the new dehydrated foods only would increase potable water requirements by about $\frac{1}{2}$ gallon per man per day. According to predictions regarding commercial/industrial capabilities, such extensive utilization of dehydrated food items is not considered likely until after 1970. Therefore, at any point in time from 1965 through 1970, increased potable water requirements should fall somewhat short of $\frac{1}{2}$ gallons/man/day. A recent study by the USACDC Engineer Agency establishes the average potable water requirement in the 1965-1970 field army to be five gallons per man per day. This quantitative requirement was arrived at anticipating wide use of dehydrated meals. It is two gallons more than the normal three gallons per man per day combat requirement stated in FM 101-10 and should more than accommodate

any increase in water requirements caused by dehydrated foods. The study further finds that the present water supply system, with its product improvements will suffice to meet the 1965-1970 army requirements.

a. Responsibilities. Responsibilities for supply of potable water in the field are set forth in Army Regulations. Specific responsibilities are presently delineated in these regulations in terms of technical services. It appears that some restatement of those water responsibilities now assigned to the Quartermaster Corps, the Transportation Corps, and Ordnance Corps will be necessary, as concepts, doctrine, and organization for functionalization of combat service support in the army in the field (TASTA-70) develop. However, no change is seen as needed or desirable in the responsibilities presently assigned to Engineer units, the Army Medical Service, or commanding officers of units.

b. Distribution. Any additional potable water requirements would have little or no impact except in division areas. Here it would be principally a problem of distribution. During the 1965-1970 time frame, the amount of increased potable water required is not anticipated to require a distribution capability which cannot be met using standard procedures and practices. Recognizing that the forward area of the combat zone will be the most difficult area in which to accomplish water distribution points up the desirability of retaining components in the individual type subsistence, other than beverages, which do not require water for reconstitution. The individual type subsistence will be used to a considerable extent from brigade base forward. In addition to avoiding an increase in water requirements, use of dehydrated foods in

the individual type subsistence is considered inadvisable because:

(1) reconstitution would require time which might not be available to the front line soldier, and (2) reconstitution would increase the effort which must be expended in the preparation of the meal, thereby causing diversion of attention from primary combat duties.

5. Special Subsistence Responsibilities (See Annex E). In addition to the basic responsibility for subsisting U. S. Army troops, army commanders in the various areas of the theater of operations will, from time to time, be assigned special subsistence responsibilities by the theater commander. These responsibilities will be concerned with the provision of subsistence to certain other organizations and individuals supporting or operating with US forces, prisoners of war and civilian internees, displaced persons, refugees, and evacuees. The extent of this type support will vary both in kind and degree, dependent upon such factors as the nature of the warfare, its magnitude, and geographic locale. The manner in which these special subsistence responsibilities may be fulfilled is further discussed below.

a. US Armed Forces Personnel Other than Army. The Navy and Marine Corps and the Air Force will have installations and units in the theater of operations. They will rely upon the Army wholly or in part for their subsistence needs as provided for by agreements and assignments. In practically all instances such requirements will be met with the food supplies regularly used by the Army. Additionally, pre-flight and in-flight meals will be required for crews of aircraft. (Expanding concepts for Army aviation activities in a field army may create a similar requirement for such food

packages.) All special subsistence peculiar to the requirements of other services will be procured, stored and issued, as required.

b. Allied Military Forces. Where allied military forces are participating with U. S. forces in combined operations, subsistence support in some degree will be furnished by the United States. The extent and type of subsistence support will vary in accordance with stipulations set forth in various mutual-security agreements and with ethnic and religious customs of allied forces. It is anticipated that allied forces generally will operate as units and thus will operate their own messes.

c. Military Hospitals and Aid Stations. The treatment of casualties requires certain special subsisting considerations. For theater hospital messes, the large group subsistence (unitized B-type) to be furnished to organized troop messes throughout the theater will be suitable for subsisting patients capable of consuming normal diets. Unitized meals for special diet patients (solid/semi-solid consistency and liquid diets) also will be furnished. Unitized packs containing subsistence items for resuscitative feeding of casualties will be supplied for use at medical aid stations and clearing stations; water, a means for heating liquids, and insulated containers are other items which will be required and furnished.

d. U. S. Civilian Personnel. This group of people, comparatively negligible in number, will consist of special mission personnel, e.g., Red Cross workers, representatives of the press, technicians and consultants fulfilling contracts, etc. They will normally mess with army organizations. In limited instances, separate subsistence may be furnished.

e. Non-U. S. Labor Personnel. Included in this category will be those hired to work as individuals at established work sites (static labor) and those organized into what are called "mobile labor units." The individuals may be furnished one or more meals per day at the installation or activity at which they are employed. The mobile labor units will operate their own messes and will be provided with mess equipment and appropriate subsistence designed for the U. S. military field food system, with substitution of locally procured items, as available, to conform to religious and ethnic eating customs.

f. Prisoners of War and Civilian Internees. Prisoners of war will be fed in conformance with the Geneva Convention Relative to the Treatment of Prisoners of War, 12 August 1949. Civilian internees, another category of persons normally under Military Police custody, will be fed in accordance with the Geneva Convention Relative to the Protection of Civilian Persons in Time of War, 12 August 1949. In normal operations, prisoners of war and civilian internees will be moved as quickly as possible to the rear. While on this rearward move, they will be subsisted in the areas through which they pass from army stocks and other available sources such as captured food supplies. In rear areas, they will be subsisted on an austere basis using only essential items drawn from the most practical sources, such as: (1) army large group subsistence; (2) bulk stocks of basic foodstuffs, especially requisitioned for prisoner of war/civilian internee feeding; (3) supplies procured for host country populations; (4) items obtained through local procurement; and, (5) fresh produce from prisoner of war/civilian internees garden projects. Equipment necessary for operation of prisoner of war/civilian internee camp messes also will be provided. Consideration will be given to furnishing foods which conform to their religious beliefs and dietary habits. Food supplements for prisoners of war/civilian internees doing labor and for those hospitalized will be determined by the local surgeon.

g. Displaced Persons, Refugees, and Evacuees. Planning must give consideration to manner and means for subsisting these categories of civilians. Food will have to be made available at civilian collecting points, assembly areas, and camps which will be administered and operated by civil affairs units. Continuation of some measure of subsistence support may be necessary even after these people have been returned to their home communities or resettled. Advance planning is currently underway to develop a master list of standard, "off-the-shelf" type foods (about 13 or 14 in all) from which items acceptable to the religious and dietary habits of the peoples in various areas of the world can be selected and used to form a small number of standard menus. These menus will provide per capita nutrition of a predetermined, specified amount. This type subsistence support is almost inevitable in the event the United States becomes involved in any level of armed conflict.

6. Implications of CBR Operations (See Annex F). The effects of chemical, biological, and radiological agents on subsisting situations and the supply of subsistence generally parallel the effects of these weapons on other tactical and logistical operations. Unprotected subsistence can be contaminated by the vapor, aerosol, sprays, splashes, or smokes of toxic chemical agents. Likewise, unprotected subsistence can be contaminated by biological aerosols, sprays, or vectors and by radioactive dusts and other materials. Protective measures for subsistence include special packaging, proper storage procedures, dispersal of supplies, and maximum use of both natural and artificial shelters or other shielding devices. Fortunately, the types of packing and packaging currently employed for subsistence for use by the army in

the field afford good protection against all CBR agents. The methods of packaging future operational subsistence and unitization of bulk supplies will provide even better protection. Packaged food supplies, properly stored, are not likely to be contaminated. Where food supplies have been contaminated, such supplies are not arbitrarily destroyed. Frequently, large percentages of the supplies affected may be reclaimed by decontamination procedures. Mess equipment, food processing, transportation, and storage facilities are all subject to contamination by CBR agents. Decontamination of equipment and facilities may be necessary prior to further usage. Water can be contaminated by the various CBR agents. While water in closed canteens, cans, and other containers may not be contaminated, the outside surfaces of such containers will require decontamination. Bulk water supplies can be decontaminated by present equipment and equipment which will be available in the mid-range period. Water contaminated by biological agents generally can be purified by boiling for 15 minutes. Water contaminated by chemical or radiological agents is more difficult to decontaminate and may not be feasible for the individual soldier. It is evident that CBR operations could affect operations of the subsistence system from the forward areas of the field army into the rear areas of the communications zone. Additional problems could be imposed at all echelons. Policies and guidance for protection and decontamination of subsistence items and equipment are discussed in detail in current field manuals and technical manuals. This doctrine appears to be adequate during the time frame of this study. Relative

to procedures and techniques, however, little or no guidance was discovered concerning the actual operation of field messes or subsisting the individual soldier in or around contaminated areas. It is considered that such doctrinal guidance should be developed.

7. Training (See Annex G). The impact of the feeding system proposed in this study upon training is seen to be as follows:

a. The Individual Soldier. With increased emphasis on new types of preserved foods in operational types of meals the soldier will need training in their use. The average soldier is not likely to be familiar with these foods and although they will not require cooking in the form that he will use them, nevertheless, they will require certain preparation such as the rehydrating of the dehydrated items. Additionally, the soldier will require a knowledge of the operation and maintenance of the heating device used in connection with the small group meal. He should also be trained in the protection and decontamination of food packages and equipment under conditions of CBR warfare.

b. Supply Personnel. The training requirements for supply personnel handling subsistence will be reduced and training will be simplified. These personnel savings will result largely from: (1) reliance in the theater of operations on nonperishable foods, (2) elimination of military furnished refrigeration, and (3) extensive use of subsistence unitized in the zone of the interior, reducing handling and breakdown operations to a minimum.

e. Food Service Personnel. No material reduction in training requirements for mess stewards and cooks is foreseen. The modular

packaging of meals made up of processed and preserved foods will eliminate most, if not all, of the steps and procedures necessary in preparing food articles for cooking, to include determinations relative to apportionment. Also, the use of labor-saving mixes and other "convenience" type foods will reduce the knowledge and skill level which is required when such items must be formulated from bulk supplied components. However, the large group subsistence will consist mainly of uncooked foods; accordingly, training in the fundamentals of cooking will continue to be a necessity. Also, training in rehydration techniques will be an added requirement. In the case of bakery personnel, training will be simplified to a large extent through the use of the bread premix.

V. CONCLUSIONS.

1. Anticipated Field Subsisting Situations. The percentages shown in Table 1 for large group, small group, and individual subsisting situations in the field army are valid as broad planning factor guides; the large group subsisting situation generally will prevail in the communications zone with requirements for small group and individual types of subsistence being comparatively negligible.

2. The System for Subsisting in the Field.

a. During the time frame of this study, the products of new food processing technologies will supplement and/or substitute for, but not wholly replace, the types of processed foods presently used in Army operational subsistence. These new processed foods should be phased into the field food system as they become available.

b. All types of operational subsistence should be packaged on a unitized meal module basis to facilitate interchangeability of meals.

c. The organic type unit mess is the most efficient and satisfactory method for providing meals to troops in the large group subsisting situation.

d. Subsistence for preparation in unit messes will be composed of a combination of the most acceptable nonperishable articles which the commercial/industrial base can produce.

e. Current standard types of field food service equipment can be used for unit mess operations, but should be replaced in highly mobile field army units with the proposed modular mobile field kitchen at the earliest practicable date.

f. Furnishing nonexpendable eating equipment and utensils from the mess facility will eliminate the need for standard individual field messing equipment presently issued to the soldier except for the canteen and canteen cup.

g. Bread for unit messes will be produced by combat service support elements using the present standard field bakery equipment until such equipment is replaced by the new bakery system, continuous.

h. Sundries should be supplied gratuitously in composite packs until such time as sales outlets become established.

i. Dispersed small groups should be subsisted in one of the two following ways, whichever is the most practicable under the prevailing conditions: (1) By means of packaged operational subsistence especially designed for preparation and consumption by members of a small group, or (2) By means of meals centrally prepared by a unit mess, placed in food distribution equipment, and transported to dispersed small groups.

j. When troops must be subsisted on an individual basis, a packaged operational meal should be furnished which is acceptable and palatable when heated and appropriate for eating cold, if necessary.

k. Subsistence supplied to the communications zone should be the same as that supplied to the field army with the exception that the large group subsistence may be shipped in bulk from CONUS if unitization capabilities in CONUS become insufficient to satisfy the total requirements of the theater of operations.

l. The field food system proposed in this study will be fully effective for subsisting troops in a theater of operations during general war; moreover, the system contains all the necessary elements for equally effective subsistence support of U. S. forces deployed in limited war/cold war, in extreme environments, in airmobile operations, and in unconventional warfare.

m. The proposed field food system can be implemented using currently available food products and standard field food service equipment; however, optimum functioning of the system depends in large measure upon attainment of the approved and proposed CDOG qualitative materiel requirements specifically identified in this study.

3. Subsistence Supply.

a. Subsistence supply is particularly adaptable to integration into the improved supply system for a theater of operations which will result from the TASTA-70 studies.

b. The unit of issue for operational subsistence should be the meal rather than the ration.

c. Provisions should be made for procurement and issue of the operational B-ration in 25-man meal modules. This unitized B-ration should be modified by substitution of freeze-dehydrated items during the 1965-1970 period and ultimately replaced by the Meal, Uncooked, 25-man.

d. Planning for the procurement of small group subsistence such as the Meal, Quick-Serve should be limited to a 6-man module. Provisions should be made to overpack four of the 6-man modules in one container. Development of a separate 25-man module for small group subsistence should be discontinued.

e. The substantial tonnage and cube reductions which will accrue from the use of dehydrated foods indicate that, of the CDOG qualitative materiel requirements for subsistence, emphasis should be placed upon attaining the requirement for the Meal, Uncooked, 25-Man-- the type subsistence designed for use in the most prevalent anticipated subsistence situation, namely the large group situation.

f. The capabilities of the national industrial/commercial base to provide sufficient quantities and types of freeze-dehydrated food products to support large scale mobilization by 1970 are uncertain. To develop the industrial/commercial base needed, it appears that the growth of this industry must be stimulated and accelerated by positive and continuing government procurements.

4. Water Requirements.

a. Use of dehydrated foods in lieu of processed foods containing water will cause an increase in potable water requirements for meal preparation; the amount of increase will be dependent upon the degree to which dehydrated foods are used in operational rations, with maximum usage requiring no more than $\frac{1}{2}$ -gallon per man/day.

b. Projected water production capabilities within the field army during 1965-1970 can readily accommodate increased water requirements caused by the use of new dehydrated foods in operational subsistence.

c. The qualitative materiel requirement for the Meal, Ready-to-Eat, Individual (CDOG paragraph 1439f(16)) should be revised to limit dehydrated components to beverages only, thus minimizing requirements for reconstitution.

5. Special Subsistence Responsibilities.

a. The proposed system for subsisting the army in the field generally will provide suitable subsistence support for personnel of the other U. S. military services and U. S. civilians in a theater of operations. However, supplements will be necessary to provide food for casualties, hospitalized patients requiring special diets, and dietary needs peculiar to other services (e.g., pre-flight and in-flight aircrew meals).

b. U. S. Army responsibilities in a theater of operations may include subsistence support for allied military forces, PW's, civilian internees, non-U.S. labor, refugees, and displaced persons. Subsistence to be furnished these categories of personnel can come from a variety of sources; advance planning may be necessary to include foods meeting religious beliefs and dietary habits.

6. Implications of CBR Operations.

a. Initiation of CBR operations would impose additional problems on the system for subsisting the army in the field and could affect all echelons within a theater of operations.

b. Unitization of all types of operational subsistence, using present and improved packaging and packing methods foreseen for the 1965-1970 period, will reduce the vulnerability of military subsistence to contamination by CBR agents.

c. Protective measures for subsistence and decontamination procedures, described in detail in current doctrine, will remain effective during the time frame of this study; however, additional doctrinal guidance should be developed on procedures and techniques for unit mess operations and subsisting the individual soldier in or around contaminated areas.

7. Training.

a. The individual soldier should be trained in the preparation of individual and small group meals.

b. No appreciable reduction in the skill levels required of food service personnel is foreseen during the 1965-1970 period.

c. Unitization of all types of operational subsistence and elimination of military refrigeration will reduce both the skill level and the number of subsistence supply personnel required.

VI. RECOMMENDATIONS. It is recommended that:

1. Products of new food processing technologies which offer improved military characteristics for operational subsistence be phased

into current Army field rations as they become available from industrial/commercial sources.

2. A program of positive and continuing government procurements of freeze-dried foods suitable for use in Army field rations be initiated to motivate expansion of the present industrial/commercial base.

3. All types of operational subsistence be packaged on a meal module basis, using:

a. A 25-man modular case for large group meals;

b. A 6-man module for small group meals, overpacked four 6-man modules per case; and

c. The current modular packaging for individual meals, i.e., 12 meals per case.

4. Action be taken to develop specifications for procurement of the standard B-ration in unitized modules of 25 meals per case; actual procurement of this type subsistence be based on requirements for support of emergency or mobilization planning in CONUS and oversea commands.

5. Action also be taken to convert the packaging specifications for present standard small group subsistence (i.e., the Ration, Small Detachment, 5-Persons) from the 5-man ration to the 6-man meal basis.

6. Priority for military utilization of freeze-dried foods be assigned to the large group (B type) subsistence.

7. Present doctrine be expanded to provide more detailed guidance on procedures and techniques for unit mess operations and subsisting the individual soldier in or around CBR contaminated areas.

8. Army Training Programs provide for integrated training in the preparation and use of small group and individual types of operational subsistence.

9. Individual messing equipment and utensils, except for the canteen and canteen cup, be provided as nonexpendable, organic equipment of units and as expendable items in small group and individual operational subsistence.

10. Relative to qualitative materiel requirements:

a. The proposed requirement for the modular, mobile field kitchen be approved and developmental effort be expedited to make this equipment available for highly mobile field army units.

b. The approved requirement for the Meal, Ready-to-Eat, Individual (CDOG paragraph 1439f(16)) be revised to restrict dehydrated components to beverage type items only.

c. All references to the 25-man meal module size be deleted from the requirement for the Meal, Quick-Serve (CDOG paragraph 1439f(15)).

11. A small development requirement be prepared for a suitable holding device (pliers, tongs, dip basket, or hook) to permit total sanitization (complete immersion in hot water) of non-expendable mess trays.

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ANNEX A¹

ANTICIPATED FIELD SUBSISTING SITUATIONS

Section I

INTRODUCTION

1. Purpose. To determine the various types of subsisting situations which are expected to prevail in the field army, to include their respective importance in terms of probable percentages of troops typically involved in specific subsisting situations (e.g., large group, small group, and individual) at any given time.

2. Scope. The changing concepts of land warfare such as increased mobility, dispersion of forces, and increased firepower require a critical analysis of the attendant subsisting situations. This annex describes operational environments and organizational and operational concepts of the field army and forecasts the frequency of occurrence of the various subsisting situations.

Section II

ENVIRONMENT

3. General. Conflicts in which US Army forces may be employed involve a wide variety of situations and conditions. At one end of the spectrum is cold war, a state of international tension wherein political, economic, technological, sociological, psychological, paramilitary and military measures, normally short of armed conflict of regular forces, are employed to achieve national objectives. The other end of the spectrum represents the unrestricted application of military force which

1. This annex was prepared by the USACDC Infantry Agency and represents the coordinated position of the USACDC Infantry, Armor, and Artillery Agencies.

is termed general war. Between those extremes is limited war, a term which covers a wide range of conflicts among which are those commonly called local aggression, conventional war, or limited nuclear war. US Army forces must be able to operate effectively across the entire spectrum of war, in any area where conflict may occur.

4. Area of Operations. The physical features of the area of operations, climate and weather, affect the organization and composition of the forces and the manner in which they are employed. The size, composition, and organization of forces are affected by the size and configuration of the area of operations. Similarly considered are the resources within the area, the existing highway nets, rail systems, port facilities, and airfields, and the length of lines of communication. Other factors include the density and distribution of the population and the number and location of critical areas that must be seized or held to ensure control. These interrelated factors help determine the number of troops that can be employed and sustained, as well as the proportion of combat to combat service support forces. This, in turn, affects the organization and command structure. The configuration of the terrain and the extent and type of vegetation influence the type of forces assigned, especially where these factors present difficulties in the operation, support, and maintenance of heavy equipment or require that special equipment be issued to troops. Natural obstacles and extreme climatic conditions reduce the operational capabilities of troops and increase the difficulties of supporting them.

5. Local Populations. The attitudes, actions, and capabilities of local populations may facilitate or hinder military operations. Additionally, the requirements of the local population for food, medical support, and assistance in reestablishing municipal operation may require military effort that would otherwise be available for support of combat operations. Where the population is actively sympathetic to the enemy, it may become necessary to divert a significant number of combat troops to rear area security.

6. Opposing Forces. Enemy forces may consist of loosely organized bands of irregular forces; massive formations of regular forces provided with minimal equipment and marginal combat and combat service support; highly trained, modern forces with ample combat and combat service support; or combinations of each of these. The missions of enemy forces may be similar or widely divergent from those of US forces. US forces must adopt tactics, organizations, and procedures as necessary to operate effectively against the specific enemy force encountered.

7. Weapons Systems. When authorized for employment by national directive, nuclear, chemical, and biological weapon systems exercise an intensive influence upon the conduct of operation. When the authority to employ these munitions is granted, the combat power available to commanders is increased tremendously and the capability of forces at all echelons is correspondingly enhanced in both offensive and defensive combat. The results of an engagement are determined in far less time than would otherwise be required. These same factors, however, dictate special

measures to reduce the vulnerability of friendly forces and installations. Dispersion, mobility, decentralization of control, rapid exploitation, and the reduction of reaction time are primary considerations. Operations plans must be based upon current requirements with due regard to probability of a sudden change in the operational environment brought about by the decision to implement nuclear warfare.

Section III

ORGANIZATIONAL AND OPERATIONAL CONCEPTS

8. General. The organizational and operational concepts described in this section are those which have a definite and differing influence on subsisting situations. For this purpose the field army battlefield is divided into four zones, beginning with the line of contact as shown on the chart at Appendix 1. These zones generally categorize the area by a combination of unit activity and vulnerability. Though each zone is characterized by certain major units and activities there are other type units located in all zones such as engineer, signal, and chemical. Zones I and II together form the area in which are located the maneuver battalions in contact and the forward supporting artillery. Zone I represents only that portion of the area under direct enemy observation and attendant direct fire weapons; this is mainly the area of the rifle and tank companies in contact. Zone II contains the battalion CP, the battalion reserve unit, the division DS artillery and a large portion of the GS artillery that is reinforcing the DS fires. Zone III has the brigade CP, the brigade reserve unit, the medium range GS artillery and missiles,

and the brigade field trains. It is vulnerable to enemy indirect fires; however, it is further characterized as the limit of enemy tube artillery and its rearward extensions might generally correspond to the brigade rear boundary. Zone IV is comprised of the remaining army area and troops therein. These are mainly headquarters and support units, although some long range artillery, corps and army missile units and air defense artillery are also dispersed in this zone.

9. Organizational Concepts. Organizations embrace the concept that operational requirements will dictate an organization that can provide heavier forces for one area, light forces for another, or balanced forces for a third. Brigades, divisions, corps, and field armies are organized or "tailored" to meet specific operational missions. This organizational concept produces "package" forces based on the requirements of missions and environments.

a. Army forces assigned to a theater of operations include appropriate control headquarters and necessary elements of the several arms and services. These forces are combined in accordance with the requirements of the mission, and the nature of the operation.

b. The number and type forces provided subordinate commanders within the theater is dependent on the mission assigned and the nature of the operation. These forces may be assigned, attached, or placed in support of the command concerned. Forces for which there is a continuing demand are usually assigned. Forces required for specific tasks or for a limited period of time are normally pooled at higher

echelons and attached as required. Forces whose capabilities exceed the requirements of a single command, or whose attachment to a subordinate command would unduly burden the commander thereof, are held under centralized control and placed in support of one or more subordinate commands.

c. The organization of Army forces must provide the capability to conduct successful operations under nuclear, nonnuclear, chemical and biological conditions, as well as in a wide range of environments without major change in organization and equipment. This multi-capability is provided by combining units that permit effective maneuver and delivery of fires, adequate combat support and combat service support, and effective command and control in any environment.

d. The field army headquarters directs tactical operations and provides for the combat service support of assigned and attached units. The field army consists of a headquarters and headquarters company, a variable number of attached corps, a variable number of divisions normally attached to corps, and other attached combat, combat support, and combat service support units. A field army may be organized with a small number of divisions without utilizing the corps echelon.

e. The corps is a force consisting of a variable number of divisions and other combat and combat support units. Operating as part of a field army, a corps normally will have few combat service support responsibilities, receiving such support directly from field army units. Frequently, a corps will be reinforced by attachment of combat service support elements and given a mission which requires

it to operate as a separate force. Under these conditions it approaches the capabilities and characteristics of a small field army and is referred to as an independent corps.

f. The division is the basic Army unit of the combined arms and services. The division can be tailored for the environment and accomplishment of specific missions. It has both tactical and administrative functions. The division conducts operations either independently or as part of a larger force, normally the corps. The division achieves flexibility through the tailoring of its components to meet tactical requirements and through its capability to vary its organization for combat. When organized, Army divisions may be characterized as either infantry, mechanized infantry, armored, airborne or air assault. These divisions are capable of operating independently or in conjunction with each other, in all forms of war, and in either a nuclear or a non-nuclear environment.

10. Combat Elements. A combat element is distinguished by its ability to employ fire and maneuver to close with the enemy in combat. Its mission may be to destroy or capture the enemy; seize, control, or deny terrain; protect a larger force; or gain information. It uses both direct and indirect fires and is trained, organized, and equipped to operate in direct contact with the enemy.

a. The mission and operational environment dictates the organization of combat elements of a force. Force composition should be adaptable to a variety of environments without major change. Combat

formations may contain combat elements of a single type, or various combination of types. The composition of these elements within a larger force may be modified by attachment or detachment as required.

b. Combined arms teams include infantry, armor, artillery, and combat engineers. The infantry battalion, the mechanized infantry battalion, the airborne infantry battalion, the tank battalion, and the armored cavalry squadron are the basic combat elements around which combat task forces are organized.

c. These fighting units take the greatest risks and endure the greatest hardships. The relative contribution of these combat forces to the success of the Army in combat far exceeds their proportion of Army strength. All other components of land forces support these forces.

d. The basic infantry function is to close with and destroy the enemy by fire and maneuver and close combat. The essential characteristics of infantry close combat elements are the ability to fight on foot in all types of terrain and under all conditions of weather, coupled with the ability to move and fight with any means of mobility provided, either organic or attached. Infantry seizes, holds, or controls ground by physical occupation or by use of firepower. Infantry can maneuver in adverse weather and over terrain impassable to armor. The ability of infantry to move in small, inconspicuous formations in all types of terrain enables it to take advantage of covered routes of approach and variations of the ground to overcome strong positions, to infiltrate the enemy position, or to perform patrols. Its characteristics ideally suit it for use in operations in underdeveloped areas. Without protection,

infantry is particularly vulnerable to the effects of nuclear weapons. It reduces this vulnerability by avoiding detection through the use of cover, concealment, camouflage, and dispersion and appropriate communication and electronic security measures.

e. The basic armor function is to attack, disrupt, and destroy enemy forces by employing its inherent characteristics of firepower, mobility, and shock action. Armor forces include tank, armored cavalry, and air cavalry units. The armored vehicles of these units enable them to fight mounted and to maneuver through fire swept or chemically, biologically, and radiologically contaminated areas. These forces can concentrate or disperse rapidly over extended distances in combat-ready formations, and their organization for combat and direction of effort can be changed quickly. Armor habitually applies the combined arms concept; rarely will tank elements operate without infantry for extended periods. Armor units can fight in all phases of war, in all type operations, limited only by extremes of weather and terrain conditions, by tailoring combined arms forces to meet specific situations.

f. The basic cavalry functions are reconnaissance, security and economy of force. Cavalry combat elements can fight mounted, in ground or air vehicles, or dismounted. In performing the basic cavalry function, cavalry combat elements may reconnoiter, screen wide fronts or flanks, maintain contact with the enemy or between friendly forces, defend, delay, conduct raids

in the enemy rear, or conduct harassing, reconnaissance in force, or diversionary attacks. Air cavalry provides a unique capability for operations in underdeveloped areas.

11. Fire Support. The mission of artillery is to provide continuous and timely fire support to the force commander by destroying or neutralizing, in priority, those targets jeopardizing the accomplishment of his mission. Artillery is the principal Army agency for delivering indirect fire on ground targets. The artillery is prepared to fire under either nuclear or non-nuclear conditions. The general organizational objective of artillery is to provide an organization for combat which can most effectively and economically support the combat forces. The division artillery is organized for combat to support the division scheme of maneuver. Flexibility is achieved through the assignment of suitable tactical missions to the units of the division artillery. Additional artillery support is ordinarily provided by attaching artillery units to the division or by reinforcing the fire of the division artillery with other artillery. Each echelon retains centralized control of subordinate elements to the maximum. Tactical missions or attachment are used to regulate the extent of centralization or decentralization.

12. Combat Support. While close combat and fire support elements are the primary sources of power of a force, combat support forces also provide important elements of combat power. Appropriate combat support elements are assigned to each force structure. Such combat support includes elements of Army aviation, engineer, electronic warfare, intelligence,

military police, signal, transportation and psychological operations organizations.²

13. Combat Service Support. The combat service support system of the field army is designed to meet the requirements of all types of war. It recognizes that increased distances and mobile operations are involved. It provides aircraft to supplement ground vehicles. The system provides, to the extent feasible, a single source of support to each tactical organization. Throughput of supplies from the communications zone is accomplished wherever practical, by-passing intermediate installations and avoiding multiple handling. Maintenance support provides one-stop service whenever feasible. The concept recognizes the close association between repair parts supply and maintenance operations, and the interdependence of the two functions. Direct exchange procedures are used.

14. Operational Concepts. Operational concepts are presented in the broadest terms of offense and defense as they encompass the entire range of tactical operations in which combat power is employed. The commander selects that combination of offensive and defensive action which will most effectively accomplish his mission. A command may conduct an offensive even though large portions of the force are employed defensively. Conversely, the defense depends for success on the use of a part of the force offensively. Under fluid, dispersed battlefield conditions operations may have both an offensive and defensive purpose. Nuclear operations may differ considerably from non-nuclear. The difference arises primarily from the increased combat power provided by nuclear weapons; the sharply

2. FM 100-5, Field Service Regulations, Operations, February 1962, pp. 38-40.

increased vulnerability of troops and installations in the nuclear environment; and from the measures required to counteract this increased vulnerability, to include increased security requirements for nuclear weapons and their associated delivery and support units.

a. In order to offset this vulnerability, it is imperative that forces operating in a nuclear environment be dispersed to minimize presentation of targets susceptible to nuclear weapon attack. Determination of the extent of dispersion compatible with the capability to perform the assigned mission is a command responsibility. Force dispersion requires assignment of increased areas of responsibility. However, increased combat power, increased vulnerability of enemy forces, improved control systems, and enhanced mobility permit forces to operate effectively in larger areas of responsibility. Increased areas of responsibility broaden areas of interest. In a non-nuclear environment, the vulnerability of forces is less, the area that can be controlled is smaller, and greater concentration of forces is required. Consequently, the areas of responsibility and interest are smaller.

b. The dispersion of tactical units, control headquarters, and administrative installations must be governed by the operational environment. The dispersed formations required by the nuclear environment will invite defeat in detail. While dispersion is generally proportioned to the level of employment of nuclear weapons, there are limiting factors: the assigned mission, control of subordinate units, adequacy of combat intelligence, responsiveness of the logistic system, weather and terrain, mobility of forces, and nature of disposition of enemy forces.

c. Mobility of combat forces in the nuclear environment must be increased in order to reduce vulnerability, facilitate control of extended areas of responsibility, provide mutual support, maintain freedom of action, and exploit the effects of nuclear fires. The mobility required by the nuclear environment also has application in the non-nuclear environment, although not to the same degree. The reduced firepower of the latter environment, together with the more restricted areas of responsibility and the greater concentration of forces, may not present the frequent opportunities for deep, exploiting maneuvers that characterize the nuclear environment.

d. Fire and maneuver receive equal consideration by the commander in the nuclear and in the nonnuclear environments. Even though a major portion of the combat power to be exerted may be in the form of nuclear fires, maneuver is required to exploit their effects and ensure favorable decision. As the level of employment of nuclear weapons rises, the effects of these weapons will begin to saturate the battle area. Close combat elements will find it increasingly difficult to maneuver decisively. Because of the destructiveness involved, situations of this type will be of relatively short duration.

e. The tempo of operations in the nuclear environment will be significantly accelerated as a result of the combination of nuclear firepower and increased mobility. Engagement of forces will be of shorter duration, characterized by extreme violence. Deep, decisive

objectives will be sought, causing the battle to be waged in great depth. In nonnuclear operations the tempo will be more deliberate, engagements that would be decided in a matter of hours in the nuclear environment may require several days.

f. Organization for combat is affected by the factors of dispersion, mobility, vulnerability, and tempo of operation. In the nonnuclear environment greater centralization of control is practicable, particularly the control of fire support and combat support. The commander can exert greater personal direction of the course of battle, giving more deliberate and detailed instructions to his subordinates, both before and during operations. In a nuclear environment the opposite will be true. Combat forces will tend to operate semi-independently under mission-type orders. Direct support type fire units will normally be attached to close combat elements. The control of combat support units will be similarly decentralized to a significant degree. Although modern communication systems will permit the interchange of essential orders and information, the commander must place greater reliance upon the initiative, integrity, courage, and professional ability of his subordinate commanders.

15. Offensive Operations. Offensive operations are those taken to carry the battle to the enemy; the initiative lies with the attacker. The purpose of offensive operations is to accomplish one or more of the following: destroy enemy forces, deprive the enemy of

required resources, seize territory or terrain, develop enemy dispositions, divert the enemy's attention from other areas. In offensive operations, the most decisive results are obtained by strong, mobile exploiting forces. Offensive missions are normally oriented on the enemy force even though a terrain feature may be designated as the objective. To reach an objective, a force goes through, over, or around the enemy. A nuclear environment favors the use of small, highly mobile combat forces moving on the ground, through the air, or both. These forces make every effort to maintain their forward movement. Enemy forces are destroyed by fire, bypassed, contained, or where necessary, reduced by close combat. Should it become necessary for the commander to concentrate his force, he does so only at the decisive point, in close proximity to the enemy, and for the shortest practicable time. Under a nonnuclear environment greater concentration of maneuver forces may be acceptable. In offensive operations the attacking forces are maneuvered to gain an advantage over the enemy and to close with him and to destroy him. The forms of maneuver in the attack are the envelopment, the turning movement, the penetration, and the frontal attack. The attacking force frequently uses a combination of these forms; for example, one echelon of the force may attack frontally while another is making an envelopment.

a. The attack is characterized by fire and maneuver, combined and controlled to create a preponderance of combat power that culminates in a powerful and violent assault in the decisive area. Once the attack

is launched, flexibility and speed in the employment of combat power are paramount. The attack is characterized by a series of rapid advances and assaults by maneuver and fire until the final objective is secured. Momentum is maintained by the timely employment of reserves, the airlift of combat elements, the redirection of units on intermediate objectives, the provision of adequate combat and administrative support, or combination of these means. The commander provides security without sacrificing the momentum of the attack. Bypassed enemy must be contained or kept under surveillance pending subsequent elimination. Covering forces, patrols, flank guards, echeloned reserves and firepower protect exposed flanks and gaps between units. Protection from ground attack may frequently be required for administrative and combat support units when areas in rear of attacking echelons have not been cleared.

b. Night attacks and night movement are normal operations that offer an excellent opportunity for deception and surprise. The principles of daylight attack apply. Infiltration can be particularly effective in night operations.

c. Infiltration is a technique of movement used in conjunction with several forms of maneuver. The attacking force moves by individuals or small groups which pass through, over, or around the enemy forward defense elements to a previously designated assembly area in the enemy rear. By this means a strong force may frequently be deployed into the enemy rear without being subjected as an entity to decisive

enemy action during movement. The dispersed pattern of a nuclear battlefield will present frequent opportunities for movement of units by infiltration.

d. The movement to contact is a tactical operation which occurs frequently in mobile warfare. It is designed to gain contact or reestablish it. The movement is normally made in multiple columns. The command is normally organized into a covering force, a main body, and security forces. The covering force is tailored to accomplish its mission well forward of the main body. Units of the main body are organized for combat and positioned to permit maximum flexibility for employment during the movement and after contact is established. The movement may frequently be made at night or during other periods of reduced visibility.

e. A reconnaissance in force is a highly mobile operation, consisting of an attack conducted by all or a sizeable part of a force for the purpose of discovering and testing the enemy's strength, composition, and dispositions. The reconnaissance in force is particularly adaptable to the fluid characteristics of the nuclear battlefield and will serve as the basis for many offensive operations.

f. The exploitation is an operation which occurs frequently in mobile warfare. The purpose is to destroy the enemy's ability to reconstitute an organized defense or to engage in an orderly retrograde movement. Exploitation is usually initiated when the enemy force is having difficulty in maintaining his position. Once begun, the

exploitation is executed relentlessly to deny the enemy any respite from offensive pressure in the drive to the final objective. Forces in the exploitation normally advance on a wide front depending upon the mobility of the force, road net, and other aspects of the terrain. Only those reserves which are necessary to ensure flexibility of operation, momentum in the advance, and minimum essential security are retained. Airmobile and airborne forces are used to seize objectives critical to the advance and to cut enemy lines of escape.

g. The pursuit is an operation designed to cut off and annihilate a hostile force attempting to escape. In its conduct, direct pressure against retreating forces is maintained relentlessly while an enveloping or turning force cuts the enemy lines of retreat. Maximum use should be made of airmobile and airborne elements in the enveloping forces. Pursuit operations are conducted aggressively and under decentralized control; they are pushed to the utmost limit of endurance of troops and equipment. Continuity of administrative support is vital to the success of this type of operation.

16. Defensive Operations. Defensive operations are the employment of all means and methods available to prevent, resist, and destroy an enemy attack. The purpose of a defensive operation may be to: develop more favorable conditions for offensive action, economize forces in one area in order to apply decisive force elsewhere, destroy or trap a hostile force, reduce the enemy capacity for offensive action, or deny an enemy

entry into an area. Defensive operations may be imposed by an inability to attack. However, the commander, particularly under fluid, nuclear battlefield conditions, may deliberately undertake defensive operations in combination with deception to destroy the enemy. Under nuclear conditions the deliberate shift from offense to defense or vice-versa, may occur rapidly and with considerable frequency. A defensive operation usually is a composite of major and minor actions and engagements. Elements of the command may be holding on position, delaying, attacking, feinting, or delivering fires as part of the defense.

a. Mobile defense is the method in which minimum forces are deployed forward to warn of impending attack, to canalize the attacking forces into less favorable terrain, and to impede, to harass, and to disorganize them. The bulk of the defending force is employed in vigorous offensive action to destroy the enemy at a decisive time and place. In general, the forward forces employ the principles of the delaying action, while the remainder of the force utilizes the principles of offensive combat. In nonnuclear operations, the mobile defense is applicable to highly mobile warfare and situations in which broad frontages must be covered. This type of defense may be of prime importance in the nuclear environment, since the defending forces are able to retain their mobility and freedom of action. This form of defense requires that the defending force have mobility comparable or superior to that of the enemy.

b. Area defense is based on retention of specific terrain. When this is mandatory, primary reliance is placed on the ability for

fires and forces deployed on position to stop and repulse the attacker. In retaining specific terrain the commander must use sufficient forces in the forward area to create the necessary combat power on or to dominate the terrain to be defended. The forward area normally has a higher priority for forces than does the reserve. The reserve is employed to block and destroy the enemy, to eliminate penetrations if they occur, or to reinforce threatened areas. Since the troops conducting an area defense are apt to be quite vulnerable to nuclear attack due to their relatively fixed positions, this type of operation is more suitable to the nonnuclear environment, although it may be adopted to a low-level nuclear environment.

c. The area defense and the mobile defense lie at opposite ends of a scale of wide variation in the form of defensive operations. Frequently, neither of these basic patterns will be suitable to a given situation and mission. In such cases a variation incorporating applicable portions of each must be devised. Within a larger force conducting the defense, the operations of the various component units may encompass both defensive patterns and delaying operations as well, with certain units being assigned primarily an offensive role.

d. A retrograde movement is any movement of a command to the rear or away from the enemy. Retrograde movements are further classified into withdrawal, delaying action, and retirement. They may be forced by enemy action or may be made voluntarily. Retrograde operations by a defender may permit him with the lesser portion of his force to reduce the combat effectiveness of an attack so that these two forces approach parity.

Section IV

CONSIDERATIONS IN SUBSISTING

17. Definitions of Subsisting Situations. For the purpose of this study a subsisting situation is defined as that condition existing at a particular time and place in the area of operations, resulting from a combination of operational circumstances, which has a controlling effect upon the subsisting of troops. The manner in which men will be subsisted in the various sectors of the area of operations will depend mainly upon the particular operational environment at the moment. The environment includes physical (terrain, weather, darkness) as well as tactical conditions. The criteria for determining the situations are oriented on the preparation of the meal, not the serving or eating. The situation will determine the size of the group, which will, in turn, influence the types of ration or meals, food service equipment, and food service personnel which can be used effectively to satisfy the subsisting requirement. These specific type situations are used in this study:

a. Large Group. This type situation is employed when centralized preparation is desirable because the tactical situation and time permit, and field kitchen equipment and trained preparation personnel are available. The meals so prepared can be consumed at the preparation site or at dispersed locations.

b. Small Group. This type situation, a counterpart to large group, is employed when the tactical situation restricts massing, limited

time is available for preparation and eating, and there is neither field kitchen equipment nor trained preparation personnel available. Meals prepared in this situation will normally be consumed at the preparation site.

c. Individual. The meal is prepared by the individual when large or small group situations are neither feasible nor practicable.

18. Factors in Determining Subsisting Situations. In order to determine the anticipated situations, one must first know the controlling factors that are involved. These factors are closely interwoven and are difficult to separate, even for discussion purposes.

a. The type of unit involved in a situation is the easiest to determine and the least variable. It is defined by branch and mission, i.e., infantry rifle company, artillery battery, engineer bridge company, transportation truck company, and an engineer battalion (combat). The type of unit and its mission normally determine its location in the Army area, together with its operational environment, and, therefore, significantly influence its subsisting situation.

b. The location of the unit in relation to the enemy is a factor which varies widely with the operational environment. The distance between the unit and the enemy, which is one measure of vulnerability, varies with our movement, the enemy's, or a combination of both. The vulnerability of a unit will affect its activities. The proximity of the enemy will vary the numbers and types of weapons that can be employed against the unit. The range of weapons and target acquisition means are

inseparable in establishing the vulnerability of an area or potential target. It is the state-of-the-art that the range of effective and responsive target acquisition means is significantly less than the range of the weapon delivery means. There is a period of time that a potential target will be safe from enemy artillery and missile fire, even though it is within range of enemy weapons. This time period extends from the time the target is in position until it can be located and fired upon. The length of this period will vary considerably with the type of target acquisition means and the type of weapon selected for the fire missions. Generally, the greater the distance from the FEBA, the longer this period becomes. The importance attached to this period lies in the safety that is provided to fleeting targets. These are normally not profitable targets. It is possible, through intelligence, that the enemy could deduce that the area population density is sufficient to attack by fire without actually locating any specific target within the area. However, this will be weighed against the effects of counterbattery fire, which is becoming increasingly efficient. There are instances where weapons systems combine the acquisition means and the destructive power in the same vehicle with the result that the safety period approaches zero.

c. The activity of the unit is closely related to the type of unit. However, the activity of the unit is a variable factor which in the same unit can fluctuate within certain limits a number of times in one day. Some activities are common to all units. For example, a

road march or other movement from place to place. A unit may have a number of different activities occurring at one time. The activities of a howitzer battery may include those of forward observers, survey and reconnaissance teams, firing sections, and supply and maintenance sections. The activity of the unit affects the subsisting situation in several ways: the time available to prepare and consume a meal, the availability of mess personnel and equipment to prepare a meal, and the number of personnel that can mess together.

d. The vulnerability throughout the field army is considered by the use of a diagram (Appendix 1). For planning purposes, it is valid to assume that the enemy has a firepower capability at least equal to ours. The vulnerability is expressed in broad terms with consideration that areas covered by surveillance means and weapons fire will vary with the tactical situation. Enemy guerilla and partisan activity is not indicated as it can affect all zones in varying unpredictable degrees.

Section V

FREQUENCY OF SUBSISTING SITUATIONS

19. General. The preceding sections provide the background for establishment of specific subsisting situations in various geographical areas in the field army, beginning with the forward edge of the battle area (FEBA) and proceeding rearward. The emphasis in the determination of the subsisting situations has been placed upon the vulnerability of

the preparation area and the messing area to an attack either by direct or indirect fire or ground attack. It is an obvious practicality that the messing should be as near as possible to where the person's normal duties are performed. This reduces unnecessary movement, minimizes the loss of time from primary mission, and enables the individual or group to adjust messing times so there is the least interference with mission duties. Organizational and operational concepts may change; however these subsisting situations remain unchanged. The chart at Appendix 2 reflects frequency of subsisting situations by percentage of total meals in the type field army. These are averages. Reference Book 101-1, USA Command and General Staff College, "Type Organizational Data for the Army in the Field," contains the type field army utilized. A type field army model was positioned in a tactical formation and zones were created as discussed in the following paragraphs. Units or elements of units located in each zone were examined in terms of the variable tactical environments that might be encountered plus the factors discussed in paragraph 18. A percentage figure was developed by professional judgment and applied to the strength of the unit to reflect the frequency of subsisting situations expected to be encountered by each type unit. As an example, a unit in Zone I could be expected to require a high percentage figure for individual subsistence in the attack and a low percentage figure in the defense when action was

relatively light. Therefore, the percentages indicated in Appendix 2 reflect an average of percentages computed over the variable tactical environments encountered by the unit (i.e., attack, defense, retrograde, pursuit, exploitation). In addition, for the purposes of broad determination of subsisting situations for this study, it was assumed that all maneuver units would be exposed to these variable tactical environments for an equal amount of time. Thus, a unit in reserve for a given period (using a high percentage of large group subsistence) could be expected to be in close contact with the enemy in the next period (using a high percentage of individual subsistence) and another unit would have taken its place in reserve.

20. Zones I and II. The areas of greatest vulnerability and most fluid and changing action are Zones I and II. Combined, these extend from the line of contact a distance of between seven and twelve kilometers in either direction. Combat units in contact with the enemy, and artillery, armor, and engineer units in immediate support of the combat units in contact, are employed in these sectors. Patrol actions and reconnaissance probes into insecure and hostile areas occur in these zones. The tactical disposition of troops is dispersed by units, and prepared for all type operations regardless of the type engaged in at the moment.

a. In an offensive atmosphere the activity and vulnerability of the squads, platoons and companies of the infantry and tank battalions can be expected to vary from meal to meal. At one extreme there is no

meal because the action is too intense, while at the other extreme it is possible for squads and perhaps platoons to assemble by increments for brief periods. In an active defensive position there is comparatively more routine in day to day activities. Assembly of squads and platoons by increments is normally possible at times other than when the area is under attack. There are times when all or portions of the close combat sector are under such intense enemy surveillance and fire that all movement is restricted to periods of reduced visibility.

b. In the combat units the squads and platoons on the line of contact experience an average of two individual meals to one small group prepared meal when in a fluid offensive action. In a stabilized defensive situation the ratio is reversed, one individual meal to two small group meals. These ratios vary for artillery and mechanized and armor units. The percentages reflect averages for all units in varying situations. At all practical opportunities unit commanders utilize organizational facilities to provide large group messing.

21. Zone III. The area in Zone III contains a large portion of the general support units which function in immediate support of the combat units in contact. It is out of ground observed direct fire range, but indirect fire can be expected, observed by aerial or long range methods or fired by map data. This zone includes the reserve battalion, the brigade CP area, and extends generally to the brigade rear boundary. The ratio of type meals consumed in this area follows the trend set in Zone II, with the percentage of individual meals decreasing and the

large group meal increasing. The units in this area have missions and activities which require unit grouping tempered only by vulnerability to the enemy's indirect fire capability. As in the more forward areas, a fluid or fast moving situation may require a greater percentage of individual and small group meals; however, in a static defensive position where the enemy can gather considerable target data, his indirect fire capability increases to the detriment of large group subsisting even in this area.

21. Zone IV. The remainder of the field army is dispersed throughout Zone IV, which is that area beyond the normal range of enemy tube artillery. This area, as well as those forward, is subject to aircraft and indirect missile fires. Guerrillas and partisans are more likely to be active in this area than in those forward. The percentages shown for this area were obtained with the same detail accorded the forward areas. The seemingly high percentages of individual and small group situations are similarly justified. All headquarters and units which effect a 24-hour operation efficiently use individual and/or small group meals for a small portion of their elements in addition to operation of the organizational mess. Units which perform transportation and decentralized services perform more efficiently using individual and small group meals when the operational requirement dictates.

Section VI

CONCLUSIONS

23. In nuclear or non-nuclear warfare, Zones I, II, and III of the field army are characterized by frequently changing environments which

have an impact on the type subsisting situation at the moment, as reflected in a high proportion of individual and small group subsistence situations.


24. Zone IV is comparatively more stable and consequently has a high percentage of large group subsisting situations.

25. Frequency of occurrence of various type operations, i.e., attack, pursuit, exploitation, mobile defense, area defense, is not validly predictable.

26. Unit activity within the various zones of environment of the field army determine broad average percentage occurrences of the subsisting situations.

27. The percentages shown in Appendix 2 are considered valid as broad planning factor guides.

APPENDIX 1

ZONE IV	ZONE III	ZONE II	ZONE I
All remaining field army units	Brigade reserve med rng artillery field trains	Battalion reserve DS artillery med rng GS artillery	Squad and platoons in contact, recon units, patrols
Indirect missile fires based on intelligence	Indirect fires possibly observed Limit of enemy tube artillery	Partially observed indirect fires	Observed direct and indirect fires
All zones vulnerable to aircraft and unobserved missile fires			

FIELD ARMY ZONES FOR SUBSISTING SITUATIONS
 BASED ON UNIT ACTIVITY AND VULNERABILITY TO ENEMY FIRES

APPENDIX 2

SUBSISTING SITUATIONS	ZONE IV (67.84%)	ZONE III (12.32%)	ZONE II (11.97%)	ZONE I (7.87%)
LARGE GROUP (63.84%)	49.25%	6.72%	6.09%	1.78%
SMALL GROUP (23.83%)	12.51%	4.06%	4.41%	2.85%
INDIVIDUAL (12.33%)	6.08%	1.54%	1.47%	3.24%

FREQUENCY OF SUBSISTING SITUATIONS - SHOWN IN PERCENT OF THE FIELD ARMY TOTAL

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ANNEX B

THE SYSTEM FOR SUBSISTING IN THE FIELD, 1965-1970

SECTION I

INTRODUCTION

1. Food Service Doctrine. Throughout the history of the United States Army, there has been a gradual but progressively increasing realization of the importance of the soldier's diet.¹ The tremendous improvement made in the Army subsisting system since the days of the Continental Army, which fought on a diet largely of salted meat, fish and starchy foods, is reflected in the statement which became axiomatic in Korea - ". . . the farther forward, the better the food."² This progress has been achieved through implementation of official doctrine such as that which currently states, "The objectives of the Army Food Program are to provide good quality, nutritionally adequate food, prepared and served according to the highest standard attainable, within reasonable costs, in order to maintain health, combat efficiency, and high morale throughout the Army."³

2. Subsisting Standards. The current food service objectives quoted in paragraph , above, need no revision for meeting the conditions and situations under which troops in the field will be subsisted during

1. Ritkind, Herbert R., Fresh Foods for the Armed Forces, QMC Historical Studies No. 20, Historical Section Office of The Quartermaster General, 1951, pp. 1-22.

2. Baldwin, Lt Col Coy W., QMC, "Food Service United Nations Korea," The Quartermaster Review, May-June, 1953, p.20.

3. AR 30-11, Food Service, Food Program, Department of the Army, 2 April 1965, p. 1.

the 1965-1970 time frame. In keeping with this doctrine, the following subsisting standards have been incorporated into this study. Individuals will be served three hot meals per day, or be furnished meals which can be prepared readily in a heated state or eaten cold if necessary. At the outset of armed conflict and until conditions become stabilized, subsistence will consist of a balanced diet of common American food items requiring no refrigeration but possessing acceptability equal to or closely approaching the acceptability of their fresh food counterparts; - the need for refrigeration facilities and fresh food items can be eliminated without materially sacrificing the palatability of meals through application, where practicable, of foods processed by new technologies such as improved dehydration in conjunction with continued use of conventional types of processed foods of proven acceptability. These foods will be supplied in a menu cycle consisting of a sufficient number of menus to preclude monotony. When it is determined that the operational situation within the theater of operations will permit the introduction of perishable foods, adjustment or conversion will be made to employ a modified B or the A type field ration. Such determination will be controlled by theater priorities and resources which can be provided for construction/rehabilitation, maintenance, and operation of facilities and equipment for the storage, movement, and handling of perishable foods.

3. Military Criteria for Subsistence Items. A new or differently processed food must pass certain criteria before it can be adopted for use in the military subsistence system. These are discussed briefly below.

a. Acceptance. General public acceptance is an initial criterion. Usually, changes in such acceptance occur rather gradually because consumption habits result from a lifetime of training and past experience. The vital importance of this fact from the military standpoint has been very well expressed as follows: "No great scientific discovery in the food processing field is worth its salt if the finished product, as it appears on the soldier's plate, is not acceptable to him."⁴ Any new food must possess, therefore, a familiar color, flavor, and texture if it is to be successfully used as a regular item in the soldier's diet.

b. Nutritional Adequacy. A new food item must contain sufficient nutrients so that, when combined with other foods, a proper balance of proteins, fats, carbohydrates, minerals, and vitamins is maintained. For a short period of days energy foods will suffice but over a protracted period of time, all dietary needs must be satisfied to maintain health.⁵ The basic standards of diet are prescribed in AR 40-5, Appendix V.

c. Availability. A new food item must be readily available at the time and in the quantities needed. It should also be capable of being manufactured or produced at multiple sources.

⁴. McGuickian, Col A. T., "Food Service Developments," Quartermaster Review, September - October 1955, p. 16.

⁵. Armored Medical Research Laboratory, A Critique of Army Rations: Acceptability and Dietary Requirements, 10 April 1944, Appendix A, p. 4.

d. Stability. This is the criterion of keeping qualities to withstand all climatic and handling conditions. The new food item must retain its food value, flavor, color, and consistency over a long period of storage. Military characteristics for operational types of subsistence usually specify a minimum storage capability without refrigeration of two years.

e. Utility. These are characteristics such as low weight content, small volume, waterless to the point of practicability, and ease and convenience of handling and preparation.

4. Incorporating New Food Products Into the Military Subsistence System. When it is realized that any new food must pass severe criteria as outlined above before it can become a standard item for the military diet, it is obvious that we will not completely changeover at any one date from the conventional foods of today to the new foods of the future. Rather, it will be a phasing-in process of one or a few foods at a time as they meet or exceed military requirements. Stated in another way, the products of food technology, which will eventually be found in the future subsistence system, will be adopted in a transitional fashion. It is also relevant to note that, in the opinions of experts in the food field, no one of the various newer food processing technologies under development will completely replace the methods presently being used. Instead, it is felt that these new technologies will supplement the current ones, and, in combination, will give the planners of the military feeding system a wider selection of foods to choose from.

5. The Current System. The current subsisting system for a theater of operations is similar to that used during World War II and the Korean War. Basically, this system for subsisting troops is built around the normal use of unit messes in which organic food service personnel and field mess equipment are employed to prepare meals from bulk rations. For those occasions when the use of organized messes is prevented or made impractical by operational conditions, the system provides troops with various types of packaged operational rations which furnish an adequate diet for a limited period of time. Based upon the extensive experience of World War II, the most serious deficiencies attributed to this system are: a. The unsuitability of the packaged operational rations for continuous use over prolonged periods of time; b. The spare parts and maintenance burden encountered with field food service equipment; and c. The large numbers of improperly selected and misused food service personnel. (See Appendix 1, "The Current Field Subsisting System," to this Annex).

SECTION II

SUBSISTING IN THE COMBAT ZONE

6. Anticipated Subsisting Situations. Annex A to this study presents an analysis of the operational environment and the concepts of organization and operations of a field army deployed in an established theater of operations during the 1965-1970 time frame. In this analysis, continuation is foreseen of the traditional types of subsisting situations which have occurred in previous conflicts. The extent and frequency of occurrence of these subsisting situations, in terms of the average distribution of field army troops at any one meal time, is predicted to be approximately as follows:

<u>Subsisting Situations</u>	<u>Percent of Field Army Troops</u>
Large Group (Company Size or Larger)	65
Small Group (Squads, Crews, Patrols, etc.)	25
Individual	10

The highest proportion of the individual and small group subsisting situations will be from brigade rear boundary on forward, an area characterized by greatest vulnerability, dispersion of troops, and fluid, changing actions. The remainder of the field army area, i.e., that behind brigade rear boundaries, will be comparatively more stable and consequently will have a high percentage of large group subsisting situations (See Annex A, "Anticipated Field Subsisting Situations," to this study).

7. The Large Group Subsisting Situation. The field subsisting system must be designed with a capability for supporting the company or larger size groupment, since a large percentage of troops are expected to be in this situation at any one meal time. The unit mess has proven to be the most advantageous way of furnishing such support. Specific advantages which accrue from centralizing the task of food preparation in a unit mess, as opposed to decentralized (multiple small group and/or individual) food preparation are self-evident: (1 Less personnel and manhours are involved in preparing meals, (2 Less breakdowns of rations are required with a consequent decrease in personnel and distribution requirements, (3 Increased efficiency is obtained in food preparation activities, (4 More economic utilization of food is achieved, and (5 Food prepared by skilled cooks is more savory and acceptable in quality. Experience also shows that kitchen prepared meals are a distinct contribution to the morale and well being of troops; acceptance of small group and individual packaged operational subsistence decreases when it is known that kitchen prepared food can be served.

a. Means for Providing Unit Messes. There are several ways in which unit messes can be provided. These are discussed below.

(1) The Organic Basis. By this traditional method, the required food service personnel and equipment are organic to army, corps, and division organizations. The feature highly in favor of the organic principle is that organizations have their own mess personnel and equipment continuously under their direct control. By virtue of

being organic, the self-sufficiency of field army units is insured. Setting up and operating unit messes is dependent only upon the existence of a permissible situation and the furnishment of subsistence appropriate for field kitchen preparation. The main disadvantage to provision of organic means for unit messing involves problems created in forward areas when centralized large group food preparation is not feasible. In such situations the food service equipment may have to be stored or certain items such as burner and pots utilized in decentralized subsisting. In this case, the mess teams can be further fragmented to provide cooking skills in the actual location of the maneuver company or platoon.

(2) The Non-Organic Basis. By this method, field army organizations would be served, when tactical and operational conditions permit the use of unit type messing, by food service units attached from a field army food service organization. A great deal of merit can be seen in the concept of a field army food service organization. Being staffed with trained, experienced personnel at all times, the proficiency and level of food preparation should be of a uniform professional caliber and unit commanders would be relieved of an administrative, non-combat type of activity. On the side of disadvantages, a field army food organization would require not only operating elements capable of being fractionated into food service teams to operate unit messes but also organizational elements to execute the associated supervisory and control functions. Further, it would be necessary to support field army organizations with separate food service units in CONUS and while intransit from CONUS to areas of combat operations.

(3) Evaluation. When evaluated one against the other, continuing to furnish unit messes on the organic basis emerges as the most satisfactory solution for the 1965-1970 time period. As long as the majority of troop units habitually employ unit messes, the provision of this capability on the organic basis is the most economical in terms of manpower. A non-organic method of providing food service would require a separate organization composed of operating elements (pools of Mess Stewards, Cooks and Cooks Helpers) and several echelons of command units, all of which would require staffing for executing control, coordination, supervision, and customary overhead functions. Controlling the many elements of the food service organization also would place a burden on the communications system that would otherwise be unnecessary. Finally, the preparation and serving of food to troops is a first echelon service which has a direct effect upon the day-to-day operations, moral and welfare of troops and therefore is most properly controlled by the established chain of command down to and including the unit commander.

(4) Organizational Concept. The personnel and equipment for the operation of field messes has been incorporated into the recent ROAD organizations. In the Infantry, Mechanized Infantry, Airborne Infantry, and Armor maneuver battalions, a mess section of cellular mess teams is located in the support platoon of the headquarters company. One team is allocated for and will habitually support each company; present TOE strength of the teams and section permit at least two meals to be prepared and delivered to up to four separate locations

per company - a team of cooks and kitchen equipment may be attached to a company for operation of a company mess.⁶ The pattern established for the provision of the mess capability on an organic basis in ROAD organizations is applicable for extension in the design and development of the RODAC-70 and TASTA-70 organizations.

b. Large Group Subsistence. Subsistence for large groups (i.e., subsistence for preparation in field messes) will resemble the present standard operational B ration in that it will be composed of nonperishable foods requiring no refrigeration. However, instead of shipping each of over one hundred separately packaged articles in bulk packing, which is the presently accepted procedure, this type subsistence will be unitized. Also every advantage will be taken to incorporate improved food items processed by new food technologies and new light-weight, space-saving packaging as they become available (see Appendix 1, "New Technologies for Processing and Preserving Foods" to Annex C). These and other principle characteristics of the large group subsistence are discussed more fully in the following paragraphs.

(1) Unitization. Packaging components together on a meal module basis will facilitate flexibility in the employment of various types of operational subsistence during any one ration cycle. For example, unitized large group type meals will be interchangeable with other types of packaged operational (small group and individual) meals. Thus, the commander can designate and employ the type meal most suitable for use under changing tactical situations; any combination of the various types

6. Ltr, US Army Combat Developments Command Infantry Agency, CAGIN-DO, 29 September 1964, subject: "CD Study Directive: Subsistence and Food Service for the Army in the Field," Incl 1, "Infantry Field Subsisting Requirements."

of operational meals will provide the individual with the nutrients prescribed for a ration. A number of other very important advantages which may be obtained from unitizing subsistence relate to supply and are covered in detail, in Annex C, "Subsistence Supply," to this study.

(a) At the beginning of the 1965-1970 time period, the large group subsistence will consist of current standard operational B ration components assembled and packaged on the meal module basis. During the fall of 1962, this type subsistence unitized into 25-man meal modules was tested by 7th Army Troops during Exercises MARINE ROCK, SILVER STRIKE, and SOUTHERN EXPRESS. The test results on the use of the "Unitized B" subsistence in field messes were highly favorable.⁷

(b) Progressively throughout the 1965-1970 time frame, present standard canned (heat processed) operational B ration components will be replaced by new types of processed foods, such as freeze dehydrated items, as they become available. These new items will serve to reduce weight and bulk of the meal module. They will also enhance acceptability - their flavor, color, and texture will closely approach or equal that of fresh foods. To the extent practicable, lightweight, space-saving, flexible type packaging also will be used to replace conventional cans. Appendix 2, "State of the Art" to Annex C, contains additional information about these new developments. However, based upon the current industrial capability and the outlook over the next five years for commercial production of freeze dehydrated foods and other new food processing developments, the "Unitized B" type subsistence still will employ a considerable

7. Trip Summary, Report of Findings, STEFA-FC, J. Brugh, Quartermaster Research and Engineering Field Evaluation Agency, 11 January 1963, p. 11.

amount of heat processed foods packaged in cans by 1970 (see Appendix 3, "Industrial/Commercial Base," to Annex C). Stimulation to accelerate industrial growth will be necessary before the stated CDOG qualitative materiel requirement⁸ for the unitized Meal, Uncooked, 25-man can be procured in quantities adequate to supply a major theater of operations. The Meal, Uncooked, 25-man is being developed to make maximum use of dehydrated foods and lightweight packaging and is intended to ultimately replace the current standard B ration.

(c) The use of the "Unitized B" subsistence is not intended to prohibit the use of perishables in the field food system. The organic food service personnel and equipment will be capable of preparing a modified B or Field Ration A at any time it is determined practical and desirable to introduce perishable articles and bulk handling of ration components into the supply system.

(2) Menu Variety. Acceptability of food over an extended period is dependent, to a large degree, upon variety. Lowered preference and acceptance of many foods accompanies the repetitive eating of those foods. Inasmuch as the large group subsistence will be the basic type food in the field food system, a sufficient number of different menus is necessary to prevent the development of monotony. Scientific data is not available which establishes the minimum number of different menus required for a menu cycle that will not become monotonous with repetitive use. In the absence of such data, experience and custom

⁸. Department of the Army, Combat Development Objectives Guide (U), Para 1439b (14)

provide the best guide. The field ration A master menu contains different breakfast, dinner and supper menus for each day of a 30-day period. The standard B ration, however, reduces the menus to a 15 day cycle. The Meal, Uncooked, 25-man, presently under development and intended as the ultimate replacement for the standard B ration, is being designed to consist of a 10-day menu cycle (10 breakfast menus and 20 interchangeable dinner-supper menus). A 10-day menu cycle appears to provide reasonable variety since the same meals would only be served 3 days a month. In development, however, a 10-day menu cycle should be used as a goal to be exceeded to the extent feasible.

(3) Other Characteristics. The large group subsistence should be of minimum weight and bulk, be packaged to be resistant to CBR contamination, and be capable of delivery from aircraft by high velocity drop. Also, all components should be sufficiently stable to meet mobilization reserve requirements.

c. Organizational Field Mess Equipment. The current standard types of field food service equipment can be used in unit field messes. However, improvements in efficiency and reductions in weight, bulk and maintenance would increase utility characteristics. A more desirable answer is seen in the proposed qualitative materiel requirement for a Modular Mobile Field Kitchen.⁹ This requirement has been coordinated and concurred in at the combat developments command agency level and is presently undergoing staff review.

9. Qualitative Materiel Requirement for Modular Mobile Field Kitchen (U), Prepared by USAÇDC Quartermaster Agency, 7 November 1962.

It calls for a simple, efficient, integrated mobile field kitchen with a capacity for preparing meals for a unit mess of 100 men. It will be a composite, self-contained entity comprising all essential food preparation equipment. The kitchen will be suitable for loading and transport on standard, high density, general purpose vehicles without requiring modification of the base transport, which would limit its general purpose use. It will be readily demountable and rapidly available for ground level operation when the tactical situation permits. The kitchen enclosure will be of sufficient size to accommodate additional modular components to provide central food preparation facilities for groups up to approximately 200 men. Maximum cognizance will be taken of new cooking techniques.

d. Individual Field Messing Equipment. The standard individual field messing equipment presently consists of the mess kit, knife, fork, spoon, canteen and canteen cup. Experience in World War II disclosed that certain items of this equipment were unsatisfactory in a number of respects. The knife, fork, and spoon were too large to be carried conveniently unless stowed inside the mess kit and when carried in this manner they caused considerable noise; the mess kit itself was not considered satisfactory because it was bulky to carry.¹⁰ Even under the relatively more stable conditions of the Korean War, this individual

¹⁰ Army Ground Forces, Army Service Forces, Report of Food Conference, Army War College, 1-30 April 1946, Cooking and Messing Equipment Subcommittee Report, p. 4.

equipment (except for the canteen and canteen cup) was generally left with the unit kitchens for use when permitted by the tactical situation.¹¹ In a recent study of how to lighten the combat Infantryman's load, the canteen and canteen cup are the only items of nonexpendable individual messing equipment to be included in the "fighting and existence loads."¹² Other essential messing utensils will be furnished in conjunction with meals. In this connection, the Combat Developments Command position is that the requirement for the mess kit no longer exists. Nonexpendable trays and utensils should be provided by the mess facility when units prepare and serve the large group subsistence.¹³ Currently, means are improvised to totally sanitize (completely immerse in hot water) trays when used in field messing situations. Development of a suitable holding device for use by individuals while immersing trays would overcome this problem.

e. Condiments, Seasonings, and Spices. Usually, these type items only are required in small quantities for meal menus. Present procedures for supply of the B ration specify issue for most of these type items in quantities allowed for 15 days; one issue for 15 days is more practicable than issue on a daily basis. To simplify breaking down these type items into small quantities for kitchens in overseas areas, an assortment of the most commonly used items formerly was placed in one package.¹⁴ This standard package (MIL-R-1498A), known as the Ration

11. Office of The Quartermaster General, Military Planning Division, Research and Development Branch, Environmental Protections Section Observation Unit, Comments on Performance of Quartermaster Equipment, No. 2, Korea, Winter 1950-1951, May 1951, p. 44.

12. US Army Combat Developments Command, A Study to Conserve the Energy of the Combat Infantryman, 5 February 1964, p. 6.

13. Ibid, p. C-6.

14. Federal Stock Number 8970-268-9934 for this item was deleted from the Federal Stock Catalog in 1960.

Supplement, Spice Pack, supplied spices, condiments, and flavoring and leavening agents desired for general cooking purposes. The basis of issue was one pack per 1000 B rations. Although such a pack could be re-established in the supply system for issue with increments of unitized meal modules of the B type subsistence, the condiments, spices, and seasonings could be furnished, without adding an additional (spice pack) line item, through their inclusion with each meal module. Many could be incorporated into the food when it is formulated. The modern mixes like griddle cake mix, cookie mix, and cake mix contain the necessary leavening agents and flavorings. Items like soup and gravy base are manufactured with monosodium glutamate. Any number of other examples of foods which can be formulated to contain appropriate seasonings and spices could be cited. Other commonly used items, not suitable for inclusion in food item formulations (e.g., meat sauce, hot sauce, etc.) could be packaged separately for assembly with the meal module components.

f. Sundries. Sundries are items principally of a luxury nature which contribute to the soldiers morale, comfort, and well being. The standard Ration Supplement, Sundries Pack (specification MIL-R-3465) is a composite pack of these "post exchange" type items designed for gratuitous issue to troops in the field until such time as it is feasible to establish sales outlets; it is intended to be issued on the basis of one pack per day per 100 men. This method for distribution of sundries has worked satisfactorily in the past and also is suitable for use in the future. Maximum benefits are realized when the tobacco, confection, and toilet articles in the pack consist of the proper proportions of the

more generally popular commercial products. Since public acceptance for these types of items is not static, but rather subject to gradual and continual change, as in the case of the rise in popularity of filter tip cigarettes since the close of World War II, the types and quantities of sundries items to make up the pack should be up dated at periodic intervals using data obtained from consumer type surveys.

g. Bread. The importance of bread as a component of the meal warrants specific attention. From a nutritional viewpoint, bread is a good source of certain vitamins and minerals. In addition to its nutritive value, bread gives a desirable texture to the food which aids in the digestive process.¹⁵ From the military viewpoint bread has several other values: (1 Bread consumed with a meal aids in the feeling of satiation, (2 More food is eaten when bread is furnished with a meal, and (3 The availability of bread often made the difference between acceptance and rejection of operational rations in World War II.¹⁶

The fact that the presence of bread with a meal contributes to more utilization of the food justifies particular effort to assure that a highly acceptable type of bread product is served. Types of bread suitable for a system of large group feeding which can be produced in the field either currently or in the near future, are conventional bread and bread made from instant bread mix.

15. Sherman, H. C. and Pearson, Constance S., Modern Bread from the Viewpoint of Nutrition, MacMillan Co., 1942.

16. McGuckian, Col Ambrose T., "Food Service Plans for Mobilization," Quartermaster Review, November-December 1955, p.

(1) Conventional Bread. Conventional types of bread can be produced by combat service support elements using the standard M-1945 mobile bakery equipment. To bake bread with this equipment, six ingredients (flour, milk solids, salt, shortening, sugar and yeast) plus water must be supplied. The finished product is of high quality and well accepted by troops in the field. On the basis of the stated production capability and personnel staffing for a bakery platoon using M-45 bakery equipment, approximately 420 pounds of bread can be produced ¹⁷ per man/day. Similar type bread also can be baked from the same ingredients using the M-42 portable bakery equipment. The M-42 bakery possesses better flexibility characteristics and is lighter and less bulky than the M-45 bakery. From the standpoint of efficiency, however, it compares less favorably; the bread production per man/day will approximate only 310 pounds.¹⁸ At present, and until new equipment is developed, standardized, and procured, bread baking in the field will be accomplished with M-1945 mobile and/or M-1942 portable bakery equipment, the M-1945 being employed by combat service direct and general support units and the M-1942 model by bakery detachments. For distribution of bread products from the field bakery to the user, field testing has found that the corrugated fiberboard

¹⁷. Man/day production figure is derived from information contained in TOE 29-114F, Field Service Company, Supply and Services Battalion, General Support (Forward). The 38-man bakery platoon of this unit is capable of providing fresh bread for approximately 32,000 troops based upon the normal bread ration of $\frac{1}{2}$ -pound per man per day.

¹⁸. Man/day production figure is derived from information published in US Army Quartermaster School Special Text 10-5-1, Summary of Quartermaster and Related Tables of Organization and Equipment, August 1960, p. 12.73. The Team BL, Bakery Detachment comprised of 32 men is capable of providing bread for 20,000 individuals based on $\frac{1}{2}$ pound of bread per day per individual.

outer containers used to package 25-man meal modules of the unitized "B" type subsistence are suitable for re-use as containers for the delivery of bread products. These containers will be readily available, thereby contributing to logistical efficiency and economy.¹⁹

(2) Bread Produced From Instant Bread Mix. A preformulated, prepackaged bread mixture containing a quick-acting chemical leavening agent has been developed and standardized (specification MIL-B-35092). The present industrial capacity for production of this prepared premix has been determined to be 14,500,000 pounds per month (See Appendix 3, "Industrial/Commercial Base," to Annex C). This would be sufficient to support a field force numbering over a million men.²⁰ The logistical advantages to be gained from using a bread premix are obvious. Ingredients required for baking bread can be reduced from six line items to one. Further, the mix will require a minimum of space in transport. With respect to training of bakery personnel, the requirement could be reduced greatly since a highly acceptable bread product can be produced from the premix by relatively unskilled personnel. The troop acceptability

19. Burt, Thomas B., US Army Test and Evaluation Command, US Army Quartermaster Research and Engineering Field Evaluation Agency, Report of USATECOM Project No. 7-3-0157-02K, Engineering Design Test of Containers, Delivery for Instant Bread Rolls, September 1963, p. 3.

20. Basis for this statement is as follows: $14,500,000 \div 30 = 483,333$ lbs per day capability. 100 lbs of bread premix + 50 lbs of water yields 125 lbs of baked product. $483,333 \times \frac{125}{100} = 604,167$ lbs bread per day.

604,167 lbs of bread will supply 1,208,335 men with $\frac{1}{2}$ lb of bread - the normal bread ration per man per day for troops in the field.

of rolls made from instant bread mix has been tested and found to be
equal to standard field bread.²¹ A major problem remaining to be over-
come before the instant bread mix can be used in the field is in the
equipment area.

(a) A qualitative materiel requirement was approved
in 1961 for a Bakery System, Continuous.²² The system is to be light-
weight and have self-contained, skid-mounted units capable of being
mounted on a trailer or powered vehicle. It will be operable with a
minimum number of personnel and will produce bread type products from
the instant bread premix. This equipment will replace standard mobile
and portable field bakeries. Development of the Bakery System, Continuous
has reached the stage of prototype testing. However, type classification
scheduled for 4th Quarter, Fiscal Year 1965 appears highly susceptible
to slippage.

(b) Baking bread using the M-1945 bakery equipment and
the standard bread premix could be an interim solution. Limited scale
trials conducted at Fort Lee have demonstrated the feasibility of this
idea; the product obtained varies from conventional bread but is considered
acceptable.²³ The results of these trials indicate further investigation

21. Burt, Thomas B., US Army Quartermaster Field Evaluation Agency,
Quartermaster Research and Engineering Command, Technical Report T-228
(FEA 61055), An Engineering Test of Instant Bread Mix, May 1962, p. 32.

22. Department of the Army, Combat Development Objectives Guide (U),
Para 1439f(19).

23. US Army Combat Developments Command Quartermaster Agency, Memorandum
for the Record - 10 January 1964, CDCQMA-B, 16 January 1964, subject:
"Conference on Bakery Premix."

and field trials are justified. Another possibility exists that bread products are practical to bake at the unit level using the bread premix and only presently authorized TOE food service equipment. The attractive feature of this proposal is that, if feasible, it could lead to the elimination of centralized field bakery facilities.

8. The Small Group Subsisting Situation. When subsisting in large groups is not practicable, the small group and/or individual subsisting situations prevail. These latter two subsisting situations arise more frequently and continuously during fast moving, fluid, and mobile operations. For example, individual and small group type rations accounted for approximately 50 percent of the subsistence issued in the first four months of operations in the European theater during World War II.

Date	Percent of Rations Issued		
	Large Group (Type A/B)	Small Group (Type 10-in-1)	Individual (Type K/C)
June (6th-30th), 1944	0	71	29
July 1944	57	28	15
August 1944	52	20	28
September 1944	58	14	28

Due to pursuit operations during August and September, 1944, the consumption of C, K, and 10-in-1 rations was actually about double the rate originally expected.²⁵ Moreover, the influence of a fluid tactical situation on types of subsistence is illustrated by a comparison of

²⁴. Report of the General Board, United States Army, European Theater, Quartermaster Supply Operations, Quartermaster Section, Study Number 109, (Cirea 1945) Appendix 12, p. 1.

²⁵. US Army in World War II, European Theater of Operations, Logistical Support of the Armies. Vol II, 1959, p. 189.

consumption data between First and Third US Armies in August 1944. During this month, FUSA used 43 percent packaged operational rations while TUSA consumed 90 percent. Actually FUSA's 43 percent consumption for the month consisted of 26 percent until 21 August 1944 and 79 percent thereafter, showing how Hodge's (FUSA) shifted from combat to pursuit nearly three weeks after Patton's (TUSA).²⁶ Similarly, considerable reliance was placed upon small group and individual rations in other theaters when centralized food preparation and consumption was impractical. Questionnaire data obtained from the 7th Infantry Division, based upon experience in the campaigns of Attu, the Marshalls, the Phillipines, the Marianas, and Okinawa, disclosed that only operational rations of the 10-in-1, C and K types were furnished during the period of approximately two months following each respective D-day.²⁷ Judged, therefore, by past experience and the analysis of future subsisting situations summarized in paragraph 6, above, the field food system for 1965-1970 must include an adequate capability for satisfying both the small group and the individual situations. Because differences will obtain between these two situations, the remainder of this discussion is confined to the small group situation. The individual situation is the topic of paragraph 9.

²⁶. Fitzpatrick, Edwin J., Colonel, Passing in Review, 1 November 1945, "Ration Issue Experience on the European Continent." Ch 33, Vol II, App 4G.

²⁷. Quartermaster Food and Container Institute for the Armed Forces, Ration Development, Operational Studies Number One, Volume Twelve, June 1947, p. 200.

a. Methods for Subsisting Small Groups. Rifle squads, tank crews, long range patrols, radio relay teams, water point detachments, forward observer teams, and reconnaissance scout sections are illustrative of the many types of small groups who frequently will be separated by some distance from the location of their unit mess. The length of time they will be so separated will vary. Nevertheless, the most desirable type meals should be furnished at all times other than when the situation dictates the employment of the individual operational subsistence. Such procedure is in consonance with both the established US Army food service doctrine and the field subsisting standards accepted by this study. This may be accomplished in one of two ways. As indicated in paragraph 8, immediately above, dispersed small groups can prepare and consume their meals using packaged operational subsistence especially designed and furnished for this purpose. Also, meals prepared at a central location may be apportioned into insulated food containers and distributed for consumption at the dispersed small group sites. Both of these methods for small group feeding will have application in 1965-70 field food system.²⁸ Of these, decentralized food preparation and consumption (packaged operational subsistence for preparation and consumption by small groups) will prevail more extensively in forward areas. Centralized food preparation and decentralized consumption (food prepared in unit field messes, placed in food distribution equipment and transported to dispersed troop locations for consumption) generally will be more preferable to employ in division rear and throughout the corps and army areas; here,

28. US Army Combat Developments Command Quartermaster Agency, Memorandum for Record, CDCQMA-C, 1 July 1964, subject: Report of Travel - James H. Taylor to USACDC Infantry Agency, 22-24 June 1964, Section IV, Para 2a.

with short distances, like a half-hour's travel over roads, kitchen prepared meals can be delivered easily and quickly to dispersed troop groupments. A more detailed discussion of each of these two methods for subsisting small groups follows.

b. Decentralized Food Preparation and Consumption. To employ this method, small groups must be furnished the means to prepare and consume their own meals. Obviously, such means must be both simple and convenient and result in a highly acceptable meal as an end product.

(1) Subsistence. Small group subsistence, like large group, subsistence will be unitized on a meal module basis to facilitate interchangeability with other type operational subsistence during any one ration cycle. It will contain menu items (meat, potatoes, vegetables, fruits, etc) separately packaged which can be individually prepared to form a meal having an appearance and close resemblance to the kitchen prepared type meals American soldiers are accustomed to eating. It will be suitable for preparation by personnel untrained in food service operations using rudimentary cooking equipment; preparation only will involve opening containers and packages of foods customarily eaten cold, plus adding an appropriate amount of water to dehydrated items, and heating foods which are more palatable hot. In connection with heating, the requirement should be limited to either heating the food in its container (heat processed food) or heating water and adding it to the food container (precooked dehydrated food). A 10-day menu cycle (10 breakfast and 20 interchangeable dinner-supper menus) is being used for research and development of this type subsistence. This seems to be a reasonable objective in the light

of the new food technologies which offer a continual expanding selection of processed foods for use in the military subsistence system. Like the large group subsistence, the small group subsistence should be of minimum weight and bulk, be packaged to be resistant to CBR contamination and be adaptable to delivery from aircraft by high velocity drop. Also, all components should be sufficiently stable to meet mobilization reserve requirements. During the initial portion of 1965-70 time frame, small group operational subsistence requirements probably will be satisfied with the standard Ration, Small Detachment, 5-Persons (Specification MIL-R-10754). Progressively, as development and the commercial industrial base permit, freeze dehydrated components in flexible packaging should be phased into the small group ration replacing canned, heat processed counterparts. Additionally, conversion from the ration basis to the meal basis of issue should be implemented at the earliest practicable date. The ultimate objective, like that for large group subsistence, is to attain the CDOG qualitative materiel requirement which, in the case of small group subsistence, is for the Meal, Quick-Serve, 6-Man.²⁹ Research and development to satisfy this QMR is well advanced. According to projections regarding the growth of the commercial industrial capability to produce freeze dried foods, however, elimination of an appreciable amount of heat processed articles from the operational type subsistence probably will not be feasible until sometime after 1970 (See Appendix 3, "Industrial/Commercial Base," to Annex C).

29. Department of the Army, Combat Development Objective Guide (U), para 1439f(15).

(2) Messing Equipment. Preparation of small group type subsistence will necessitate a means for heating certain of the meal components. Standard items such as the heavy duty, one-burner, 5000-BTU, stove (Specification MIL-S-10736) with field cookset (Specification MIL-C-1417), the field cooking outfit (Specification MIL-C-1588), and bars or tablets of compressed Hexamine fuel (MIL-F-10805) or field improvisations can be used until a more satisfactory portable device becomes available. A disposable carbon heat unit is under development. Field testing of this item in conjunction with the experimental Quick-Serve Meal has disclosed deficiencies which remain to be overcome before type classification can be considered. A speedy and convenient means to adequately heat canned foods or water (for rehydration of precooked dehydrated foods) for groups of approximately 6-men is an area which appears to require intensive research and development effort if the requirements are to be satisfied during the 1965-1970 time frame. Elimination of all present standard items of individual field messing equipment (the mess kit, knife, fork and spoon) except the canteen and canteen cup, as discussed in paragraph 7d, above, will make it necessary to furnish messing utensils with the small group subsistence. The most desirable solution is seen in disposable items which can be incorporated, along with the food items, into the shipping container because: troops would be assured of having the necessary items to eat with at every meal; they would be relieved of the time-consuming task of

cleaning the utensils after meals; and water requirements for sanitation purposes, as well as the potential health hazard from using contaminated utensils, would be eliminated. The many advantages of disposable utensils outweigh such disadvantages as a small increase in weight, bulk and cost of the small group packaged operational subsistence.

(3) Bread. The previous discussion on bread contained in paragraph 7g, above, emphasized the importance of its provision with the large group type meal. Bread should be included with the small group meals for the same reasons.

(a) During the time frame under consideration, canned bread probably is the best product which can be packaged with the small group subsistence. Canned bread demonstrated favorable acceptability characteristics when it was supplied in limited quantities as an experimental item in Korea during 1952-53; however, no data were obtained concerning its acceptability if consumed over a long period of ³⁰ time. Other tests of canned bread have been conducted, however, which report that although the canned product remains edible after many months of storage, its acceptability rating declines constantly throughout ³¹ the storage period.

(b) Bread substitutes (biscuits, crackers and cookies) could be used instead of canned bread. They are stable and have good ³² storage life in regard to texture and flavor staling. They possess a

30. Office of the Quartermaster General, Research and Development Division, Field Observer Comments on Performance of Quartermaster Equipment, No. 5, May 1952 through May 1953, October 1953, p. 132.

31. Matz, Dr. Samuel A., Modern Baking Concepts for Troop Feeding, a paper presented at the 18th Annual Meeting of the Institute of Food Technologists, Chicago, Illinois, 25-29 May 1958.

32. Quartermaster Food and Container Institute for the Armed Forces, Activities Report, Vol. 9, No. 4, January 1958, p. 240.

number of other excellent characteristics for use in packaged operational rations; namely, (1 they are compact and relatively high in density compared to bread; (2 they are easily packaged and transported; and (3 they lend to unitization of meals. The principal disadvantage of bread substitutes is that they rapidly decline in acceptability with continued use as found in World War II experience.³³ In addition to many informal reports, poor acceptance of the bread substitutes in the C and K rations was further confirmed by the following data which were obtained in March and April 1946 from approximately 10,000 combat troops, each of whom was a recipient of the Combat Infantryman Badge:³⁴

	Ate (%)			
	<u>Almost All</u>	<u>Some</u>	<u>Almost None</u>	<u>Never Issued</u>
C Ration Biscuits	38	42	19	1
K Ration Biscuits	42	41	16	1

Because of low acceptability, bread substitutes should be used only in the event a better product is not feasible or available.

(c) Greater stability and therefore better long term storage of bread may be obtained from bread pasteurized by chemical or irradiation treatments. These methods of pasteurization, using flexible film type packaging to permit economies in weight and bulk, have received attention in research and development investigations but no information

33. Bean, W. B., "Nutritional Survey of American Troops in the Pacific," Nutrition Review, 4(9) 1946, pp. 257-259.

34. Research and Development Branch, Military Planning Division, The Office of The Quartermaster General, Combat Ration Study, 1 November 1946, pp. 8 and 9.

was found during this study which indicates feasibility of such processed bread for use in the 1965-1970 military food system.

(4) Accessory and Sundry Items. In addition to food, there are a number of other types of items which experience has shown are more efficiently distributed to troops through subsistence channels. These may be broadly grouped into three categories, namely: utility items which are used in conjunction with and contribute to the effectiveness of preparing and consuming packaged operational subsistence; items essential to the daily personal needs of the soldier; and items of a luxury nature which contribute to the soldiers' moral, comfort, and well being. However, the logistical advantages of packaged operational subsistence are lost to a substantial degree if it is necessary to transport, store, and issue these types of items as individual, extra, augmenting components.³⁵ Accordingly, experience has shown that a combination of two methods provides the best solution for supplying these items to the individual soldier. One is to package the utility items and certain selected items required for the soldiers personal needs as accessories in the packaged operational subsistence. These include such items as can openers, matches, and toilet paper. The other method is to package assorted items of the luxury type in sundries packs for separate distribution through subsistence channels (somewhat more detail regarding this type pack is contained in paragraph 7f, above). It is obvious that utility items should be issued as accessories. However, it is more

35. Littlejohn, Major General Robert M., Fitzpatrick, Colonel Edwin J., Burns, Captain Robert W., US Army Subsistence Experience in the European Theater, World War II, 1 November 1945.

difficult to make a clear cut differentiation between accessories and sundries where many of the personally needed and luxury type items are concerned. In these instances, a decision must be made on the basis of practicality. Cigarettes, candy, and chewing gum are excellent examples of luxury type items which are included in accessory packets of standard operational subsistence. It is not considered within the purview of this study to define the exact types and quantities of all the accessory and sundries items to package with the small group subsistence. Criteria for such determinations will be the benefits soldiers will derive from the item evaluated against the economies of its cost, weight, and space requirements.

c. Centralized Food Preparation and Decentralized Food Consumption.

This method may be used to serve troops with meals prepared in field messes, using the large group type subsistence. The main difference between this form of messing and the large group subsisting situation is the additional requirement for transportation of the kitchen prepared food. In previous wars, this method has been used with reasonably good success. Perhaps its most extensive application occurred during the Korean War. According to one report, prepared by a field observer from the Office of the Quartermaster General, front line companies and other units transported and served food to men in forward areas on a daily basis.³⁶ The report briefly described the procedure as follows: "Hot food is transported to troops from hauls of 50 yards, to hauls of several miles or more. The containers [containing the food] are transported by

36. Office of The Quartermaster General, Research and Development Division, Field Observer Comments on Performance of Quartermaster Equipment No. 5, May 1952 through May 1953, October 1953, p. 91.

$\frac{1}{4}$ -ton truck, $\frac{3}{4}$ -ton truck, by indigenous personnel on "A" frames, and almost any other method possible." ³⁷ One disadvantage in this method, compared to the method of preparing food where it will be consumed, is that additional equipment for food distribution as well as additional transportation are required. Whereas these additional requirements did not prevent centralized food preparation and decentralized consumption from working satisfactorily for feeding stabilized front line troops in a limited war, central preparation and decentralized consumption has obvious limitations as a method for feeding combat troops engaged in mobile operations. The feasibility of its application, therefore, is controlled by the time-distance-terrain factors coupled with the degree of fluidity of tactical operations.

9. The Individual Subsisting Situation. When the time and environment do not permit the preparation and grouping necessary for large and/or small group subsisting, food packaged for issue to and preparation by the individual must be supplied. This type subsistence has wide application, especially in the combat environment, typical examples being: when the individual is performing sentry duty, patrolling, or positioned in a foxhole; when members of a unit must eat on the move; when meals must be consumed by individuals in a matter of minutes only; and when assault type operation are being carried out. Two types of packaged operational subsistence are needed to adequately meet these

37. Ibid.

various situations, namely, the individual meal and the individual food packet.

a. The Individual Meal.

(1) Essential Characteristics. There are many occasions when the soldier must eat cold food if he is to eat at all. This is particularly true when he is engaged in combat. In this situation, troops must adjust to eating whenever an appropriate opportunity occurs. Time and circumstances require a meal which can be eaten without any preparation other than opening packages. It can be expected, however, that such intense activity will not be continuous. Rather, there will be frequent periods of less extreme activity when components of the individual meal can be heated prior to consumption. Thus, it is desirable that this type subsistence be formulated so that components are acceptable and palatable when heated and are appropriate for eating cold, when necessary. There are a number of other basic requisites which this type subsistence must possess. Sufficient menu combinations are necessary to permit recurrent use for periods up to one week without causing monotony. Each menu must be acceptable for breakfast, dinner, or supper. Although bread substitutes (biscuits, crackers, and cookies) are not as acceptable as bread, their inclusion, in lieu of bread, in the individual meal is dictated by requirements for maximum utility and minimum size. The stability of all items in the meal must be sufficient to meet mobilization reserve requirements. Packaging should be compact, resistant to CBR contamination, and able to withstand high velocity drop from aircraft.

The meal also should be packaged so that components are capable of being easily separated and conveniently carried in the pockets of field clothing.

(2) Accessories and Sundries. The accessory and sundry type items to include in the individual meal should be determined in the same manner as for the small group meal (see paragraph 8b(4), above). Additionally, the individual meal should contain a means for heating the main dish component and the beverage. This type item would have greatly increased the acceptability of individual rations during World War II but it could not be included because the heating materials (tablets) then available were said to transmit distasteful odors and flavors when packaged with foods and the then known heat tablets were unacceptable to the Office of The Surgeon General for incorporation in packaged rations. As a result, various reports were made to the effect that many soldiers in the field were unable to heat their rations unless they could find the time and ingenuity to do so.³⁸ Towards the close of World War II, the need for an accessory item to provide a source of heat was recognized as a military requirement in a combat ration study conducted by the Quartermaster Corps.³⁹ As late as the Korean War, reports still contained similar recommendations, one of which is quoted,

³⁸. Quartermaster Food and Container Institute for the Armed Forces, Ration Development, Operational Studies Number One, Volume Twelve, pp. 16 & 17. June 1947.

³⁹. The Office of The Quartermaster General, Military Planning Div., Research and Development Branch, Subsistence R&D Laboratory, Ration Development Branch, Interim Report, Combat Ration, September 1945, p. 6.

as follows: "It is recommended that the fuel tablet be packaged with the operational rations. This would insure that the tablets always arrive with the ration. [In] the present system the fuel tablets are shipped separately and therefore, the ration and the heat tablets don't necessarily arrive at the user together" (Major Dobson, 16 April 1951).⁴⁰

Another such report stated "The heat tablet should be included with each meal rather than with each ration" (Major Sunderline 27 December 1950).⁴¹

These, and many other reports, as well as a test evaluation published in April 1958 by the Marine Corps Equipment Board,⁴² substantiate the desirability of a heating material as an accessory item for the individual meal. Continued effort is indicated for research and development of a highly efficient item of this type which can be packaged with foods without causing any adverse effects.

(3) The CDOG Requirement. A qualitative materiel requirement is stated in the Combat Development Objectives Guide for a Meal, Ready-to-Eat, Individual.⁴³ Prototype menus recently subjected to field testing have disclosed shortcomings in acceptability, particularly when eaten cold.⁴⁴ These shortcomings, together with the fact that maximum use is

⁴⁰. Office of The Quartermaster General, Research and Development Branch, Military Planning Division, Environmental Protection Section Observation Unit, Comments on Performance of Quartermaster Equipment, No 2, Korea, Winter 1950-51, Appendix A, V. Food & Containers, May 1951 p. 63.

⁴¹. Ibid.

⁴². Marine Corps Equipment Board, Marine Corps Landing Force Development Center, Marine Corps Schools, Project No. ET-1336, Ration Individual, Combat Meal Type: Evaluation of, 30 April 1958, p. 6.

⁴³. Department of the Army, Combat Development Objectives Guide, par 1439f(16).

⁴⁴. Burt, Thomas B., US Army Test and Evaluation Command, Quartermaster Research and Engineering Field Evaluation Agency, USATECOM Project No. 8-3-7400-04K, Final Report of Engineering Test of Meal, Ready-to-Eat, Individual, May 1964, p. 5.

intended to be made of precooked foods processed by novel methods to include radiation processed foods when the state of the art permits, would indicate that availability of the Meal, Ready-to-Eat, Individual is not imminent. Until it does become available, the present standard Meal, Combat, Individual (Specification MIL-M-35048), which comes in 12 menus, will furnish adequate subsistence for the individual situation. Further, the portability of the Meal, Combat, Individual could be substantially increased by the latter part of the 1965-1970 time frame through replacement of cans with flexible type packaging of the main menu components (see Appendix 3, "Industrial/Commercial Base" to Annex C).

b. The Food Packet. There are times when a soldier cannot receive complete meals through planned supply, examples being the initial stages of amphibious or airborne assault, patrol actions, and special forces type activities. For such situations, food is needed that is lightweight, highly nutritious and palatable, and easy to carry. As in the case of each previously discussed type of operational subsistence, an approved qualitative materiel requirement is contained in the Combat Developments Guide for a Food Packet, Individual, Combat.⁴⁵ The only subsistence of this type which can presently be supplied is the Packet, Subsistence, Long Range Patrol. This is a type classified item (limited production type)⁴⁶ which does not fully meet the CDOG requirement. An interim item, known as the "M" Packet is scheduled for type classification

⁴⁵. Department of the Army, Combat Development Objectives Guide, Par 1439f (17).

⁴⁶. 3rd Ind, US Army Combat Developments Command Quartermaster Agency to Ltr, Hqs, US Army Materiel Command, AMCRD-DM-E, 13 July 1964, subject: "Review of Army Combat Rations."

by the 4th quarter of FY 66. This interim item will represent an improvement over the Packet, Subsistence, Long Range Patrol but, in weight and certain other characteristics, will be a down-graded version of the approved QMR. The M packet will probably not be replaced until 1970 or thereafter.

SECTION III
SUBSISTING IN THE COMMUNICATIONS ZONE

10. General. The administrative and logistical organizations to support the combat zone will be located in the communications zone. COMMZ troops will operate the permanent, fixed type facilities needed for the theater mission activities concerned with personnel, medical, supply and maintenance, transportation, and construction. In addition, a certain number of COMMZ troops will be engaged in area support responsibilities of the COMMZ commander. Under these conditions, the subsistence system will be similar to but somewhat more conventional than that in the combat zone. Practically all of the COMMZ troops will be served kitchen prepared meals in company or consolidated type messes. Some subsistence of the small group and individual types will be used but, in comparison with the combat zone, the amounts will be negligible. Maintenance teams, pipeline inspection teams, vehicle drivers, radar site operators, and road rehabilitation crews are examples of personnel who will be, from time to time, in the small group and individual subsisting situations. Packaged operational subsistence of the small group and individual types supplied in the combat zone and the communications zone will be identical.

a. Subsistence for Company and Consolidated Type Messes. This subsistence will be the same as the unitized large group subsistence to be supplied to the field army. In the event that unitization capabilities in CONUS are unable to keep pace with demands, as the theater of operations becomes established, priorities for unitized subsistence will be accorded to the field army(s). In lieu of unitized large group subsistence, COMMZ

would be furnished the same components on a bulk basis. The burden of handling and issue (breakdown) of bulk subsistence could be assumed more easily in the COMMZ making maximum use of non-US personnel. In COMMZ, the stability of operating conditions would be more conducive for the handling of subsistence in bulk. It also is probable that refrigeration facilities will exist in this section. To the extent that they are available and can be conscripted for military purposes, such facilities may be used for locally purchased perishable articles. With respect to bread, the conventional type or the type made from bread premix could be used. This will depend upon whether commercial type bakery facilities and non-US labor can satisfy requirements or whether military personnel and equipment for producing bread of either the conventional or premix type are needed.

b. Food Service Personnel and Equipment. Whenever possible, organic food service personnel will be replaced with non-US personnel who can meet skill level and medical requirements for employment in unit or consolidated type messes. Conventional field food service equipment or garrison type equipment already in place will be satisfactory for mess operations.

c. Sundry Items. Until available through sales outlets, sundries should be supplied in the same manner as in the combat zone, i.e., by means of gratuitous issue of composite packs.

SECTION IV
SPECIALIZED OPERATIONS

11. Extreme Environments. The basic standards of diet are prescribed in AR 40-5, Appendix V. These standards represent the minimum amounts of essential nutrients per person per day which, if consumed and properly utilized, will meet the requirements for health and the prevention of nutritional deficiency disease.⁴⁷ They apply to troops undergoing average operational activities. Recent published studies have shown that contrary to popular belief, cold does not require an increased calorie intake but hot weather may; however, for usual activities the nutritional requirements published in Appendix V of AR 40-5 are considered to be adequate world wide.⁴⁸ Unusually strenuous work or exceptional activity can cause energy expenditure requiring above average calorie intake. Such food requirements may be met by increasing the daily consumption of all meal components; no requirement exists for development of standardized supplementary rations for use in Arctic or tropical regions.⁴⁹ Accordingly, the various types of subsistence discussed in preceding sections of this annex for general operations in the temperate zone will be adequate for average operations in the Arctic and Tropical environments. One

47. AR 40-5, Medical Service, Preventive Medicine, April 1964, p. 6-2.

48. 1st Ind, US Army Combat Developments Command Medical Service Agency, 14 July 1964, to Letter, US Army Combat Developments Command Quartermaster Agency, CDCQMA-C, 5 June 1964, subject: "Requirements for Ration Supplements in Arctic and Tropical Regions."

50. Ibid.

exception might be the use of the standard Ration, Individual, Trail, Frigid in lieu of the standard Meal, Combat, Individual or its planned successor, the Meal, Individual, Ready-to-Eat which is presently under development. The Ration, Individual, Trail, Frigid is especially designed for trail use under cold weather conditions.

12. Airmobile Operations. Airmobile operations extend the range, tactical mobility, and maneuverability of combat forces through primary use of aircraft for transport of personnel and supplies. These types of operations are planned for rapid execution and timely withdrawal; at times, the mission and tactical operations require continual forward displacement. A deployed airmobile force is characterized by widely dispersed units supported over difficult or restricting terrain by an air line of communications.

a. The Air Assault Division. Concepts of airmobile operations are undergoing test and evaluation at this time. These activities are aimed at determining the validity of the current concepts and establishing the organization, doctrine, and materiel requirements necessary for the execution of airmobile operations. Tentative doctrine with respect to Class I, states that the operational B ration, packaged or supplied in quantities to provide a complete meal for 25 men and the individual combat meal are the types of subsistence normally used; standard sundries packs, ration supplements (Ration, Supplement, Aid Station) and subsistence packets will be provided as required. ⁵⁰ Subsistence that requires

50. US Army Combat Developments Command Special Text, ST 10-50-1, Supply and Field Services Support, Air Assault Division, June 1963, p. 24.

preparation is distributed only to brigades, combat battalions when they have messing teams attached and to other elements which have messing capabilities; meals prepared centrally by battalions and brigades are distributed to unit level by these organizations.⁵¹ Broad concepts for the supply of subsistence have been expressed in a recent combat developments study of combat service support for airmobile operations.⁵²

These concepts emphasize the need for simple, flexible, and direct procedures for subsistence support. The desirability of employing "scheduled supply," "unitized supply," "modular packaging," and "non-perishable" subsistence compatible with movement by air receive specific emphasis.

b. Concept Compatibility. Current concepts for subsisting the Air Assault Division are fully compatible with the overall concepts of this study of subsistence and food service for the army in the field, particularly those discussed in Section II, "Subsisting in the Combat Zone," of this annex and Annex C, "Subsistence Supply." Procurement lead time and other considerations prevented inclusion of unitized B type subsistence in the recent Field Test Program, Army Air Mobility Concept. During the test period, however, a trial of the Quick-Serve type meal gave indications of being particularly adaptable to air assault operations because of lightweight, small bulk, and flexibility of preparation.

13. Limited War/Cold War.

a. Limited War. Limited war is defined as "armed conflict short of general war, exclusive of incidents, involving the overt

51. US Army Combat Developments Command Special Test, ST 54-2-1, Air Assault Division Combat Service Support and the Support Command, January 1963, p. 54.

52. US Army Combat Developments Command, Combat Developments Study USA CDC CSSG Project No. 63-3, Combat Service Support for Airmobile Operations, 10 March 1964, Annex F, pp. F9-F11.

engagement of the military forces of two or more nations."⁵³ The requirements for subsistence in operations during limited war are relatively the same as in operations during general war. While in limited war tactical operations may be "limited" in a number of ways, the system for subsisting in the field, as discussed in Sections II and III of this annex, would be fully applicable.

(1) The escalation of hostilities from cold war to limited war may be rapid. The initial sudden deployment of US forces under these conditions requires that special considerations and planning be directed toward the supply of subsistence. "At the time of the Korean conflict - during July, August, and September, 1950, consumer stocks were taken from warehouse shelves and were shipped to Pusan. Boxes fell apart in the holds of ships, labels came off, cans rusted out and a chaotic mess resulted."⁵⁴ An extract from current doctrine for supply of subsistence in a theater of operations is particularly descriptive of conditions which may be encountered in limited war. "Automatic resupply is usual in the initial stages of the tactical development of a theater of operations. This is the phase during which subsistence requirements of the supported command are provided automatically for a period determined by estimate based on theater strength. Semiautomatic supply is the step which may follow as the supported command gains

53. JCS Pub 1, Dictionary of United States Military Terms for Joint Usage, The Joint Chiefs of Staff, 1 December 1964.

54. Mehrlick, Dr. F. P., Director, Food Division, US Army Natick Laboratories, at a joint CDC-AMC briefing entitled, "Army Combat Rations" for a Board of General Officers at Hq, Army Materiel Command, 2 June 1964.

control over its supply system and attains or builds up a balanced stock position. Semiautomatic supply is the phase under which some items are furnished automatically and others by requisition."⁵⁵

(2) These conditions which may attend the initial commitment of US forces in a limited war forcefully demonstrate the requirement for modularized subsistence for large groups as discussed in Section II. Use of such modularized subsistence will enable stocks to be habitually balanced. Further, as an added and important benefit, special training will not be required for supply personnel handling the receipt, storage, and issue of modularized subsistence supplies.

b. Cold War. Cold war is defined as "a state of international tension, wherein political, economic, technological, sociological, psychological, paramilitary, and military measures short of overt armed conflict involving regular military forces are employed to achieve national objectives."⁵⁶ The Army's most active role in cold war activities is in the field of counterinsurgency operations. To fulfill US Army counterinsurgency missions, Special Action Forces (SAF) have been organized and trained. The size and composition of US Army counterinsurgency forces committed in a host country is responsive to planning of a unified command and may range from a single individual to a complete Special Action Force reinforced with the back-up echelons. The missions of the forces, are

⁵⁵. FM 10-60, Supply of Subsistence in a Theater of Operations, November 1960, p. 8.

⁵⁶. Headquarters, Department of the Army, Dictionary of United States Army Terms, February 1963.

are primarily training and advisory, and may include civic action-type support and operational assistance for host country forces. ⁵⁷

(1) Counterinsurgency operations are joint operations in which Army forces are part of a US country team. Within a host country the US Ambassador or principal US Diplomatic Officer is Chief of the Country Team. Administrative and logistical support for US forces is based on Department of Defense instructions and inter-service agreements. A designated military department may provide all or part of the support and services common to the needs of the joint forces.

(2) SAF personnel in small detachments and mobile training teams (MTT's) may operate in widely dispersed areas throughout the interior of the host country. These personnel normally will be in a TDY or station allowance status, authorized to ration separately. ⁵⁸ When feasible, small, cooperative messes may be established. Personnel in detachments and MTT's will generally subsist on local resources to the maximum extent practicable. In some areas, however, subsistence may be scarce or unavailable. "A commissary-type operation provides an effective source of supply for purchase of basic or supplemental Class I supply items by deployed teams and detachment." ⁵⁹ Where

57. FM 31-22, US Army Counterinsurgency Forces, November 1963, p. 4.

58. Study, Initial Draft Report, Combat Service Support for Special Action Forces and Back-up Brigades, (USACDCCSSG Project 64-2) Hq, USACDC Combat Service Support Group, September 1964, p. 13.

59. Ibid

commissary facilities are already established in a host country by another US department or agency, additional commissary facilities may not be needed to support a SAF task force. When larger SAF task forces include organized TOE messes, provisions must be made to issue subsistence from established supply facilities.

(3) The system established for support of a SAF task force in a host country may parallel post, camp, and station type support in CONUS even though SAF personnel are widely dispersed.⁶⁰ Distribution of supplies, including subsistence, to deployed SAF detachments and MPT's will frequently be dependent upon an airline of communication (AIOC). If SAF elements are located in remote areas where air landing facilities are nonexistent, supplies must be prepared for airdrop.

(4) Established TOE messes of a SAF task force may be provided field ration "A", when feasible.⁶¹ However, since facilities for refrigeration may be limited or not available, particularly for deployed teams and detachments, the operational B type ration should be supplied as needed. Emergency reserves of individual and small group subsistence should be stocked in-country for issue as appropriate. Additionally, survival food packets, ration supplements for aid stations, and sundries packs (PX-type items) should be stocked as required. Availability of the Meal, Quick-Serve, 6-man will be extremely valuable in providing subsistence for deployed SAF teams and detachments.

60. FM 31-22, op. cit, p. 59.

61. Study, Initial Draft Report, Combat Service Support For Special Action Forces and Back-up Brigades, op. cit, p. D-9.

Light in weight and needing no refrigeration, the Meal, Quick-Serve, 6-man offers many advantages for supply of few personnel at widely dispersed locations via AIOC.

14. Unconventional Warfare.

a. General. In unconventional warfare operations, it is anticipated that Special Forces personnel will depend primarily upon indigenous subsistence obtained in guerrilla warfare operational areas.⁶² In some situations, however, food and other essential survival items may be scarce or unavailable. Subsistence to committed Special Force detachments will be supplied, based on operational requirements and resupply capabilities. In discussing procedures for resupply to guerrilla warfare operational areas, current doctrine states: "The number of resupply missions is limited until it can be determined that the detachment will not be compromised by flights over the guerrilla warfare operational area, and/or until air superiority can be established at a preselected time and place. A minimum of one resupply mission per thirty days per committed detachment is planned during this initial period. The frequency of missions increases with the degree of air superiority established by friendly forces, until resupply missions are flown as required."⁶³

b. Subsistence Requirements. Special Forces detachments in guerrilla warfare operational areas request supplies "essential to combat operations" or "essential for individual survival" by means of

⁶². FM 31-21, Guerrilla Warfare and Special Forces Operations, September 1961, p. 95.

⁶³. Ibid, p. 52.

a brevity code known as a catalogue supply system (CSS). Subsistence, along with clothing and medicines, is included in the latter category. Supply bundles for delivery into operational areas must be under 50 pounds in weight to facilitate man-portability; packages also must be protected against handling and weather damage.

(1) The needs of the indigenous (guerrilla) forces are of primary concern to Special Forces personnel in an operational area. Control of subsistence and other supplies is one of the principal means available to the Special Forces commander to influence decisions of guerrilla leaders. Therefore, national, ethnic, or religious customs and traditions of indigenous personnel must be considered in supplying subsistence to Special Forces detachments. Current doctrine specifies an allotment of subsistence on the basis of 15 pounds per individual per month.⁶⁴

(2) Subsistence for committed Special Forces detachments presently would have to consist of packaged components of the Operational B-ration, packages of the Meal, Combat, Individual, and survival food packets. Sundries packs (FX-type items) also may be required for barter purposes. In the future, both the Meal, Quick-Serve, 6-man and the Meal, Uncooked, 25-man may provide a useful contribution to Special Forces Operations. The reduction in both weight and cube achieved by use of these meals is impressive, and appears to make them well-suited for delivery into guerrilla warfare operational areas.

64. Ibid, p. 229.

SECTION V
CONCLUSIONS

15. General.

a. During the time frame of this study, the products of new food processing technologies will supplement and/or substitute for, but not wholly replace, the types of processed foods presently used in Army operational subsistence.

b. These new processed foods will be incorporated into the system for subsisting in the field by means of a phasing-in process of one or a few new foods at a time as:

(1) They meet or exceed military criteria, and

(2) The commercial industrial capacity becomes available for production in quantities required for military usage.

16. Subsisting in the Combat Zone.

a. The organic type unit mess is the most efficient and satisfactory method for providing meals to troops in the large group subsisting situation.

b. Subsistence for preparation in unit messes will be composed of a combination of the most acceptable nonperishable articles which the commercial/industrial base can make available.

(1) To simplify the use of the various types of operational subsistence during any one ration cycle, the large group subsistence will be unitized on a meal module basis.

(2) A 10-day menu cycle (10 breakfast menus and 20 interchangeable dinner-supper menus) should offer adequate variety and should be used in planning as a minimum objective to be exceeded, if feasible.

c. Current standard types of field food service equipment can be used for unit mess operations, but should be replaced in highly mobile units with the proposed modular mobile field kitchen at the earliest practicable date.

d. Furnishing non-expendable eating equipment and utensils from the mess facility will eliminate the need for standard individual field messing equipment presently issued to and carried by the soldier except for the canteen and canteen cup.

e. Bread for unit messes will be produced by combat service support elements.

(1) Until the Bakery System, Continuous becomes available for producing bread products from instant bread premix, present standard field bakery equipment and ingredients will be used to supply conventional type bread.

(2) An interim solution which appears to warrant further investigation is the baking of bread using M-1945 bakery equipment and standard bread premix. Another concept worthy of feasibility testing is bread baking at the unit mess level using standard bread premix and only presently authorized TOE food service equipment.

f. Sundries should be supplied gratuitously in composite packs until such time as sales outlets become established.

g. Means must be provided for small group and individual messing since tactical and operational conditions will frequently prevent subsisting substantial numbers of troops in the large group situation.

h. Dispersed small groups will be subsisted in one of the two following ways, whichever is the most practicable under the conditions prevailing at meal time:

(1) Packaged operational subsistence will be supplied which is especially designed for preparation and consumption by members of a small group. With respect to overall characteristics this type subsistence should:

(a) Be unitized on the meal module basis to facilitate interchangeability with other type operational subsistence.

(b) Be made available in a 10-day menu cycle, as a minimum.

(c) Be designed to be consumed in a heated state so as to resemble as closely as possible the type kitchen prepared meals American soldiers are accustomed to eating.

(d) Contain disposable messing utensils to simplify meal procedure and reduce water requirements for sanitation.

(e) Include bread, rather than bread substitutes.

(f) Have a packaged assortment of suitable accessories.

(2) Meals may be centrally prepared by a unit mess, placed in food distribution equipment and transported to the point where the food is to be consumed.

1. When troops must be subsisted on an individual basis, a packaged operational meal will be furnished which is acceptable and palatable when heated and appropriate for eating cold, if necessary. This type meal should contain essential accessories and be provided in a minimum of 10 different menus to alleviate monotony in the diet.

17. Subsisting in the Communications Zone.

a. Subsistence for kitchen preparation will be the same as that supplied for unit messes in the combat zone with the exception that it may be shipped from CONUS in bulk if unitization capabilities in CONUS become insufficient to satisfy total requirements of the theater of operations.

b. Although large group subsisting will be the norm, individual and small group packaged operational subsistence will have certain application.

c. To the extent that refrigeration facilities exist and are available for military use, they may be used for locally procured perishables.

d. Conventional bread or bread produced from instant bread premix will be supplied to field messes dependent upon which is the most practical to furnish.

e. Present standard types of field food service equipment will be adequate for use in field mess operations.

f. Until they become available in sales outlets, sundries should be supplied gratuitously in composite packs.

18. Specialized Operations. The system proposed in this annex for subsisting troops in the combat zone of an established theater of operations contains all the necessary elements for adequate subsistence support of US forces deployed in extreme environments, in airmobile operations in cold war/limited war and in unconventional warfare operations.

19. Implementation.

a. The system described in this annex can be implemented using standard items of food service equipment and food products which are currently available.

b. Optimum functioning of this system, however, depends in large measure upon attainment of the approved and proposed CDOG materiel requirements specifically identified in Section II of this annex.

c. A materiel or device for heating standard and experimental type packaged small group operational subsistence is a problem area requiring emphasis in research and development.

APPENDIX 1 TO ANNEX B

THE CURRENT FIELD SUBSISTING SYSTEM

1. General. The current system for subsisting troops in the field closely resembles that developed and employed in World War II and, subsequently, in Korea. This system places emphasis upon meals prepared in unit messes. Accordingly, food service personnel and field food service equipment are provided on an organic basis. The food is supplied, in bulk, on the basis of daily requirements. To provide the flexibility needed when the subsisting of troops by means of unit messes is impracticable or impossible, the system includes packaged operational subsistence in the form of small group rations and individual rations, meals and packets.

2. Food Service Personnel. The broad responsibilities of the various Department of the Army staff agencies and major commands are specified in the Army Regulations.¹ Under the jurisdiction of the Chief of Support Service, Headquarters, Department of the Army, the United States Army Subsistence Center:

a. Provides staff supervision and technical assistance in the preparation, service, and conservation of food, except for patient feeding at medical treatment facilities (all matters related to patient feeding are the responsibility of the Surgeon General);

b. Developing and standardizing recipes for use in Army feeding facilities;

1. AR 30-11, Food Service-Army Food Program, 2 May 1963

c. Developing criteria relative to operation of field messes;
d. Conducting liaison visits and field surveys of Zone of Interior installations and overseas commands to observe operations and render assistance on all matters pertaining to Army Food Program activities; and

e. Monitoring the subsistence and food service career fields. The Commanding General, US Continental Army Command is responsible for training to include approval of curricula, training aids, training doctrines, and policies. Zone of Interior US Army commanders are responsible for the training of food service personnel in the US Army Training Centers in accordance with the policies and inputs established by CG, USCONARC. Commanders at all echelons are responsible for:

(1) Utilizing the most fully qualified and trained personnel available in the command, and

(2) Operation of field messes.

Food service supervisors and mess personnel consisting of mess stewards, assistant mess stewards, cooks and cooks helpers are provided in accordance with authorizations contained in AR 310-32, Organization and Equipment Authorization Tables, Personnel, June 1964.

3. Food Service Equipment. Unit messes in the field operate with field mess equipment authorized by the unit TOE and with field expedients built from available materials whenever combat conditions permit.² The field equipment is portable, small, and compact in

2. TM 10-405, Army Mess Operation, September 1962, p. 61.

comparison to the permanent type equipment furnished for use in garrison type messes. In rear area (semipermanent) messes, the M1948 kitchen tent and the general purpose tent may be erected to shelter the food service equipment. In forward areas, a 2½ ton, 6x6 cargo truck may be converted into a kitchen truck, and a trailer also may be provided to increase the capability to transport equipment and supplies.

Irrespective of whether field mess operations are carried out in a semipermanent or mobile type situation, the major items of organizational food service equipment consist of gasoline field range outfits and a gasoline field range accessory outfit. Small groups of men detached from their organizational messing facilities can be provided with either the field cooking outfit or the field cookset (with 5500 BTU gas burner stove); the former item is capable of cooking food for from 6 to 30 men, the latter item has a cooking capability adequate for six men or less.³ Messing equipment which is issued to each individual consists of the mess kit, knife, fork, spoon, canteen and canteen cup.⁴

4. Subsistence.

a. Field Ration A. The basic Army field ration is the field ration A. It consist of approximately 200 items including fresh and, or fresh frozen fruits, vegetables, meats, and other articles which require refrigeration and cannot be stored over any considerable period.. Food-stuffs are issued in bulk to centralized unit messes in conformance with well balanced, varied menus. Field ration A is intended for use primarily in stable conditions and static phases of military operations

3. AR 310-34, Organization and Equipment Authorization Tables, Equipment, December 1963, p. 27.

4. TA 50-902, Clothing and Equipment, (Mobilization,) 3 April, 1963, pp. 10-12

when normal cooking and refrigeration facilities are available. The ration should be used in preference to other types of rations whenever it is available and circumstances permit.⁵

b. Standard B Rations. The standard B ration is the basic operational ration. It is composed of nonperishable foods and is designed as a substitute for the field ration A when refrigeration facilities are not available.⁶ Supplied in bulk, the B ration contains approximately 100 different components (mainly canned and dehydrated); well balanced, varied meals can be prepared in the form of a 15-day menu cycle having an average food value of approximately 4,400 calories per man per day.⁷ Bread, which is furnished separately from field bakeries, is the only perishable component of this ration; other fresh foods which become available can be incorporated into the ration either as supplements or substitutes. Like the field ration A, the standard B ration requires the use of trained food service personnel and conventional field food service equipment.

c. Other General Purpose Operational Rations. Various types of prepackaged operational rations containing precooked and prepared foods that may be eaten hot or cold are supplied when organized messing cannot be accomplished. These rations are designed for short intervals of use and are not intended for consumption over extended periods of time.

5. FM 10-60, Supply of Subsistence in a Theater of Operations, November 1960, p. 54.

6. Ibid, p. 54.

7. TB QM 52, Army Rations, Food Packets, and Supplements, 11 September 1962, p. 2.

(1) Ration, Small Detachment, 5 Persons. Where feeding in small groups is possible, the ration, small detachment, 5 persons, is employed. Such situations arise when radar station and weather station crews are located at isolated outposts and when tank crews, patrols, or similar small groups deploy beyond the range of their unit kitchens; it also may be used for a limited time for organizational feeding.⁸

The ration is packaged in a case which can be easily distributed and carried when transportation is limited. Each case contains one menu of foods sufficient for five men for one day together with certain comfort and welfare items like cigarettes, matches, and toilet articles. Five different menus are provided to avoid monotony. It is not suitable for issue to individuals (i.e., one man for five days) since most of its components are packaged in 5-man portions. The diet is nutritionally adequate, containing approximately 3,600 calories per ration.⁹

(2) Meal, Combat, Individual. The meal, combat, individual is utilized when troops must be subsisted on an individual basis. This situation arises during active combat engagements, amphibious landings, and other situations where group feeding is not practical. The meal which comes in a variety of menus, contains packaged and prepared foods which may be eaten hot or cold. Heating may be accomplished using field heating equipment, heating tablets or improvised methods. Each meal supplies

8. FM 10-60, Supply of Subsistence in a Theater of Operation, November 1960, p.55.

9. TB QM 52, Army Rations, Food Packets and Supplements, 11 September 1962, pp. 2 and 3.

one-third of the minimum nutrient daily intake required by Army regulations; necessary items (toilet paper, matches, cigarettes, etc.) are packaged with each meal. This meal is packaged so that either individual meals or multiples of three meals (a ration) may be issued as dictated by the tactical situation. The meal combat individual type of operational subsistence is intended for limited use only and not for extended periods as a substitute for the field ration A or standard B ration.¹¹

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d. Special Purpose Subsistence. In addition to the general purpose type of packaged operational rations described above, the current Army feeding system includes a number of other more specialized types of subsistence in the form of rations, and ration supplements, namely:

(1) Ration, Individual, Trail, Frigid. This ration is designed for use for a short period of time in extremely cold climates by individual members of small patrols or trail teams.

(2) Ration Supplement, Sundries pack. Comfort items such as toilet articles, tobacco, and confections are included in this pack for issue as a supplement to the B ration when normal post exchange facilities are not available.

(3) Ration Supplement, Aid Station. Selected beverages are contained in this supplement for use at forward aid stations in preparing hot, stimulating beverages for combat casualties.

10. Ibid, p. 4

11. FM 10-60, Supply of Subsistence in a Theater of Operation, November 1960, p. 58.

12. Ibid, pp. 58 and 60.

5. Dificiencies.

a. Rations. In reporting upon wartime problems in subsistence research and development, the Quartermaster Food and Container Institute has pointed out that "Largely because of small interest in such matters as ration planning between the two world wars, the food issued to soldiers during the second one was not always the best possible, and the principles and details constituting 'the best possible' had to be learned hurriedly, while the war was being fought."¹³ During this period little attention was given to developing special types of rations to augment the regular field ration. QMC Historical Studies No. 6 advances the following reasoning for this lack of development. "The shadow of the 'blitzkrieg'... had not yet appeared on the horizon that circumscribed military planning and for many years the conception of a relatively stable or slow moving front continued to dominate the minds of the planners. There was no attempt, therefore to balance the [operational type] ration or make it nutritionally complete because it was the general belief that the soldier in the field would in the future as in the past never have to subsist on it for more than a day or two at the most and that he would always have access to some part of the regular food supply"¹⁴. Consequently the packaged operational rations at the beginning of World War II were of the nature of reserve or emergency rations and were not intended for consumption over long periods of time. In this connection, it is significant to note the following excerpts from a document published by the Food and Container

¹³. Quartermaster Food and Container Institute, for the Armed Forces, Ration Development, Operation Studies Number One - Volume Twelve, June 1947, p. 2.

¹⁴. Thatcher, Harold W., The Development of Special Rations for the Army, QMC Historical Studies, No. 6, September 1944, p. 1.

Institute. "... even up to the end of 1943 the philosophy with regard to the military use of individually packaged rations was that the soldier would have to live on the ration for only from one to three days. Accordingly, the US Army [packaged, operational] rations were designed and produced on the basis of lightness, compactness, and simplicity of manufacture. As time went on, more and more reports showed that during military operations soldiers had to live on individual rations for long periods of time!"¹⁵ Extracts from typical reports are as follows:

"In the experience of the First Armored Division in North Africa, the [operational] ration, on which the division subsisted for many months, was inadequate Troops usually preferred the C rations to the K ration. C rations actually made men sick. Cold meals over a prolonged period produced gastritis, associated with nausea, vomiting and occasionally diarrhea. A ration, to be in fact a ration, must be eaten. Neither C or K rations could be generally consumed by troops beyond a very few days (estimates, 2-6 days). To be eaten the rations must be more attractive, appealing to the American taste...."¹⁶

"An observer from the Italian theater noted ... Losses of weight after 2 months on [operational rations] ranged from 20-40 pounds. Hot meals were rare in forward areas In areas behind the front lines where a rest or changes were looked for, the men were often given the same emergency rations which they were sick of."¹⁷

15. Johnson, Robert E. MD, and Kirk, Robert M. MRCP (London), Feeding Problems as Related to Environment, Harvard Fatigue Laboratory, Morgan Hall, Soldier's Field, Boston, Massachusetts, 30 June 1946, p. 5.

16. Armored Medical Research Laboratory Project No. 1, A Critique of Army Rations: Acceptability and Dietary Requirements, 10 April 1944, Appendix A, p. 2.

17. Ibid.

"Combat troops in the line are often forced to subsist on individual rations for extended periods of time, organizational messing being impossible or impractical because of terrain and the tactical situation."¹⁸

Whereas such reports clearly indicated the inadequacy of packaged operational rations for continuous feeding, no serious faults were found with respect to the field ration. Thus, it is evident that insofar as subsistence is concerned, the feeding system was mainly deficient in the area of packaged operational rations. When used over a long period of time, monotony occurred, certain components were thrown away which caused troops to consume a poorly balanced diet, and morale and physical efficiency was impaired.

b. Food Service Equipment. A considerable number of deficiencies were found in field food service equipment during World War II,¹⁹ the majority of which indicated a need for research and development in the area of product improvement. The most serious of these concerned the M-1937 field range with which multiple deficiencies were found indicating²⁰ a need for complete re-investigation of the military characteristics. The two principal faults generally expressed in connection with this range are that it presents a hazard of fire or explosion and it lacks sufficient durability thereby causing a spare parts and maintenance burden. A new field range was standardized in 1957 to replace this M-1937 field range.

¹⁸. Subsistence Research and Development Laboratory Interim Report, Combat Ration, Research and Development Branch, Military Planning Division, Office of the QM General, September 1945, p. 13.

¹⁹. Army Ground Forces - Army Service Forces, Report of Food Conference, Army War College, Washington, D. C., 1-30 April 1946, pp. 9-25 of Conference Recommendations.

²⁰. Ibid.

The M-1957 range represents a marked improvement over the M-1937 field range in weight, compactness, and repair parts requirements. Other than this new range, which is beginning to be issued, present field mess equipment consists of either similar or improved versions of the type equipment used during World War II.

c. Food Service Personnel. Preparation of savory, palatable meals from the components of the present bulk rations requires a high degree of experience and skill on the part of food service personnel. During time of peace this does not create any particular problem because the normal functioning of the food service program produces adequate numbers of well qualified food advisors, mess stewards and cooks. However, in a general war with rapid and large scale mobilization, the problem of training and supplying sufficient numbers of competent food service personnel becomes acute. According to the final report on Army Ground Forces and Army Service Forces Food Conference, World War II experience indicated that "... large numbers of improperly selected personnel were selected for training in Schools for Bakers and Cooks."²¹ Other factors which magnified the problem were assignment of large numbers of trained mess personnel to other types of duty and the short²² (two months) period allowed for training.

21. Army Ground Forces - Army Service Forces, Report of Food Conference, Army War College, Washington, D.C., 1-30 April, 1946, p. 4 of Report of the Selection and Training Committee.

22. Ibid.

ANNEX C

SUBSISTENCE SUPPLY

Section I

INTRODUCTION

1. The Supply System of the 1965-1970 Time Frame.

a. The Present System. Principles and policies for establishment of a supply system in a theater of operations are contained in current doctrine. Supply management, depots, general support, and much of the direct support are organized on a commodity basis by the technical services. At the direct support supply level, the Division Support Command of the ROAD divisions represents the first major step in designing supply organizations on a functionalized basis for support of the Army in the field.

b. The Future System. Approved concepts of the CO-STAR studies provide for the further functionalization of supply support within the field army during the 1965-1970 period. Under this organization, the rest of the direct and general support structure (with certain exceptions) will be functionalized. TASTA-70 studies already accomplished, or now in process, extend the functionalization of supply support to include the supply organizations of the communications zone. In the TASTA-70 concepts certain highly specialized supplies, e.g. ammunition and POL, may continue to be supplied through special channels; however, the general concept for a theater of operations foresees the functionalization of supply organizations at all echelons.

2. Subsistence Supply. The broad concepts of present and future supply systems establish the framework within which the supply of subsistence and related items must operate harmoniously. Current doctrine and procedures for the supply of subsistence in a theater of operations are contained in field manuals and technical manuals. Present subsistence supply procedures are based on experience of World War II and the Korean campaigns; the compatibility of these procedures within the overall supply system is a demonstrated fact. During the time frame of this study (1965-1970) functionalization of the supply system, already in existence at the division level, will be extended rearward through direct support, general support, depot, and supply management levels. The objective of this annex, therefore, is to examine subsistence supply as it may affect, or be affected by, changes in the supply system which are expected to occur during this time frame. Subsistence supply also will be influenced during the period by new food technologies, the state of the art, and the industrial/commercial base for procurement of military subsistence. These factors are discussed in Appendices 1, 2, and 3, of this annex.

Section II

SUPPLY CONCEPTS - TASTA 70

3. General. The TASTA-70 studies visualize that changes in the supply system for a theater of operations will develop along the following lines:

a. Current procedures where improvement is expected to be made include the use of automated inventory control centers that also perform stock control functions, and the employment of depots that perform storage functions as a "bonded warehouse."¹ The primary improvement will be speed in administrative reaction to customer demands combined with closer relationship between materiel releases for shipment and the movement means. Progress is anticipated in automated techniques to assist in requirements determination. "The supply concept is dependent upon automated centers at the theater level and the field army level."² Techniques and procedures currently being examined from which benefits may accrue include "scheduled supply" and "unitization of supplies."³

b. TASTA-70 supply support concepts are a logical extension of the CO-STAR studies.⁴ The functionalized general support supply elements in CO-STAR actually originated in the first outline drafts of TASTA-70. In addition to the Field Army Support Command (FASCOM) inventory

1. Ltr, US Army Combat Development Command Quartermaster Agency, CDCQMA-C, 8 Sep 1964, subject: "Supply and Maintenance Command - Study Plan."

2. Ibid.

3. Ibid.

4. US Army Combat Developments Command Combat Service Support Group, "Conceptual Framework, TASTA-70", 31 July 1963, p. 1b.

control center (ICC) of CO-STAR, stock control centers are provided in each support brigade. This organization further extends the principle of centralizing controls into computer supported systems with the general support supply operating units becoming "bonded storage points" - receiving and shipping upon instructions from the stock control center.⁵

c. In the communications zone, the supply concepts of TASTA-70 represent a major realignment from current concepts. Direct support is provided by the same type of organizations used in the field army. The direct support supply function is exercised by area support commands. The general support function in the communications zone will be performed by field depots. Direct support supply requirements are received in the Theater Army Support Command (TASCOM) inventory control center where materiel releases are issued to field depots.⁶

d. The theater of operations supply mission is performed by the Supply and Maintenance Command. All operating elements necessary for performing the mission are assigned to the S&M command. These include the theater inventory control center to receive requirements from armies and other consumers, control inventories, and submit requirements to CONUS; a subordinate petroleum organization to operate pipelines and tank farms; and a field depot system to receive, store, and ship other supplies.⁷

5. Ltr., USACDCQMA, 8 Sep 1964, op. cit.

6. Ibid.

7. US Army Combat Developments Command Quartermaster Agency, Study (First Draft) "Supply and Maintenance Command TASCOM" (TASTA-70), 15 Nov 63.

4. Fundamentals. See Figures 1 and 2. A summary of the TASTA-70 supply system includes the following list of fundamentals which assist in a visualization of the system:

- a. Automated systems for stock control and supply management are established at support brigade, field army, and theater level.
- b. Supply control activities and movement control activities are automated so that actions can be coordinated at all levels.
- c. Direct support supply elements provide a single source for supplies except medical, ammunition, repair parts, and cryptographic supplies.
- d. Direct support supply elements are the same for all non-divisional elements - field army or COMMZ.
- e. General support supply units may be employed in a general support role in the field army or in a field depot of COMMZ.
- f. The system will accept advances that may develop in automation, unitization, supply scheduling, and throughput of supplies.

8. Ltr, UEACDCQMA, 8 Sep 1964, op. cit.

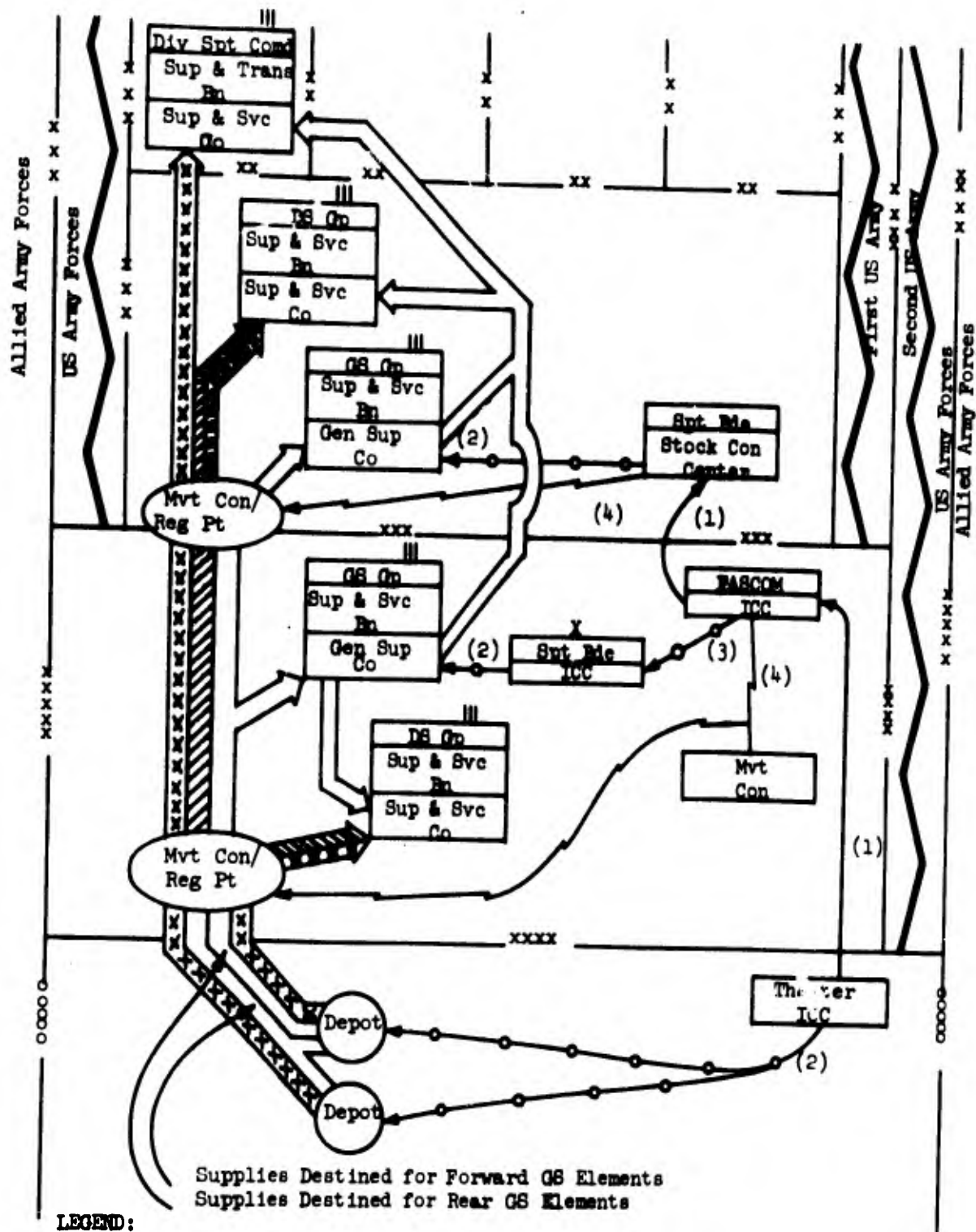


FIGURE 1

DISTRIBUTION OF SUBSISTENCE (TASTA-70)

NOTE: Information shown was developed for UEACDCOMA study, "Updating of Class I Feeder Study to CCIS-70."

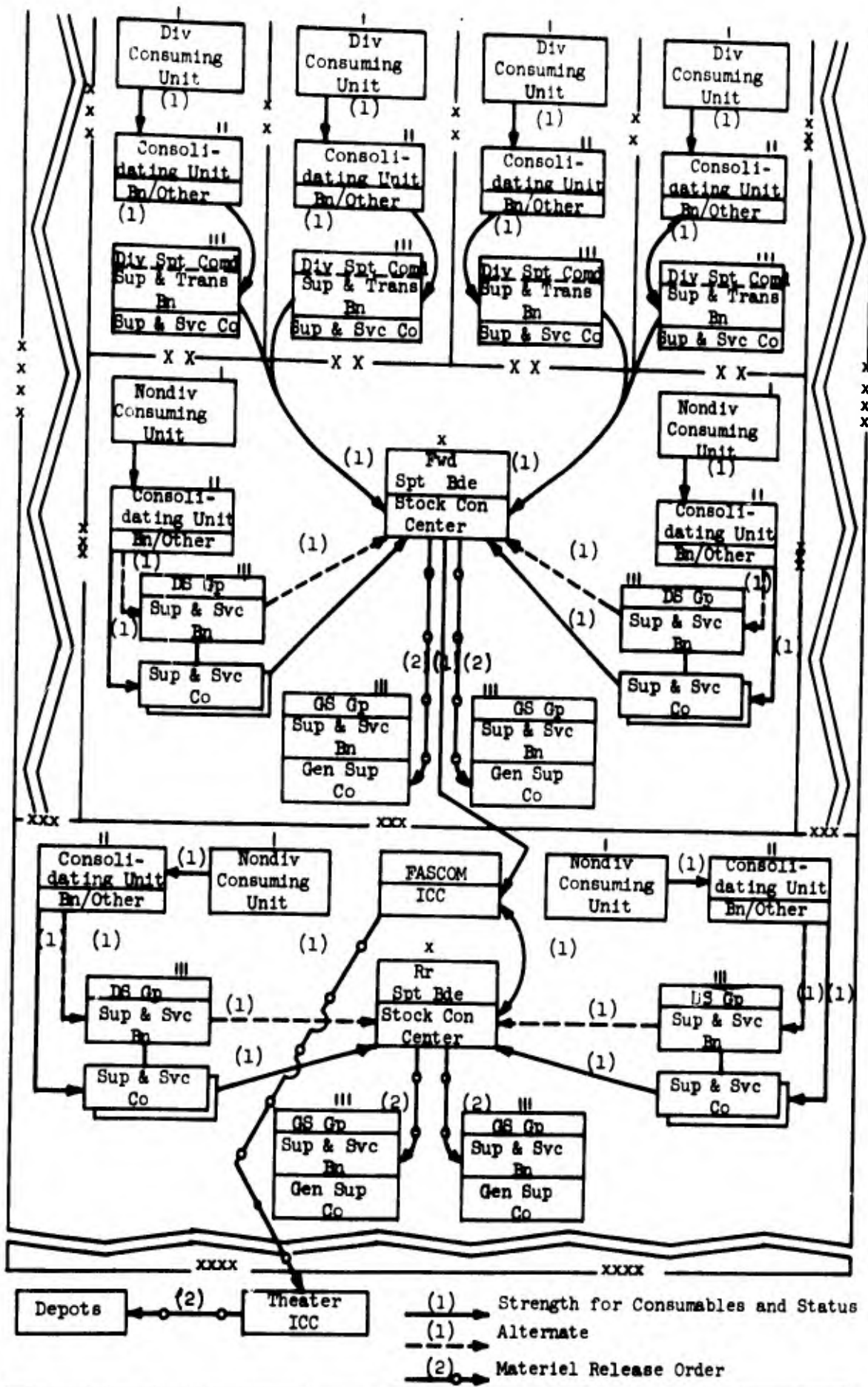


FIGURE 2

Strength and Status Reporting Channels for Subsistence (TASTA-70)

NOTE: Information shown was developed for USACDCQMA study, "Updating of Class I Feeder Study to CCIS-70."

Section III

DEVELOPMENTS IN SUBSISTENCE SUPPLY

5. **Compatibility of Subsistence Supply.** The compatibility of subsistence supply within the framework of TASTA-70 supply concepts is perhaps best illustrated in current doctrine for subsistence supply in a theater of operations:

"Current concepts look toward maximum exploitation of automatic and electronic data transmitting and processing facilities by which Class I requirements may be submitted and responsive action taken. The procedure outlined herein has been designed primarily for use in the combat zone and provides for rapid transition to a completely automatic data processing system, whenever possible. It is presented for guidance only and can be modified when equipment, facilities, and other considerations permit establishment of centralized stock and/or inventory control agencies."⁹

While current doctrine, in effect, provides a "line of departure" for this study, the TASTA-70 studies generally provide the "objectives." The extract from current doctrine, cited above, serves to demonstrate the inherent capability of present subsistence supply procedures to accept advances in technology and organization. Such advances which appear most likely to affect the supply of subsistence during this time period are discussed in the following paragraphs.

a. Unitization of Supplies.

(1) Greatest economy in the movement and storage of supplies is achieved when equipment available handles the largest loads practicable.

⁹ FM 10-60, Supply of Subsistence in a Theater of Operations, November 1960, p. 45

It is common practice to combine similar subsistence items on pallets to form unit loads throughout the entire storage operation. TASTA-70 concepts look toward additional application of the "unitized load" concept. Currently a study project is underway at the US Army Logistics Management Center to determine and recommend unitization actions for supply items (Project SUNSPOT). TASTA-70 studies envision a "container system" to eliminate handling of loose cargo. The development of supply units for TASTA-70 will be based upon the extent to which "containerization" is deemed feasible. Feasibility, in turn, will depend upon a determination of the "point" in the distribution system when containers must be opened or bands on pallet loads must be cut, considering the peculiarities of each group of supplies.¹⁰ For subsistence supply consisting of operational rations, it seems appropriate to suggest that unitized loads may be designed for distribution down to the DS level before further breakdown is necessary.

(2) Unitization of subsistence supplies may be further combined with other "consumables." Subsistence has been the classic example of supplies consumed at a uniform daily rate under all conditions; however, ration strength can be the "triggering device" for several types of consumables. The daily and uniform aspects of subsistence supply provide the contact and distributory means for many other items. A recent study has suggested that office supplies, cleaning supplies, and toiletries, now consisting of some 600 line items could be combined in 60 (or less) unitized packs during combat operations.¹¹

¹⁰ US Army Combat Developments Command Quartermaster Agency, staff paper, Subject: "Philosophy - Principles of Supply" (TASTA-70), undated.

¹¹ US Army Combat Developments Command Quartermaster Agency, Study, Consumables Feeder Study to CCIS-70 for TASTA-70 Field Army, 31 March 1964.

(3) The subsisting system proposed in Annex B is designed so that the field army can be supported with a minimum number of unitized types of subsistence and related supply items. In Table C-1 the approximate number of line items that would be needed is comparatively shown, using the unitized types of subsistence and related supply items visualized for the future versus their closest, present day counterparts. It will be seen that total use of the unitization principle will sharply reduce the number of line items in the subsistence supply system with the resultant effect of simplifying storage and distribution operations, stock control and accounting procedures, and manpower requirements.

b. Scheduled Supply. The TASTA-70 conceptual framework study advocates the use of scheduled supply in general terms. A computer assisted project has been undertaken by the Combat Operations Research Group at Headquarters, US Army Combat Developments Command Combat Service Support Group to develop and determine feasibility of applying scheduled supply techniques. The extent to which "scheduled supply" may be developed during the 1965-1970 period is not predicable at this time; however, subsistence and other consumable supplies, issued on the basis of unit personnel strength are the types of supplies most susceptible to scheduling.

c. Throughput of Supplies. The procedure of moving supplies from the supplier directly to the consumer, bypassing intermediate installations, is a well-established principle of supply distribution. It is anticipated that efforts will be made to improve the application of this principle. Traditional problems of the supply officer have been

TABLE C-1

LINE ITEMS OF SUBSISTENCE FOR THE FIELD ARMY

Types of Subsistence	Number of Line Items
Present Types	
Ration, Operational, B Ration, Small Detachment, 5 Persons Meal, Combat, Individual Ration Supplement, Sundries Pack Ration Supplement, Aid Station Packet, Subsistence, Long Range Patrol <div style="text-align: right;">TOTAL</div>	100 (approx) 5 1 1 1 1 <hr style="width: 10%; margin-left: auto; margin-right: 0;"/> 109
Future Types	
The Large Group Meal Breakfasts Interchangeable Dinner-Suppers The Small Group Meal Breakfasts Interchangeable Dinner-Suppers The Individual Meal Meal Supplement, Sundries Pack Ration Supplement, Aid Station Food Packet, Individual Combat (Interim M-Packet) <div style="text-align: right;">TOTAL</div>	30 (10) (20) 30 (10) (20) 1 1 1 1 <hr style="width: 10%; margin-left: auto; margin-right: 0;"/> 64
Difference Percent Difference	45 41%

to know "what he has" and "where it is;" similarly, problems of the movements officer have involved knowing "what his capabilities are" and "where the capabilities are located." Automated systems and improved communications can assist in overcoming these traditional problems. These developments may permit the supply officer and the movements officer to make decisions while supplies are moving and continue their movement to the point of intended use.¹²

d. CCIS-70. . The rapid communications visualized with CCIS-70 is another service that will improve the response by the supplier. CCIS-70 is not to be a subordinate element of the supply system. It is to provide a service to logistics operators.

TASTA-70 studies currently in process will determine where the supply system can use automatic data service support in improving the supply system.¹³ Channels for distribution of subsistence and for strength and status reporting, as visualized in TASTA-70 studies, are illustrated in Figures 1 and 2.

6. Subsistence Supply Characteristics. Current operational rations and the development of new and better counterparts are discussed in the appendices to this annex. The accepted practice of developing operational subsistence to satisfy the requirements for large group, small group, and individual situations is expected to continue. While

12. Staff Paper, "Philosophy - Principles of Supply," op. cit.

13. Ibid.

the aim is to develop meals which will be interchangeable relative to nutritional sufficiency, subsistence for small groups can be designed to provide greater variety than individual subsistence. Likewise, meals for the large group can have a similar advantage over subsistence for the small group. These factors, combined with anticipated field subsisting situations, discussed in Annex A, proclaim the wisdom of continued development of operational subsistence on the present basis, i.e., large group, small group, and individual.

a. Unit of Issue.

(1) Individual and Small Groups. The unit of issue for subsistence traditionally has been the ration - "food for one man for one day." A significant change occurred recently when the individual operational "ration" was packaged to permit issue on a meal basis. "The 'meal' as a standard unit of issue has long been coming into its rightful recognition."¹⁴ By packaging individual operational rations for issue as meal units, more accurate issue of subsistence is possible. The problem of having to issue an individual a full ration (3 meals) when only one or two meals are required is eliminated. Packaging and issue by meal units is both practical and economical. These same advantages accrue in packaging subsistence for small groups. It should be noted that subsistence for small groups discussed in Appendix 2 (State of the Art) and in Annex B, is projected for issue on a "meal" basis rather than a "ration" basis.

(2) Large Group. The advantages of the "meal" as the unit of issue are not limited to individual or small group subsistence.

14. "Consumable Feeder Study to CCIS-70 for TASTA-70 Field Army," op. cit.

Many additional advantages may be gained by packaging subsistence for large groups on a meal basis. The problem of providing balanced rations plagued supply officers during World War II. In the European Theater, fluid operational conditions during August and September 1944 had caused extensive use of individual and small group rations (C's, K's and 10 in 1's) and depleted theater stocks.

"The large - scale swing to bulk rations highlighted a problem in distribution with which the theater had already had some experience. Delivering a balanced B ration, which consisted of approximately 110 separate components, called for careful handling along the entire supply line from New York Port to the using unit. Experience in July had already revealed how the loss of one or more components could disrupt the balance and create difficulties for cooks trying to follow published menus. *** At one point early in October an embargo actually had to be placed on deliveries out of Le Havre so that quartermaster units in Channel Base Section could sort ration components. By that time stocks had become so unbalanced and dispersed that it proved necessary to set up intermediate collecting points in Paris and Sommesous, where rations could be sorted and balanced loads again made up for delivery to the Armies. *** For some time, however, the imbalance of subsistence stocks often threatened to present the Quartermaster Corps with the paradox of scarcity in the midst of plenty - that is, of having ample Class I supplies but few rations."¹⁵

15. Office of the Chief of Military History, Department of the Army, US Army in World War II, European Theater of Operations, Logistical Support of the Armies, 1959, Vol II, p. 190.

Earlier in the war, the problem of maintaining and issuing balanced bulk rations was relatively even more severe. In commenting on a famous daily train which arrived at the Class I railhead near Beja and that was scheduled to have rations for 50,000 men - "it had sixteen carloads of peanut-butter and one carload of crackers. This together with a case of grapefruit juice and a sack of flour equalled rations for 50,000

men." In discussing the application of packaged needs for subsistence of large groups, a recent study stated:

"The last frontier to be broken in packaging 'meals' for issue is the supply of large groups fed from central messes. Peacetime/garrison methods require units to project requirements by meal - then authorizations are calculated by meal and subsistence items issued accordingly. To follow this same procedure during military operations by a field army, considerable manpower is expended at each breakdown echelon to break packages, repackage and distribute. With adverse weather conditions and enemy action always a threat or a fact, the breakdown of ration components becomes more aggravated and manpower consuming. To offset these problems, there have been highly successful tests in unitizing the current B ration into 25-man meal modules. These tests resulted in an estimated 50 to 75 percent savings in handling time and paperwork from the depot through the division distributing point. Favorable comments were received on improved mobility - some comments rated the ration superior to the 'A' ration for preparation time and ease of handling and serving - and some participants rated the modularized meals as tactically superior to both 'A' and 'C' rations. It must be kept in mind that all these favorable indications resulted from taking 'off-the-shelf' 'B' ration components and assembling them into 25-man meal modules - an improvised packaging. The real objective is the meal, uncooked, 25-man, listed in Annex B. It is believed that the improvised modularization of 'B' rations would be installed immediately in the event of hostilities in the near future and would be replaced by the meal, uncooked, 25-man, as it became available."¹⁷

b. Meal Modules.

(1) Large Group. The 25-man meal module for large group subsistence is a CDOG objective of relatively long standing.¹⁸ While in previous practice, large group type subsistence has been issued on the

16. McNamara, A. T., Lt General, Quartermaster Review, July-August 1956, Quartermaster Activities of II Corps thru Algeria, Tunisia, and Sicily and First Army thru Europe, 4th of 9 parts.

17. Consumable Feeder Study to CCIS-70 for TASTA-70 Field Army, op. cit.

18. Dept of the Army, Combat Development Objectives Guide (U), para 1439(14).

bulk ration basis, a number of tests have been conducted using the 25-man meal module. One of the most comprehensive tests was conducted during the fall of 1962 with Seventh US Army troops. This test which utilized B-ration components assembled into 25-man meal modules, demonstrated the efficiency and economy of this modular size. The efficiency characteristics were evident in field supply operations. It was the consensus of all supply personnel involved that the 25-man meal module logistically was superior to the bulk B ration in terms of ease of handling, loading,¹⁹ and truck to truck transfer. The savings in time and paperwork are indicated in paragraph a(2), above, and were computed from these same tests. In issuing subsistence packaged in multiple meal modules, some over-issue is mandatory where the troop strength is not exactly divisible by the multiple. The economy of the 25-man module was demonstrated by the tests in Seventh US Army. In these tests, the over-issue was reported to be approximately 3% or only 298 meals out of 10,475²⁰ meals issued. These data support continued usage of the 25-man meal module for packaging large group subsistence.

(2) Small Group. Like the requirements for large group operational subsistence, modular size for small group operational subsistence also has been stated in the CDOG for ~~some~~ time. For small group subsistence, however, two module sizes are designated, viz., 6-²¹ man and 25-man modules. The need for both of these modules repeatedly

19. Trip Summary, Report of Findings, STEFA-FC, J. Brugh, Quartermaster Research and Engineering Field Evaluation Agency, 11 Jan 1963, p. 10.

20. Ibid

21. Department of the Army, Combat Development Objectives Guide (U), para 1439f(15).

has been subject to question by various Department of the Army commands and agencies. Investigation of requirements during the course of this study reveals that only the smaller, 6-man module is essential. Four 6-man modules overpacked in one unit will contain 24 meals and will eliminate the need for the 25-man module. The inclusion of one large (24-meal size) preparation container in each 6-man module will provide a capability for reconstituting main menu components in one 24-man increment as well as in four 6-man increments. Of these two modular capabilities thus provided, the basic 6-man unit is expected to be in demand much more frequently. This determination of the modular size required for small group meals is in consonance with stated positions of major users of operational subsistence. ^{22 & 23} Elimination of a special 25-man meal module for small group subsistence will reduce by one-half the number of line items involved in supply operations. Since 10 breakfast and 20 interchangeable dinner/supper menus have been projected for each size module, this reduction amounts to 30 line items. From the procurement standpoint, the acceptance of one meal module size for small group subsistence may have an even more important impact. Establishment of automated assembly and packaging facilities for Quick-serve type meal components requires resolution regarding module sizes.

22. Ltr, US Army Combat Developments Command Infantry Agency, CAGIN-DO, 29 Sep 1964, subject: "CD Study Directive: Subsistence and Food Service for the Army in the Field."

23. 1st Indorsement, US Army Combat Developments Command Armor Agency, CAGAR-P (23 Jul 64), 6 Aug 1964, to Ltr, US Army Combat Developments Command Quartermaster Agency, CDCQMA-M, 23 July 1964, subject: "Draft Proposed Qualitative Materiel Development Objective (QMDO) For Military Operational Subsistence."

Acceptance of the single (6-man) size module will resolve capacity questions and associated technical/mechanical problems. A firm basis for implementing actions thereby will be established.

(3) Individual. Action already has been taken to package the Meal, Combat, Individual, so that it may be issued either on a "meal" or a "ration" basis. The intended replacement for this meal, the Meal, Ready-to-Eat, Individual, will possess the same modular characteristics. This type of modular packaging for individual meals is considered most appropriate for the Army field food system during the 1965-1970 time period.

c. Types of Operational Subsistence. Comparative data concerning the weight and volume of current and proposed types of operational subsistence is shown in Table C-2.

7. Supply Levels and Locations. The term "levels of supply" indicates those quantities of supplies authorized or directed to be stocked at various echelons and/or locations in anticipation of demands. Subsistence supply levels are expressed in "days of supply" which must be converted to units of quantity. TASTA-70 studies anticipate a 45-day supply level for a theater of operations which, for illustrative purposes, could be comprised of 35 days in the communications zone and 10 days in the field army area.²⁴ Within the field army, general support supply units

24. Ltr, HQ US Army Combat Developments Command Combat Service Support Group, CSSG-GZ, subject: "The Administrative Support, Theater Army, 1965-1970 (TASTA-70)," 7 July 1964. (Rescinded)

TABLE C-2

TYPES OF SUBSISTENCE - WEIGHT AND VOLUME DATA

PRESENT ^a	WEIGHT PER RATION (LBS)	CU FT PER RATION
Ration, Operational, B	6.00	.165 ^b
Ration, Small Detachment, 5 Persons	5.80	.220
Ration, Combat Individual	4.80	.212
PROPOSED ^{c&d}		
Meal, Uncooked, 25-man	2.34	.093
Meal, Quick-Serve, 6-man	4.59	.270
Meal, Ready-to-Eat, Individual (Estimate)	3.00	.212 ^e

a. With one exception, data on present rations was extracted from paragraph 5.3, Part I, FM 101-10.

b. Cube shown is for B ration packed in 25-man modules and is based on data contained in QM Field Evaluation Agency's Engineering Test of Ration, Hardcore (Technical Report T-129/58049F) October 1959. Cube for bulk B ration is .120 (FM 101-10).

c. Source: Operational Rations Current and Future, Research and Development Associates, Food and Container Institute, Inc., Chicago 9, Illinois, March 1963.

d. Although proposed meals are being designed on a meal basis rather than a ration basis, weights and cubes of proposed meals have been multiplied by 3 to provide for easier comparison.

e. Since no data is available concerning the cube of proposed Meal, Ready-to-Eat, Individual, the data for the current Meal, Combat, Individual is indicated. This is considered conservative since some reductions due to new and improved types of packaging and packing materials can be anticipated.

supporting the Corps will stock 3 days of Class I supplies. General support supply units in the army service area will maintain an additional 4 to 5 day reserve for their portion of the field army. Direct support supply units will carry 1 to 2 days supply for units supported.²⁵ In addition to subsistence stocked in depots, general support, and direct support elements of the supply system, all units will carry a basic load of subsistence as authorized or directed.

8. Subsistence Requirements. In evaluating the system for subsisting discussed in Annex B with respect to compatibility with concepts of the future supply system, an analysis of subsistence requirements is needed.

a. Daily Requirements. On the basis of a proposed type field army, daily requirements would be approximately as shown in Tables C-3 and C-4.

b. Subsistence Stockage. By combining the daily subsistence requirements for a type field army, illustrated in Tables C-3 and C-4, with stockage levels proposed in TASTA-70 studies, subsistence stocks at various echelons are illustrated in Table C-5. The number of containers required for the various amounts of stockage is illustrated in Table C-6. The effect proposed meals will have in reducing the number and weight of containers and, consequently, the weight of daily subsistence supplies for the field army is shown in Table C-7. Possible cube reductions in subsistence for a type field army are shown in Table C-8.

25. US Army Combat Developments Command Quartermaster Agency, Study, Initial Draft of Expanded Conceptual Framework, TASTA-70, 15 Nov 1963.

TABLE C-3

	Individual Meals	Small Group Meals	Large Group Meals
Zones I, II, & III (Combat Brigade Areas)	80,916	146,555	188,891
Zone IV (Remainder of Field Army Area)	78,715	161,962	637,620
TOTAL	159,631	308,517	826,511

NOTES:

a. These data are based on a field army strength of 431,553 contained in Reference Book 101-1, "Type Organizational Data for the Army in the Field," US Army Command and General Staff College, included in letter, USACDC Infantry Agency, CAGIN-DO, 15 August 1964, subject: "CD Study Directive: Subsistence and Food Service for the Army in the Field."

b. The daily requirement in percentages represented by the above data would be 12.3% individual meals, 23.8% small group meals, and 63.8% large group meals.

TABLE C-4

DAILY SUBSISTENCE REQUIREMENTS OF A TYPE FIELD ARMY^a

Area & Activity (See Annex A)	Types of Subsistence Required Per Day (Percent of FA Daily Subsistence)			Number of Troops To Be Fed 3 Meals Per Day	Number of Meals Required Per Day By Type		
	Individual	Small Group ^c	Large Group		Individual	Small Group	Large Group
Combat Brigade Areas (Zones I, II, & III)	6.25 ^b (19%)	11.32 (35%)	14.59 (46%)	138,787	80,916	146,555	188,891
Remainder of Field Army Area (Zone IV)	6.08 (9%)	12.51 (18%)	49.25 (73%)	292,766	78,715	161,962	637,620
	12.33	23.83	63.84	431,553	159,631	308,517	826,511

a. Based upon data developed by US Army Combat Developments Command Infantry Agency and included in letter, CAGIN-DO, 15 August 1964, subject: "CD Study Directive: Subsistence and Food Service for the Army in the Field."

b. Figures in parenthesis indicate percentage of subsistence by type in the two major areas, e.g., individual meals consumed in combat brigade areas (zones I, II, & III) will average about 19%.

c. Small group meals and percentages indicate figures which are probably maximum for operational subsistence designed to feed the small group; these figures will be subject to reduction as operational conditions permit distribution of meals to dispersed small groups from centralized mess facilities.

d. Total meals per day for the field army are (431,553 x 3 meals per day) 1,294,659.

NOTE: Additional daily requirements now shown in the table are:

- (1) Approximately 4,300 containers with one 100-man ration supplement sundries pack per container.
- (2) Ingredients for baking fresh bread.

TABLE C-5

SUPPLY LEVELS - DISTRIBUTION IN THE FIELD ARMY^a

		GENERAL SUPPORT UNITS			DIRECT SUPPORT UNITS		TOTAL
		1 ^b	2 ^b	3 ^c	4	5 ^d	
GS Units - Army Svc Area (5 Days' Supply - All Troops)		GS Units Army Svc Area (3 Days' Supply - Local Troops)	GS Units - Corps Spt Bdes (3 Days' Supply - All Troops)	DS Units - Army Svc Area (2 Days' Supply - Local Troops)	DS Units - Corps & Division (2 Days' Supply - All Troops)		Field Army (10 Days' Supply)
Individual Meals	798,155	76,623	402,273	51,089	268,215		1,596,355
Small Group Meals	1,542,585	148,089	777,465	98,725	518,310		3,085,174
Large Group Meals	4,132,555	396,726	2,082,758	264,484	1,388,538		8,265,061
Total	6,473,295	621,438	3,262,496	414,298	2,175,063		12,946,590

a. Based on a strength of 431,553 x 3 meals per day x 10 days' supply = 12,946,590 meals.

b. Total stockage of GS units in the Field Army Service Area may be computed by adding columns 1 and 2.

c. For computing data in columns 2, 3, 4, and 5, it is estimated that 28% of the total field army personnel strength will be located in each Corps and 16% in the Field Army Service Area. (28% x 3 (Corps) + 16% = 100%).

d. Column 5 indicates number of meals carried by direct support supply units supporting nondivisional troops and by division support commands.

TABLE C-6

SUPPLY LEVELS - NUMBER OF CONTAINERS^a

		GENERAL SUPPORT UNITS			DIRECT SUPPORT UNITS		TOTAL
		1	2	3	4	5	
GS Units - Army Svc Area - 5 Days' Supply - All Troops	66,513	GS Units - Army Svc Area - 3 Days' Supply - Local Troops	6,386	GS Units - Corps Spt Bdes - 3 Days' Supply - All Troops	DS Units - Army Area - 2 Days' Supply - Local Troops	DS Units - Corps & Division - 2 Days' Supply - All Troops	Field Army - 10 Days' Supply
Individual Meals	66,513	6,386	33,523	4,258	22,352	133,032	
Small Group Meals	64,275	6,171	32,395	4,114	21,597	128,552	
Large Group Meals	165,303	15,869	83,311	10,580	55,542	330,605	
Total	296,091	28,426	149,229	18,952	99,491	592,189	

a. For purposes of illustration, the following container sizes were used: Individual - 12 meals; Small Group - 24 meals; Large Group - 25 meals.

b. This table is based on data developed in Table C-5.

TABLE C-7

POSSIBLE DAILY TONNAGE REDUCTIONS IN A TYPE FIELD ARMY

Types of Subsistence	Number of Meals Per Shipping Container	Number of Meals Required Daily	Number of Shipping Containers (Daily)	Gross Weight Per Shipping Container	Gross Weight of Subsistence	
					Pounds	Tons
Current Types						
Ration, Combat Individual -	12	159,631	13,303	25 lbs	332,575	166.3
Ration, Small Detachment, 5 Persons	15	308,517	20,568	31 lbs	637,608	318.8
Ration, Operational, "B"	25	826,511	33,061	50 lbs	1,653,050	826.5
Total					2,623,233	1,311.6
Proposed Types						
Meal, Ready-to-Eat, Individual	12	159,631	13,303	13 lbs (est)	172,939	86.5
Meal, Quick-Serve, 6-Man	24	308,517	12,855	41.5 lbs	533,483	266.7
Meal, Uncooked, 25-Man	25	826,511	33,061	20 lbs (approx)	661,220	330.6
Total					1,367,642	683.8
Possible Daily Weight Reductions					1,255,591	627.8 or 47.9%

TABLE C-8

POSSIBLE CUBE REDUCTIONS IN A TYPE FIELD ARMY
(CUBIC FEET - DAILY)^a

TYPE MEALS (DAILY)	PRESENT	PROPOSED
Large Group (826,511)	Unitized B-Ration 45,458 cu. ft.	Meal, Uncooked, 25-Man 25,622 cu. ft.
Small Group ^{b & c} (308,517)	Ration, Small Det, 5 Persons 22,522 cu. ft.	Meal, Quick-Serve, 6-Man 27,767 cu. ft.
Individual (159,631)	Meal, Combat, Individ. 11,334 cu. ft.	Meal, Ready-to-Eat, Individ. 11,334 cu. ft. (Estimated)
Total	79,314 cu. ft.	64,723 cu. ft.
Reduction	-----	14,591 cu. ft.
Percent Reduction	-----	18%

a. Computations are based on application of data shown in Table C-2 to average number of various types of meals supplied daily.

b. Data for small group is based only on types of meals shown. In practice, where a substantial percentage of these meals are prepared by a unit mess and transported to small groups in lieu of furnishing small group-type operational subsistence, cube reductions will be even larger. (Per meal cube of proposed large group subsistence is .031 compared to .090 for proposed small group subsistence.)

c. Per man/meal cube for Meal, Quick-Serve, 6-Man is larger than meals of Ration, Small Detachment, 5 Persons primarily because disposable messing utensils are included.

c. Industrial/Commercial Capabilities. Appendix 3 contains information on the capabilities of the national industrial/commercial base to provide military operational subsistence. For most types of subsistence; little doubt exists concerning the capability of the national base to provide the items and quantities needed for any emergency condition. For some of the new types of proposed subsistence, however, questions exist concerning industrial/commercial capabilities.

(1) Both the Meal, Uncooked, 25-man and the Meal, Quick-Serve, 6-man require freeze - dehydrated components. Freeze-dehydration is a new and expanding industry. Comprehensive studies have been conducted to predict the probable growth rate of this industry and its probable output by 1970. Recent projections place the annual output at about 120/150 million pounds of processed food products by that time. This capability appears to be insufficient to support large scale mobilization requirements. For example, Table C-7 indicates that large group and small group subsistence for a field army (using the Meal, Uncooked, 25-man and the Meal, Quick-Serve, 6-man) would amount to 1,135,028 meals daily. Each meal is estimated to contain an average of 0.11 pounds of freeze dried component before rehydration. Application of this factor to the daily meals for a field army produces an annual requirement in excess of 45 million pounds. It will be seen that this requirement for one field army could exceed one-third of the total, projected industrial capability in 1970.

26. US Army Natick Laboratories, Study, Industrial Capabilities for Production of Quick-Serve Meals, undated, Annex C. (Note: This 1962 study applied the factor of 0.11 lbs only to freeze dried components in Quick-Serve meals. Computations indicated above are based on the further assumption that this factor also may be applied, conservatively, to Meal, Uncooked, 25-man.)

(2) Another problem area in connection with the availability of freeze-dehydrated foods concerns the capability of the industry to produce sufficient amounts of "cooked" items.²⁷ At present, and as projected into the future, the freeze-drying industry is expected to be concentrated primarily on producing commercially acceptable "uncooked" products. Army operational subsistence for small groups, however, i.e., the Meal, Quick-Serve, 6-man, is based on pre-cooked foods. Unless an unforeseen demand develops for pre-cooked, freeze dehydrated food items for commercial markets, the availability of this type of freeze-dried food will be almost entirely dependent upon military procurement.

(3) Only semi-automatic facilities presently exist for the packaging of Quick-Serve meals. This limitation does not necessarily restrict production capabilities since increased demands could be met by adding more assembly lines and manpower; however, such action would result in higher costs than when fully automatic lines can be employed. The multi-purpose package used in Quick-Serve meals must provide military characteristics which make it a package for conveyance,²⁸ a vessel for reconstitution, and a container for dispersing food. At present, there is no commercial counterpart. The effect of critical military requirements "when applied to a flexible package of the style²⁹ needed, is such as to tend to dispel normal commercial interest."

²⁷. Letter, Headquarters, Defense Supply Agency, DSAH-N, 2 September 1964, subject: "Conference Minutes" with inclosure, Conference, US Army Combat Developments Study, "Subsistence and Food Service for the Army in the Field; (USACDCQMA Project 65-7) held at Hqs DSA, 24 August 1964."

²⁸. Study, Industrial Capabilities for Production of Quick-Serve Meals, op. cit., Annex A, p. 3.

²⁹. Ibid.

Technological advances have been made in packaging equipment permitting increases in production rates from about 60 packages per minute to as high as 300 per minute. Packaging materials also are considered to be available in sufficient quantities. Due to the unique nature of military packaging requirements, however, "immediate interest in the multipurpose packages is being given impetus solely by the military."³⁰

(4) The availability of freeze-dehydrated food in sufficient quantities, the availability of the right types of freeze-dehydrated products (i.e, both precooked and uncooked), and the availability of adequate packaging and assembly facilities are all critical to the acceptance of new, proposed meals as standard items. As indicated in Appendix 2 (State of the Art) and in the above paragraphs, industrial/commercial interests and military requirements are frequently dissimilar. The development of an adequate industrial/commercial base in this field may require stimulation of the industry by extensive and continuing government procurements. This idea is not new. On this subject, the Deputy Assistant Secretary of Defense (ISA) noted in a recent memorandum:

"I believe the Army estimates that the freeze drying industry, without stimulation by the Defense Department, will grow until, by the early 70s it will be able to provide complete supplies for a 14-division Army in the field. This forecast tacitly, and I believe, correctly assumes that there will be widespread acceptance of this food processing technique when it is marketed. At the present time it is being used commercially for certain high cost items, such as shrimp. It is equally

30. Ibid.

true that the benefits of such food processing will slowly but surely be perceived by the DoD so that seven or eight years hence we will be utilizing this technique on a large scale, the question arises as to why we should not consider accelerating the process if very real benefits are to be gained. It is my understanding that by ordering \$10-\$15 million worth of food within the next year, which would otherwise cost probably \$3-\$4 million, we might well accelerate this process by quite a few years. I realize that Service tastes are a significant and important factor in making such judgments, but I believe that if these foods were made available -- if only on an experimental basis -- the demand would rise rapidly and the consequent economic benefits (low weight shipping, ease of storage, and reduction of waste) could be achieved earlier.

RECOMMENDATION: I suggest that the Comptroller's office and I&L take a look at these possibilities to determine whether the superficial attractiveness of these processes is, in fact, valid after close examination. I suggest that the Defense Supply Agency similarly investigate possible benefits and disadvantages from the Service point of view regarding possible large scale procurement of such foods.³¹"

31. Deputy Assistant Secretary of Defense (ISA) to Deputy Director, DGA and Deputy Assistant Secretaries of Defense (SA) and (I&L) in Memorandum, subject: Frozen Dried Foods, 17 August 1964.

4. Organization For Subsistence Supply - TASTA-70.* The time frame for this study (1965-1970) requires a description of some organizations that currently do not exist beyond the concept stage. Others are in being. Some are proposed in tables of organization and equipment. Therefore, the organizations should not be considered the final word in manpower, equipment, or operating elements. It follows that any system proposed or designed should be flexible enough to meet changes in organizations that may evolve. The organizations will be discussed in three segments-- direct support, general support and management elements at field army level.

a. Direct Support Elements.

(1) A command element of group size usually exists to command and coordinate direct support supply, service, administration and maintenance functions. In divisions, the command element is a division support command. In the remainder of the field army, the command element is the direct support group. By the very fact that he is a commander, the division support command commander or the direct support group commander can have a major impact on the direct support supply system. This usually will not occur because neither commander has a staff of adequate size to become involved, and there are subordinate battalion commanders with the mission and the capabilities to perform the mission. The organization and missions of division support commands and direct support groups are not included in this discussion; details are readily available in appropriate field manuals and special texts.

*Discussion of the supply organization basically is an extract from Consumables Feeder Study to CCIS-70 for TASTA-70 Field Army, op. cit.

(2) Subsistence is the supply responsibility of the supply and transport battalion in divisions. An outline of the pertinent elements is in Figure C-3.

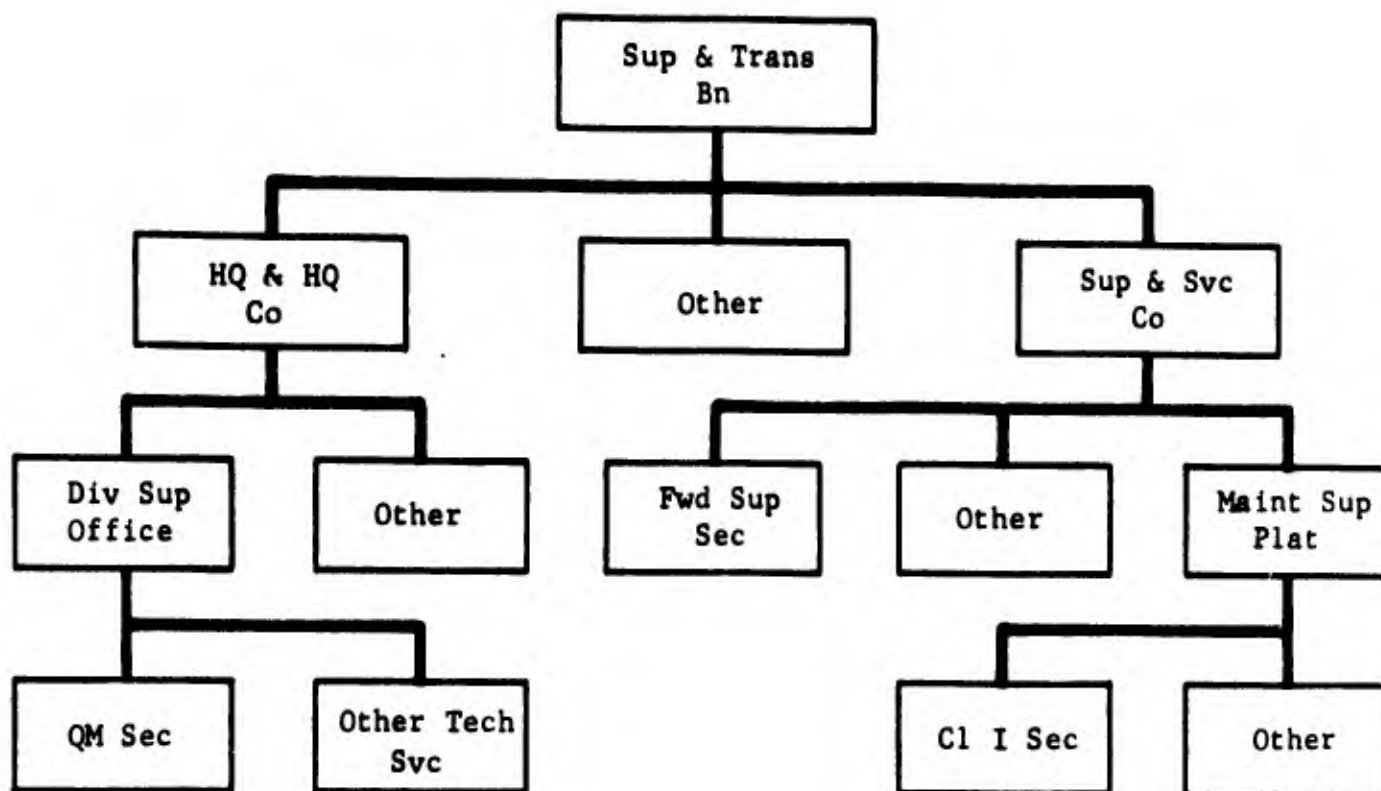


Figure C-3 - Sup & Trans Bn

(a) The headquarters and headquarters company (TOE 29-6E) (ROAD) includes the division supply office which has a quartermaster section for the control of all quartermaster-type items. This section would control supply actions for subsistence and submit requirements to the FASCOM supporting element responsible for providing general support. The section has a division quartermaster supply officer, a subsistence

NCO and a subsistence storage specialist. By 1970 the division supply office may be organized more along commodity lines with technical service designations greatly reduced--but the control functions and responsibilities will not change.

(b) The supply and service company (TOE 10-7E) (ROAD) contains the operating elements for receipt, storage and issue of subsistence. The company has a main supply platoon with a Class I section. The section includes an officer, two subsistence NCO's, four subsistence specialists, a forklift operator and eight supply handlers. Most of the Class I supplies for the division will be handled by this section. The exceptions will be those times where throughput may be achieved to consumers or to the forward supply sections.

(c) Each forward supply section has an enlisted subsistence supply specialist. There are supply clerks and supply handlers in the forward supply sections who perform clerical tasks and labor requirements for all classes of supply.

(3) Subsistence is the supply responsibility of a supply and service battalion (direct support) for nondivisional units. The battalion is a part of the direct support group. An outline of significant elements of the supply and service battalion, direct support, for CO-STAR II is in Figure C-4.

(a) The headquarters and headquarters company TOE 29-216F includes the battalion headquarters and staff. The supply of subsistence is influenced by the operations section which provides direction and

technical assistance to all assigned or attached operating companies. The section does not contain stock control personnel. The individuals receiving consumer requirements and performing stock control are in the stock control section of the supply and service company (TOE 29-217F). When the battalion is operating under conditions that permit companies to operate in close proximity, the battalion operations officer may consolidate stock control sections from companies into the battalion operations section and perform all controls from this centralized office. The bakery platoon has only one mission--to provide fresh bread. The bakery ingredients will be distributed through subsistence channels to the bakery and the finished product returned to subsistence channels for control and distribution. By 1970 it is expected that the headquarters and headquarters company will be realigned to reduce or eliminate technical service identity in the operations, and the bakery element may be relocated to the supply and service company. These changes will be directed toward improved organizational alignments rather than changing basic operational techniques.

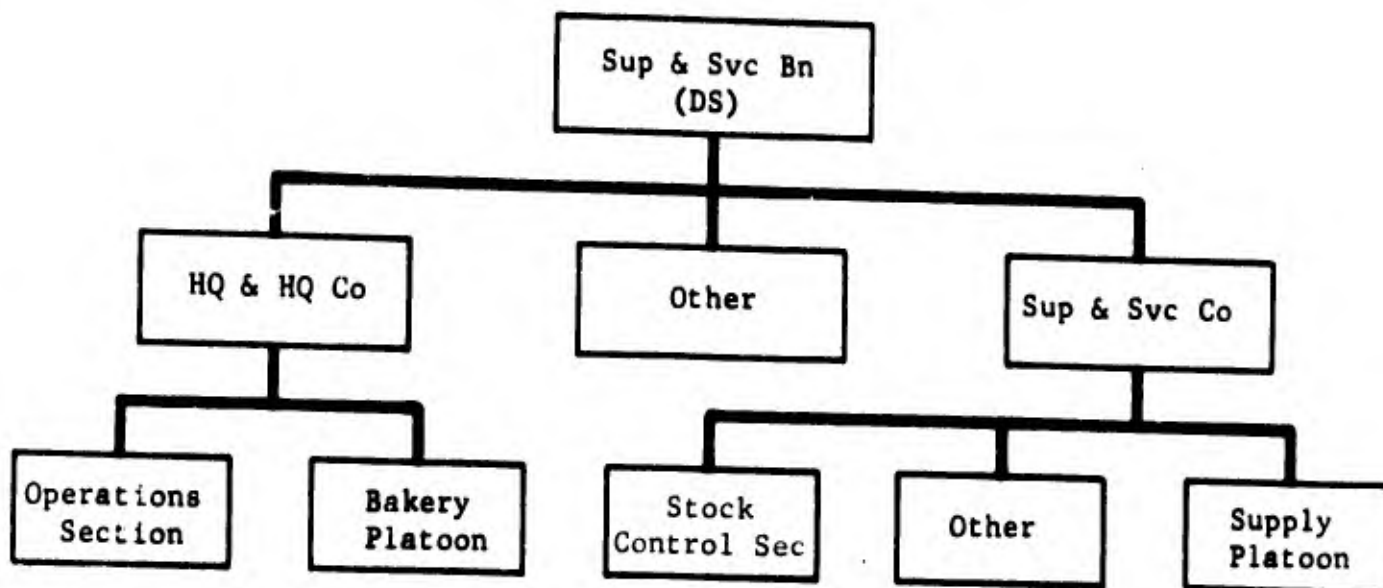


Figure C-4 - Supply & Service Bn (DS) (CO-STAR II)

(b) The supply and service company (TOE 29-217F) has two elements involved with the supply of subsistence--the stock control section and the supply platoon. The stock control section consists of an officer as section chief and stock control specialists representing each technical service. The section controls all receipts and issues of the company. The supply platoon receives, stores and issues Classes I, II and IV supplies. The current organization of the supply and service company is influenced by a requirement to reflect representation of most technical services. By 1970 it can be expected that functionalized supply MOS will have been accepted and the supply platoon organized to perform the task in an efficient manner. The supply and service company should be able to support 15-17,000 troops.

b. General Support Elements.

(1) The supply of subsistence within the field army involves four organizations for general support operations--some primarily involved, while others are involved only incidentally.

(2) The general support group headquarters is the least involved of all units that may be in the channel of command. The group is not staffed to place itself in the chain of action--as presently staffed and as proposed, the group could only be a bottleneck. Therefore, if the group headquarters requires information, it should obtain the information by requesting an information copy of some required report.

(3) The support brigade headquarters is scarcely involved in a manual system of supply and supply control. It is much like the group headquarters in that its information should usually be "copies" of reports that are otherwise essential in the operation of the system. However, the support brigade headquarters is strongly involved in a system where a computer is employed at the support brigade.

(4) At this time, there is no known organization or proposed organization for the support brigade headquarters when equipped with a computer. It is logical to estimate that a supply control section will be established either as a separate element reporting direct to the headquarters or as a part of one of the brigade staff sections. Within the supply control section will be trained officers and NCO's who are specialized in the fundamentals of stock control and management of supplies.

(5) Draft TOE do not exist for the general support battalion and a general supply company. The outline organization is presented in Figure C-5.

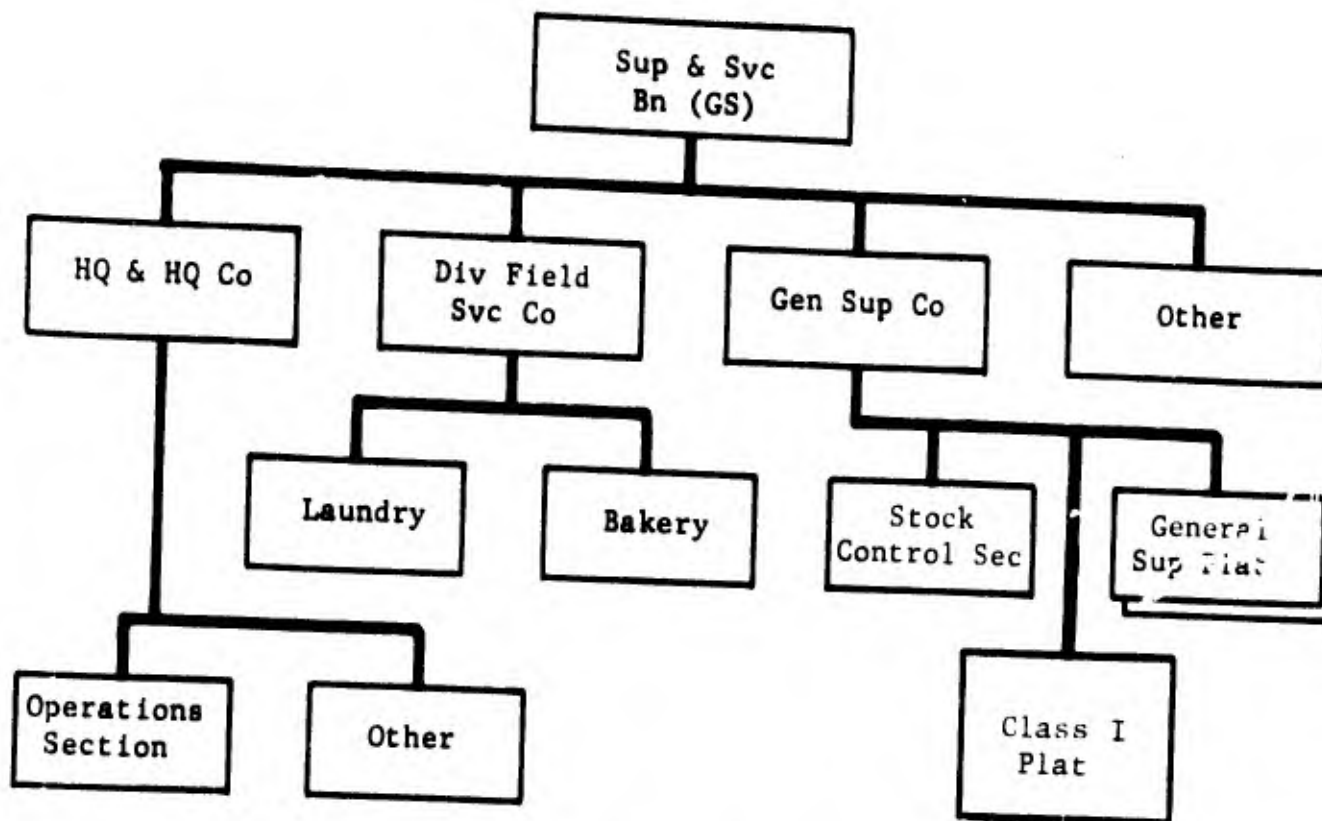


Figure C-5 - Outline of Sup & Svc Bn (GS)

(a) The headquarters and headquarters company has an operations section to perform staff planning and assist the battalion commander in such operations as may be under his control. As in other supply and service battalions, the intent is for battalion headquarters to set up an operations center augmented by personnel from the stock control sections of operating companies when centralized control of operations is feasible. For TASTA-70 organizations, it is expected that the headquarters and headquarters company will be totally functionalized without reference to technical services.

(b) The general support company is the workhorse. It provides general support to two or more direct support elements. This

company is being designed around forklift trucks as its basic operating equipment for the expeditious handling of palletized loads. In addition to class I supplies, the unit will receive, store and ship other major tonnages that are palletized to include packaged petroleum. The stock control section performs all record keeping and other pertinent administrative work. The supply platoons receive, store and ship. It is estimated that approximately 12 of these units will handle subsistence in the field army.

(c) In the CO-STAR organization, a Bakery Platoon in the HQ & HQ Co provides fresh bread to Division Support Commands for distribution to units of a division. Under TASTA concepts, this same function will be performed by a Bakery Platoon to be relocated in a Division Field Service Company.

c. Supply Management Elements.

(1) Support brigades, when equipped with computers, will exercise supply management within their area to the degree authorized by the Field Army Support Command Headquarters. The center of supply management in the field army will be the FASCOM ICC.

(2) A FASCOM ICC has been developed in CO-STAR II which is organized along functional lines (TOE 29-402T) and will be further extended by TASTA-70 concepts. It is significant that the ICC will be directly responsible to the FASCOM headquarters, have authority to determine requirements, requisition supplies, and issue materiel release orders.

Therefore, any system designed for 1970 should recognize the FASCOM ICC as an element organized into compatible commodity groupings and directly responsible to the FASCOM headquarters.

d. Communications Zone. Organizations responsible for subsistence supply within the communications zone are being developed by the TASTA-70 studies.

Section IV

EVALUATION

10. Conclusions: It is concluded that:

a. On the basis of current doctrine, the supply of subsistence is fully integrated with the capabilities of an established supply system for a theater of operations.

b. Subsistence supply is particularly adaptable to integration into the new supply system for a theater of operations which will result from the TASTA-70 studies. The supply of subsistence will be fully compatible with new supply concepts and, in fact, will be improved by advances in technology and organization which include:

(1) Functionalization of supply support organizations at all echelons of direct support, general support, and supply management levels in the field army and the communications zone.

(2) Use of automated inventory control centers.

(3) Increased use of "unitization of supplies" and "scheduled supply" techniques.

(4) Increased use of the "throughput of supply" principle.

(5) Utilization of rapid communications techniques visualized by CCIS-70 studies.

c. Subsistence for the Army in the field should continue to be developed on the basis of large group, small group, and individual subsistence.

d. The unit of issue for operational subsistence should be the meal rather than the ration.

e. Provisions should be made for procurement and issue of the standard "B" ration in 25-man meal modules. Current efforts should be directed toward providing adequate stocks of these modules for theater reserves. Menus should include 10 breakfasts and 20 interchangeable dinner/suppers. This "unitized" B-ration should be modified by substitution of freeze-dehydrated items during the period and, ultimately replaced by the Meal, Uncooked, 25-man, based on availability and acceptability of the latter.

f. Planning for the procurement and issue of "quick-serve" type meals for subsistence of small groups should be limited to the Meal, Quick-Serve, 6-man. Provisions should be made to overpack four of the Meals, Quick-Serve, 6-man in a single container. By providing the Meal, Quick-Serve, 6-man in this type of packaging, no requirement will exist for the Meal, Quick-Serve, 25-man, which should be eliminated from further planning and developmental actions.

g. The use of dehydrated food items in place of conventional, heat processed items can cause substantial reduction in subsistence tonnage and cube, as demonstrated in Tables C-7 and C-8. The most spectacular reduction will be in subsistence for the large group, i.e., the difference between a unitized "B-ration" and the Meal, Uncooked, 25-man. This factor indicates that emphasis should be placed upon attaining the Meal, Uncooked, 25-Man, since this CDOG qualitative materiel requirement is designed for the most prevalent subsisting situation anticipated throughout the theater of operations - the large group subsisting situation.

h. The capabilities of the national industrial/commercial base to provide sufficient quantities and types of freeze-dehydrated food products to support large scale mobilization by 1970 are uncertain. Likewise, automatic packaging facilities for these products have not been established. To develop the industrial/commercial base needed, it appears that the growth of this industry must be stimulated and accelerated by positive and continuing government procurements.

APPENDIX 1 TO ANNEX C

NEW TECHNOLOGIES FOR PROCESSING AND PRESERVING FRESH FOODS¹

1. General. Historically, significant improvements in the diet of the Armed Forces have been dependent upon the character of the agricultural economy and the progress made in scientific advancements. The capability of the United States to produce practically all types of foods common to the American diet in surplus quantities is a matter of record. This appendix is confined, therefore, to a summary of the new food processing and packaging techniques which hold the greatest promise for application in the future Army field food system.

2. The Dehydration Technique. In this technique of food preservation, water is removed from food leaving the solid material behind. The principle is not new, but tremendous improvements in the techniques have been made since World War II.

a. Methods of Dehydrating Foods. There are a number of ways in which foods can be dehydrated. The oldest, of course, is sun drying. Of the more modern methods, one is spray drying which is used for eggs, coffee, milk, certain thick materials such as soups and other liquids. Another is hot air drying for pieces or slices of vegetables and fruits such as carrots, potatoes, cabbage, prunes, apples, etc. Vacuum drying, which is used for drying juices, is a fourth way. More recently, a

1. The information contained in this appendix is derived primarily from an unpublished study by this agency (then designated The Quartermaster Board.)

freeze drying method has been developed and has proven very successful for dehydrating foods such as meats which are subject to heat-damage if subjected to fairly high temperatures. These various methods of dehydration can be used to dehydrate raw foods which at a later time can be reconstituted by adding water and, after a period of reconstitution, be cooked in a conventional manner. Considerable success also has been achieved in dehydrating precooked foods. These precooked dehydrated foods possess great potential for military application because they can be prepared simply by the addition of hot water; after a reconstitution period of approximately 20 minutes, they are ready for serving and eating.

b. Advantages of Dehydrated Foods. The value of dehydrated foods for use in the military feeding system lies in the following advantages which they offer. Foods processed in this manner do not require refrigeration and they do not need to be sterilized. When stored at high temperatures they are more stable than most other types of foods; when stored at low temperatures, they will not freeze. Because water is removed, those foods are considerably lighter and more compact than their fresh or canned counterparts. Insofar as preparation is concerned, the new types of uncooked dehydrated foods require a negligible amount of additional cooking skill and the precooked dehydrated foods can be prepared by individuals who have not had food service training or experience. In addition, the present stage of progress is such that many dehydrated items can be produced today which are better than canned foods, and equal or almost equivalent to frozen foods, in flavor, color, and texture. These items, together with many others which are in promising stages of research and development, can be used over an extended period

of time to prepare nutritious, acceptable meals. Nearly every major commercial food producer in the United States is involved in the production of some form of dehydrated foods, in laboratories, pilot plants, or volume production (see Annex C, Appendix 2, "State of the Art").

c. Disadvantages of Dehydrated Foods. Dehydrated foods also have certain disadvantages which must be recognized. The types of dehydrated foods used previously in World Wars I and II were not entirely satisfactory. As a result, a psychological barrier against dehydrates has developed among servicemen; however, time and the progressively increasing acceptance of commercially marketed dehydrates is rapidly overcoming this attitude. Also foods preserved in this manner must be rehydrated. This requires some attention, time, and potable water. Packaging presents another problem because moisture or oxygen contamination must be prevented, moisture deterioration by the action of bacteria, molds and insects must be prevented, and the product must be maintained in a palatable condition until used. Lastly, the process of dehydration, particularly the freeze dehydration method, entails manufacturing and processing facilities which, at present, are inadequate for supplying military needs during a general war.

3. The Irradiation Technique. Radiation preservation is a process which employs nuclear energy, instead of heat, to destroy the microorganisms which promote food decomposition and spoilage. Active work commenced in this area of research and development in 1953. Irradiation shows prospects of being an improvement over any other

known method for processing certain food items. Encouraging progress has been made which gives reason to expect that irradiated foods will be available, in time, for the military food system. In general, the results have been more successful with meats, fish and poultry than with fruits and vegetables.

a. Methods of Irradiating Foods. Currently, there are five known processes for irradiating foods. Total sterilization is the process which accomplishes 100% destruction of microorganisms; however, the doses required to obtain this lethality produce undesirable flavor, odor, and texture defects in many foods. Pasteurization (partial sterilization) employs enough radiation to destroy between 90 and 99 percent of all bacteria and fungi; the attraction of this process is that only 2 to 5 percent of the radiation needed to sterilize is needed in this process with a resultant lessening of changes in acceptability. Another process is that used to disinfect grains, tobacco, and spices where the problem is mainly that of insects as opposed to bacterial or fungal attack. Also, relatively small doses of radiation can be used as a process to inhibit sprouting of tubers such as onions and potatoes. The fifth process is that of inhibiting reproduction of helminthic parasites carried in food such as trichinosis carried by pork. In brief, radiation preservation can be accomplished by a variety of processes, the selection of which is dependent upon the specific problem of preservation which is to be solved.

b. Advantages of Irradiated Foods. Foods processed by irradiation have significant advantages for a military subsistence

system. Improved acceptability, particularly with respect to meats, over foods processed by conventional methods is perhaps the most important. In addition, foods can be processed by irradiation so as to not require refrigeration facilities. Foods irradiated in the raw state can be cooked in the same manner as fresh foods with no additional skill requirements. Foods which are precooked and then irradiated can be eaten at a later date with no preparation other than heating, if desired.

c. Disadvantages of irradiated Foods. Like dehydrated products, irradiated items must be packaged to prevent contamination and deterioration from oxygen and moisture. Additionally, there are a number of more serious problems which must be overcome before irradiated food can assume an important role in the military subsistence system. Technological breakthroughs are still necessary to expand the limited number of items presently developed. Also, the question concerning wholesomeness and safety for regular consumption remains to be fully resolved. General public acceptance is another consideration. Lastly, irradiated foods today are only in the laboratory stage; there is no commercial production base for their supply (See Annex C, Appendix 2, "State of the Art").

4. The Heat Processing Technique. The conventional heat processing or canning method of food preservation is a highly developed technology which needs little discussion other than to mention the active efforts of the industry which are aimed towards developing canning procedures to improve the quality and nutritive value of canned foods.

5. Other Food Processing Developments. The application of antibiotics and chemicals are becoming increasingly important in food preservation. Developments are in progress on new preservatives of these types which are likely to result in processed foods with better retention of nutrients and fresh quality characteristics. Work is also being accomplished to improve flavor and acceptability of processed foods by the application of enzyme flavor regeneration techniques. The rapid growth of "convenience foods" also deserves mention. This is a modern and expanding trend which will continue, undoubtedly, for the reason that, in our high speed economy, time is important to everyone. Notable achievements which are especially applicable to the military subsistence system of the future include products known as mixes for various kinds of cake, biscuits, bread, rolls, pie, frostings, puddings and desserts. There is also another group of these time saving foods known as semi-prepared goods, i.e., brown-n-serve baked goods, cereals, rice, and Italian, Chinese and Mexican dinner packs. These are only a few types of convenience foods on the commercial market today and it is almost a certainty that new and better products will be available in the immediate years to come.

6. New Packaging Techniques. Extensive research and development is taking place in the area of packaging. Much of this work is being devoted to flexible packaging for foods. It is entirely possible that many of the items presently requiring rigid metal containers may,

in the future, be packed in non-rigid or rigid plastic containers, with or without lamination with other materials such as aluminum. This is especially probable in the case of certain acid fruits and vegetables, for example blueberries and tomatoes. (See Annex C, Appendix 2, "State of the Art").

7. Summary. There are a number of technological developments in the areas of food preservation and packaging, other than those mentioned in this appendix. However, at present, they are either in infancy stages or require extensive time and effort before adequate capabilities are attained. In the time frame of this study, foods dehydrated by various methods and flexible packaging are the new developments which hold the greatest promise for extensive application in the Army field food system.

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APPENDIX 2 TO ANNEX C

STATE OF THE ART¹

1. General. Food research to be meaningful has to look ahead 5, 10, or 20 years. Nearly all convenience foods currently on the market - and most of those to come - were initially designed as a result of military needs. The job of the U. S. Army Natick Laboratories is to translate concepts expressed in QMDO's and QMR's into hardware prototypes - and finally, of course, to supply requisite procurement documents. Theory and process design are investigated to the extent necessary. One of the objectives of the military subsistence system has been to cut the weight and cube of World War II rations by as much as 50%. This objective is close to accomplishment; in time it will be exceeded. Another objective has been to purge the system of all refrigeration. Taken together, these demands - along with other essential characteristics - exceed the potential of extant processes. Therefore, three strikingly new food processes have been sought out, adapted, or designed: (1) freeze-drying, (2) radiation preservation, and (3) "flex-canning." A brief explanation of these processes is necessary for a better understanding of the time-consuming foundation studies which underlie the scores of new food products originated in engineering the new meals and packets.

2. New Food Processes.

a. Freeze-drying. Prior to use by the military, this process had been employed primarily for the drying and preservation of blood-plasma

1. The information contained in this appendix was derived from the text of a presentation by Dr. F. P. Mehrlich, Director, Food Division, US Army Natick Laboratories at a joint CDC-AMC briefing entitled, "Army Combat Rations" for a Board of General Officers at Headquarters, Army Materiel Command, 2 June 1964.

and antibiotics. Costs were high - up to 30 cents per pound of water removed. Drying cycles were long - at times exceeding 24 hours. No food commodity could stand such costs. Re-engineering resulting directly and indirectly from pioneering efforts by U. S. Army Natick Laboratories has shortened cycles to time frames of from 4 to 6 hours (less than 2 hours in specific cases) and has lowered costs to from 2 to 5 cents per pound of water removed. The process of freeze-drying is accomplished in the following essential steps.

(1) In the first step, the food is frozen quickly in a tunnel-blast of cold air at temperatures approximating negative 45° F. or colder. This assures freezing without large crystal formation and without distortion of cells and tissues of the food product.

(2) In the second step, the frozen commodity is removed from the blast freezer and is placed in a vacuum chamber, where partial pressures range from a millimeter or two of mercury down to a few microns. In this chamber, sublimation of the ice within the food is induced. Great care must be taken to prevent thawing at any point within the food mass. Under these conditions, the moisture passes off in molecular form as water vapor. No liquid is formed. Drying is completed at a residual moisture level of 1 or 2 percent (dry weight basis).

(3) The dried food is then shelf stable for long periods of time without refrigeration. Foods so prepared must be further preserved by clean wrapping which also must exclude oxygen from the package.

b. Radiatic Preservation of Foods. There is need for large cuts of fresh-like meat - such as ribs of beef, loins of pork, whole hams, roasts, whole turkeys and the like for use - when available - in the

Meal, Uncooked, 25-Man. No method of food preservation known has had the potential of keeping essentially uncooked, "fresh-like," large cuts of meat ready for use - "year on end" without refrigeration. This is a military need; it is believed this need can be met once the art of irradiating foods appropriately has been mastered. Irradiated meat items are also needed for the Meal, Individual, Ready-to-Eat. Certain benefits of "low-dose" radiation treatments in prolonging the shelf life of perishable commodities are also noteworthy. The U. S. Army Natick Laboratories have become a world leader in the development of practical types of food irradiation to meet military needs. The essence of the radiation process includes the following features:

(1) In the preservation of meats, irradiation functions in much the same way as heat usually applied in the conventional canning processes. It is noteworthy, however, that irradiation has only moderate effect on the temperature of the product - raising the temperature thereof only a few degrees, compared to the profound cooking effect of heat. Meat products to be processed are cut, trimmed and heated briefly to inactivate the enzymes. They are then filled into cans which are sealed - very much as they would be for heat processing. The cans require far less liquid than used in cooking, and larger pieces of meat can be accommodated. The closed cans are conveyed past sources of either gamma irradiation or accelerated electrons.

(2) Irradiation studies in the U. S. Army Natick Laboratories have utilized two processes. In the first, the million curie Cobalt 60 source has two ranks of cobalt rods between which the canned food passes.

Gamma rays - like X-rays which they resemble - penetrate the can and the food therein, killing all microorganisms. The second method utilizes a Varian Linear Electron Accelerator. In this method, a cathode emits electrons which are accelerated by high voltage and RF energy inputs and delivered at high energies to the food product to be sterilized.

(3) Irradiated foods have been kept as long as 36 months without refrigeration and when served to consumer panels have rated highly in acceptance tests. "Low-dose" gamma irradiation can be used to prolong the shelf-life of important perishable meat commodities. Considerably more work needs to be done in this area of investigation.

c. Flex Canning. "Flex canning" is the heat processing of foods enclosed in flexible laminates of films and foils. This novel process--of great potential in military subsistence--was developed by the Natick Laboratories as a major step in replacing the can with packages, which will fit in the pockets and have other important characteristics.

3. Meal, Uncooked, 25-Man. This type meal is designed to replace and to greatly simplify the B-ration of former years; to provide hot meals in optimal feeding situations, where simple food service equipment can be used and food service personnel are available; and to be used where normal resupply is established and large group feeding is tactically feasible.

a. Any three meals, with bakery supplements, comprise a ration, each meal supplying 1,200 calories. Menus for at least a 10-day cycle (30 meals) ultimately will be designed, and will include irradiated components

when the state of the art permits. The first 9 prototype meals have been successfully engineer-tested, and 9 additional meals have been developed. Natick Laboratories are now ready to procure components for these 18 meals to be engineer and service tested in FY 1965. Type classification of the 18 meals is scheduled by 4th Quarter, FY 1966.

b. Examples of components under development include uncooked dehydrated steaks, pork chops, fish sticks, fish squares, instant desserts and salad bases. A typical supper meal, comprised of dehydrated commodities could include:

Breaded Pork Chops
Cream Gravy
Mashed Sweet Potatoes
Margarine

Apple Sauce
Coffee w/Cream/Sugar
Green Beans

c. In general, compared to the B-ration, the 25-man meals save directly 30 percent in both weight and cube of shipments. They are air deliverable. They require no refrigeration or refrigerated supplements. They put into a single factory-assembled package what in the B-ration is contained in more than 100 packages - each requiring separate handling, storage, breakdown and reassembly for issuance.

4. Meal, Quick-Serve, 25-Man and 6-Man. Quick-serve meals are comprised of dehydrated, precooked foods which require only the addition of hot or cold water, as appropriate, in preparation for eating. There is no need for any food preparation personnel or of any food preparation equipment not supplied with the meal - other than the canteen cup and a water heating device. The logistical superiority of these meals over any available heretofore in the US military forces will be illustrated.

The Quick-serve meal is versatile. It is suitable for subsisting small groups as far forward in a combat zone as it is feasible to effect re-supply and to heat water. It can be adapted readily to messing while in moving vehicles or planes.

a. Within the "V-Board" carton used in packaging is the aluminum liner. This liner serves during storage to protect the meal from insects and rodents. It is the container used for heating the water - which after heating is measured into the food packages to reconstitute the dehydrated commodities. Included is an accessory packet which supplies cigarettes, matches, chewing gum, coffee, sugar and cream, salt, gun patches, and toilet paper. Supplied are all messing gear such as: spoons, knives, trays, cups, and serviettes. All are disposable. Packaging is multipurpose, serving to contain the food and functioning as the "vessel" in which rehydration is accomplished. There is a lot in this package in addition to food per se, but everything supplied meets an essential need.

b. Quick-serve meals are provided in 6-man modules - 4 modules per case - or in 25-man modules, 1 module per case. There are 21 menus - a 7 day cycle. Each meal supplies 1,200 calories and can be used interchangeably with other packaged meals of the system - such as the Meal, Uncooked, 25-man, or the Meal, Individual, Ready-to-Eat.

c. Quick-serve meals are nutritionally balanced and are suitable as the sole diet for 120 days or more. In addition to some 80 new kinds of foods which have been already engineered for these meals, work on others is continuing to enhance variety and acceptance. Such products on which development is nearing completion include: pre-cooked

dehydrated scrambled eggs, sliced beef and brown gravy, sliced pork, beef hash, beef and noodles, meat and spaghetti with tomato sauce, macaroni and cheese, sweet corn, carrots, peas, spinach, green beans, lima beans, rice, dehydrated fruit cocktail, and dehydrated pineapple.

d. These meals are low in weight, weighing 9.2 pounds for the average 6-man module, and this module including the service items and accessory packets occupy but 0.56 cubic feet.

e. Quick-serve meals are also very stable, very tasty, and highly acceptable. They have been field tested with approximately 100,000 troops in various temperate, tropic and Arctic situations. The "yard stick" used in qualifying acceptance of various foods is called the "9 point Hedonic scale." A high score indicates that a food is well liked and a low score that is is disliked. "Like extremely" rates the top score of 9; the odious "dislike extremely" is the lowest, carrying the numerical designation of 1. The value of 5 is the "fulcrum" value - dividing categories of "like" from categories of "dislike." The Quick-serve acceptance scores are in the 7's mostly - on the Hedonic scale - equal to the "GI's dream of perfection."

f. Type classification of Quick-serve meals is currently scheduled for 1st Quarter FY 1965. However, more recently Natick Laboratories was advised that, as a result of an "in-process review" held last fall (21 October 1963), type classification must be held up for: development of a suitable water heater, determination of suitable module sizes, and reduction in price. Comment should be made on these matters - as they bear reference to the availability of these important meals.

(1) First, with respect to availability and probable cost of the meals, and components thereof -- Since the advent of Army's R&D activities in the development of Quick-serve (and 25-man, uncooked meals) a number of commercial houses have become interested in producing several kinds of dehydrated foods - not alone those prepared by freeze drying. Instant potatoes are becoming an important consumer item; freeze dried shrimp in institutional packages are being purveyed by a Boston Company; instant sweet potatoes will soon be commercial - peas, carrots, cabbage, selected fruits and some meats are beginning to appear in test quantities in consumer markets. Commodities with short shelf life, as noted earlier, are fine for the grocery store, but are generally inadequate for combat meals. Consumer packages and packaging are entirely different from military requirements. Hence, in our judgement, nothing short of substantial, recurrent military orders for quick-serve meals - in appropriate modules - will create the industrial base needed - if we intend to use such meals in future combat situations. Cost is expected to drop significantly in competitive procurement - especially as automated facilities for packaging into multipurpose, expandable reconstitution cartons become available. An industrial preparedness study which had been approved to expedite solution of design and engineering problems to achieve this end was cancelled last year [1963] - as being possibly premature. Staff of the Food and Container Division of Natick Laboratories estimated probable costs of meals of Quick-Serve types, if procured in production quantities - at a level approximating current procurements of Meal, Combat, Individual (12 million rations/year): A cost of \$3.68 per ration (of 3

meals) including the heater, was projected for 1965; and assuming a reasonable degree of automation by 1970 - a cost of \$3.00 per ration - including expendable mess gear and comfort items, and allowing \$0.50 for the heater (or \$2.50/3 meals exclusive of the heater). These figures compare to \$2.10/ration for the Meal, Combat, Individual now being purchased - and \$1.04 for the standard B-ration.

(2) On the suitability of heaters - the prototype heating unit consists of an activated charcoal block, igniter, fuel cage, stove and water container support, and a stove shield. The perforated fuel block measures approximately 10- $\frac{1}{2}$ " X 19- $\frac{1}{2}$ " X 1". The fuel is easily ignited with a match and is completely aglow in 1 $\frac{1}{2}$ to 2 minutes. It provides intense heat for about 50 - 70 minutes. The complete heater weighs 3 pounds. In the laboratory, it heats six quarts of water from initial temperature of 35^oF. to a boil in 10 minutes at an ambient temperature of 68^oF. or in 25 minutes at 20^oF. The unit has melted snow and ice from an initial temperature of -40^oF. and boiled the resultant water in less than 50 minutes at an ambient temperature of -40^oF. The prototype heater under test has been designed to meet maximum performance, that is, to be an adequate source of heat in the Arctic. Arctic service testing has been successfully completed - and the US Army Arctic Test Board has recommended that the heater be considered suitable for Army use in the Arctic. Type classification of the heater has been rescheduled to 2d Quarter, FY 1965 - to permit full coordination and approval of the Engineer Test/Service Test reports.

(3) Regarding the module size - CDOG has for many years stipulated the 6-man and 25-man modules which Natick Laboratories has engineered.

5. Meal, Ready-to-Eat, Individual. Important facts relating to the Meal, Ready-to-Eat, Individual are:

Target weight -	1-lb Meal (Achieved to date 22 oz.)
Cube -	135-in, 3/meals
Type classification -	Currently scheduled for 4th Quarter FY 66. It seems evident that type classification of this meal will be delayed by one year - as a result of priority now placed on the "M" Packet, together with planned funding reductions for the meal in FY 1965.

a. For operations which permit planned resupply but preclude utilization of either the 25-man uncooked or quick-serve meals, the Meal, Ready-to-Eat, Individual is being developed. It will afford significant advantages in portability and acceptability over the still generally used combat meal - the well-known successor to the "C" ration. It is designed to provide an individually packaged meal which will be highly acceptable when eaten hot or cold - by troops operating under combat conditions. Supplying 1,200 calories per meal, it can be used interchangeably with other type operational subsistence.

b. At least 12 meals will be designed so that any one meal is suitable for breakfast, dinner, or supper - and any three are suitable as a ration. Food components are being developed in terms of maximum

acceptability when eaten cold. Variety will be sufficient to avoid rejection when Meal, Ready-to-Eat, Individual is consumed as the sole diet over a period of one week. The meals will require no preparation other than the opening of packages and no reconstitution except of beverage components. Lightweight packaging capable of use as a heating vessel under conditions permitting heating is being designed. An aluminum-foil lined container can be made up as a heating vessel. Observation of an engineering test just completed on the first three prototype meals indicates some problems in using the experimental stove container as heating vessel.

c. The meal package will contain all accessories needed for its consumption except canteen, canteen cup, and water. It is assumed that the separately provided heating device will be the standard trioxane fuel tablet, as no requirement has been established for a different device. Gross weight of each meal will not exceed one pound - compared to 1.8 pounds per meal of the currently available Meal, Combat, Individual.

d. The configuration of the meal is to be compatible with pockets of field clothing - but currently the meal would have to be broken into its components for storage in the pockets of clothing. A higher degree of compaction is needed in subsequent designs. The round tin-cans of the C-ration and its successor, the Meal, Combat, Individual have been replaced in general by flex-packed heat-processed foods. The advantages of this change are too obvious to require comment.

e. Irradiated components, when available, will be used to increase the variety of foods available in this Meal, Ready-to-Eat, Individual. Examples of other experimental items under study include: ready-to-eat

freeze dried meat and potato patties; tuna, salmon, and potato salad; fruit cocktail, peaches, pears, strawberries; unconventionally processed (HTST) and aseptically packed pork sausage links and salisbury steak; flex-packaged bread and dessert items; and beverages.

f. Cases in which these meals are packed are designed for aerial delivery without parachute with assurance that 75% of the contents will be suitable for consumption within 24 hours after air-drop (on representative terrain, at speeds and from altitudes normally used by Army aircraft) in support of tactical operations.

g. The new meal will offer the following advantages over the Meal, Combat, Individual: Significant improvement in palatability when eaten cold, reduction in packaging weight of almost 50%; configuration to fit the soldier's pocket; flex-packs to protect both the food and the soldier; capability of free drop air-delivery. Its obvious major advantage will be portability on the person.

h. Natick Laboratories are currently awaiting results of their first field test (ET of 3 meals and EDT of 3 others). Engineer Testing/Service Testing of 12 meals are scheduled currently for late FY 65 and Type Classification is scheduled for 4th Quarter, FY 66. As stated earlier, however, owing to acceleration of the "M" packet, these actions will have to be rescheduled.

6. Food Packet, Individual, Combat. A food packet is substantially different from a meal. It is minimal subsistence - to keep body and soul together. It is austere. A food packet is a short-term source of nourishment

for use in special operational situations. It consists of prepared foods - specially selected for maximum nutritional value, palatability, and stability - commensurate with the requirements for minimum weight/cubage and other utility factors. One or more food packets do not necessarily constitute a nutritionally complete ration.

a. On 27 March 1964, Natick Laboratories were directed to develop the "M" Packet. Based on technology in an advanced state of development, it envisions use of flexibly packaged heat-processed foods providing slightly more than 1000 calories per packet. Each packet will have a gross weight of approximately 18 ounces and an average volume of 46.6 cubic inches. Given continuing availability of funds, it is the plan to conduct engineer design of this packet during the balance of FY 1964 and through FY 1965; begin and complete engineer design test in FY 1965; begin ET/ST in FY 1965; and type classify not later than 4th Quarter, FY 1966. Currently, nutritional data is being compiled for coordination with Office of the Surgeon General and procuring experimental components. Within the limits of existing technology, this food packet will meet many, but not all, of the essential military characteristics.

b. Longer range effort to extend the limits of existing technology is in progress on a food packet which will meet all of these requirements. It will be extremely lightweight, flat in shape, and only somewhat larger than a pack of cigarettes. Each packet will weigh not over 5 ounces (net food weight), supply 500 calories from fabricated food components, and will be flex-packed.

c. The food in this packet will be sufficiently portable to assure easy carrying; acceptable enough to assure consumption; sufficiently balanced nutritionally to maintain combat effectiveness, when two packets a day are consumed as the sole diet (with water) for as long as 10 days. The packet will also find wide usage in operations with friendly indigenous personnel. Six food packets will be overpacked in a bandolier; 9 bandoliers will be packaged in a storage/caching case having a gross weight when filled of 25 pounds.

d. These requirements are extremely stringent and the need is urgent. The packet is scheduled for type classification in FY 1969. There currently is not in a counterpart of the Food Packet, Individual, Combat: The old Food Packet, Assault was removed from the supply system during 1961 leaving 'the Meal, Combat, Individual as the interim standard item. This ration definitely cannot meet the need. Work thus far has indicated that the requirement can be met by expanding and applying new art in food fabrication. Studies in progress towards this end are giving extremely promising results. However, work on this packet has travelled a rocky road indeed. There has been vacillation between no need at all for such an item - and for an immediate, imperative requirement; funds have been withheld, provided, withdrawn, deferred, and reprogrammed. The result is that type classification is now not expected before FY 1969.

e. Interim items have been provided. In 1962, for example, an Army Staff decision required development and procurement of the Food Packet, Combat, Supplemental (Interim) to provide an interim emergency

capability. One hundred thousand of these supplemental (interim) packets were procured during calendar year 1962 and a number of these have been used by US troops operating in Vietnam. The Interim Packet is based on standard food items: It weighs approximately 7 oz per packet and supplies some 500 calories each from meat bars, cereal bars, candy bars and the like. As the title indicates, this packet is supplemental in nature and may be nutritionally incomplete - without the availability of other foods - especially of carbohydrate composition.

f. In 1963, under a reimbursable order provided by the US Army Limited War Laboratory at the request of Special Forces, a one-man food packet, based on Quick-Serve Meals was fabricated and provided for service testing. The tests were successful and 300,000 "Packets, Subsistence Long Range Patrol" are now in supply procurement to meet operational needs. Later in 1963, a plan for another "Mark 1" method of meeting elements of this [Food packet] requirement, before FY 1969, within the limits of available processing arts, was outlined, namely, the "M" packet.

g. Applied research and exploratory development studies on the Food Packet, Individual, Combat itself are producing the capability of fabricating compact food bars by either molding or compressing processes, from any food which is dry enough to resist deterioration - of modifying porous foods for use in bars requiring high calorie concentration per unit volume - and of incorporating flavoring materials without loss - as a result of masking or storage. Thus, if we can continue, extend and apply these studies, there is little doubt that despite rigorous

requirements, the Armed Forces will have the highly convenient, low-weight Food Packet, Individual that it has asked for. We cannot meet these requirements, however, without continuing research and development.

7. Food Service Equipment.

a. The Continuous Bakery to support the Meal, Uncooked, 25-Man is scheduled for completion during FY 1965. The prototype under development is capable of handling bread-rolls only. This integrated unit can produce 3000 pounds of bread "buns" per 24-hour day or about 1 pound per day for each pound of equipment weight. Ultimately, the continuous bakery must be capable of handling additional bakery items if the requirements established for both the meals and the bakery equipment are to be met. However, no work is programmed toward that end at the present time.

b. The Meal, Uncooked, 25-Man can be prepared with existing kitchen equipment although pre-portioning and current use of dehydrated components offer possibilities for simplifying preparation equipment, as well as procedures. Development of a modular mobile field kitchen in response to a QMR now being staffed is scheduled to begin in FY 1965 on the assumption that approval will be received by that time. The draft QMR available to Natick Laboratories requires this kitchen to support the A-ration as well as the Meal, Uncooked, 25-Man.

APPENDIX 3 TO ANNEX C
INDUSTRIAL/COMMERCIAL BASE

1. Introduction.

a. This appendix does not present a detailed investigation or analysis of industrial capabilities, present or future, to produce military subsistence. The magnitude of such an analysis is considered to be beyond the purview of a conceptual combat developments study directed toward support of the Army in the field. In general, it reasonably can be assumed that mobilization planning for expansion of the national industrial base would be capable of supporting Army subsistence requirements under emergency conditions. (See Incl 1).

b. Both the historical record and the details of current mobilization planning tend to assure the availability of adequate amounts of subsistence to support any level of military operations. There are certain new developments, however, which can materially improve the utility and acceptability of military operational subsistence. The purpose of this appendix, therefore, is to provide summary information on current and projected industrial/commercial capabilities to produce those new items having greatest promise for application during the period 1965-1970. Material included in this study has been extracted from a number of authoritative sources, as indicated.

2. Background.

a. Food Preservation Methods

(1) Heat processing is the dominant method employed for the preservation of foods. The whole subsistence economy of the USA is involved with canned foods and for many years military operational rations have been almost entirely dependent upon canned components. The annual production of canned foods exceeds 19 billion pounds.¹

1. U.S. Dept of Agriculture, Economic Research Service, Marketing Economics Division, ERS-147, Selected Writings on Freeze-Drying of Foods, January 1964, P.46.

(2) In methods of food preservation, the frozen food industry is next to canning in magnitude of operations. Food freezing has an annual volume in the U.S.A. of about 7 billion pounds.² While widely used in Army subsistence at present, frozen foods require continuous refrigeration - a characteristic unacceptable for support of future combat operations.

(3) In order of importance as a method of food processing, dehydration follows the heat processing and freezing methods. Nearly every major commercial food producer in the country is involved in the production of some form of dehydrated food, in laboratories, pilot plants, or volume production. "The whole dehydration industry, of which freeze drying is but a small part, has been growing more important. Until recent years, food drying was used only during war years or national emergency. Now, however, a wide assortment of dry foods are currently stocked on grocer's shelves. These are of a quality suitable for peacetime use."³

(4) The preservation of foods by irradiation is a most promising new method. "Except for canning, developed approximately 150 years ago, radiation processing is the only completely new method⁴ of preserving foods developed since the dawn of history." This method

2. Ibid

3. Bird, Kermit, Economic Research Service, Marketing Economics Division U. S. Dept of Agriculture, in a speech, Designing a Freeze-Drying Plant - Some Economic Considerations, at Winter Haven, Florida, March 17, 1964

4. Josephson, E. S., QM Research and Engineering Center, Natick, Mass. in a paper Radiation Preservation of Foods presented at Eastern Experiment Station Collaborator's Conference on Food Processing Techniques, Eastern Utilization Research and Development Division, ARS, U.S. Dept of Agriculture, Philadelphia, Penna. October 22 & 23, 1963.

of food preservation, now in the laboratory stages of development, is expected to lead to limited but definite uses in food preservation within the next decade.⁵ Although the potentialities of irradiation have been amply demonstrated, a wide variety of problems remain to be resolved. * * * The completion of the Army's Radiation Laboratory at Natick during the summer of 1962 provides for the first time the pilot facility for food irradiation with food preparation and radiation processing operations under a single roof. We are optimistic that the program will continue to move rapidly and that by the end of the decade or sooner irradiated products will be in commonplace use.⁶

b. The Freeze Drying Method

(1) The process of freeze drying has been used for many years in the medical and drug fields; the processing of blood plasma has been a prime example.⁷ Likewise, freeze drying studies have been conducted by food processors, government laboratories, and equipment manufacturers. The first commercial vacuum contact drier was operated in Norway during the 1946-1948 period for drying fish. The British Ministry operated a research establishment and experimental factory for dehydration of foods in Aberdeen, Scotland from 1951 to 1961. Engineers there converted a Danish vacuum-contact drier for freeze drying studies. Their work resulted in publication of considerable data and a much improved technology for dehydrating a broad range of food-stuffs. In the United States around 1940, pioneering investigations were

5. Goldblith, Samuel A., Food Preservation, Radiation, Food Technology, September 1964, Vol. 18, No. 9, p. 145.

6. Josephson, E. S., Op. Cit.

7. Bird, Kermit, Selected Writings on Freeze Drying of Foods, U. S. Dept. of Agriculture, Economic Research Service, Marketing Economics Divisions, ERS 147, January 1964.

undertaken. The first commercial applications were made here by Armor & Co., Wilson & Co., T. J. Lipton Inc., and Tiana Foods.⁸ Undoubtedly freeze-drying will have direct and side effects that will be felt over the whole field of food processing. What these results will be, and their magnitude is difficult to appraise since the industry is new.⁹

c. Food packaging.

Foods preserved by heat processing methods habitually have been packed or filled into rigid containers, i.e., metal cans or bottles. Both frozen foods and dehydrated foods have been packaged generally in light-weight materials, e.g., plastic films, metal foils, and paper or cardboard cartons.

3. Planning and New Food Developments.

a. Planning and procedures to insure both the availability and procurement of military subsistence are discussed in Inclosure 1 (Industrial Mobilization Planning for Subsistence). The system in effect involves detailed current planning to provide adequate types and quantities of subsistence during present and future periods of normal (peacetime) operations and under any condition of mobilization or emergency. There is little doubt that the industrial/commercial production base, guided by the military planning indicated, can assure the availability of current operational rations in required amounts. But what of the new food products,

8. Nair, John H., North Carolina State University, in a paper, Present Status and Outlook for Freeze-Drying presented at Eastern Experiment Station Collaborator's Conference on Food Processing Techniques, Eastern Utilization Research and Development Division, ARS, U.S. Dept of Agriculture, Philadelphia, Pa., Oct 22 & 23, 1963.

9. Bird, Kermit, op. cit.

processes, and techniques which will influence the characteristics of operational rations by 1970? Will an adequate industrial/commercial base be available to support military requirements? The advanced types of operational rations which can be provided during the time frame actually hinge on these two key questions.

b. In seeking to answer these questions, the first step seems to be an appraisal of the effect of new food products, processes and techniques on current operational rations during the time frame 1965-1970. How much will the new methods influence operational rations during this period? Certainly some of the answers are dependent upon the "state-of-the-art," summarized in Appendix 2 to Annex C. However, other answers must be supplied by an evaluation of the state-of-the-art in its relationship to the industrial/commercial base. Even though technical knowledge in certain processes and techniques, may be adequate to permit production of new products, unless such products are actually in commercial production, their availability to military consumers would be doubtful. On this basis, the conclusions have been drawn (see Annex C) that the new processes and techniques most likely to have significant effect on operational rations during the time period are the freeze dehydration process and the flexible packaging of heat processed food. While other innovations in food processing, e.g., food irradiation, may become accepted practices during the period, their impact on operational rations in this time frame will not be profound. The following paragraphs, therefore, are limited to a summary of current and projected industrial/commercial capabilities in developments most likely to have application for operational rations during the 1965-70 time period.

4. Freeze Drying of Foods

a. Current Capabilities

(1) The freeze drying of foods is a new and growing industry. One of the outstanding authorities in this field has recently described the industry as follows:

"To some observers, freeze-drying appears on the threshold of becoming a major food preservation industry. To others, freeze-drying is scarcely to be reckoned as a food preservation process. They consider it useful only in preserving biological and pharmaceutical supplies, and museum specimens. Equipment company personnel, food processors already in the freeze-drying business, and armed forces food research people are optimistic about the future of the industry. Food technicians and cost engineers tend to be cautious, and sometimes even pessimistic, concerning industry prospects. Estimates of future industry volumes range from zero to 2 billion pounds annually.

My feeling is that freeze-drying is no longer a novel food preservation process. It is an important emerging dehydration technique in a growing family of food drying methods. Offering the advantage common to other dehydration techniques - lightness in weight - there is no need for refrigeration. It differs from other drying methods in that its products retain flavor to a greater degree. Foods thus dried¹⁰ rehydrate faster and more completely."

10. Bird, Kermit, Marketing Economics Division, U.S. Dept of Agriculture, in a paper, The Freeze-Drying Industry: Projections of Capital and Labor Requirements 1963-1970, for presentation to the Philadelphia Chapter of the American Society of Heating, Refrigerating, and Air Conditioning Engineers, April 9, 1964.

(2) From the time of their introduction on the U. S. market about 1959, new commercial freeze-dried food products have been introduced each year. The current number of freeze-dried foods for sale includes 50-60 items. In 1962 about 6.5 million pounds of food were freeze-dried which resulted in 2 million pounds of dried end-product. However, these figures represented only 46 per cent capacity of the seven food freezers in business in 1962. Had these freezers run at full capacity, 14 million pounds of frozen food could have been dried.¹¹

(3) Four new freeze-drying plants entered business in 1963 and represented an expansion of operating plants in the industry by 57 per cent. In 1963 the 11-firm industry dried about 11.7 million pounds of food which resulted in 3.7 million pounds of dried food products. If the full capacity of the industry had been utilized, 26 million pounds of food could have been freeze-dried in 1963.¹²

(4) Expansion of the industry in 1963 over 1962 took place in three different ways: (1) more efficient operation of plants previously established; (2) increase in capacity of existing plants; and (3) new firms entered the industry. Between January and April 1964, two new plants commenced operations while several others were under construction. As of April 1964, there were 14 freeze-drying plants in operation or under construction in the U.S. Six were located on the West Coast; four were in the Midwest, three were in the East, and one was in the South.¹³

11. Ibid, p. 2.

12. Ibid, p. 2.

13. Ibid, p. 2.

b. Anticipated Capabilities.

(1) In projecting the capabilities of the freeze-drying industry to 1970, certain assumptions must be made. The assumptions used in arriving at the figures shown in Table 1, below, included the following:

(a) "Changes in freeze-drying technology will continue to occur at about the same rate as in the past. Main ones expected for the future will be continuous flow dryers.

(b) The knotty problems involved in heat application and packaging will be largely overcome by 1967. Microwave heating methods will be in general use for the latter part of the drying cycle.

(c) Technological improvements in other drying methods will be developed at about the same rate as in the past.

(d) Prices of dried and other processed foods will remain at about the same absolute and relative levels as at present.

(e) The trend of increasing consumption of dried foods will continue.

(f) An implied assumption is that the volume of food freeze-dried can and will be marketed.

(g) Continuation of world tension resulting in a high government demand for dried foods."¹⁴

14. Ibid, p. 9

TABLE 1¹⁵

YEAR	FOOD FREEZE-DRYING VOLUME EXPECTATIONS (MILLION POUNDS)		
	FROZEN INPUT FOOD	WATER EVACUATED	DRIED FOOD
1963	11.3	7.9	3.4
1964	19.0	13.3	5.7
1965	32.0	22.4	9.6
1966	50.0	35.0	15.0
1967	76.0	53.2	22.8
1968	117.0	81.9	35.1
1969	175.0	122.5	52.5
1970	250.0	175.0	75.0

15. Ibid, p. 5.

(2) Based on a January 1964 publication by the Department of Agriculture, the volume of freeze-dried food in 1970* is estimated by type as follows:

TABLE 2¹⁶

ITEM	FROZEN INPUT FOOD (MILLION POUNDS)
Poultry Meats	58
Red Meats	28
Shellfish	9
Other Fish	5
Fruits, Berries, Juices	23
Vegetables	14
Mushrooms	8
Dairy Products	16
Seasonings	8
Beverages	20
Desserts	14
Miscellaneous Items	15
New Items Not Now Marketed	25
Total	243

16. U. S. Department of Agriculture, Marketing Research Report No. 639, Freeze-Drying of Foods: Cost Projections, January 1964, p. 27.

*It will be noted that the estimate of 243 mil. lbs. is 7 mil. lbs. less than the April 1964 estimate of 250 mil. lbs. (Shown in Table 1)

(3) In another publication Mr. Bird has concluded:

"The future growth rate of the industry is uncertain. However, if present interest continues, volume may double or triple each year for the next few years. If so, the volume by 1970 could well be 400 to 500 million pounds of raw input product annually - - about 2 per cent of the processed food volume. This is not large, compared with present food freezing and canning industries, which have annual volumes of about 7 billion and 19 billion pounds, respectively."¹⁷

5. Bread Mix, Instant (MIL-B-35092). This new item is intended to be used for producing the bread requirement, which is to be supplied as a separate component, for the large group subsisting situation. Its use in the field is dependent upon the completion of research and development, type classification and procurement of the Bakery System, Continuous. At present, industry has the capacity for production of approximately 14,500,000 pounds of instant bread mix per month; production at this rate would, for all practical purposes, utilize the entire capacity of industry to dehydrate flour and would, in turn, eliminate any capacity for the production of cake mixes which are also used by the Armed Forces.¹⁸ Controlling factors in the production of instant bread mix are the industrial capacity¹⁹ to produce dehydrated flour and glucono-delta-lactone. Unless

17. U.S. Department of Agriculture, Economic Research Service, Marketing Economics Division, ERS-147, Selected Writings on Freeze-Drying of Foods, January 1964, pages 45-46.

18. Ltr, HQ, Defense Subsistence Supply Center to Commander, US Army Combat Developments Command QM Agency, DSSC-P/1, 17 August 1964, Subject: "Industrial Capacities for Subsistence."

19. Ibid.

stimulated by government procurements, it would appear that any increase in the present capability for producing instant bread mix must stem from an increase in the civilian market demand for dehydrated flour/cake mixes and glucono-delta-lactone.

6. Flex Canning. There is a definite trend in the commercial food industry towards flexible packaging. The extensive treatment given to flexible packaging in food industry trade magazines is indicative of this trend. Moreover, a number of leading metal can producers have acquired flexible packaging organizations in recent years. Also, advances in production rates of flexible packing equipment, from a normal speed of 60 packages per minute to as high as 300 per minute has added impetus to this trend.

a. The Armed Forces have had a particular interest in the development of flexible packaging for operational subsistence inasmuch as it provides a means for effecting reductions in weight and cube, achieving better portability on the person than that obtained from cans, and for conserving strategic materials.

b. The various types of flexible packaging employed in commercial practice, however, are not suitable for application to military operational subsistence. Military operational subsistence requires packaging which possesses greater strength and durability. Further, meals and food packets under development, of which the Meal, Quick Serve is an example, require multipurpose packages for which there is no present commercial counterpart. This multipurpose package serves as a package to hold and protect the dry food and as a reconstitution vessel when water is added in the course of food preparation.

c. As a result of interest by the Armed Forces, the long-term storage flexible pouch for heat-processed foods has evolved; it is composed of lightweight materials adapted to volume production, has the capability of affording long storage and maintenance of quality similar to that obtained from canning; and can withstand considerable stress and buffeting without adverse effects on contents or container.²⁰

d. To date, heat-processed foods have been packaged in military-type flexible pouches only in laboratories and in limited commercial production. Nevertheless, a sizeable portion of the machinery that is required is available. An industrial preparedness study is available which describes the machines and ancillary processing equipment to provide information to prospective contractors for the establishment of a production facility. The costs of standard or modified devices are included.²¹ Other industrial preparedness studies have been conducted in recent years in connection with: (1) the packaging of spreads and sauces in collapsible tubes, (2) systems for packaging dehydrated foods in flexible packages, and (3) development of facilities to package and heat process foods in flexible packages.²²

e. At present, the industrial base for the flexible packaging of heat-processed foods for military operational subsistence is extremely limited; that for packaging precooked dehydrated foods, such as those in the Quick-Serve type meal, on a large scale is now virtually nonexistent.

20. General American Transportation Corporation, MRD Division, Final Report on Industrial Preparedness Measures Project Q-13, Development of Facilities to Package and Heat Process in Flexible Packages (Contract No. DSA-30-62-908 (CHI-2522-62)), undated, p. 1.

21. Ibid, p. 4.

22. See Incl 1 to this appendix p. 13.

To create an adequate industrial base capability for flexible packaging of military operational subsistence will require considerable expenditure of funds backed up with substantial, recurring government procurement.²³

7. Summary.

a. In reviewing the capabilities of the national industrial/commercial base to provide required military operational subsistence during the period 1965-1970, the adequacy of both capability and planning to provide conventional foods is clearly evident. The capability of the industrial/commercial base to support requirements for new types of operational rations, which would utilize new food processing and canning techniques, is less assured. The freeze-drying of foods is a new industry. As indicated by the foregoing paragraphs, the capacity of the industry is expected to increase rapidly during the time period. It is considered that best estimates concerning the magnitude of expansion of this industry are from a capacity of about 26 million pounds of frozen input food in 1963 to 400/500 million pounds by 1970. In terms of dried end-product, these figures represent an increase of from 7.8 million pounds to 120/150 million pounds.

b. The present industrial capacity for instant bread mix is 174 million pounds per year. In the absence of projected capacity figures for the 1965-1970 time frame, it appears that increase in this capacity is dependent upon an increase in civilian market demands for dehydrated flour/cake mixes and/or further expansion of the industry in response to additional government requirements.

23. Minutes, Conference, US Army Combat Developments Study, Subsistence and Food Service for the Army in the Field (USACDCOMA Project 65-7), held at Headquarters, Defense Supply Agency, 24 August 1964, p. 47-50.

c. Like freeze-drying and instant bread mix, "flex-canning" is a relatively new development in the food industry. Industrial preparedness study of this process has been conducted. The present industrial capacity for military application of flexible packaging is limited. Nevertheless, the capability for expansion exists; a significant portion of the machinery and ancillary equipment as well as technical "know-how," is available. Future expansion of the industrial capability for flexible packaging of military operational subsistence is keyed to the magnitude of government demand.

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INCLOSURE 1 TO APPENDIX 3 TO ANNEX C
INDUSTRIAL MOBILIZATION PLANNING FOR SUBSISTENCE¹

1. The purpose of industrial mobilization planning is to prepare for production during peacetime. Its object is to achieve optimum readiness for mobilization or other emergency situations.
2. The background for industrial mobilization is found in the basic elements of our defense posture. Planning responsibility for national defense rests with the President of the United States as Chief of the Executive Branch and as Commander in Chief of the Armed Forces. The National Security Act of 1947, amended June 1953, established the Office of Defense Mobilization (ODM) as the staff agency of the President to monitor and coordinate all mobilization plans. Reorganized several times in recent years, the office currently is called Office of Emergency Planning (OEP). The coordination of policies and programs for current defense activities and readiness for future mobilization, as well as preparation to absorb the impact of military and essential civilian requirements upon the national economy during a period of emergency, continues as a direct responsibility of OEP. Other specific responsibilities to develop national emergency plans and preparedness programs within assigned areas have been delegated to other agencies in the Executive Branch.
3. The Assistant Secretary of Defense (Installation and Logistics) is charged with responsibility for Armed Forces mobilization. The Business and Defense Services Administration (BDSA), in administering the Priorities and Allocation Program, also supports and assists in expediting delivery of

1. The information contained in this Inclosure was presented by Mr. Ralph Roth, Acting Chief, Industrial Mobilization Office, Defense Subsistence Supply Center at the U. S. Army Quartermaster School on 16 September 1964.

end items (from industry) for current and mobilization needs. Formal industrial readiness planning for subsistence by Defense Subsistence Supply Center is limited to planning with industry for emergency production of combat essential items which pose a production problem. Considerations include the following:

a. MILITARY MUST KNOW:

- (1) Who can make what?
- (2) How much can be made?
- (3) How fast can it be made?

b. INDUSTRY MUST KNOW:

- (1) What military agency needs what?
- (2) How much is needed?
- (3) How soon is it needed?

5. The program itself is divided into seven distinct but interrelated areas of activity:

- a. Conversion planning
- b. Industrial preparedness measures (IPM)
- c. Layaway of government and/or contractor owned production equipment or facilities
 - (1) Provisions of production facilities
 - (2) Layaway of production facilities
 - (3) Industrial equipment reserve
 - (4) Industrial plant reserve

- d. Special studies (usually items in short supply)
- e. Pre-planning of new dehydrated items
- f. Studies of processes compiled by an industrial specialist who acts as an observer during production testing contracts.
- g. Pre-award surveys

6. For the most part, subsistence planning is conducted under the Conversion Planning System prescribed in DOD Instructions (4005.15) and implemented by DSA Manual 4005.1, dated April 1963, subject: Industrial Mobilization Planning. Fundamentally, Conversion Planning concerns plants which during an emergency, plan to produce items other than those currently in production. For example, a can of pre-fried bacon is different than bacon normally processed by a meat packer.

7. Contributing to this difference are factors such as: specification materials, sources of material, inspection (including quality control), some degree of difference in production processes, etc. It is readily seen that Conversion Planning is essential so both manufacturer and government can jointly determine the optimum distribution of the production capacity of the industry. Each facility survey is made to determine the various military items that can and should be produced in each planned facility. Thus the wartime workload is distributed, the government knows where the supplies are coming from and each supplier knows what he is to produce. Surveys also reveal how quickly production can be started and the production that can be expected. This information is needed to determine the extent of reserve stocks needed to fully support any logistic requirement. Finally, after analyzing the data from surveys, decisions can be made regarding pre M-Day preparedness measures that should be undertaken to maintain or improve the mobilization production base.

8. Conversion planning is used where it is desirable to plan with manufacturers to shift from production of an item that is not required to one that will be required with or without expansion and/or conversion of production facilities. The degree of conversion planning necessary depends greatly on the extent of conversion required to shift from production of the civilian to the military item. Usually, the greater the difference between the peacetime and the wartime item, the more extensive and detailed the planning required on production equipment, plant layout, materials and other lead time factors. The intensity of the planning decreases (more or less) as the similarity in the items (materials, equipment, manufacturing processes) increases.

9. Through proper planning, emergency plans can be implemented through a letter of intent to instruct the supplier to initiate production in accordance with his agreed to schedule. The production leadtime saved through this readiness planning will result in much greater production during the early stages of mobilization and reduce the need for reserve stocks accordingly. Normally, conversion planning is limited to essential military items and then only where there is reasonable assurance that such planning will improve significantly the capability to produce and the expected results are well worth the cost of such planning. Conversion planning is prohibited for common shelf items or other items which can be procured on the open market without undue delay.

10. Conversion planning differs from compression and acceleration planning in that the latter two systems basically provide for increased

deliveries from contracts in effect prior to the emergency. Procurement of most DSSC items normally is made under relatively short term contracts executed as a result of negotiation; hence, it is not possible to forecast which contractors will be producing a given item on the planned M-Day. Accordingly, it is assumed that each planned producer will be producing items other than the "planned items" on such day and would convert his production from a commercial to a military item.

11. The objective of DSSC's Industrial Mobilization Plan is to close the existing gap between the production base established by levels of current procurement, the current subsistence inventory, and the total M+12 month requirement. The present plan is based on a projection of the military services' consolidated requirements for 118 line items of B-ration components and 2 lines of composite food packages.

12. Planning factors for the military services are in two elements: First, the approved forces, as the forces which are currently in being, and secondly, the forces of the Joint Strategic Objectives Plan (JSOP) which include the approved forces. Requirements for the approved forces are known as the Mobilization Reserve Materiel Requirement (MRMR) and are computed for the period from M-Day to M+6 months. Requirements for the general forces (JSOP) are known as the General Mobilization Reserve Materiel Requirement (GMRMR) and cover a full 12 month period following M-Day. The consolidation of the GMRMR submitted by the services is the basis for industrial mobilization production planning. For planning purposes, quarterly requirements after M+12 continue at the same rate as for M+10 thru M+12. Monthly increments in any one quarter will be equal.

13. The last two published plans were based on a new method of planning known as the "P-Day" concept. P-Day is described as the first day of the month during

which the quantity from production, phased to reflect acceptance in the CONUS depot system, equals or exceeds the rate of consumption of an item and can sustain subsequent demands. It is a point in time when industry can supply the demands of the services. These planned requirements can be authorized and implemented for any emergency (brush fire type of war) (limited war) or general war. This new concept allows for application of industrial mobilization plans in other than an all out emergency.

14. Conversion planning involves subsistence items for which DSSC is the single manager representative in the operational ration & "B" ration category. These items are all regarded as combat essential, based on determinations made by each of the requiring services. All designations are made in conformance with the policy guidance and criteria prescribed to determine the items for which mobilization reserve stocks are to be established. Of the 120 items previously noted, current plans involve 33. These are as follows:

- a. Meal Combat, Individual
Plus 32 of the components that go into the make-up of this item.
- b. Food Packet Individual In-Flight
Plus 22 of its components.
- c. "B" Ration
31 components of the B-Ration, for a total of 87 actual planned items.

15. The services have all indicated that these items are combat essential. DSSC applies a second set of criteria (established by OSD) to each item to determine whether it will qualify for formal planning with industry under the Industrial Readiness Planning Program. First, there must be an urgent military requirement not satisfied from reserve stocks; second, the requirement must be of such magnitude and urgency that corrective action is warranted; third, planning with industry will

improve the capability to procure the item; and fourth, the cost of planning is reasonable in the light of expected results. As a matter of information, DSSC has recently completed a procurement of the Food Packet Abandon Ship, and is also in process of procuring additional quantities of Meal, Combat, Individual and Food Packet, In-Flight (both planned items) and the Food Packet, Abandon Aircraft, Individual. In addition new items known as the Survival Packet, Individual, General Purpose, which replaces the Food Packets, ST and SA, and Packet, Subsistence, Long Range Patrol (for use by Army Special Forces) are being procured. DSSC is also conducting a production test on the Meal, Uncooked, 25-Man. Both of the latter items contain many dehydrated and some freeze dehydrated items; some of the present components of the Meal, Uncooked are good candidates to replace some of the present B-Ration items and, therefore, could very well become planned items of the future.

16. For items such as combat rations and dehydrated items, the industry peacetime production is relatively small. The scarcity of production bases for dehydrated meats, vegetables, and fruits is well known. DSSC is continually trying to locate potential sources of supply for these items and to develop and maintain realistic plans for expansion and acceleration of emergency production. Since this segment falls far short of mobilization needs, it is necessary to enlist the services of past producers and potential suppliers and plan for extensive conversion of facilities for the production of operational rations and dehydrated items.

17. The requirements for combat feeding will tax the capability of industries normally producing quality items. It is entirely feasible to start procurement of any item, when the next emergency occurs without

industrial mobilization planning, but it will be extremely difficult to meet mobilization requirements unless we have reliable information on capable producers and schedules readily available both in government and industry. DSSC's mobilization requirements cannot be met by merely adding more people, equipment and shifts to the current production level. The large requirement for operational rations, dehydrated items and "B" ration components, will far exceed the capability of industry normally engaged in food packaging or assembly. Planning, therefore, has been extended into those industries which produce non-essential military or non-essential civilian items, and which have facilities suitable for handling large quantities of ration components. Revised industrial mobilization plans are processed at least semi-annually and more often if necessary.

18. In addition to this item analysis, DSSC prepares a Mobilization Procurement Plan Package. This package will contain all the necessary guidance required by the contracting officer to initiate all or part of the planned emergency procurement on a timely basis. A study was recently completed on converting the standard format of plans to the cartwheel format. The cartwheel concept presumes that the assembler is the hub of the wheel and the component suppliers are the spokes. It is hoped that some type of machine application can be made to this format which will allow the selection of an assembler and let the machine determine which component producers are to supply a designated assembler.

19. Formal planning with industry, through survey of facilities and alignment of supply sources, plus scheduling of the mobilization production, significantly reduces procurement leadtime. Under current procurement, the leadtime for composite food rations has normally been 210 days. Industrial readiness planning reduces this leadtime by 105 days. Without formal planning with industry for these items, it would be necessary to pre-stock

the entire net M+6 month mobilization requirements, whereas (with planning) 75 days production will be received prior to M+6 months.

20. The new concept of a future war has placed emphasis on locating sources of supply and building up to maximum capacity as rapidly as possible to cover a M+12 month requirement. In the past, planning was conducted and production scheduled to provide supplies when they were needed. Production was scheduled to closely follow the requirement curve over 3 years. Actually, when budgeting for mobilization reserves, the instructions provide for reliance on post D-Day production to the extent possible. This means enough supplies must be on hand prior to D-Day to satisfy needs until production can meet all requirements. DSSC is fortunate in that many of its supply items have a relatively short production leadtime, and through proper planning, large quantities can be realized very shortly after M-Day, and thus greatly reduce the dollars needed to provide reserve stocks.

21. The planning office, HQ DSSC allocates production planning requirements on a proportionate basis among eight DSA Procurement Support Offices located in Boston, New York, Philadelphia, Atlanta, Memphis, Columbus, Chicago, and San Francisco. These offices were established by DSA in January 1963 and are charged with both inspection and industrial mobilization functions. The DSSC mobilization planning office is concerned with only the industrial mobilization functions and, while these offices are under the direct control of DSA, they are also under

the technical supervision and direction of the various planning offices located at Defense Supply Centers. These offices are charged with locating and surveying facilities capable of producing assigned items and selecting and recommending production data for inclusion in mobilization procurement plans. They also may be requested to perform pre-award surveys and special studies as required by the planning offices. During FY 1964, approximately 300 such visits were accomplished.

22. Upon receipt of production information, the planning office reviews and analyzes the production information submitted and develops the end item mobilization plan. The plan consists of the following parts:

- a. Statistical Portion (Part 1 - Recapitulation of
 In Two Parts (production by district
 (Part 2 - List of producers and
 (their production schedules
- b. Narrative Portion or , (Narrative sections which include
 End Item Write Up (item descriptions, production
 (problems, leadtime factors, man-
 (power, materials and other factors
 (which may affect production

23. Overall, DSSC maintains an active interest in some 450 plants and will have obtained approximately 500 signed Tentative Schedules of Production. Forty-five of these plants will be scheduled for the assembly of the composite operational rations; 230 will be scheduled for production of operational ration components; and 175 will be scheduled for production of "B" ration components. DSSC's objectives provide that such facilities will be surveyed at least every two years unless a major change in requirements or design of the planning item necessitates an earlier contact.

The diversification of the food industry into other areas of endeavor quite often are causes for additional visits, as attempt is made to keep abreast of corporate structures and the changes in their operating plans including mergers which in itself can be quite a problem.

24. Formal planning with industry has a favorable effect on DSSC's industry relations. Many nonplanned producers have inquired regarding their status and have requested that they become planned producers. Inclusion of the producers in the "Register of Planning Emergency Producers" assures the producer that he is considered in the military plans for emergency production. All producers who have signed a Tentative Schedule of Production must be solicited when planned items are procured. Facilities participating in DSSC's Industrial Readiness Program are kept informed as to changes in requirements and specifications current procurement needs. Continuity of production in the event of national emergency is a further consideration of industrial mobilization planning and, therefore, is appealing to industry at least to some degree. In addition, some facilities become current producers after being planned producers.

25. Industrial Preparedness Measure Studies (IMP's) are used to find out where production bottlenecks might develop during an emergency and to take corrective action before an emergency arises. In general, these measures comprise plans and actions by industry and/or government agencies, in the development of pre-M-Day measures for rapid conversion and expansion to high volume war production. DSSC's objective in the employment of these industrial preparedness measures is to increase and improve the industrial base of new or improved subsistence items.

IMP's are conducted for development type items only when progress of the item involved is sufficiently advanced to be reasonably assured that subsequent standardization will result. In addition the following criteria must be met:

- a. There must be a need for improved productibility.
- b. Mobilization requirements must be sufficient to warrant an expenditure of funds to increase the item's productibility.
- c. Preparedness can be better achieved thru this medium than thru current procurement.

26. Preproduction work should be integrated closely with later stages of development. Emphasis is given to those measures designed to close the gap between item development and mass production capabilities including more rapid transition from prototypes to volume production. Completed industrial preparedness measure projects are made available to private agencies on a loan basis provided industrial trade secrets are deleted from the study. Through this media it is hoped that private industry will be encouraged to improve, through capital investment, its capabilities to produce military subsistence items, thereby eliminating the necessity of additional studies. Some of the studies that have been contracted for and completed in the last three or four years are as follows:

- a. Packaging spreads & sauces in collapsible tubes
- b. Development of systems to package dehydrated foods in flexible packages in definite portion modules

- c. Development of facilities to package and heat process foods in flexible packages
- d. Pre-cooked dehydrated sweet potatoes
- e. Pre-cooked dehydrated carrots
- f. Freeze dehydrated fruits & vegetables

27. Layaway of government and/or contractor owned production equipment and/or facilities is further divided into the following sub-categories:

- 1) Layaway of production facilities; 2) Industrial equipment reserve;
- 3) Industrial plant reserve. This element of activity provides for the layaway, maintenance, and inventory of production equipment and/or facilities or special long leadtime category, necessary to expedite mobilization production in private industry and government owned facilities after M-Day. DSSC has never been involved in layaway or equipment reserve, however, serious consideration is now being given to submitting necessary justification for spoon molds and possibly some can closing and/or flip test equipment necessary for the production of canned baked type items which are components of the operational ration.

28. In addition to conversion planning industrial preparedness measures, and layaway programs, readiness planning also includes one other planning technique which is used as the need arises. On occasion the planning office may be confronted with the question of an entire industry, such as the meat industry, to satisfy probable emergency demands. In this event, permission must be obtained from the Bureau of the Budget, before a questionnaire can be sent out on an industry wide basis.

29. Another mission of the Industrial Mobilization Office, DSSC, is the pre-planning of new items. This is of constant concern, and this office is

always on the lookout for new dehydrated items which have never been processed on other than laboratory or pilot-plant scale. The mission includes location and attempt to obtain capacities from facilities which are or will be interested in the processing of these convenient type foods both commercially and for the Armed Forces. The food industry has taken an increasing interest in dehydrated foods, but because of the intense competition for new dehydrated items, representatives of multi-plant or individual plants are often unwilling to disclose future plans for new product development or for expansion of dehydrated product manufacturing capability. Information of such nature is often considered to be of a confidential nature by the food industry in general. However, the planning office is continuing to contact every source for any possible capability. Freeze dehydration is generally regarded by the food industry as the most promising new method of dehydration. Some of the items being dehydrated and the methods used are as follows:

a. Dehydrated meats:

- (1) Freeze dry dehydration
- (2) Pre-frying - bacon only

b. Dehydrated juices:

- (1) Vacuum dehydrated - powder
- (2) Vacuum concentration - tomato paste, etc.
- (3) Foam mat dehydration

c. Dehydrated fruits:

- (1) Vacuum dehydration
- (2) Atmospheric dehydration
- (3) Freeze dry dehydration

d. Dehydrated vegetables:

- (1) Atmospheric dehydration
- (2) Freeze dry dehydration
- (3) Drum dehydration - sweet potatoes

30. Another area of DSSC interest is called Pre-Production Testing Contracts. These tests are conducted to evaluate the requirements and Quality Assurance Provisions of a specification and to determine the capability to industry to produce an item according to a specification. In this area a mobilization planner acts as an observer only. His function is of observe the actual test run and to note all new methods and/or problem areas as they apply to a given item. A complete report of the test is submitted to the planning office and, in turn, is distributed to the support office for their information and use in future contacts with industry.

31. The completed Pre-Award Survey Form is a very important document and one of the many sources of information that the contracting officer utilizes to ascertain the responsibility of a prospective contractor. The Pre-Award Survey Form may be the last document utilized in determining an award but, conversely, the first referred to when a contractor fails to perform. Since DSSC's list of producers is fairly well established, numerous surveys are not required. Most of such surveys are confined to operational ration assemblers and component producers.

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ANNEX D

WATER REQUIREMENTS

1. General. There are many demands for water in a theater of operations. These will range from the water for soldiers' canteens to the millions of gallons of water needed daily to support the activities of large urban communities. This annex is concerned only with water as it relates to the subsisting of personnel. It does not consider the non-potable water requirements for laundry, bathing, vehicle radiators, cleansing of vehicles and equipment, and numerous other military needs. For the subsisting of personnel, potable water is required for three essential purposes, namely: drinking, food preparation, and mess sanitation.

2. Water Requirements. Individuals obtain their water needs directly from the water they drink and indirectly from water contained in the food they eat. During the 1965-1970 period, no innovations are foreseen which will materially affect the quantity of drinking water which the individual will need. However, it is probable that there will be an increase in the amount of water essential for food preparation. The extent of this increase will depend upon the degree to which the new types of dehydrated foods replace the conventionally heat processed (canned, wet-pack) components in the field food system. At this time, it is anticipated that inclusion of dehydrated foods of both the uncooked and precooked types in operational subsistence will occur progressively, commensurate with the growing industrial production capabilities.

According to predictions regarding commercial industrial capabilities, extensive utilization of dehydrated food items, as visualized in the Meal, Uncooked, 25-Man (CDOG paragraph 1439f(14)) and in the Meal, Quick-Serve (CDOG paragraph 1439f(15)) is not considered likely until after 1970.¹ In order to provide a base for evaluating potable water requirements during the time frame of this study, therefore, comparative data for present standard and the developmental types of subsistence are used to provide minimum/maximum estimates. At any point in time from 1965 through 1970, the actual water requirement for meals will fall somewhere within this range, depending upon the amount of dehydrated foods in operational subsistence.

a. Comparative Man/Meal Requirement. Table 1 presents a comparison of the water required for the present standard and the developmental types of operational subsistence in terms of gallons used per man per meal. This data has been derived from a series of field tests conducted over the past several years. According to the table, the developmental large group and small group types of subsistence require approximately twice as much water for food preparation purposes as do their present standard counterparts. The developmental and standard "individual" type subsistence remain about equal in that each requires little or no water for food preparation other than that for beverages. The slight amount of water used in the preparation of the developmental Meal, Individual, Ready-to-Eat compared to the lack of any water requirement for preparation of the standard Meal, Combat Individual is accounted

1. See Appendix 3, "Industrial/Commercial Base" to Annex C of this study.

for by the inclusion of several dehydrated items in the developmental meal; reconstitution of these items required a few ounces of water.² In this connection, development of menus for individual type operational meals containing dehydrated components other than beverage components is considered inadvisable for the following reasons. Reconstitution would require time which might not be available to the front line soldier. The reconstitution operation also would increase the effort which must be expended in preparation of the meal, thereby causing diversion of attention from primary combat activities. Lastly, dehydrated components would create an increase in water requirements in the forward combat area where water distribution will be most difficult. An increase in water will be necessary irrespective of whether the dehydrated food is reconstituted before consumption or eaten dry. On this point, The Office of the Surgeon General has stated that the following information should be brought to the attention of all concerned: "A man normally secures a portion of his water requirements from the food he eats. The amount of water required per day cannot be decreased, and if it is not supplied in the food, it must be furnished elsewhere. Most of these dehydrated foods require water for their preparation. Although it is true that many can be eaten without rehydration, they are unpalatable in this state, are difficult to eat, and still require water for digestion. They make a man very thirsty and water must be readily available."³

2. Burt, Thomas B., US Army Quartermaster Research and Engineering Field Evaluation Agency, USATECOM Project No. 8-3-7400-04K, Final Report of Engineering Test of Meal, Ready-to-Eat, Individual, May 1964, p. 22.

3. 1st Ind, US Army CDC Medical Service Agency, 20 Jul 64, to ltr, US Army CDC Quartermaster Agency, CDCQMA-C, 5 June 1964, subject: "Requirements for Ration Supplements in Arctic and Tropical Regions."

TABLE 1

COMPARATIVE WATER REQUIREMENTS FOR STANDARD AND DEVELOPMENTAL
TYPES OF SUBSISTENCE
(GALLONS PER MAN PER MEAL)

TYPE SUBSISTENCE	REQUIRED WATER		
	FOOD PREPARATION	CLEAN-UP	TOTAL
Meal, Uncooked, 25-Man ^a Standard "g" ^a	0.29	0.52	0.81
	<u>0.15</u>	<u>0.47</u>	<u>0.62</u>
Difference	<u>0.14</u>	<u>0.05</u>	<u>0.19</u>
Meal, Quick-Serve ^b Standard Small Detachment, 5-Persons ^f	0.27	None	0.27
	<u>0.13</u>	(0.15)*	<u>0.13</u>
Difference	<u>0.14</u>	----	<u>0.14</u>
Meal, Ready-To-Eat, Individual ^d Standard Meal, Combat, Individual	Negligible**	None	Negligible
	None**	None	None
Difference	<u>Negligible</u>	<u>None</u>	<u>Negligible</u>

Sources of Data:

a. Burt, Thomas B., US Army Quartermaster Research and Engineering Field Evaluation Agency, USATECOM Project No. 7-3-0171-01K, Engineering Test of Meal, Uncooked, 25-Man, Prototype, September 1963, Table IV, p. 15.

b. Weeks, Elie, US Army Quartermaster Field Evaluation Agency, Technical Report T-211, FEA 61023, An Engineering Test Report of the Temperate Phase of the Consolidated Engineer/Service Test of the 6-Man and 25-Man Modules of the Experimental Quick-Serve Meal, December 1961, Table I, p. 18.

c. Burt, Thomas B., US Army Quartermaster Field Evaluation Agency, Technical Report T-171, FEA 60017, Time Study of Preparation and Use of the Ration, Small Detachment, 5-Persons, September 1960, Table V, p. 11.

d. Burt, Thomas B., US Army Quartermaster Research and Engineering Field Evaluation Agency, USATECOM Project No. 8-3-7400-04K, Final Report of Engineering Test of Meal, Ready-To-Eat, Individual, May 1964, p. 22.

NOTES:

*Clean up water for this type meal is omitted in the total water requirement shown to provide valid comparison; addition of disposable messing equipment similar to the items in the Meal, Quick-Serve, could eliminate clean-up water requirements.

**Does not include water for beverages.

b. Comparative Daily Requirements. Quantitative water requirements data for both food preparation and clean-up of messing equipment and utensils is depicted in Table II. These data were computed using a type field army having a strength of 431,553 individuals, geographically deployed and subsisted as shown in Appendix 2 to Annex A of this study. Average daily water requirements in terms of gallon units as well as gallons per man are projected for the standard and developmental types of subsistence. In this connection, it should be noted that changes in strength and/or numbers of individuals consuming the various types of subsistence (large group, small group, and individual types), i.e., the mix of troops and types of subsistence upon which the data are calculated, would cause some variations in the figures shown. They are, however, considered indicative and sufficiently valid for planning purposes. According to the table, the increase in average water required for food preparation, which would be caused through extensive use of dehydrated foods in operational subsistence, would only be approximately 1/2 gallon per man per day. Quantitatively, two gallons of water per man per day should more than satisfy the water requirements for food preparation irrespective of the type of meals supplied.

c. Evaluation. The US Army Combat Developments Command Engineer Agency recently made a study of field water supply and determined total personal water requirements should be five gallons per man per day for planning purposes; this is an average for every man in the field army.⁴

⁴. US Army Combat Developments Command Engineer Agency coordinated draft study, CECD-62-1, Field Water Supply, 1965-1970, December 1963, p. A-3.

TABLE 2

AVERAGE DAILY FIELD ARMY WATER REQUIREMENTS FOR SUBSISTENCE^a
(GALLONS)

SUBSISTENCE (TYPE)	ZONES 1, 2, & 3	(Per Man) ^b	ZONE 4	(Per Man) ^c	TOTAL	(Per Man)
<u>Present Standard</u>						
Large Group (B-Type)	117,112	(1.86)	395,324	(1.86)	512,436	(1.86)
Small Group (5-in-1 Type)	19,052	(0.39)	21,055	(0.39)	40,107	(0.39)
Individual (Meal, Combat, Ind) ^d	None	(----)	None	(----)	None	(----)
<u>Developmental</u>						
Total ^e	136,164	(0.98)	416,379	(1.42)	552,543	(1.28)
Large Group (Meal, Uncooked, 25-Man)	153,001	(2.43)	516,472	(2.43)	669,473	(2.43)
Small Gp (Meal, Quick-Serve)	39,570	(0.81)	43,730	(0.81)	83,300	(0.81)
Individual (Meal, Ready-To-Eat, Ind) ^d	Negligible	(---)	Negligible	(----)	Negligible	(----)
Total ^e	192,571	(1.39)	560,202	(1.91)	752,773	(1.74)
Difference	56,407	(0.41)	143,823	(0.49)	200,230	(0.46)
% Difference	41.4		34.5		36.2	

a. Computations shown in this table are based on water requirements data contained in Table 1, this annex, and daily subsistence requirements for a field army listed in Table C-4, Annex C (strength of the type field army is 431,553).

b. Zones 1, 2, and 3 comprise the area between the FEBA and brigade rear.

c. Zone 4 is that area from the rear of combat brigade areas to the field army rear boundary.

d. Does not reflect water requirements for preparation of beverages.

e. Variations in the "total" gallons per man figures are caused by including in the computations the number of troops subsisting on individual-type subsistence which requires little or no water except for beverages. For example, gallons per man/day (1.74) becomes 1.99 when only the troops using large group and small group type subsistence are included in computations.

Potable water requirements for personnel include drinking water, indirect water intake (used in preparation of food) and wash water.⁵ During the time frame 1965-70 the present water supply system, with its product improvements, will suffice to meet Army requirements.⁶ The aforementioned five gallon/man/day water requirement anticipates extensive field use of dehydrated meals (Meal, Uncooked and Meal, Quick-Serve) during 1965-1970.⁷ Allowing up to two gallons of water per man per day for food preparation and clean-up would leave at least three gallons or more than half of the total potable water requirement for other personal needs. This amount appears to be fully adequate.

3. Water Responsibilities. Responsibilities for supply of potable water in the field are delineated in Army Regulations.⁸ The specific responsibilities set forth in these regulations are in terms of technical services. It appears, therefore, that some restatement of water responsibilities, particularly those relating to combat service support functions, will be necessary, as concepts, doctrine and organization for functionalization in the army in the field (TASTA-70) develop. However, no change is seen as needed or desirable in the responsibilities of engineer units for determining requirements, sources of water, production of potable water, and distribution of potable water in bulk at central water distribution points. The Army Medical Service responsibility

5. Ibid, p. A-1.

6. Ibid, p. ii.

7. Ibid, p. A-2.

8. AR 115-20, Hydrological and Meteorological Services, Field Water Supply, 12 November 1952.

for determination of the potability of water and supervision of sanitation matters undoubtedly will remain the same. Also, commanding officers of using units normally will continue to be responsible for transporting water from central distribution points to points of use, for protecting such water from pollution; and for enforcing water supply discipline. Responsibilities now assigned in Army Regulations to the Quartermaster Corps, the Transportation Corps, and the Ordnance Corps are subject to some realignment.

4. Water Distribution. As mentioned in the foregoing discussion, it does not appear that there will be a problem associated with the function of water production. Distribution of water will be generally accomplished by the supply point system, i.e., the consuming unit will transport water from the water distribution point to the unit using organic equipment. Within units, further distribution of potable water will be made with 5-gallon water cans transported in vehicles or by carrying parties. Unit distribution will be employed for large users in rearward areas; there also will be a continuation of the trend towards this type distribution from brigade forward. No problem of serious proportions is foreseen in distribution of water rearward of the field army combat brigades (Zone 4) or in COMMZ. The problem, if any, will occur in the forward areas (Zones 1, 2, and 3). Here, the mobility, dispersion, and vulnerability of units and individuals will be greater.

a. Zones 1, 2, and 3. Table III presents a projection of the water required for meals of the present standard and the developmental types in each of Zones 1, 2, and 3 of a field army numbering approximately

40,000 men; the projections are shown both by gallon units and by gallons per man per day. According to the data in the table, each man in Zone 1 (companies and attachments in immediate FEBA area) will require slightly over .5 gal/.8 gal of water per day for subsistence purposes; to this must be added the required amount of drinking water. In Zones 2 (battalion area) and 3 (brigade area) respectively, the requirement will increase to approximately 1.0 gal/1.5 gal per man per day plus drinking water. During the 1965-1970 period, these water requirements will range closer to the lower limits shown (those for the present standard subsistence) unless the capability for producing dehydrated foods expands at an unexpected rate (see Inclosure 1 "Industrial Commercial Base" to Annex C of this study). Towards the end of the time frame of this study or shortly after 1970, it may be necessary to increase the minimum and normal water supply requirements stated in FM 101-10 for a man in combat by 1/2 gallon;⁹ this is based upon the data in Tables II and III showing that developmental meals (which are composed primarily of dehydrated items) will cause upwards to 1/2 gallon more potable water to be required. In the meantime, standard procedures and practices for water distribution should be adequate to meet expected needs.

b. Zone 4 and COMMZ. Zone 4 (from brigade rear to field army rear boundary) will present a water distribution requirement of around 1.4 gal/1.9 gal per man per day for subsistence purposes (see Table II).

9. FM 101-10, Staff Officers Field Manual, Organization, Technical, and Logistical Data, Part 1 - Unclassified Data, October 1961, p. 316.

TABLE 3
AVERAGE DAILY WATER DISTRIBUTION REQUIREMENTS FOR MEALS
IN FORWARD AREAS - ZONES 1, 2, & 3^a
(GALLONS)

SUBSISTENCE (Type)	ZONE 1 ^b (Per Man)	ZONE 2 ^c	ZONE 3 ^d
<u>Present Standard</u>			
Large Group (B-Type)	14,288 (1.86)	48,884 (1.86)	53,940 (1.86)
Small Group (5-in-1 Type)	4,797 (0.39)	7,422 (0.39)	6,833 (0.39)
Individual (Meal, Combat Individual Type)	None ^e (----)	None ^e (----)	None ^e (----)
Total	19,085 (0.56)	56,306 (1.09)	60,773 (1.14)
<u>Developmental</u>			
Large Group (Meal, Uncooked 25-Man)	18,667 (2.43)	63,864 (2.43)	70,470 (2.43)
Small Group (Meal, Quick-Serve)	9,963 (0.81)	15,415 (0.81)	14,192 (0.81)
Individual (Meal, Ready-To-Eat, Individual)	Negligible ^e (-)	Negligible ^e (-)	Negligible ^e (-)
Total	28,630 (0.84)	79,279 (1.53)	84,662 (1.59)
Difference	9,545 (0.28)	22,973 (0.44)	23,889 (0.45)
& Difference	50.0	40.8	39.3

a. Data in this table were computed in the same manner as data of Table 2, this annex.

b. Zone 1 - Infantry squads and platoons in contact; artillery, armor, and engineer units in immediate support; reconnaissance units; patrols.

c. Zone 2 - Battalion reserve; direct support artillery; medium range general support artillery.

d. Zone 3 - Brigade reserve, medium range artillery; field trains; brigade CP - extends generally to brigade rear boundary.

e. Does not include water for beverages.

The range of this requirement, like that in Zones 1, 2, and 3, also depends upon the degree to which dehydrated foods are used in operational meals. However, supplying either the minimum or maximum amounts projected for meal purposes in Zone 4 plus drinking water should be a routine type operation. The requirement per man per day in COMMZ for water in connection with subsistence, as well as distribution, should be similar to that of Zone 4.

5. Conclusions.

a. Use of dehydrated foods in lieu of processed foods containing water will cause an increase in potable water requirements for meal preparation.

(1) Increase in field water requirements for meals will be related directly to increases in the quantity of dehydrated foods introduced into military operational subsistence.

(2) Maximum use of dehydrated components, as in operational subsistence now under development, will raise present potable water requirements for meals by approximately one-half gallon per man per day.

(3) Since maximum use of dehydrated components in operational subsistence does not appear likely until after 1970, increased water requirements for meals will not approach 1/2 gallon per man per day until about that time.

(4) Projected water production capabilities within the field army during 1965-1970 can readily accommodate increased water requirements caused by the use of new dehydrated foods in operational subsistence.

b. The qualitative materiel requirement for the Meal, Ready-to-Eat, Individual (CDOG paragraph 1439f(16)) should be revised to limit dehydrated components in this type meal to beverages only.

c. The responsibilities for field water supply as presently delineated in Army Regulations and doctrinal publications will require

realignment to obtain compatibility with evolving functionalization of combat service support missions and functions.

d. During the 1965-1970 time frame, water supply and distribution will continue to be accomplished as prescribed in present doctrine with engineer units being responsible for the establishment of required water supply points.

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ANNEX E

SPECIAL SUBSISTENCE RESPONSIBILITIES

1. General. Special responsibilities for subsisting personnel other than US Army personnel will be assigned from time to time by the theater commander to subordinate army commanders. These responsibilities derive from service and joint doctrinal publications, international law, customs, conventions, treaties, agreements, and such executive orders as have the force of law. In the aggregate, special subsistence responsibilities form a heterogeneous mixture, typical examples being personnel of other service components, allied military organizations supporting or operating with US forces, PW's, sick and wounded, civilian internees and people residing in liberated and occupied territory. The extent of this type support will vary both in kind and degree, dependent upon such factors as the nature of the warfare, its magnitude, and the geographic locale. These special subsistence responsibilities of the Army in the field and the manner in which they may be fulfilled are further discussed in the following paragraphs.

2. US Armed Forces Personnel Other Than Army. The Navy, Marine Corps and Air Force will have installations and units in the theater of operations. These will include air bases, naval ship repair facilities, shore establishments, and other logistical activities. Subsistence support of these elements may be, in whole or in part, an army responsibility as provided for by agreements or assignments.¹ In practically all instances, the same types of subsistence used in the Army field food system, i.e., the large group, small group and individual types, will be satisfactory.

¹ FM 100-10, Field Service Regulations, Combat Service Support, September 1964, p. 22.

There will be an exception with respect to meals for flight crews; these personnel will require pre-flight meals consisting of components which do not cause flatulency or provoke thirst. Subsistence, such as the Food Packet, In-Flight, Individual (specification MIL-F-3764), will be available for consumption by personnel in-flight. For high altitude flights, wherein clothing and equipment such as gloves and oxygen masks prevent the eating of conventional foods, aircrews of high performance aircraft will require liquid or semi-solid foods in appropriate dispensers, food tablets and bars, and other type bite-sized foods of high caloric density. These specialized food requirements for pre-flight and in-flight usage, as well as any other types of special subsistence peculiar to the requirements of the other services, will be procured, stored, and issued, together with standard army types of subsistence, as required. (Expanding concepts for Army aviation activities in a field army may create a similar requirement for specialized food packages.)

3. Allied Military Forces. When allied military forces are participating with US Armed Forces in combined operations, subsistence support to some degree will be furnished by the United States. The necessity for such support was experienced in World War II and Korea. Since World War II, our mutual-security policies have resulted in wide-spread alliances with free world countries.² The multilateral alliances are with 14 other nations in the North Atlantic Treaty Organization (NATO), with 7 friendly countries in the Southeast Asia Treaty Organization (SEATO) and with 19 fellow American republics in the Organization of American States (OAS). To this list may be added bilateral mutual-defense agreements with a number of countries in the regional groups mentioned above, as well as with Japan, Iran, the Republic of Korea and the Republic of China (Taiwan).³ It is

2. Industrial College of the Armed Forces, The Economics of National Security, Volume XVII, Mutual Security, 1959, p. 4.

3. US Army Combat Developments Command Quartermaster Agency, Final Draft, USACDCQMA 60-1, Provision of Labor Service, July 1964, p. B-1.

anticipated that allied forces will operate individually as units and thus will have their own field messes. The extent and type of subsistence support to be furnished to these allies will vary in accordance with stipulations set forth in various mutual-security agreements and with religious and ethnic customs.

4. Military Hospitals and Medical Aid Stations. Treatment of casualties within the area of operations involves special subsisting considerations. For theater hospital messes, the unitized large group type of subsistence discussed in Annex B, Section II, of this study will be suitable for subsisting patients capable of consuming normal diets. For planning purposes, 30 percent of the hospital patient strength will require modified diets. Approximately half of these patients will require foods of solid or semi-solid consistency; the remainder will require foods of liquid consistency.⁴ Unitized meals of the B Hospital (BH) Ration and B Hospital (BHL) Ration types will be supplied for these special diet patients. A minimal amount of additional small kitchen equipment will be required for modified diet food preparations. Additional training in modified diet preparation will be required for some of the food service personnel assigned. Medical aid stations and clearing stations will require food items for resuscitative feeding of casualties as they are received and held awaiting evacuation. The present standard Ration Supplement, Aid Station (specification MIL-R-1041) is a unitized pack which, with contemplated improvements, can be used to satisfy this need. In addition to the pack, water, a means for heating liquids, and insulated containers must be supplied.

5. US Civilian Personnel. This group of people, comparatively negligible in number, will consist of civil service personnel, special

4. Department of the Army Supply Bulletin, SB 10-495-1 Standard B Hospital Ration for the Armed Forces, Section I, September 1964, p. 2.

government mission personnel, contractual consultants, technicians and aids, Red Cross workers, representatives of the press, USO entertainers, etc. No particular problem is foreseen in the subsisting of this category of personnel. They normally will mess with army organizations or in a limited number of cases will be furnished with separate subsistence.

6. Non-US Labor Personnel. Approved policy announces that maximum use will be made of the services of non-US personnel in overseas areas in support of a military mission, to the extent that such utilization is consistent with operational requirements, security, the essential manpower needs of the local economy, applicable local or United States law, international law and treaties, and agreements to which the United States is a party.⁵ This includes employment of non-US labor personnel in friendly countries, liberated countries, and occupied enemy areas. The bulk of non-US labor will be composed of static labor, i.e. people who live in their own homes and who report daily to an established US Armed Forces worksite.⁶ These individuals may be furnished one or more meals per day, particularly in those areas of the world where food shortages exist and where availability of food as a "fringe" benefit will create an incentive and cause a stabilizing influence upon labor relations. Under certain conditions, it may be more practical to use labor personnel who live away from home and move about as work requires; management of this type labor is facilitated by formation of organized mobile units of the proper size and composition to perform specific missions.⁷ Because of the mobile nature of these units, it will be necessary to furnish them

⁵ Department of the Army Pamphlet, DA PAM 690-80, Administration of Foreign Labor During Hostilities, September 1958, p. 3

⁶ Ibid, p. 23.

⁷ Ibid

with some amount of logistics support including food and messing facilities.⁸ Generally, the large group type of subsistence for use in the US Army field food system will be suitable for subsisting static and mobile non-US labor. In certain world areas, substitutions and supplements, preferably locally procured, may be essential to conform to religious and ethnic food customs.

7. Prisoners of War and Civilian Internees. The Geneva Conventions of 12 August 1949, "For the Protection of War Victims," contains conventions relative to the treatment of prisoners of war and civilian internees. Under these conventions, the contracting parties, of which the United States was one, undertook to insure respect for the provisions contained within the conventions. The basic principles for providing food and messing facilities are included in the conventions.⁹ It is specifically stated that sufficient food must be provided to keep the prisoners of war and civilian internees in good health and to prevent loss of weight or the development of nutritional deficiencies. The conventions also state that account shall be taken of their habitual diet. Implementing instructions are contained in Army regulations.^{10 & 11} In normal operations, prisoners of war and civilian internees will be moved as quickly as possible to the rear. While on this rearward move, they will be subsisted in the areas through which they pass from army stocks and other available sources such as captured food supplies. In the rearward areas, prisoners of war and civilian internees will be interned in separate camps operated on an austere basis. Mess personnel

8. Ibid, p. 24.

9. Geneva Conventions of 12 August 1949, For the Protection of War Victims, (1) Relative to the Treatment of Prisoners of War, Part III, Article 19 and Section II, Internment of Prisoners, Chapter II, Article 26, and (2) Relative to the Protection of Civilian Persons in Time of War, Section IV, Chapter 3, Article 89.

10. AR 633-50, Prisoners of War; Administration, Employment and Compensation, 8 August 1963.

11. AR 633-51, Civilian Internees; Administration, Employment and Compensation, 8 August 1963.

and equipment for the operation of the prisoner of war/civilian internee camp messes will be provided for as authorized in TOE 29-500, except that qualified prisoner of war/civilian internee personnel will be substituted for US Army personnel.¹² The food to be provided will consist of essential items drawn from the most practical sources; i.e., army large group subsistence, bulk stocks of basic food stuffs, especially requisitioned for prisoner of war/civilian internee feeding, supplies of the type brought into the theater for indigenous populations, local procurement, etc. Articles selected should not include luxury items or items in short supply. Nutritive requirements will be predicated upon prisoners of war/civilian internees in compounds doing sedentary camp housekeeping duties and engaged in some recreational activities. Food supplements, as determined by the local surgeon, will be needed for prisoners of war/civilian internees doing labor and for hospitalized prisoners of war/civilian internees. At all times, due consideration will be given to furnishing articles of subsistence which conform to the prisoners' religious beliefs and dietary habit. Expectant and nursing mothers and children under fifteen years of age will receive additional food in proportion to their physiological needs.

8. Displaced Persons, Refugees, and Evacuees. The theater commander is responsible for care, control, and disposition of refugees, evacuees, and displaced persons; all commanders are under legal obligation imposed by the rules of international law, including the Geneva Convention of 1949, to provide a minimum standard of humane care and treatment.¹³ Accordingly, planning for the care and control of these categories of

12. US Army Combat Developments Command Military Police Agency final report, USACDCMPA 61-2, Prisoner of War Operations in a Theater of Operations During the Period 1965-1970 (U), June 1964, p. 77.

13. FM 41-10, Civil Affairs Operations, May 1962, pp. 127 and 128.

civilians must give consideration to the manner and means for providing the basic necessities of life, as required. Food will have to be made available at civilian collecting points, assembly areas, and camps which will be administered and operated by civil affairs units until these persons can be returned to their normal places of habitation, resettled in local communities, repatriated to their own countries or otherwise appropriately disposed of as may be designated.¹⁴ Even then, it may be necessary to continue some measure of civilian subsistence support through civil affairs channels. Sudden and unforeseen requirements for feeding hundreds of thousands of civilians in an area of operations would place a severe drain on US military subsistence supplies. In anticipation of this problem, advance planning for civilian population feeding, as foreseen in civil affairs annexes to various contingency plans, is being accomplished under the auspices of the Defense Supply Agency.¹⁵ The aim is to develop a master list of some 13 or 14 standard, "off-the-shelf" type food items. From this list, items acceptable to the religious beliefs and dietary habits of the peoples in various geographical areas of the world can be selected and used to prepare a small number of standard menus. These standard menus, each providing per capita nutrition of a specified, predetermined amount, will be submitted as recommendations to the Joint Chiefs of Staff for coordination as deemed appropriate and approval. The type of subsistence support for which these standard menus are being designed is almost inevitable in the event that the United States becomes involved in any level of armed conflict. There

14. Ibid, pp. 129-135.

15. Letter, Headquarters Defense Supply Agency, DSAH-N, 2 September 1964, Subject: "Conference Minutes," pp 94-98 of inclosure.

are only two areas in the world today which are considered to have a general surplus of food stocks, namely North America and Oceania (Australia and New Zealand).¹⁶

9. Conclusions.

a. The Army responsibilities in connection with subsistence supply to Navy, Marine and Air Force organizations generally can be satisfied with the packaged operational meals to be used in the Army field food system. Additionally, the Army must be prepared to store and issue special subsistence peculiar to these services, particularly in-flight and pre-flight meals for crews of aircraft.

b. Subsistence and food service equipment support to allied forces will be furnished in accordance with agreements with allied governments.

c. The large group type subsistence for general troop consumption will fulfill the normal requirements of theater hospital messes. Unitized food supplements for patients needing special diets and for resuscitative feeding of casualties at aid stations and clearing stations also will be required.

d. The subsistence and manner of messing provided for Army personnel will meet the requirements of US civilian personnel located in the same area.

e. Static non-US labor will be provided meals, as appropriate, at the worksite where they are employed. Non-US mobile labor units will be supplied with standard army operational subsistence with substitutions/supplementations to meet religious and ethnic dietetic habits.

16. Brown, Lester R., Department of Agriculture, Economic Research Service, Foreign Agriculture Economic Report No. 11, Man, Land, and Food: Looking Ahead at World Food Needs, 1963.

f. Nutrition sufficient to maintain PWs at the standards of weight and health prescribed in the Geneva conventions can be supplied from any of various sources, whichever are the most practical to utilize under prevailing circumstances, e.g., from Army stocks of operational subsistence or from bulk commodities brought into the theater or locally procured for PW/indigenous population feeding; mess facilities for operation by the PWs can be established with TOE type field food service equipment.

g. The food requirements of displaced persons, refugees, evacuees, and civilian internees can be satisfied adequately from a limited number of basic, off-the-shelf type foodstuffs which can be combined into a number of standard menus, each in keeping with the geographical considerations of the world area where the food is to be consumed; such food items probably will be drawn from surplus stock in CONUS.

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ANNEX F

IMPLICATIONS OF CBR OPERATIONS

1. Introduction. Any subsistence system for the Army in the field must include provisions for feeding all echelons in a theater of operations in a CBR environment. This annex explores the effects of CBR operations on subsistence items, including packing and packaging, mess equipment, and subsisting situations. Additionally, the problems of protection, storage, movement, and decontamination of subsistence supplies are reviewed.

2. The Effects of CBR Agents on Packaged Subsistence Items.

a. Chemical. Chemical agents may contaminate subsistence by means of vapor, aerosol, or liquid. The vulnerability of subsistence items to chemical agents is affected by the type of subsistence, the type and amount of chemical agent, and the effectiveness of protective measures. Such protective measures include special packaging of subsistence, proper storage procedures, dispersal of supplies, and maximum use of both natural and artificial protective shelters or other shielding devices.¹ Food supplies in storage are not likely to be contaminated if reasonable precautions are taken to protect them from chemical attack. Foods not specifically packed in protective packages generally constitute the major difficulty. The present methods employed by the Armed Services in packing for overseas shipment reduce the danger of contamination. Current packaging materials

1. FM 10-69, CBR and Nuclear Protection and Decontamination of Quartermaster Supplies and Equipment, November 1961, (Rescinded), p. 19.

offer some protection against all contaminating agents² and may be summarized briefly as follows:

(1) Airtight glass bottles, sealed metal cans, and sealed metal drums give complete protection against vapor and liquid.

(2) Wooden barrels, well sealed for the exclusion of air, give complete protection against vapor; protection against liquid is also complete except for heavy, prolonged concentration.

(3) Wooden boxes, if sealed for the exclusion of air, give good protection against vapor, but poor protection against liquid.

(4) Waxed paper boxes well sealed for the exclusion of air give good protection against vapor and fair protection against liquid.

(5) Untreated wrapping papers give poor protection against vapor and poor protection against liquid.

(6) Cellophane wrappings, sealed for the exclusion of air, give good protection against vapor and complete protection against liquid if all joints are tight.

(7) Metal foils and plastic-foil laminated bags give complete protection against both vapor and liquid if joints are tight and there are no scuffed areas or severe creases.

(8) Ordinary textiles (canvas etc.) in single layer packaging give practically no protection against vapor and liquid.

(9) Generally, double layers greatly increase the protective efficiency of packaging materials.³

2. Ibid, pp. 20, 21.

3. FM 21-40, Small Unit Procedures in Chemical, Biological, and Radiological (CBR) Operations, October 1963, p. 54.

(10) Packaged operational subsistence such as the Meal, Combat, Individual and Ration, Small Detachment, 5 Persons are so packaged as to protect the inclosed foods for many hours even when the outside of the package is heavily contaminated with liquid agent.

b. Biological. Food supplies properly protected in storage or protected by adequate packing and packaging are reasonably safe from contamination by biological agents.⁴ Sealed metal drums, sealed, metal lined cases or casks, sealed cans, bottles or glazed vessels with well-fitting stoppers or impervious materials, sealed wooden barrels such as those used for liquids and multilayer paper bags (asphalt binders, cellophane plies) offer complete protection against biological agents. Cellophane packages, wooden or thick cardboard boxes and metal foil afford complete protection if all joints are tight. Bottles or glazed vessels with ordinary cork stoppers, cans with well-fitting lids but not sealed, and sealed, dry, paper containers offer good protection. Food stored in refrigerators or refrigerated warehouses is not likely to be contaminated.

c. Radiological. As with other CBR agents, subsistence items can be protected from radioactive dusts by proper storage and protective packing and packaging. Sealed metal drums, sealed metal-lined cases or casks, sealed cans, bottles or glazed vessels with well-fitting stoppers of impervious materials, sealed wooden barrels, multilayer paper bags, bottles or glazed vessels with ordinary cork stoppers, cans with

⁴. FM 10-60, Supply of Subsistence in a Theater of Operations, November 1960, p. 77.

well fitted lids but not sealed all give complete protection. Cellophane, wooden or thick cardboard boxes and metal foil will give complete protection against dusts if all joints are tight. Sealed and dry paper containers will give good protection while canvas containers and sacks give fair protection.⁵ Beverages, such as soft drinks and beer are protected by commercial crown sealed glass bottles and metal cans. Heat-sterilized foods canned in tin or glass containers are protected. The containers themselves may have induced radiation; the foods in the majority of instances will be safe.⁶

3. Effects of CBR Agents on Unpackaged Subsistence Items. CBR agents will contaminate unpackaged subsistence items. In addition to the toxic hazards, many chemical agents cause undesirable appearance changes in foods. Oily and fatty foods in particular are vulnerable. Biological agents will not cause any immediate changes in the contaminated foods. Refrigerated foods are protected from CBR agent contamination, when stored in the refrigerator. Radiological contamination agents may also cause undesirable odor, flavor and appearance changes in unpackaged foods.⁷ These changes, however, may not be pronounced enough to have the foods rejected by the individual as unfit to eat. Contaminated unpackaged foods in many

5. FM 10-69, op. cit., p. 21.

6. TM 3-220, Chemical, Biological, and Radiological (CBR) Decontamination, September 1961, p. 89.

7. Federal Civil Defense Administration: (a) The Effect of Nuclear Explosions on Meat and Meat Products, Operation Teapot Project 3313 WT-1216, 14 December 1956, pp. 3-4; (b) The Effect of Nuclear Explosions on Semiperishable Foods and Food Packaging, Operation Teapot Project 32.4 WT-1214, 14 December 1956, p. 4; (c) The Effect of Nuclear Explosions on Bulk Food Staples, Operation Teapot Project 32.1 WT-1163, 14 December 1956, pp. 3-4.

instances can be utilized by proper decontamination, segregation, or handling procedures. Proper procedures for decontamination and reclamation of subsistence vary with the type of CBR agent contamination involved. This is discussed further in this annex.

4. Effects of CBR Agents on Mess Equipment. Contamination of mess equipment by CBR agents generally will be limited to the surface of such equipment except for items near enough to a nuclear explosion to contain induced radiation. For protection against airplane spray of chemical or biological agents, mess equipment in field kitchens and kitchen trucks should be covered with paulins, tent flies, or other overhead covers.⁸ Both unit and individual mess equipment may be in use and unprotected. It must be assumed, therefore, that such items would be contaminated under conditions of CBR attack and would require decontamination to make equipment available for use after exposure.

5. Effects of CBR Agents on Food Processing, Transportation and Warehousing Facilities. It must be assumed that food processing, transportation, and warehousing facilities may be contaminated by CBR attack and would require decontamination prior to further use. Foods stored in warehouses and certain transportation facilities would be usable after the facilities were decontaminated. The assumption has been made that a large percentage of food facilities and foodstuffs stored in

8. FM 21-40, op. cit, p. 54.

them would be salvable beyond the 8 mile radius of total and severe destruction from a 10 million ton equivalent H-bomb burst and a very large percentage beyond the 12-mile moderate damage zone. An overall reduction of at least 95 percent in radioactive fallout particles has been reported for the inside of buildings even with doors open at many points. Refrigerated warehouses will offer a high degree of protection from fallout to stored merchandise so long as the openings are kept closed. Non-refrigerated warehouses with tight covers for all window and door openings will afford suitable protection against radioactive fallout but the premises may be more subject to fallout than refrigerated warehouses since the warehouses are not sealed.⁹ Refrigerated railroad cars containing fresh fruits, vegetables, and meats would not have the contents contaminated unless the cars were damaged to the extent of exposing the contents to fallout. The conditions for railroad cars pertain to truck and trailer transport, and air transport, i.e., if the foods are carried in sealed transport, there is little likelihood of the foods becoming contaminated by fallout. In general, warehouses and transportation facilities affording protection from radiological contamination will afford protection against biological and chemical agents.

6. Effects of CBR Agents on Potable Water. The blast and heat from a nuclear explosion may cause evaporation or other dissipation of water resources. Water also may be contaminated by radiological fallout.¹⁰ Fallout may settle directly into reservoirs and lakes or it may contaminate

9. Civil Defense Food Advisory Committee of the National Academy of Sciences, NRC, The Vulnerability of Food Industries to Chemical, Biological and Radiological Warfare Agents, November 1955, p. 145.

10. FM 10-69, op. cit., p. 11.

water sheds to be subsequently washed into streams used as water sources. Water in canteens, tanks, water cans, or other sealed sources will not be contaminated by fallout. The same is usually true of water from ground sources such as protected wells.¹¹ However, water from ground sources may become contaminated by radiological material leached through the soil under certain geological conditions.¹² Significant contamination of water supplies, in excess of permissible levels, may occur at considerable distances (hundreds of miles) downwind from the point of detonation of a weapon in the order of a megaton or more fission yield.¹³ Most biological agents as well as soluble or insoluble chemical agents can contaminate water.¹⁴ Employment of biological agents by an enemy usually will not be immediately apparent. At present, there are no standard automatic biological agent detection or warning devices for field use; therefore, rapid detection or determination of biological contamination cannot be made.¹⁵

11. Eckermann, Edgar H., Medical Field Service School, Brooke Army Medical Center, Symposium, Management of Mass Casualties, January 1964, p. 221.

12. U. S. Department of Health, Education, and Welfare, Public Health Service, Public Health in Civil Defense, 1957, p. 8-8.

13. Armed Forces Special Weapons Center, Contamination of Water Supplies by Radioactive Fallout, (U) AFSWC-TN-58-7, June 1958, p. 1.

14. FM 10-69, op. cit., p. 11.

15. U. S. Army Combat Developments Command Chemical-Biological-Radiological Agency, Final Report, Marking of CBR Contaminated Areas, CBRCD 63-14, November 1963.

7. Protective Measures. Proper packaging and storage will normally protect subsistence items from CBR contamination. Paragraph 2, above, lists such packaging materials. Likewise, ventilated protective shelters, permanent or temporary, when correctly operated, will give adequate protection against CBR agents.¹⁶ CBR agents can be carried into shelters by passage of contaminated personnel or supplies. In addition to specific permanent or temporary shelters, underground shelters, covers, tunnels and buildings, which can be made airtight, will offer protection. Storage of subsistence items should be at least one-half mile from possible profitable targets to be protected against extreme destruction from nuclear heat, blast, and induced radiation. Generally subsistence which is afforded the least protection in packages and containers must be given the most protection possible in storage. For example, foods in cans and bottles which require the least protection can be stored in a partially protected location. Subsistence that must be stored in the open or in only partially enclosed buildings should be covered with paulins or other protective covers. While protective covers will not prevent contamination from CBR agents, the amount of direct contamination will be reduced and decontamination will be made easier. Subsistence in tightly closed storage facilities normally will require no additional protection from CBR agents.¹⁷ Protective measures include special packaging materials and methods, proper storage procedures, dispersal of supplies, and maximum use of natural or artificial shelters and other

16. TM 3-350, Improvised CBR Protective Shelters, September 1954, p. 6.

17. FM 10-69, op. cit, pp. 21-22.

shielding devices. Detailed discussion of current doctrine is contained in Chapter 3, FM 10-69, "CBR and Nuclear Protection and Decontamination of Quartermaster Supplies and Equipment."

8. Decontamination and Reclamation Procedures.

a. Subsistence.

(1) General. Properly stored and packaged items which have been subjected to attack by CBR agents generally will be safe for use, i.e., the food within packages or containers probably will not be contaminated. However, the surfaces of packages, containers, warehouses, storage areas, or other protective devices would be contaminated. The methods used to decontaminate subsistence items and storage facilities vary according to the type of CBR agent involved. Procedures and techniques for decontamination are discussed in detail in current field manuals and technical manuals; the following subparagraphs only briefly review some of the most important features.

(2) Chemical Decontamination. Food supplies contaminated by chemical agents should be decontaminated only by personnel trained and equipped to perform this function. No attempt should be made to decontaminate exposed unprotected food. A survey is made prior to initiating decontamination procedures to determine the extent of contamination.¹⁸ The food testing and screening kit, chemical agents, ABC-M3, provides simple and rapid tests for detection of chemical agents in foods and food packages.¹⁹ Subsistence items exposed to chemical agents are segregated into three groups according to type of subsistence, protective packaging,

18. FM 10-69, op. cit., pp. 58-59.

19. TM 3-220, op. cit., p. 60.

and degree of exposure to chemical agents (vapor or liquid). Subsistence items heavily contaminated with chemical agents are immediately segregated to minimize the spread of contamination.²⁰ Further procedures and techniques for decontamination and reclamation of subsistence to be applied as appropriate include aeration or weathering, the use of standard chemical decontaminants (slurry, DANC solution, DS2 solution etc.), trimming or peeling, washing, and boiling.

(3) Biological Decontamination. Hard items of equipment (containers, cans, etc.) may be decontaminated by washing with soap and water, brushing, or exposure to sunlight to kill the micro-organisms. Beta-propriolactone may be used for decontamination of shelters or warehouses. Ordinarily, thorough cooking will insure effective destruction of microorganisms.²¹ Uncovered items such as bread and already cooked foods will have to be destroyed.²²

(4) Radiological Decontamination. Normally subsistence protected in cans or other sealed containers will not be contaminated by radiological fallout.²³ Contamination of sealed cans and containers from radiological agents will generally be confined to the outer surfaces. The outer surfaces of undamaged cans or containers may be decontaminated by washing and scrubbing. Food containers must not be opened until decontamination of outer surfaces has been completed. Subsistence items

20. TM 3-220, op. cit., p. 60.

21. U. S. Army Medical Service, Combat Developments Group, Study Project AMSCD 61-2, Casualty Producing Effects of Biological Weapons (U), Final Report, May 1962.

22. Ibid.

23. TM 3-220, op. cit., p. 89.

exposed to radiological contamination which cannot be decontaminated
must be protected and isolated until radioactivity decays to a safe level.²⁴
Where radioactivity in foods has been induced, decontamination can only
be accomplished by aging.

(5) Summary. Techniques and procedures for decontamination
and reclamation of subsistence vary according to the type of CBR agent
involved. Several characteristics, however, are common to decontamination
regardless of the type of chemical, biological, or radiological agents to
which the subsistence was exposed. These characteristics include the
following:

- (a) Prior to initiating decontamination operations,
a survey of exposed subsistence is conducted;
- (b) Exposed protected subsistence is not indiscriminately
destroyed because of exposure to CBR agents;
- (c) Care must be exercised during decontamination operations
not to spread contamination;
- (d) Trained personnel properly equipped are necessary
for decontamination of large stocks of subsistence;
- (e) After exposure to CBR agents and decontamination
operations, subsistence will be approved by the Army Medical Service prior
to consumption.

b. Water. The decontamination of water contaminated by chemical
agents is difficult and requires chemicals and equipment not regularly
issued to troops.²⁵ However, two items of decontamination equipment,

²⁴. FM 10-69, op. cit., pp. 65-66.

²⁵. TM 3-220, op. cit., p. 62.

i.e., the CW-BW Water Decontamination Set and the ION-Exchange Unit are currently undergoing engineer and service testing and are expected to be issued as class II items.²⁶ Water in canteens, cans, or other containers may be safe for consumption after decontamination of outer surfaces but, where certain nuclear weapons have been used, dissolved mineral matter in water may become activated by neutron bombardment even in closed containers. Water contaminated by biological agents may be decontaminated by boiling for 15 minutes. Large amounts of water are decontaminated under the supervision of the Corps of Engineers and the Army Medical Service. Usual practices involve the following treatments:²⁷

Superhypochlorination with 70% calcium hypochlorite to 100 ppm available chlorine.

Activated carbon treatment with 600 ppu activated carbon.

Coagulation with ferric chloride and limestone.

Diatomite filtration.

Post chlorination.

Water contaminated by radiological agents, like chemical agents, is difficult to decontaminate. Current doctrine emphasizes that uncontaminated sources should be sought prior to attempting decontamination. Ground water is less likely to be contaminated than surface water and, although not completely immune to contamination, "ground water is a strong line of defense against CBR attack."²⁸ In an emergency, water from a moving stream or similar source may be filtered through a 6-inch column of loose dirt

26. Ltr, USACDC Engineer Agency, CAGEN-S, 30 April 1965, Subj: "Review of CDOG Study USACDCQMA 65-7, 'Subsistence and Food Service for the Army in the Field.'"

27. Ibid.

28. Ibid.

(preferably clay-type) followed by boiling or treatment with iodine tablets to provide a field expedient-type radiological decontamination. Submerging a canteen below the surface of a raw water source, while filling, is good practice to avoid any floating surface debris. This technique, however, does not eliminate the need for water purification procedures. Concerning water supply in general, a recent study by the USACDC Engineer Agency has concluded that: (1) Present equipment and equipment which will be available in the mid-range period will be capable of removing CBR contaminants from water; (2) Inland water sources will be generally adequate for the field army in all the most likely areas of involvement except in the more arid regions.²⁹

c. Equipment, Warehouses, Transportation Facilities. Procedures used to decontaminate surfaces of packaged subsistence items can be applied to decontaminate surfaces of mess equipment, warehouses, and transportation facilities. However, a distinction should be made between the procedures for decontamination of chemical and biological agents and in the procedures for removal of radiological contamination. There are no decontaminates available which will cause deterioration of radiological contamination. The three principles of radiological decontamination are (1) aging, (2) sealing, and (3) removal. Some of the decontaminates used in chemical and biological decontamination may be corrosive to the materials being decontaminated. This, however, does not prevent their use since they serve to keep equipment, warehouses, and transportation facilities operational.

9. Implications of CBR Operations on the Subsistence System.

29. USACDC Engineer Agency Study, Field Water Supply 1965-1970 (CDCD 62-1) (U), December 1963, pp. 6-7.

a. General. CBR operations are conducted to produce casualties among enemy personnel and to restrict enemy use of areas, materiel, or facilities.³⁰ The enemy's objectives in using CBR agents will be the same. In addition to producing casualties, CBR contamination may result in: loss of troop efficiency caused by wearing protective masks and clothing; loss of time in decontaminating procedures; loss of time in bypassing or avoiding contamination hazards; an additional logistical burden imposed by carrying decontamination supplies and equipment; and loss of supplies (subsistence) where decontamination is impractical. It is evident that these factors could affect operations of the subsistence system from the forward areas of the field army into the rear areas of the communications zone. Enemy use of CBR agents could impose additional problems at all echelons. The effects of toxic chemical agents on the efficiency of personnel in World War I was pointed out in a recent article:

"The harassment of possible contamination and the annoyance of masking were commonplace. The masked soldier was often an ineffective soldier. When gas mask training and discipline were outstanding, a shrewd enemy could induce gas mask exhaustion by periodic shellings. On the other hand, the careless soldier, or the one with poor training and discipline would soon find himself a casualty."³¹

Certainly, measures taken in conventional warfare operations to prevent casualties and destruction of materiel, such as dispersion and other passive defensive action, would become even more urgent under conditions

30. (a) FM 3-5, Chemical, Biological, and Radiological (CBR) Operations, September 1961, p. 5; (b) TM 3-220, op. cit., p. 2.

31. Kleber, Brooks E. and Birdsell, Dale, "The Unused Weapon," Military Review, January 1965.

of CBR operations. For operations to continue without interruption, however, additional protective measures and operational techniques must be effected under CBR conditions.

b. Protective Measures and Decontamination. Protective measures and decontamination of subsistence, examined briefly in this annex, are discussed in detail in current field manuals and technical manuals. Clearly, present methods of packing and packaging subsistence for overseas shipment afford a high degree of protection against CBR agents. New subsistence items, discussed in Annex B, which will become available in the present and future time frames, will provide even better protection. Successes in unitization of subsistence, as discussed in Annex C, will likewise provide additional protection. Attendant with new packaging and unitization of subsistence will be a reduction in the amounts of bulk rations which include the types of subsistence most difficult to protect. Such reduction (or elimination) of bulk rations could be of great value in simplifying additional protective measures needed at storage locations and supply points. Additional protective measures for subsistence in a CBR environment and decontamination procedures, specified in current doctrine, should remain effective during the time period of this study in reducing the probabilities of contamination by CBR agents and in eliminating contamination hazards when necessary.

c. Operational Procedures and Techniques.

(1) Although the detailed discussion contained in current doctrine concerning the protection and decontamination of subsistence items appears to be adequate, there is little or no guidance provided on the actual procedures and techniques of subsisting under CBR conditions.

Research in this area discovered little guidance for operation (or other action) by unit messes in contaminated areas. To be sure, certain protective measures and decontamination procedures are prescribed or can be interpreted. However, operation of a unit mess to perform its mission under CBR conditions does not appear to be covered. Likewise, subsistence for the individual soldier to include techniques of eating (or not eating) seems to be an omission. For example, techniques for sleeping, urinating, defecating, and other essential functions are prescribed for soldiers who must remain in contaminated areas 24 hours or longer. No details on eating are included. It appears that additional guidance on procedures and techniques for the operation of unit messes and subsisting of the individual soldier should be developed.

(2) Currently, certain items under development are expected to improve the capability of troops to subsist in or around contaminated areas. It is anticipated that the positive pressure CB collective protection field shelter will be available during the time frame 1965-70. This shelter will employ positive pressure to prevent entrance of contaminants, thus allowing performance of activities which require a CB hazard-free atmosphere or to provide a toxic hazard-free area in which combat and combat support troops may eat, drink, smoke, shave, or perform other bodily functions. Also, development is nearing completion on an SDR for drinking equipment to be used with the protective mask. This device would provide troops with a safe method for drinking water and may provide a means of partaking of liquid nourishment while wearing the protective mask without compromising the protection afforded by the mask.³²

32. 1st Ind, USACDC CBR Agency, CAGCB-DP, 20 April 1965 to Letter, USACDC Quartermaster Agency, CDCQMA-C, 22 March 1965, Subj: "CDOG Study Project, USACDCQMA 65-7, Subsistence and Food Service for the Army in the Field."

d. Monitoring Devices and Decontamination Teams. Inherent with the ability to feed troops in a CBR environment is the ability to detect CBR contaminants for protective and monitoring actions. Equipment now exists for detecting most chemical and radiological contamination. However, the development of a rapid biological agent monitoring device is needed. Like chemical and radiological equipment, distribution of such a detection device should be at the tactical level. Decontamination teams and supplies and equipment must also be at the tactical level to assure prompt decontamination as required.

10. Subsistence Requirements. Under conditions of CBR operations, as in conventional warfare, loss of subsistence is to be expected. The magnitude of such loss cannot be accurately estimated. It is considered, however, to be not substantially greater than losses under conventional warfare considering protective and reclamation procedures that are available, and the degree of dispersion of stocks that will be practiced. Although opened and unprotected subsistence might have to be discarded, salvaging procedures will make some of these foods available. Use of packaged operational subsistence will further reduce losses under combat conditions in forward areas.

11. Conclusions.

a. Initiation of CBR operations would impose additional problems on the system for subsisting the army in the field.

b. The present methods of packing and packaging nonperishable subsistence for overseas shipment provide protection for subsistence items.

c. Improved packaging and unitization of subsistence during the 1965-1970 time period, and the corollary reduction in bulk rations, will further reduce the probabilities of contamination by CBR agents.

d. Additional protective measures and decontamination procedures, specified in current doctrine, for subsistence items, mess equipment, transportation, and storage facilities are adequate.

e. Additional doctrinal guidance should be developed on procedures and techniques for unit mess operations and subsisting the individual soldier in or around contaminated areas.

ANNEX G

TRAINING

1. General. The purpose of this annex is to examine the implications that the subsistence system has upon the training of US Army personnel during the time period 1965-1970. Training for military feeding must be compatible with new organizations and operations of the army in the field and must keep pace with new developments in food technology. Training of the individual soldier, food service personnel, and subsistence supply personnel must be accomplished. General unfamiliarity with the methods of preparing new food products causes training in food service to become increasingly important. Moreover, this type of training must be expanded to include not only the active army but also national guard and reserve components.

2. The Individual Soldier. During basic training the individual soldier should become familiar with the individual and small group type meals. The added training required for the individual soldier primarily is that of familiarization. Although the individual and small group meal will not require cooking, the soldier must be taught skills and techniques for preparing the foods to the most palatable state. In addition, the soldier must learn to utilize available heating devices. Training in camouflage discipline and other protective measures will be required in conjunction with the preparation of meals and for the disposal of waste. More emphasis in training should be placed on CBR implications in the food area because: (1) probabilities of

encountering these conditions have increased; (2) a substantial proportion of subsistence in the forward areas will be prepared by non-food service personnel; and (3) consumption of foods contaminated by chemical, biological, or radiological agents could cause incapacitation or death.

The individual soldier becomes really proficient in the use of operational subsistence only through training with a unit and participation in field exercises. To a large extent in both basic and unit training, indoctrination and training of the individual soldier in the use of individual and small group subsistence can be accomplished concurrently with training in other subjects. Moreover, survival in combat areas may depend upon lessons learned in the protection and preparation of food. Individual training must prepare the soldier accordingly.

3. Food Service Personnel. The training of food service personnel under the proposed field food system outlined in Annex B will not constitute new or additional problems. In fact, two items currently under development ultimately should lead to some reduction in both the numbers and skill levels of food service personnel. These items are the Meal, Uncooked, 25-Man and the Bakery System, Continuous. It does not seem likely, however, that these items will cause any major reductions in either numbers or skill levels of food service personnel during the time frame of this study. The reasons for this view are outlined in the following paragraphs.

a. Meal, Uncooked, 25-Man. The Meal, Uncooked, 25-Man is dependent upon freeze-dehydrated foods; availability of this meal for the

field food system in large quantities is not likely to occur until near the end of the 1965-1970 period (Annex C). A preponderant percentage of meals in a theater of operations utilize large group-type subsistence which requires trained mess personnel for preparation (Annexes A & B). Even when available to fulfill requirements for large group type subsistence, the Meal, Uncooked, 25-man must be prepared by trained mess personnel.¹

b. Bakery System, Continuous. The purpose and objective of the Bakery System, Continuous which utilizes Instant Bread Pre-Mix is to simplify the problem of supplying fresh bread to troops in the field and to eliminate the requirement for skilled bakers for the production of field bread.² This item of equipment is designed to replace the present standard mobile field bakery. The Bakery System, Continuous is currently in the process of development and testing. Like all new items of equipment, extensive tests must be completed prior to type classification of this equipment as standard. Subsequent procurement of this item may be influenced by economic considerations. As the equipment becomes available for issue, it seems logical to assume (or recommend) that issue should be made on a priority basis with the highest priority assigned to field army support units which have the greatest

1. US Army Quartermaster Research and Engineering Field Evaluation Agency, TECOM Project No 7-3-0171-01K, Engineering Test of Meal, Uncooked, 25-Man Prototype, September 1963, p. 2.

2. Quartermaster Field Evaluation Agency, US Army Quartermaster Research and Engineering Command, Technical Report T-226, An Engineering Test of Mixing and Baking Outfit Continuous For Instant Bread Mix, May 1962.

need for mobility. While the continuous Bakery System, Continuous will permit reduction in baking skills, it is probable that the potentialities of this item of equipment will not be fully realized during the period 1965-1970.

c. Formal Training. To facilitate training and assure the provision of qualified food service personnel, individuals scheduled for training in food service schools should be carefully screened and selected. Experience in World War II clearly indicated that such screening and selection is necessary to produce competent cooks and other food service personnel with the least amount of military training. Emphasis should be placed on obtaining men who have had civilian food service experience or who have an aptitude for food service activities. Probably more than in most occupational specialties, effectiveness in food service activities is related to, "liking the job." Formal training of food service personnel is currently included in the following courses:

<u>Course</u>	<u>MOS for Which Trained</u>	<u>Length of Course (Weeks)</u>
Cooking	941.1	8
Bread Baking	943.1	8
Mess Steward	None	5(+)
Food Service Supervision (EM)	None	8(+)
Food Service Supervision (Officer)	4114	12
(Warrant Officer)	941A	12
Unit Mess Officer	None	3

It is anticipated that the above courses will continue to be required throughout the 1965-1970 time period.

4. Subsistence Supply Personnel. Some reduction in training requirements for subsistence supply personnel may be possible during the period covered by this study. The extent to which training can be reduced or simplified depends on several factors, discussed in detail in Annexes B and C. These factors include: (a) the reliance on non-perishable foods and the elimination of military refrigeration in a theater of operations; (b) packaging all operational subsistence on a "meal" basis which will reduce ration break-down operations to a fraction of the present task; and (c) unitization of subsistence supplies which will reduce both number of handlings, stock control and accounting procedures, and the number of support personnel needed in an operational theater. These features of subsistence supply are all innovations which are currently under study, development, or testing. A close interrelationship exists among them. Changes in the training of subsistence supply personnel will be dependent upon successes achieved in these areas.

5. Conclusions.

a. Familiarization in preparing individual and small group meals should be included in the training of the individual soldier.

b. The Meal, Uncooked, 25-man and the Bakery System, Continuous may ultimately permit some reduction in the skill levels and numbers of food service personnel; however, the potentials of these items are not likely to cause such reduction during the 1965-1970 period.

c. Reliance upon non-perishable foods and elimination of military refrigeration in a theater of operations, providing "meals" rather than

"rations" as the unit of issue, and unitization of subsistence are developments in progress which will affect the training of subsistence supply personnel.

(1) Reductions in either skill levels or numbers depends upon successes which are achieved in these developments.

(2) Until the practicability and acceptability of new operational subsistence, equipment, and procedures have been fully demonstrated, training must continue to be accomplished on the current basis.

ANNEX H
BIBLIOGRAPHY

Department of the Army Publications.

Army Regulations.

- AR 30-11, Food Service - Army Food Program, 2 April 1965.
- AR 40-5, Medical Service, Preventive Medicine, April 1964.
- AR 115-20, Hydrological and Meteorological Services, Field Water Supply, 12 November 1952.
- AR 310-34, Organization and Equipment Authorization Tables, Equipment, December 1963.
- AR 320-5, Dictionary of United States Army Terms, February 1963.
- AR 633-50, Prisoners of War; Administration, Employment and Compensation, 8 August 1963.
- AR 633-51, Civilian Internees; Administration, Employment and Compensation, 8 August 1963.

Field Manuals.

- FM 3-5, Chemical Biological, and Radiological (CBR) Operations, September 1961.
- FM 10-60, Supply of Subsistence in a Theater of Operations, November 1960.
- FM 10-69, CBR and Nuclear Protection and Decontamination of Quartermaster Supplies and Equipment, November 1961 (Rescinded).
- FM 21-40, Small Unit Procedures in Chemical, Biological, and Radiological (CBR) Operations, October 1963.
- FM 31-21, Guerrilla Warfare and Special Forces Operations, September 1961.
- FM 31-22, US Army Counterinsurgency Forces, November 1963.
- FM 41-10, Civil Affairs Operations, May 1962.
- FM 100-5, Field Service Regulations; Operations, February 1962.
- FM 100-10, Field Service Regulations, Combat Service Support, September 1964.

FM 101-10, Staff Officers Field Manual, Organization, Technical, and Logistical Data, Part 1 - Unclassified Data, October 1961.

Other DA Publications (CDOG, TM, TA, TB, SB, DA Pam, TOE RB, ST).

TM 3-220, Chemical, Biological, and Radiological (CBR) Decontamination, September 1961.

TM 3-350, Improvised CBR Protective Shelters, September 1954.

TM 10-405, Army Mess Operation, September 1962.

TA 50-902, Clothing and Equipment (Mobilization), 3 April 1963.

TB QM 52, Army Rations, Food Packets, and Supplements, 11 September 1962.

SB 10-495, Standard B Ration for the Armed Forces, 9 April 1954.

DA Pam 690-80, Administration of Foreign Labor During Hostilities, September 1958.

Department of the Army, Combat Development Objectives Guide (U).

Draft TOE 29-118F, General Supply Company, Supply and Services Battalion, General Support (Forward) or (Army), undated.

TOE 29-114F, Field Service Company, Supply and Service Battalion, General Support (Forward), 11 March 1965.

TOE 29-216F, Headquarters and Headquarters Company, Supply and Services Battalion, Direct Support, 8 February 1965.

TOE 29-217F, Supply and Service Company, Supply and Service Battalion, Direct Support, 8 February 1965.

TOE 29-402T, Headquarters and Headquarters Company, Inventory Control Center, 12 March 1965.

US Army Command and General Staff College, Reference Book 101-1, Type Organizational Data for the Army in the Field.

US Army Quartermaster School Special Text, ST 10-5-1, Summary of Quartermaster and Related Tables of Organization and Equipment, August 1960.

US Army Combat Developments Command Special Text, ST 10-50-1, Supply and Field Services Support, Air Assault Division, June 1963.

US Army Combat Developments Command Special Text, ST 54-2-1, Air Assault Division Combat Service Support and the Support Command, January 1963.

Reports (Studies, Tests, Investigations, etc.).

- Armed Forces Special Weapons Center, Contamination of Water Supplies by Radioactive Fallout, (U) AFSWC-TN-58-7, June 1958.
- Armored Medical Research Laboratory Project No. 1, A Critique of Army Rations: Acceptability and Dietary Requirements, 10 April 1944.
- Brown, Lester R., Department of Agriculture, Economic Research Service, Foreign Agriculture Economic Report No. 11, Man, Land, and Food: Looking Ahead at World Food Needs, 1963.
- Brugh, J., Quartermaster Research and Engineering Field Evaluation Agency, Trip Summary, STEFA-FC, Report of Findings, 11 January 1963.
- Burt, Thomas B., US Army Quartermaster Field Evaluation Agency, Technical Report T-171, FEA 60017, Time Study of Preparation and Use of the Ration, Small Detachment, 5-Persons, September 1960.
- Burt, Thomas B., US Army Quartermaster Field Evaluation Agency, Quartermaster Research and Engineering Command, Technical Report T-228 (FEA 61055), An Engineering Test of Instant Bread Mix, May 1962.
- Burt, Thomas B., US Army Test and Evaluation Command, US Army Quartermaster Research and Engineering Field Evaluation Agency, Report of USATECOM Project No. 7-3-1057-02K, Engineering Design Test of Containers, Delivery, for Instant Bread Rolls, September 1963.
- Burt, Thomas B., US Army Quartermaster Research and Engineering Field Evaluation Agency, USATECOM Project No. 7-3-0171-01K, Engineering Test of Meal, Uncooked, 25-Man, Prototype, September 1963.
- Burt, Thomas B., US Army Quartermaster Research and Engineering Field Evaluation Agency, USATECOM Project No. 8-3-7400-04K, Final Report of Engineering Test of Meal, Ready-to-Eat, Individual, May 1964.
- Civil Defense Foods Advisory Committee of the National Academy of Sciences, NRC, The Vulnerability of Food Industries to Chemical, Biological, and Radiological Warfare Agents, November 1955.
- Federal Civil Defense Administration: (a) The Effect of Nuclear Explosions on Meat and Meat Products, Operation Teapot Project 3313 WT-1216, 14 December 1956; (b) The Effect of Nuclear Explosions on Semiperishable Foods and Food Packaging, Operation Teapot 32-4 WT-1214, 14 December 1956; (c) The Effects of Nuclear Explosions on Bulk Food Supplies, Operation Teapot Project 32-1 WT-1163, 14 December 1956.

- General American Transportation Corporation MRD Division, Final Report on Industrial Preparedness Measures Project Q-13, Development of Facilities to Package and Heat Process Foods in Flexible Packages, (Contract No. DSA-30-62-908 (CHI-25222-62)), undated.
- Johnson, Robert E., and Kirk, Robert M., Harvard Fatigue Laboratory, Boston, Massachusetts, Feeding Problems as Related to Environment, 30 June 1946.
- Littlejohn, Major General Robert M., Fitzpatrick, Colonel Edwin J., and Burns, Captain Robert W., US Army Subsistence Experience in the European Theater, World War II, 1 November 1945.
- Marine Corps Equipment Board, Marine Corps Landing Force Development Center, Marine Corps Schools, Project No. ET-1336, Ration, Individual, Combat, Meal Type; Evaluation of, 30 April 1958.
- Office of The Quartermaster General, Military Planning Division, Research and Development Branch, Interim Report, Combat Ration, September 1945.
- Office of The Quartermaster General, Military Planning Division, Research and Development Branch, Combat Ration Study, 1 November 1946.
- Office of The Quartermaster General, Military Planning Division, Research and Development Branch, Comments on Performance of Quartermaster Equipment, No. 2, Korea, Winter 1950-1951, May 1951.
- Office of The Quartermaster General, Research and Development Division, Field Observer Comments on Performance of Quartermaster Equipment, No. 5, May 1952 through May 1953, October 1953.
- Quartermaster Food and Container Institute for the Armed Forces, Operation Studies Number One - Volume Twelve, Ration Development, June 1947.
- Report of the General Board, United States Army, European Theater, Quartermaster Section, Study Number 109, Quartermaster Supply Operations, (Area 1945) Appendix 12.
- Research and Development Associates, Food and Container Institute, Inc., Chicago, Operational Rations-Current and Future, March 1963.
- Rifkind, Herbert R., QMC Historical Studies No. 20, Historical Section, Office of The Quartermaster General, Fresh Foods for the Armed Forces, 1951.
- Ruppenthal, Roland G., Office of the Chief of Military History, US Army in World War II, European Theater of Operations, Logistical Support of the Armies, Vol. II, 1959.

- Test, Evaluation, and Control Group, Fort Benning, Georgia,
Final Report, Field Test Program Army Air Mobility Concept,
Annex H (Combat Service Support), 15 January 1965.
- Thatcher, Harold W., QMC Historical Studies No. 6, The Development
of Special Rations for the Army, September 1944.
- US Army Combat Developments Command, Evaluation of the Air Assault
Concept (U), Volume I, Army Tactical Mobility, Part II, Annex D,
Combat Service Support (Draft), January 1964.
- US Army Combat Developments Command, A Study to Conserve the
Energy of the Combat Infantryman, 5 February 1964.
- US Army Combat Developments Command, Study USACDCCSSG Project
63-3, Combat Service Support for Airmobile Operations, 10 March
1964.
- US Army Combat Developments Command Combat Service Support Group,
Study, Conceptual Framework - TASTA-70, 31 July 1963.
- US Army Combat Developments Command Combat Service Support
Group, Study, USACDCCSSG Project 64-2 (Initial Draft Report),
Combat Service Support for Special Action Forces and Back-up
Brigades, September 1964.
- US Army Combat Developments Command Chemical - Biological -
Radiological Agency, Final Report, CBRCD 63-14, Marking of CBR
Contaminated Areas, November 1963.
- US Army Combat Developments Command Engineer Agency Coordinated
Draft Study, CECD 62-1, Field Water Supply, 1965-1970, December
1963.
- US Army Medical Service, Combat Developments Group, Study Project
AMSCD 61-2, Casualty Producing Effects of Biological Weapons (U),
Final Report, May 1962.
- US Army Combat Developments Command Military Police Agency Final
Report, USACDCMPA 61-2, Prisoner of War Operations in a Theater
of Operations During the Period 1965-1970 (U), June 1964.
- US Army Combat Developments Command Quartermaster Agency, Staff
Paper, subject: "Philosophy - Principles of Supply" [TASTA-70],
undated.
- US Army Combat Developments Command Quartermaster Agency, Study,
Initial Draft of Expanded Conceptual Framework, TASTA-70,
15 November 1963.
- US Army Combat Developments Command Quartermaster Agency, Study,
(First Draft), Supply and Maintenance Command TASCUM (TASTA-70),
15 November 1963.

US Army Combat Developments Command Quartermaster Agency, Study, Consumables Feeder Study to CCIS-70 for TASTA-70 Field Army, 31 March 1964.

US Army Combat Developments Command Quartermaster Agency, Final Draft Study USACDCQMA 60-1, Provision of Labor Service, July 1964.

US Army Logistics Management Center Study, USALMC Project 4-63, Study of Unitization Systems, Policies and Techniques (SUNSPOT), Phase I Report, October 1963.

US Army Natick Laboratories, Study, Industrial Capabilities for Production of Quick-Serve Meals, (undated) /1962/.

US Department of Agriculture, Marketing Research Report No. 639, Freeze-Drying of Foods: Cost Projections, January 1964.

US Department of Health, Education and Welfare, Public Health Service, Public Health in Civil Defense, 1957.

Weeks, Elie, US Army Quartermaster Field Evaluation Agency, Technical Report T-211, FEA 61023, An Engineering Test Report of the Temperate Phase of the Consolidated Engineer/Service Test of the 6-Man and 25-Man Modules of the Experimental Quick-Serve Meal, December 1961.

Conferences, Briefings, Speeches, Papers.

Army Ground Forces - Army Service Forces, Report of Food Conference, Army War College, Washington, D. C., April 1946.

US Army Combat Developments Command Quartermaster Agency, Memorandum for the Record - 10 January 1964, CDCQMA-B, 16 January 1964, Subject: "Conference on Bakery Premix."

Bird, Kermit, Economic Research Service, Marketing Economics Division, US Department of Agriculture, a speech entitled Designing a Freeze Drying Plant - Some Economic Considerations, presented at Winter Haven, Florida, 17 March 1964.

Bird, Kermit, Marketing Economics Division, US Department of Agriculture, a paper, The Freeze Drying Industry: Projections of Capital and Labor Requirements 1963-1970 for presentation to the Philadelphia Chapter of the American Society of Heating, Refrigerating, and Air Conditioning Engineers, 9 April 1964.

Eckermann, Edgar H., Medical Field Service School, Brooke Army Medical Center, Symposium, Management of Mass Casualties, January 1964.

Josephson, E. S., Quartermaster Research and Engineering Center, Natick, Massachusetts, a paper Radiation Preservation of Foods, presented at Eastern Experiment Station, Collaborators Conference on Food Processing Techniques, Eastern Utilization Research and Development Division, ARS, US Department of Agriculture, Philadelphia, Pennsylvania, 22-23 October 1963.

Letter, Headquarters Defense Supply Agency DSAH, 2 September 1964, subject: "Conference Minutes" with inclosure, Conference, US Army Combat Developments Command Study, Subsistence and Food Service for the Army in the Field (USACDCOMA Project 65-7) held at HQ DSA, 24 August 1964.

Matz, Samuel A., Modern Baking Concepts for Troop Feeding, a paper presented at the 18th Annual Meeting of the Institute of Food Technologists, Chicago, Illinois, 25-29 May 1958.

Mehrlich, F. P., Director, Food Division, US Army Natick Laboratories, A Joint US Army Combat Developments Command - US Army Materiel Command Briefing, Army Combat Rations; presented to a Board of General Officers at Headquarters, US Army Materiel Command, 2 June 1964.

Nair, John H., North Carolina State University, a paper presented at Eastern Experiment Station Collaborators Conference on Food Processing Techniques, Eastern Utilization Research and Development Division, ARS, US Department of Agriculture, Philadelphia, Pennsylvania, 22-23 October 1963.

Roth, Ralph, Acting Chief, Industrial Mobilization Office, Defense Subsistence Supply Center, a paper Industrial Mobilization Planning for Subsistence, presented at the US Army Quartermaster School, 16 September 1964.

Periodicals.

Baldwin, Lt Col Coy W., QMC, "Food Service United Nations Korea," Quartermaster Review, May - June 1953.

Bean, W. B., "Nutritional Survey of American Troops in the Pacific," Nutrition Review, 4(9) 1946.

Kleber, Brooks E. and Birdsell, Dale, "The Unused Weapon," Military Review, January 1965.

McGuckian, Colonel Ambrose T., "Food Service Plans for Mobilization," Quartermaster Review, November - December 1955.

McGuckian, Colonel Ambrose T., "Food Service Developments," Quartermaster Review, September - October 1955.

McNamara, Lieutenant General A. T., "Quartermaster Activities of II Corps thru Algeria, Tunisia, and Sicily and First Army thru Europe," 4th of 9 parts, Quartermaster Review, July - August 1956.

Quartermaster Food and Container Institute for the Armed Forces, Activities Report, Vol. 9, No. 4, January 1958.

Correspondence.

Letter, Headquarters US Army Combat Developments Command Combat Service Support Group, CSSG-GZ, 7 July 1964, subject: "The Administrative Support, Theater Army, 1965-1970, (TASTA-70)" (Rescinded).

Letter, Headquarters Defense Subsistence Supply Center, DSSC-P/1, 17 August 1964, subject: "Industrial Capacities for Subsistence."

Letter, US Army Combat Developments Command Engineer Agency, CAGEN-S, 30 April 1965, Subject: "Review of CDOG Study USACDCQMA 65-7, Subsistence and Food Service for the Army in the Field."

Letter, US Army Combat Developments Command Infantry Agency, CAGIN-DO, 15 August 1964, subject: "CD Study Directive: Subsistence and Food Service for the Army in the Field with Inclosures 1 and 2, thereto."

Letter, US Army Combat Developments Command Infantry Agency, CAGIN-DO, 29 September 1964, subject: "CD Study Directive: Subsistence and Food Service for the Army in the Field with Inclosures 1 and 2, thereto."

Letter, US Army Combat Developments Command Quartermaster Agency, CDCQMA-C, 8 September 1964, subject: "Supply and Maintenance Command - Study Plan."

1st Ind, US Army Combat Developments Command Medical Service Agency, 14 July 1964, to Letter, US Army Combat Developments Command Quartermaster Agency, CDCQMA-C, 5 June 1964, subject: "Requirements for Ration Supplements in Arctic and Tropical Regions."

1st Ind, US Army Combat Developments Command Armor Agency, CAGAR-P(23 July 64), 6 August 1964, to Letter, US Army Combat Developments Command Quartermaster Agency, CDCQMA-M, 23 July 1964, subject: "Draft Proposed Qualitative Materiel Development Objective (QMDO) for Military Operational Subsistence."

1st Ind, US Army Combat Developments Command Chemical-Biological-Radiological Agency, CAGCB-DP(22 Mar 65), 20 April 1965, to Letter, US Army Combat Developments Command Quartermaster Agency, CDCQMA-C, 22 March 1965, Subject: "CDOG Study Project, USACDCQMA 65-7, Subsistence and Food Service for the Army in the Field."

3rd Ind, US Army Combat Developments Command Quartermaster Agency
to Letter, Headquarters US Army Materiel Command, AMCRD-DM-E,
13 July 1964, subject: "Review of Army Combat Rations."

Other Documents.

US Department of Agriculture, Economic Research Service, Marketing
Economics Division, ERS-147, Selected Writings on Freeze-Drying
of Foods, January 1964.

Geneva Conventions of 12 August 1949, For the Protection of War
Victims: (1) Relative to the Treatment of Prisoners of War, and
(2) Relative to the Protection of Civilian Persons in Time of
War.

Industrial College of the Armed Forces, The Economics of National
Security, Volume XVII, Mutual Security, 1959.

Sherman, H. C. and Pearson, Constance S., Modern Bread from the
Viewpoint of Nutrition, MacMillan Co., 1942.

JCS Publication 1, Dictionary of United States Military Terms
for Joint Usage, The Joint Chiefs of Staff, 1 December 1964.

Qualitative Materiel Requirement for Modular Mobile Field Kitchen
(U), Prepared by USACDC Quartermaster Agency, 7 November 1962.

US Army Combat Developments Command Quartermaster Agency,
Memorandum for Record, CDCQMA-C, 1 July 1964, Subject: "Report
of Travel - James H. Taylor to USACDC Infantry Agency, 22-24
June 1964.