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TECHNICAL REPORT

73-20-OR/SA

CAFE

Centralized Army Feeding System

EXPERIMENT AT FORT LEWIS, WASHINGTON

edited by

Ronald L. Bustead

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December 1972

UNITED STATES ARMY
NATICK LABORATORIES
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U.S. ARMY MATERIEL COMMAND

OPERATIONS RESEARCH AND
SYSTEMS ANALYSIS OFFICE

TECHNICAL REPORT

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Operations Research and Systems Analysis Office (2)

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ABSTRACT

This report concerns the Centralized Army Feeding (CAFe) System experiment conducted at Fort Lewis, Washington between 14 August – 29 October 1971, describing the overall experiment and summarizing the results obtained. As a result of this experiment, it was concluded that the new, modern food service system concept under evaluation can substantially increase customer satisfaction and significantly reduce operating costs.

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FOREWORD

In 1969 the DOD Facilities and Equipment Planning Board accomplished an on-site survey of military garrison feeding facilities in the United States. As a result of this survey, this Board created, with DOD and Army approval, a project to study, define, and then implement a new, modern food service system at Fort Lewis, Washington. The objectives were to improve performance and reduce costs. This system would then serve as a model for all military services.

In 1970 the DOD Food Research, Development, Testing and Engineering Program was established at Natick Laboratories. Included within this program were an increased emphasis on garrison food service systems and a requirement to apply a "total systems concept" in design of new military food service systems. This new requirement was implemented by the Operations Research and Systems Analysis Office at Natick Laboratories, and resulted in a rather unique but logical merger of the R&D systems study effort with the DOD and Army project to study and then implement a modern food service system at Fort Lewis.

The overall study effort was initiated in November 1970, under Project Number 1J662713AJ45, Systems Studies in Military Feeding. The purpose of this study effort was to develop a modern food service concept which would increase customer satisfaction and reduce operating costs, in that order of importance.

Due to the extent and complexity of the information and data which have been developed, this report presents the results of the experimental phase, CAFe (Central Army Feeding) System experiment at Fort Lewis, Washington, and is only one of several which have been published concerning the different aspects of the overall study effort. A list of these reports is provided below.

Natick Laboratories Report Number	**Title**
72-37-OR/SA	A System Evaluation of Army Garrison Feeding at Fort Lewis, Washington [1]*

*Superscripts denote references

Natick Laboratories Report Number	Title
72-43-PR	The 1971 Fort Lewis Food Preference Survey[2]
72-44-PR	Fort Lewis Dining Facilities Consumer Survey[3]
72-46-FL	Fort Lewis Experiment Application of Food Technology and Engineering to Central Preparation[4]
72-47-OR/SA	An Evaluation of Selected Advanced High Production Feeding Systems [5]
72-48-OR/SA	An Analysis of Consumer Responses to Proposed Changes in Army Garrison Feeding System at Fort Lewis, Washington[6]
72-56-OR/SA	A Qualitative Evaluation of the Environment and Modernization Potential of Dining Halls at Fort Lewis, Washington[7]
72-64-PR	Consumer Reaction to the Fort Lewis CAFe System[8]
72-67-OR/SA	A Cost Analysis of Modern High Production Food Service Systems for Military Garrison Applications[9]
73-10-OR/SA	A Proposed Modern Food Service System for Fort Lewis, Washington[10]
73-11-OR/SA	An Automated Headcount System[11]

As a result of the effort documented in these reports, it has been concluded that the central food preparation/central warewashing system provides the greatest opportunity to improve customer satisfaction and reduce operating costs of the modern food service systems considered.

I. INTRODUCTION

The study of garrison food service comprised four main efforts:

- Evaluate the present system.
- Evaluate modern institutional food service systems.
- Determine the requirements of the military customer.
- Design and assess the feasibility of the most promising system which can improve customer satisfaction and reduce costs.

Evaluation of the garrison system at Fort Lewis, Washington[1] * concluded that performance of the present feeding system could be significantly improved by resolving major problems in the areas of labor and food quality. Evaluation of advanced high production feeding systems[5] concluded that "where there are a large number of dining facilities to be serviced, the use of central preparation appears to be the least costly system for food service while also offering uniformly high quality products".

A detailed survey of military customers at Fort Lewis established a priority ranking of sixteen changes required to meet customer requirements.[6] The first five changes, ranked by effect, for increasing attendance were: change the menu to include preferred foods, furnish higher quality food, provide snacks, open specialty facilities, and increase food quantity. These first five changes were all food related. These and the other desirable changes determined by the survey were then further defined into specific sub-systems which could meet the customer requirements.

All of these efforts supported the design and implementation of an experimental system of food service which included central preparation and warewashing activities and an entirely new system of food outlets.

*Superscripts denote references.

II. OBJECTIVES

The objectives of the CAFe (Central Army Feeding) System experiment, as derived from initial study efforts were as follows:

- To demonstrate that a central food preparation system will provide uniform, high-quality food and result in improved service for the military customer.

- To demonstrate on a small scale the feasiblity of preparing food centrally; then, chilling, storing and transporting the food before heating and serving it in satellite dining halls.

- To demonstrate the feasibility of performing related warewashing operations centrally.

- To determine labor reduction potential at the satellite food outlets in the CAFe System.*

- To demonstrate an alternative to the present signature headcount system that would be part of a modern management information system.

- To obtain various information and data to be used in the design of a new modern food service system for a large Army base.

- To determine customer response to this new system of food service and compare it to their response to the old system.

*It is noted that there was no intent and/or attempt to investigate the central facility in this regard because of its design inefficiencies and the small number (six) of food outlets supported. The total labor reduction potential for the entire installation was determined after the experiment, based upon the analysis of a highly efficient large central facility designed to support all required food outlets at Fort Lewis.[9]

III. GENERAL DESCRIPTION OF EXPERIMENTAL SYSTEM

The experimental food service system was designed and created to represent a new modern system of food service which:

1) Would significantly increase customer satisfaction.

2) Would significantly reduce requirements for manpower and provide overall cost reductions.

Improved customer satisfaction was accomplished by providing an improved menu, higher food quality, an opportunity for snacks and meals at short order and specialty outlets, all customers as much food as desired through self-service, an automated headcount system in lieu of the signature system, and a significant improvement of decor in the short order and specialty food outlets.

It was demonstrated that significant labor reductions which will result in overall system cost reductions may be achieved in the food outlets by centralizing the majority of the food preparation, cooking and warewashing tasks. Almost all of the high labor menu items were prepared, cooked, chilled, stored and transported from the central preparation facility to the food outlets for later heating and serving. Menu items which would suffer a reduction in quality if precooked or which were low labor foods; such as, grilled items, roasts, deep fat fried items, breakfast eggs, frozen vegetables, etc.; were prepared in the food outlets.

The experimental food service system included the following elements:

1) A Central Food Preparation Facility which prepared all food items requiring high labor and/or culinary skills.

2) A new menu which offered more highly preferred foods, more frequently.

3) A new staffing structure which included a distinct technical function to continuously monitor quality and sanitation and a full-time manager of the central facility.

4) A Central Warewashing Activity which washed and sanitized the tableware for the food outlets.

5) A distribution system which transported all centrally prepared food items to the food outlets and all tableware to and from the central warewashing activity.

6) A satellite food outlet system which included four regular meal outlets, one outlet which served short order meals, and one outlet which served specialty meals. Troop units were assigned to specific regular meal facilities, but were allowed unlimited access to either of the two special food facilities.

7) A customer oriented system that offered self-service with unlimited second helpings, did not limit the customer to three meals a day, and had a short order facility open until 2300 hours.

8) The rudiments of a new management information system[12] which included an automated credit card system for headcount[11] also provided the means to drive the production system from an automatically collected consumer data base.

The experiment consisted of a two week training phase and an eleven week operational phase under direct supervision of technical personnel from Natick Laboratories. Considerable effort was expended before the training phase in the selection, design, and modification of the central facility and food outlets; modification of transport vehicles; and adapting Army recipes and preparation procedures to central preparation. In addition, work sampling was performed in the food outlets and troop interviews conducted before any system changes were accomplished, to provide a "before" picture for comparison with experimental results.

The operational phase started 14 August, and ended 29 October 1971. However, because of the high degree of customer acceptance, operation of the experimental system was continued through 30 June 1972, with limited assistance from Natick Laboratories personnel. The automatic headcount system and management information system portions of the experiment did not become fully operational during the experiment and were evaluated and refined during the post-experiment operations.

Two kinds of information were collected during the experiment. The first involved continuous observations, monitoring, and problem solving in the general aspects of the system operation, such as: system management, food preparation in the central activity, food storage, transportation, food heating and serving in the food outlets, menus, and food wastage. The second type of data obtained related to customer satisfaction through interview techniques, customer attendance, food costs, worker productivity in the food outlets, and microbiological, sanitation and quality control.

IV. MENU

Initially, a new 42-day regular meal menu was developed for the experiment using food preference data collected at Fort Lewis[2] to modify the existing 42-day Army-Air Force Master Menu. During the experiment the new 42-day menu was reduced to a 20-day menu. The adjustment in the menu was occasioned by the need to obtain more menu cycles during the experiment to collect and verify consumption data (proportion of customers selecting competing food items), and by a realization that lack of variety, which usually dictates longer menu cycles, was much less important in the experimental system where the customer had access to three different menus served in three different types of food outlets. For example, during the evening meal period each customer had a choice of as many as 23 different entree items (i.e., two in the A-ration outlet, thirteen in the short order outlet and eight in the specialty outlet). It is noted that the customer satisfaction data presented in section XI of this report supports the conclusion that a longer menu cycle was not needed because of the menu variety offered within the three types of food outlets.

The objective of the new menu was to offer the customers more highly preferred foods more frequently. For example, the least desirable items, such as liver, were dropped from the menu. More desirable items, such as soft-serve ice cream, were added and made available at every noon and evening meals. This CAFe menu was also designed to increase the choices available to the customer in the regular meal food outlets at the mid-day and evening meals by offering two entree choices (except when the highest preferred items, such as steak, were served), two starch items, two vegetables, two salads, and two desserts.

Menus were also developed for the specialty food outlet and for the short order food outlet based upon the food preference survey. The survey indicated that Italian, Mexican and Seafood items were the most highly preferred specialty foods at Fort Lewis, and the short order items included the usual hot dogs, hamburgers, sandwiches, chili and pizza. In addition, a sandwich menu was prepared for the late evening snacks in the regular outlets. Copies of the regular, short order and specialty menus are included as **Appendix 1.**

The use of vendor pre-prepared food increased because customer preferences indicated that popular items, such as shrimp and french fries, be served more frequently than usual.

Also, the availability in the Defense Supply System of low cost frozen preblanched vegetables, and their standard high quality, provided the opportunity to use these vegetables rather than to centrally prepare them.

During preparation of the menus for the experiment, it was necessary to sequence the menu items so that work was properly balanced between the central facility and the food outlets. For example, two on-site preparation entree items were not allowed to appear on the menu at the same time.

The nutritive values associated with CAFe menu were computed each day of the 20-day menu cycle using computer programs developed especially for this purpose. Sample plots of the results obtained are included as **Appendix II**. These plots show that the experimental menu exceeded the recommended daily allowances for all nutrients evaluated in the analysis: calories, protein, vitamin A, vitamin B_1, vitamin C, calcium and iron.

V. CENTRAL FOOD PREPARATION

The heart of the CAFe experimental food service system was the central facility. This facility produced virtually all of the high labor foods needed to meet the requirements of the experimental menu, and performed all the warewashing for the system. A system flow diagram is shown on **Figure 1**. The organization and staffing, facilities and equipment, and food preparation will be described, and the more significant observations discussed. Warewashing will be discussed in **Section VII**.

ORGANIZATION AND STAFFING

Although the experimental food service system changed the skill level required at the dining hall from food preparation to food service, it required a higher degree of food formulation, preparation, preservation and handling skill at the central facility. This increased complexity at the central facility required new levels of technical expertise since it created a major technical function, food preservation, that did not exist previously. During the experiment the technical expertise was supplied by Natick Laboratories. Duties new to existing subsistence activities are those of providing highly technical expertise and managing a larger number of personnel with more highly diversified skills. These created a requirement for establishing a new experimental food service organization to provide both services and facilities for control, management and operation of all phases of the system.

During the experiment, the central facility did not have an official Table of Distribution and Allowances. Instead, personnel to function in the different areas of the central facility were obtained from various participating units. **Figure 2** shows the initial staffing of 41 military personnel for a planned service of 1000 customers or approximately 1800 meals per day. After the first six weeks the meals per day count rose to 2500, and it, therefore, was necessary to increase the staff size to 51 personnel.

Chief of operations: The chief of operations had complete responsibility for supervising the kitchen, logistics, and the sanitation divisions, and overall responsibility for the preparation and delivery of the food and for pick-up and return of tableware.

Kitchen division: The kitchen division was responsible for preparing, portioning, and packaging quality food using sanitary operating procedures in one of three operating areas: salad, entree, and dessert.

Logistics division: The logistics division was responsible for obtaining, storing and delivering the food required for the experimental system; and for picking-up soiled and delivering clean tableware, pots and pans. Logistics requisitioned the raw food from the commissary, weighed and portioned it to the quantities required for preparation, and delivered it to the kitchen division. After preparation, logistics received the finished foods and delivered the required quantities to the dining halls, as well as requisitioning and delivering all food not processed in the central facility. The trucks used to deliver the prepared food to the dining halls also picked up the soiled tableware transporters, delivered them to the central facility for sanitizing, and returned the clean tableware in clean transporters to the dining halls. In addition, logistics controlled the property and non-food supplies for the central facility.

Warewashing division: The warewashing division cleaned and sanitized soiled tableware, food and dish transporters, trucks used for transport, pots and pans from the central facility, and pots and pans from satellite facilities. This division was also responsible for sanitizing the central kitchen and for general policing of the building and grounds.

Technical support: During the CAFe experiment, technical support was provided through Fort Lewis and Natick Laboratories' project officers. The number and type of personnel varied depending upon need, and are not included in the central facility staffing chart shown in **Figure 2.** Natick Laboratories assumed the quality control function during the entire experiment. Three college trained food technologists/microbiologists were hired to work full time in quality control under Natick Laboratories' supervision. In addition, the Fort Lewis project officer provided one senior NCO to serve as satellite facility advisor, the Post Veterinarian provided one senior NCO to inspect the food received at the central facility, and the Post Environmental Sanitarian provided one enlisted man to conduct sanitation inspections and satellite facility microbiological sampling.

Training: The central preparation staff was assembled two weeks before the 14 August startup. The first week was used to establish the organization, orient the personnel to the system operation, check operation of the equipment, and train the

personnel in the use of equipment new to Army food service. During the second week of training, food was prepared in the amounts that would be required for the first week of the experiment. After startup, new dining halls were added to the experiment at a rate of one a week for the first six weeks. Once the first dining hall was added, the staffs from the other dining hall spent three days working in the central facility and two days working in one of the facilities already participating in the experiment, the week before they started operations.

FACILITY AND EQUIPMENT

The central facility utilized two buildings: 5209 and 5210. Building 5210 was an unused barracks that provided office space and storage space for food service supplies. Building 5209, a 500-man consolidated dining facility built in 1941, was used as the main food preparation and warewashing facility. The layout of the facility is shown in **Figure 3**.

Building 5209 was modified (electrical, plumbing, etc.) to accommodate the equipment needed for the experiment at a cost of approximately $40,000. This building was divided into two areas: central preparation in the kitchen area, and central warewashing in the dining area. Small rooms for the chief of operations and for quality control were constructed at one end of the dining area. Specialized equipment was purchased and furnished by Natick Laboratories; however, the standard military kitchen equipment was provided by Fort Lewis and used to the maximum extent possible. The total cost for the central facility equipment in building 5209 was approximately $105,000. **Table 1** lists the major equipment in the central facility showing its utility requirements and cost.

Ingredient storage: Dry ingredients, such as canned goods, shortening, grains, sugar, and condiments were stored in a 220 ft^2 dry storage area in building 5209 and five standard military conex containers located at the rear loading dock. Chilled ingredients were stored in two 95 ft^3 built-in refrigerator boxes. Frozen ingredients were stored in a 1,280 ft^3 freezer van and two adjacent 800 ft^3 standard military refrigeration trailers at the rear loading dock.

Main preparation: The majority of the meat cooking was performed in four standard military deck ovens with one grill top and one hot top range to handle such items as french toast and meat frying. Chicken and other deep fat fried items were cooked in

four military deep fat fryers. All the boiling and brazing was performed in three steam kettles: an 80-gallon chill-tilting type, a 60-gallon standard military type, and a 30-gallon tilting type. The 80-gallon kettle was equipped with a stirrer and could be chilled, first with tap water, then with refrigerated water from a water chiller unit. A patty maker used for the forming of salisbury steaks and meat balls. A meat thawing box, meat saw, 30-quart vertical mixer, meat slicer, and two 3-compartment steamers were also used. One of the steamers was self-generating and the other standard military issue.

When the entree items and sauce-type vegetable items had been cooked, they were panned into half steam table pans and cooled in one of two liquid nitrogen coolers in a time period of 1 to 2 hours. These liquid nitrogen coolers were two military 70 ft^3 refrigerator boxes which were converted for use as liquid nitrogen chill-freeze units at Natick Laboratories and shipped to Fort Lewis. A 6,000-gallon liquid nitrogen storage tank was installed outside the building with appropriate piping to the two chiller-freezers. After the products were chilled they were passed through a shrink tunnel where the top of the steam table pans were tightly covered with a polyester film. Details and procedures are presented in the discussion of packaging. The film cover stayed on the pan until after reheating in the dining hall. After covering, the products were stored in two standard 65 ft^3 refrigerators until staging prior to loading in the food transporters for delivery to the dining halls.

The main preparation area consisted of approximately 1550 ft^2.

Salads and vegetables: Salads and vegetables were prepared in a 456 ft^2 room that had been used as a vegetable preparation room when the building was a consolidated dining hall. Two military abrasion-type vegetable peelers were used for peeling carrots and potatoes. A table model cutter-dicer was used for slicing and dicing most of the vegetables. A vertical cutter-mixer was used when large quantities of lettuce and cabbage required cutting. Lettuce and cabbage were spun dry in a converted washing machine which proved to be inefficient and was later replaced by a higher speed spin dryer. Refuse was eliminated by a waste disposal unit. One standard 65 ft^3 refrigerator was used for holding the prepared vegetables and salads until shipment. Vegetable cooking was accomplished in the three compartment self-generating steamer located in the entree area.

Dessert: The dessert area encompassed 585 ft^2. Three military standard deck ovens were used for all the baking. Two mobile proofing cabinets conditioned those products requiring proofing. Two military 25 ft^3 freezers and one military 65 ft^3 refrigerator were used for storage. A steam kettle and two standard military vertical floor mixers were used for making fillings and frostings, and mixing of products. A pie sheeter and cookie former were provided after the start of the experiment to mechanize these specialized functions.

FOOD PREPARATION

Under the experimental system bread and dairy products continued to be delivered directly to the dining halls by commercial vendors. Fresh fruits and ready-to-use vendor supplied frozen foods were shipped directly from ration breakdown to the dining halls. In many cases where the final preparation step was deep fat frying or grilling, the time needed to prepare at the dining hall was no greater than that required to heat a precooked product; and preparation was carried out in the dining facilities. Thus, the central facility prepared, chilled or froze, stored, and shipped sauce-type entrees, precooked meats (except roasts), bacon, french toast, etc. Soups were prepared, chilled, stored, and shipped as two-fold concentrates ready for dilution and heating. Salads were prepared, stored and shipped chilled as ready-to-use greens and vegetables to which only the tomatoes, which were cut in the dining hall if required, need be added. Dressings were prepared and shipped separately. Fruit pies, pastries and dinner rolls were shipped at ambient temperatures in ready-to-use form. Gelatin salads were shipped chilled and ready-to-use. A summary of food product packaging and handling methods is shown in **Table 2**.

Natick Laboratories provided menu guides and food preparation guides for operation of the system. A menu guide, for each day in the menu cycle, showed where each food item on the menu for that day was prepared and its recipe number. The food preparation guides were armed forces recipes modified for central preparation. A guide was established for each food item that required whole or partial preparation in the central facility. These guides detailed preparation, filling, cooling, and packaging instructions; and provided the recipe yield and satellite facility heating information. Samples of these guides are shown in **Appendix III**.

Salads: The salad area was used to prepare gelatin fruit salads; vegetable and greens salads; cole slaw; lettuce leaves for serving fruit and cottage cheese salads; chopped onions,

celery, and peppers for meat salads; cucumber slices, onion slices and celery and carrot sticks for relish dishes. Tomato slices and wedges and banana slices could not be prepared centrally without sacrificing quality. Fresh and canned fruits were shipped directly to the dining halls. All of the centrally prepared salad items were effectively handled as chilled CAFe foods, but some required close quality control. The centrifuge (a converted washing machine) used to dry the salad greens was not adequate for the job. The spin was too slow and unless the operator was very careful, excess moisture remained which could promote bacterial growth and lower quality. It was difficult to get some men to wash their hands after trimming off the outer lettuce leaves which promoted bacterial contamination of the prepared salads. Delays were encountered in having the potatoes and salad greens dipped in anti-oxidant solution immediately after cutting, which allowed some oxidation and discoloration to take place. In some cases the polyethylene bags used to ship the salads were overfilled or stacked several high in the transporters which caused bruising and textural damage. These problems were all correctable, but emphasize the necessity of proper equipment and effective quality control.

Entrees: The entree area was used to prepare all casserole type entrees, meat pies and loafs, baked chicken, barbecued entrees, and to slice the meat for hot sandwiches and ham steaks. It was also used to prepare such special foods as corned beef hash, lasagna, tuna salad, creamed ground beef, pizza, meat balls, salisbury steak, french toast, and bacon. The foods were prepared and cooked, then cooled from 165° to 40° (chilled items) or 0° (frozen items) in one to two hours. Steaks, dry heat roasts and seafoods were not prepared centrally. All of the entree formulations had to be adjusted to accommodate central preparation, and about half of these had to be readjusted due to conditions and equipment peculiar to the central facility. This is to be expected whenever new and different facilities start operation. In the case of the experiment, Natick Laboratories' technologists were present to make these changes which emphasizes the fact that any facility must have the technical competence available (usually in the quality control function) not only to make adjustments for start-up, but also to correct for changing conditions, menu changes, ingredients out-of-stock, deficiencies in raw materials, etc.

Soups, dressings and gravies: Soups were prepared at two times concentration then diluted and heated at the dining facility. Dressings were prepared and shipped ready-to-use.

Gravies, however, presented some problems, primarily due to formulation. Once the gravy formulations were adjusted, central preparation proved effective for all types of soups, as well as for the dressings and gravies.

Vegetables: Many vegetables were used as received in the frozen state. These were not handled by central preparation. Creole squash, buttered cabbage, baked onions with tomatoes, glazed carrots and lyonnaise green beans required additional preparation and were prepared in exactly the same manner as entrees. O'Brien, au gratin, cottage fried, hash brown, oven browned, parsley buttered and glazed sweet potatoes proved to be very acceptable when prepared centrally. For baking, potatoes were washed and wrapped in aluminum foil at the central facility; then baked on-site. For corn-on-the-cob, the corn was shucked centrally; then steamed on-site.

Pastries: Since chilling accelerates staling of pastry products, pastries were transported at ambient temperature. The pastries presented many problems during the experiment. Only one man was available with a bakers' MOS, and he had received no formal training in baking. It was necessary to bring a bakery expert from Natick Laboratories to train the bakery personnel.

Staling was a serious problem, and packaging of all pastries except pies was necessary. Initially, only bakery mixes were available, and they produced lower quality products. When flour was obtained, it was an all-purpose type that did not perform satisfactorily for all products. This problem had to be solved by special purchases of pizza and cake flour.

The number of different dessert products was too large for the degree of mechanization available. After the start of the experiment, a cookie former and pie sheeter were obtained to decrease the amount of hand labor required for pies and cookies allowing the diversity of products desired.

Packaging: Every effort had been made in designing the experimental system to minimize pollution problems and effectively accomplish waste disposal. Entree products and centrally prepared vegetables were prepared chilled and shipped in stainless steel, half-size steam table pans. Soups, dressings and gravies were shipped in seven-quart stainless

steel pots with clamp-on covers or reusable one-quart or one-gallon screw cap polyethylene bottles. Salads, shucked corn-on-the-cob, potatoes for baking, dinner rolls, cakes, pastries and cookies were shipped in disposable polyethylene bags. Cakes and pastries were shipped in half-size bun pans (13" x 18" x 1"). Polyethylene bags were placed over the pans and cake to prevent drying.

Filling and labeling was manual with small platform scales used to check weights. During the first few weeks of the experiment, the entree items were packaged in the stainless steel, half-size steam table pans covered with either a tuck wrap, polymeric (vinyl) coated, 1-mil aluminum foil; or with a shrink (polyester) film. Later, the shrink film cover was used exclusively, with the coated aluminum foil serving as backup. The film employed was a biaxially oriented, 0.80 mil polyester material--equally oriented in both directions--25 to 30%. The aluminum foil obscured the contents and tore easily during handling. The polyester film was transparent and provided the most eye appealing cover, but did become brittle and fragmented if too high an oven temperature (over 375°F) were used when heating at the dining hall.

Equipment to apply the shrink cover included a shrink tunnel and a hot-wire film cutting wire. Covers for applying the polyester film were constructed from sheet aluminum to hold the film in place during the first operation in the shrink process. Two different designs were required for production use. One design was specifically made for irregular shaped products that projected above the top of the steam table pan. It had a raised center panel. The other design fit flat over the steam table pan.

The shrink process was performed in two operations. The first operation, requiring the cover, anchored the edges of the film under the flange of the steam table pan; and the second operation tightened the film over the pan and product. The procedure followed included the use of eighteen inch wide roll film which was cut into a 19-inch length and placed over the top of the pan filled with chilled product. An aluminum cap was then placed over the film forcing the film over the flange and skirting the pan. The pan was then conveyed through the shrink tunnel. The shrink tunnel was preset to supply forced hot air at 300°F. After the first pass through the shrink tunnel, the aluminum cap was removed and the pan was passed through a second time to tighten the film.

To increase sealing speed, a one-pass shrink-film cover application method was developed. The shrink-film width was increased to 20" to eliminate cover failures during

sealing and reconstitution. A stretch band made from 1/4" shock cord was applied over the film tightly against the sides of the pan under the flange. The pan was then conveyed through the shrink tunnel, the stretch band removed and a pressure-sensitive label bearing entree identification and expiration date adhered to the shrink-film cover.

Salad greens were packaged in 15 pound quantities in 12" x 8" x 25" gussetted, 1.5 – 2 mil polyethylene bags and closed with tape or twist-ties. In the larger bags, salad greens tended to crush and compact. Cookies were packaged in small 8" x 15" bags or in a 10" x 20" bag specifically purchased for the bakery items. Cakes and sweet rolls made on full size sheet pans were overwrapped by inserting them, pan and all, into 18" x 24" bags.

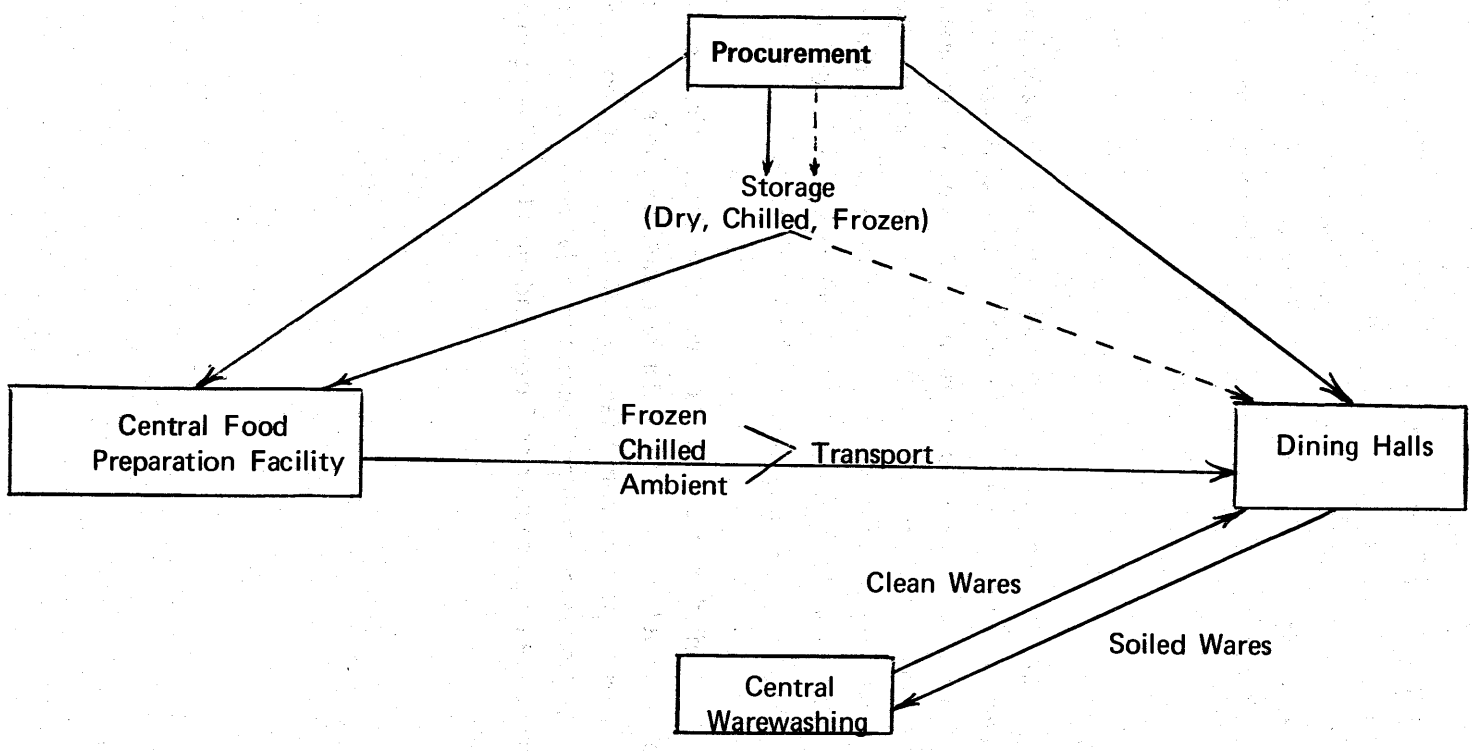
DISCUSSION

The experiment demonstrated the capability of preparing high quality appetizing food centrally. Most foods were prepared and delivered in a chilled state very effectively. However, storage and microbiological considerations made it necessary to prepare and deliver bacon, french toast, and veal-burgers in a frozen state and pastries at ambient temperatures or frozen. The time constraints for storage of the various food items were developed before the experiment and modified to reflect the operating conditions during the experiment. These constraints are presented in **Appendix IV.**

Many foods that were handled in a chilled state could be more effectively handled frozen, primarily because they could be prepared in larger quantities and stored for longer periods improving the efficiency of the central facility. Although a frozen system will be recommended for large post-wide systems, approximately one-third of the foods necessary for a highly acceptable menu cannot be frozen and must be delivered in a chilled state.

Figure 1

SYSTEM FLOW DIAGRAM



Central Preparation
- Bacon and French Toast
- Soups, Gravies and Sauces
- Tossed and Gelatin Salads and Slaws
- Chicken and Casserole Type Entrees
- Non Deep Fat Fried Potatoes
- Rice and Sauce Type Vegetables
- Pies, Cakes, Cookies, and Dinner Rolls

On-Site Preparation
- Steaks and Chops
- Roasts
- Hamburgers
- Frozen Vegetables
- Breakfast Eggs
- Fish and Shrimp

Vendor Supplied: Milk, Bread, Buns, Soft Serve Mix, Ice Cream and Cottage Cheese

Figure 2

INITIAL STAFFING FOR CAFe CENTRAL FACILITY

Adminstration	2
Kitchen	15
Logistics	11
Sanitation	13
Total	41

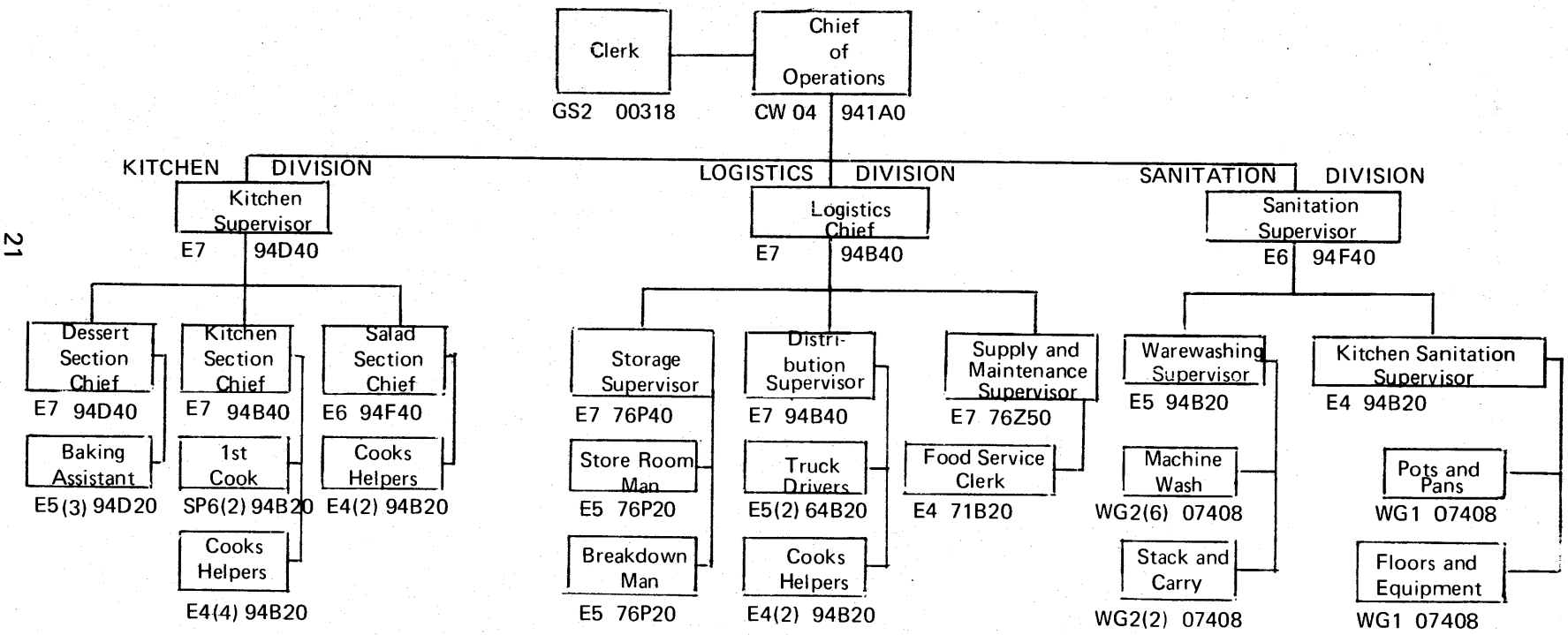


Figure 3

LAYOUT OF CENTRAL FACILITY

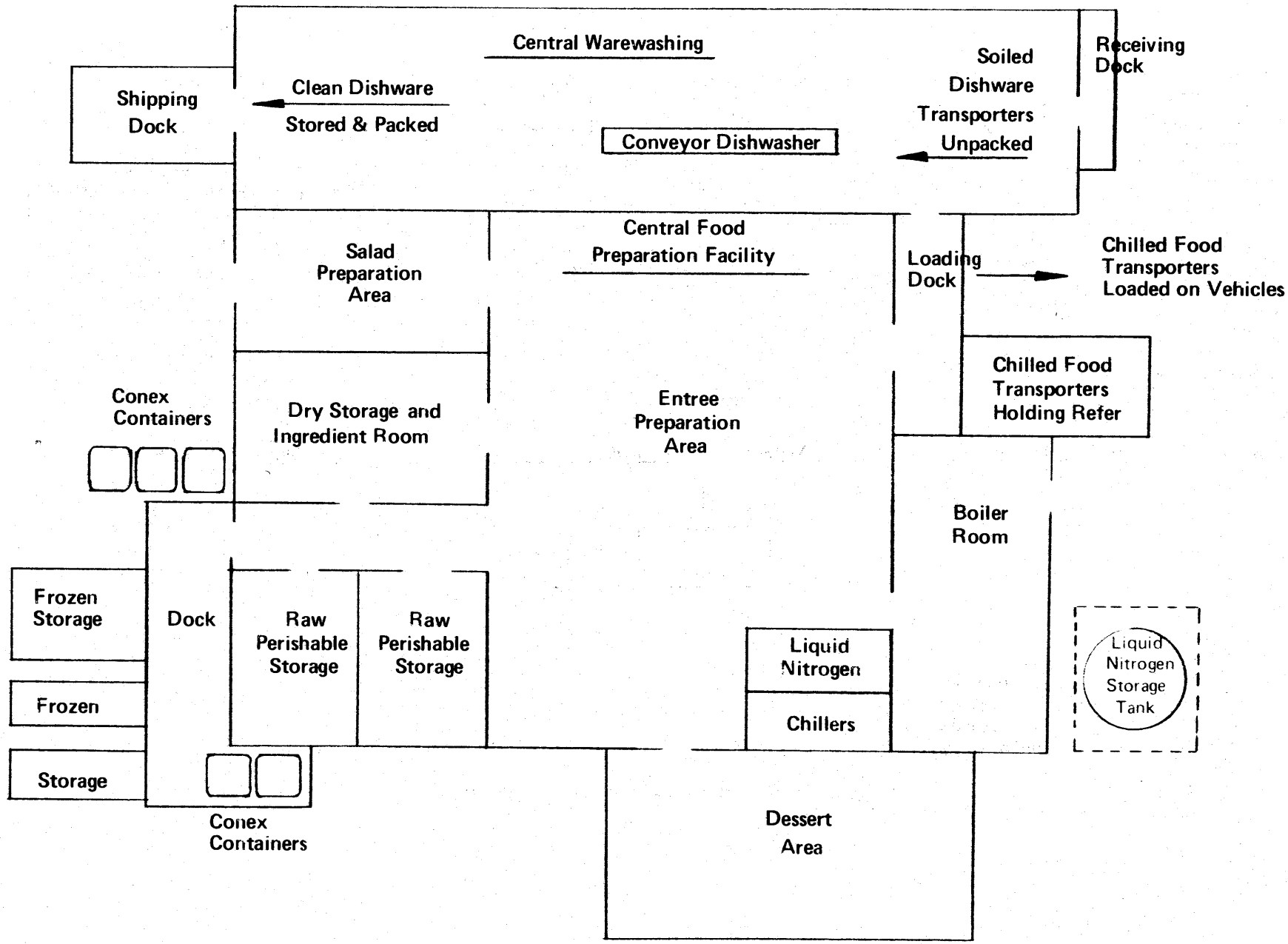


TABLE 1

CENTRAL FACILITY EQUIPMENT

Equipment	Qty	FSN	Utilities Req. (ea)	Cost (ea)	Total Cost
Main Entree Area:					
1. Range, Electric	2	7310-282-6626	208V,60H,3ϕ,21KW	$ 400	$ 800
2. Oven Baking & Roasting	4	7310-273-1880	208V,60H,3ϕ,12KW	585	2340
3. Steam Kettles					
30 gal (tilting)	1	NSN	Steam	500	500
60 gal	1	7310-551-3583	Steam	650	650
80 gal (tilting)	1	NSN	Steam-chill Water 208V,60H,3ϕ,2KW	4140	4140
4. Patty Maker	1	7320-526-7273	115V,60H,1ϕ,0.6KW	450	450
5. Deep Fat Fryer	4	7310-809-9390	208V,60H,3ϕ,12KW	250	1000
6. LN_2 Chilling Box	2	NSN	115V,60H,1ϕ,0.5KW	1200	2400
7. Meat Slicer	1	7320-222-4177	115V,60H,1ϕ,0.5KW	285	285
8. Refrigerator, 65 ft^3	2	4110-194-1572	115V,60H,1ϕ,1.8KW	685	1370
9. Food Mixer, 30 qt.	1	7320-232-6706	115V,60H,1ϕ,0.75KW	1050	1050
10. Steam Cooker	1	NSN	Water, Drain 208V,60H,3ϕ,24KW	2500	2500

Continued

TABLE 1 (cont'd)

CENTRAL FACILITY EQUIPMENT

Equipment	Qty	FSN	Utilities Req. (ea)	Cost (ea)	Total Cost
11. Steam Cooker	1	7310-244-0100	Steam, Drain	$ 1980	$ 1980
12. Pot Washer	1	7320-144-5817	Steam, Water, Drain 208V,60H,3ϕ,2.0KW	1300	1300
13. Ref, Thaw Box	1	NSN	115V,60H,1ϕ,1.5KW	1200	1200
14. Water Chiller	1	NSN	Water, Drain 115V,60H,1ϕ,1KW	1800	1800
15. Shrink Tunnel	1	NSN	208V,60H,3ϕ,5KW	1800	1800
16. Film Cutter	1	NSN	115V,60H,3ϕ,5KW	1300	1300
17. Meat Saw	1	7320-922-5907	115V,60H,1ϕ,0.5KW	735	735
Vegetable Preparation Area:					
1. Verticle Cutter Mixer	1	7320-948-4761	208V,60H,3ϕ,7.5KW	2340	2340
2. Refrigerator, 65 ft^3	2	4110-194-1572	115V,60H,1ϕ,1KW	685	1370
3. Centrifuge (Comm. Washer)	1	NSN	115V,60H,1ϕ,0.5KW	100	100
4. Potato Peeler	2	7320-240-2547	Water, Drain 115V,60H,1ϕ,1.0KW	450	900

Continued

TABLE 1 (cont'd)

CENTRAL FACILITY EQUIPMENT

Equipment	Qty	FSN	Utilities Req. (ea)	Cost (ea)	Total Cost
5. Vegetable Cutter	2	7320-240-2547	115V,60H,1ϕ,0.5KW	$ 1000	$ 2000
Pastry Area:					
1. Oven, Baking & Roasting	2	7310-237-1880	208V,60H,3ϕ,12KW	585	1170
2. Freezer	2	4110-541-5999	115V,60H,1ϕ,I.7KW	290	580
3. Proofing Cabinet	2	NSN	115V,60H,1ϕ,1.5KW	835	1670
4. Steam Kettle, 60 gal	1	7310-551-3583	Steam, Drain	650	650
5. Mixer, 30 qt.	1	7320-232-6706	115V,60H,1ϕ,0.75KW	1050	1050
6. Dough Roller - Sheeter	1	NSN	115V,60H,1ϕ,0.5KW	625	625
7. Cookie Former	1	NSN		110	110

TABLE 2

SUMMARY OF FOOD PRODUCT PACKAGING AND HANDLING METHODS

Product (Chilled Except as Noted)	How Shipped	As Purchased Commercially	Prepared In CFPF	Cooked On-Site	On-Site Equipment Required
Soups (2X concentrate)	7 Quart Pot		X		Steamer or Range
Sauces & Gravies	1 Gallon & 1 Quart Poly Bottle		X		Steamer or Range
Main Dishes					
Steaks, Roasts & Hamburgers	Specification	X		X	Grill and Convection Oven
Casserole Entrees	1/2 Steam Table Pan		X		Convection Oven
Chicken	1/2 Steam Table Pan		X		Convection Oven
Fish & Shrimp	Specification	X		X	Deep Fat Fryer
Vegetables					
Pre-Blanched	Specification	X		X	Steamer
Sauce-Type	1/2 Steam Table Pan		X		Convection Oven
Baked Potatoes	Poly Bag		X	X	Convection Oven
French Fries	Specification	X		X	Deep Fat Fryer
Other Potatoes	1/2 Steam Table Pan		X	X	Convection Oven
Pasta Products	1/2 Steam Table Pan		X		Range or Steamer
Rice	1/2 Steam Table Pan		X		Convection Oven
Breakfast Foods		X			
Eggs	Specification			X	Grill
Bacon (Frozen)	1/2 Steam Table Pan	X	X		Convection Oven
Pancakes (Dry Mix)	Specification			X	Convection Oven
French Toast (Froz)	1/2 Steam Table Pan		X		Convection Oven
Potatoes	1/2 Steam Table Pan		X		Grill or Convection Oven

Continued

TABLE 2 (cont'd)

SUMMARY OF FOOD PRODUCT PACKAGING
AND HANDLING METHODS

Product (Chilled Except as Noted)	How Shipped	As Purchased Commercially	Prepared in CFPF
Dairy Products			
Milk	Specification	X (Direct Vendor Delivery)	
Soft Serve Mix	Specification	X (Direct Vendor Delivery)	
Cottage Cheese	Specification	X (Direct Vendor Delivery)	
Ice Cream	Specification	X (Direct Vendor Delivery)	
Baked Goods			
Breads & Buns (ambient)	Specification	X (Direct Vendor Delivery)	
Dinner Rolls (ambient)	Poly Bag		X
Cakes (ambient)	1/2 Bake Pan in Poly Bag		X
Pies (ambient)	Pie Pan		X
Puddings	1/2 Steam Table Pan		X
Cookies (Frozen)	Poly Bag		X
Salads			
Tossed & Slaws	Poly Bag		X
Gelatin	1/2 Steam Table Pan		X

VI. TRANSPORTATION

Transportation was an essential element of the CAFe system since the points of food preparation and warewashing, the central facility, were removed from the point of food service, the dining hall. The transportation subsystem and its performance is presented.

TRANSPORTERS

One transporter, the food-soiled tableware transporter, could perform the bulk of the food and tableware movement required for the experiment. However, four other types of equipment were used for special transport functions. They were: mobile plastic tableware dispensers; mobile dish, glass and tray dispensers; mobile bakery cabinets; and mobile plastic tubs.

Food-soiled tableware service: In the interest of logistical economy, the transporter used to carry the food to the dining halls also served as a receiver and carrier for return of soiled tableware to the central warewashing activity. These transporters, shown in **Figure 4**, were of one-piece moulded fiberglass construction. They contained three compartments, each enclosed by a sliding door. Each compartment had stainless steel stanchions with thirteen tray slides which were specially redesigned to hold the various sizes pans and trays used in the experiment. The transporter had four 6" heavy duty casters and overall dimensions of 61" x 27" x 64". Since this transporter was initially intended for hospital use, to carry hot food to the patients and return soiled tableware to the dishwasher area, it was designed for ease of sanitation. The stanchions and sliding doors were easily removable to be sent through the dishwasher while the one-piece body of the transporter was being steam cleaned and sanitized. The outer color of these transporters was varied so each dining facility would have its own color.

The transporter was insulated, which simplified delivery since frozen, chilled and ambient deliveries could be accomplished with mixed loads on the same truck regardless of the temperature at which the truck was maintained. Entrees, cooked vegetables, and gelatin type salads and desserts were shipped in 1/2 size (10" x 12") stainless steel steam table pans. Each stanchion tray slide accommodated two of the 1/2 size steam table pans, providing a capacity for delivering 78 pans. Pastry products were shipped in 1/2 size (18" x 13") bake pans, one pan per tray slide for a maximum of 39 bake pans.

Vegetables and greens for salads and garnishes were shipped in polyethylene bags placed on 15" x 20" plastic serving trays or on the floor of the transporter depending upon available space. Soups, sauces, and gravies were shipped in seven quart lidded stainless steel pots or one gallon or one quart plastic bottles placed on the floor of the transporters. The transporters used for the chilled or frozen food were cold soaked in a refrigerator van at 35°F. prior to use. Transporters were never on the delivery truck long enough for the temperature inside the transporter to change more than a few degrees because they were not allowed to stand on the truck for any period of time, and the distances to the dining facilities were not great.

At the dining facility the food was immediately off-loaded into the freezer, refrigerator, or bakery storage cabinet, as appropriate. The transporters were then moved into the dining area, where they served as receptacles for dirty tableware at the next meal. Each stanchion slide was capable of holding two, 14" x 11", compartmented trays for a total capacity of 78 trays. Where glass dishes were used, each tray slide accommodated one 15" x 20" tray containing dishes, thus 39 trays could be carried by each transporter. At the end of each meal period, a truck would pick up the transporter containing the dirty tableware and deliver it to the central warewashing activity. Pick up for the short order facility was not required since it used disposable tableware.

Plastic service: Mobile tableware dispensers, shown in **Figure 5**, were used to transport the clean plastic tableware to the dining facilities. These dispensers, designed for cafeteria use, were enclosed, single shelf, stainless steel, self-leveling units with a ten-compartmented silverware holder mounted at the top rear of the unit. The transporter had four 5" casters with polyurethane tires and overall dimensions of 34" x 25" x 33". It was filled with silverware; compartmented trays; and plastic glasses, bowls and cups as described in Section VII (**Figure 6**). A solid plastic cover was set on top of the transporter to prevent contamination during transit. The plastic cylinders containing the silverware were placed in plastic bags with twist-ties and set into the silverware holder. These dispensers were transported to the dining hall and placed at the beginning of the serving line where each customer could remove the tableware he required. At the end of the meal, the transporters were returned to the warewashing activity for cleaning and reloading with clean tableware.

Glass service: Prior to the start of the experiment, Fort Lewis was using plastic tableware with the exception of glasses, but was making preparations for converting to

glass dishes at a future date. To demonstrate the feasibility of central warewashing to glassware and dishes, some of the new dishes were utilized in the specialty facility. Standard self-leveling dish, glass and tray dispensers were used for transporting the clean dishware back to this outlet. Plastic silverware cylinders, enclosed in polyethylene bags with twist-ties, were set into the dishwasher basket, and set on a tray dispenser, for carrying clean silverware to this outlet. These dispensers were placed at the beginning of the serving line where each customer selected a tray and the dishes and silverware he required. After he finished his meal, the trays with dishes were placed into the food-soiled tableware transporters. At the end of the meal, the loaded food-soiled tableware transporters and empty dish transporters were returned to the warewashing activity for cleaning and reloading with food and clean dishware, respectively.

Other transporters: In addition to the above three types of transporters, standard mobile bakery cabinets were used to deliver pastries and rolls during the latter part of the experiment when the food transporters needed repair and were in short supply. These mobile cabinets functioned effectively, but are additional pieces of equipment that should not normally be required.

Each dining hall steward was allowed to send dirty pots and pans to the central facility for cleaning, if he desired, and most stewards took advantage of this additional service. Mobile plastic tubs measuring 39" x 27" x 30" were used to transport both clean and soiled pots and pans. However, when space was available, soiled pots and pans were also returned in the tableware transporters and the food-soiled tableware transporters. The mobile plastic tubs were extremely effective for transporting pots and pans, and these, or similar equipment, would be required if pots and pans are to be cleaned centrally.

TRUCKS

The delivery truck was a military flat bed refrigerated van which could be maintained at 35°F when delivering food. During moderate weather the truck refrigeration was not used since the transporters were insulated and only on the truck a short time, usually less than two hours. The truck was modified by the addition of a tailgate lift that would raise or lower transporters between the truck bed and the dock. This truck delivered the food and clean tableware and picked up the soiled ware.

A standard 1 1/2 ton non-refrigerated truck was also modified by the addition of a tailgate lift and used for emergency pick-ups and deliveries. This truck did not require

refrigeration since food transporters were insulated, and, for these emergency requirements, were only on the truck for very short periods of time, usually less than one hour.

DELIVERY

Under the normal schedule, food was prepared one day, delivered the next, and served the next. Soiled tableware and utensils were picked up in the morning and delivered clean in the afternoon, picked up in the afternoon and evening (twice) and delivered clean in the morning. Because the lower headcounts at the evening and breakfast meals required about the same quantity of tableware as for the noon meal, clean tableware for these meals was delivered together. All regularly scheduled deliveries were made between 0800 and 1000 hours or between 1300 and 1500 hours.

DISCUSSION

The transporters used for the experiment were modified off-the-shelf items. None of these transporters could be used in a larger system without design modifications. The primary shortcoming of the transporters was durability, as would be expected, because the equipment, which was designed for indoor hospital and cafeteria use, was shipped by truck. However, these transporters did perform much better than expected and did demonstrate the feasibility of transporting food, tableware and utensils. The information gained during this experiment had been used to design and test prototypes of new transporters which will be used in a large central system.

For the experiment a back-up for delivery of clean plasticware, dishware and silverware was available. Module packs of tableware, tightly wrapped in polyethylene, were designed to fit on the trays in the food-soiled tableware transporter. However, moving clean tableware in the tableware dispensers proved so effective the back-up method was never used.

The military standard trucks modified with the rear tailgate functioned quite well during the experiment. In the operation of a central system, dedicated trucks with a driver and assistant driver on each vehicle will be needed to load and unload the transporters at the dining halls. Food must be delivered directly to the refrigerators or freezers and tableware to the serving line in order to minimize the number of personnel required in the dining halls.

Figure 4

FOOD-SOILED TABLEWARE TRANSPORTER

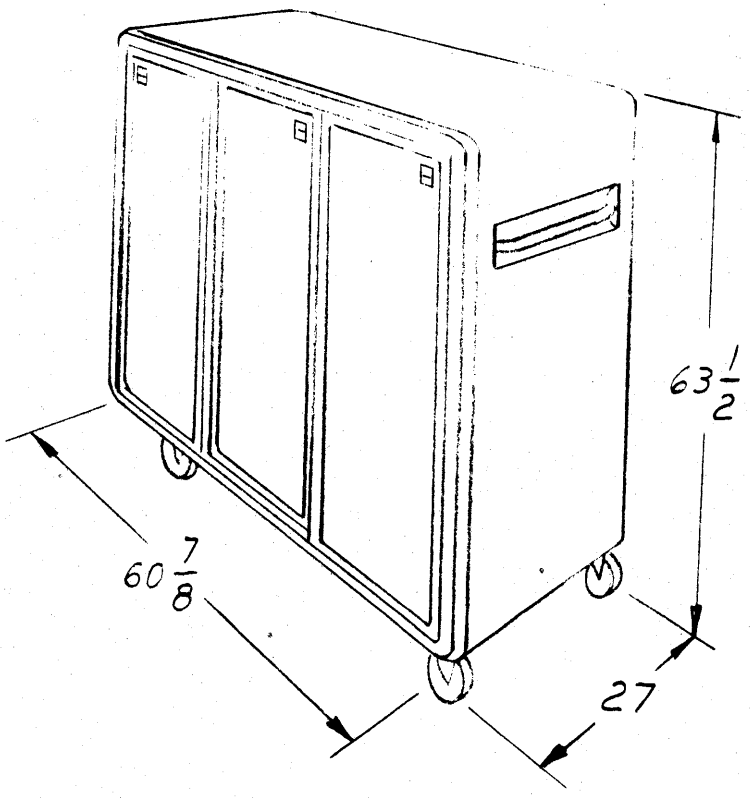
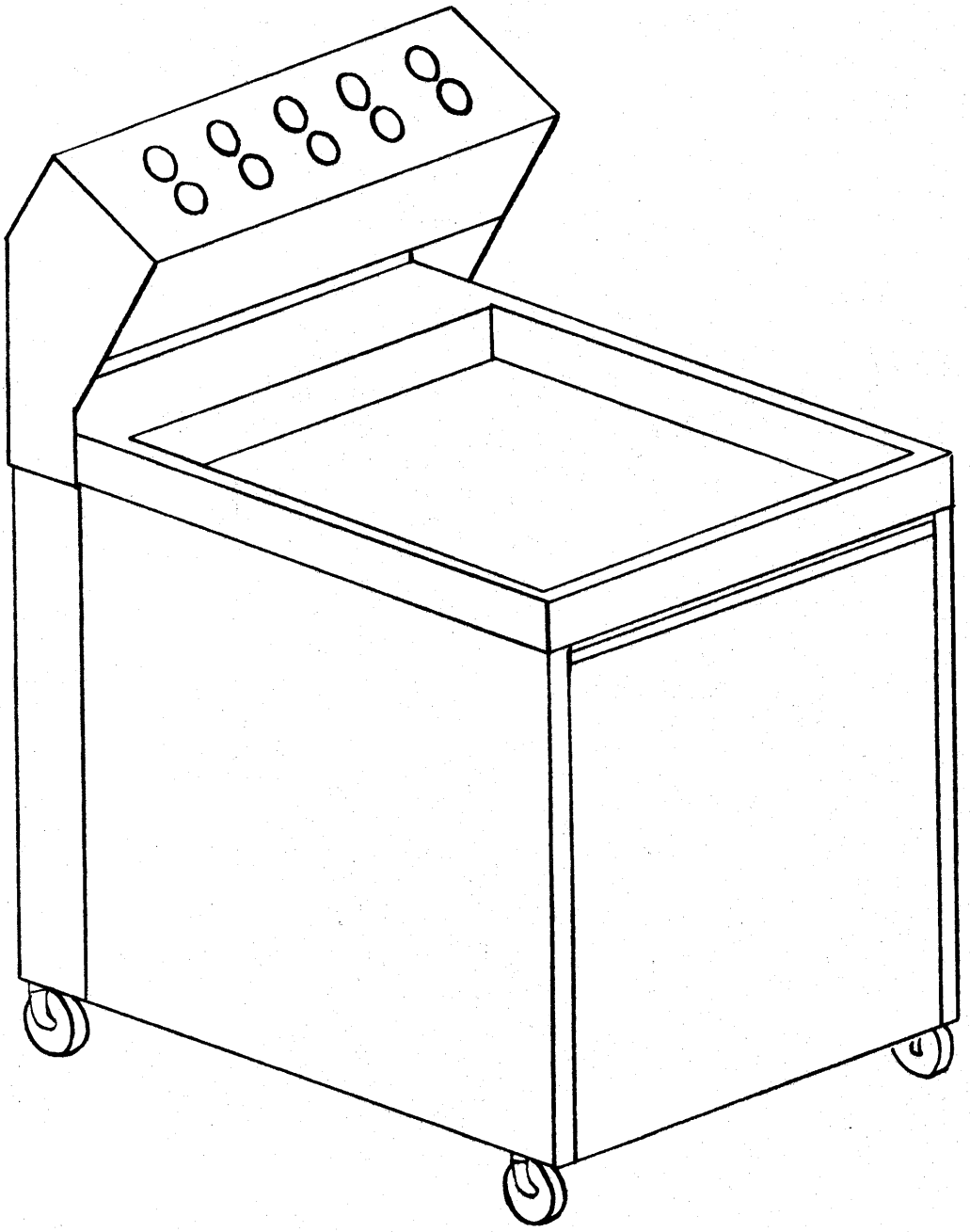


Figure 5

PLASTIC TABLEWARE TRANSPORTER/DISPENSER



VII. CENTRAL WAREWASHING

Another important feature in the experiment was the warewashing activity. Virtually all of the plastic tableware, dishes, glasses, silverware, and pots and pans were washed and sanitized centrally. The various aspects of this operation are discussed below.

FACILITY

Warewashing was performed in the former dining area of the 500-man consolidated mess. The warewashing area was partitioned off from the food preparation area to prevent possible cross-contamination. A two compartmented sink was installed where the coffee urns were previously located to serve as a soak tank. A porch that served as a loading dock already existed at one end of the dining area and another dock, to receive soiled ware, was built at the other end of the dining area.

DISHWASHER

The dishwasher was a 31 foot, variable speed, four tank, flight-type dishwasher with two prewash, a wash, a rinse, a sanitizing rinse, and a drying section. The rinse water booster was steam operated. The dishwasher had an operating capacity of 13,000 pieces per hour. A soap and drying agent dispenser was installed for automatic operation. The dishwasher was mounted on the curbing which originally supported the serving line.

WASHING

Soiled tableware transporters from the A-ration facilities were loaded with soiled silverware, plastic cups, bowls, glasses and compartmented trays while the ones from the specialty facility were loaded with soiled glass dishes, glasses, silverware, and flat plastic trays. The clean tableware transporters and plastic tubs were returned loaded with soiled pots and pans. Transporters were wheeled into a holding area and rotated past a breakdown table at the intake end of the dishwasher. Here the trays, dishes, silverware, pots and pans were removed and collected for washing. The supply of hot water was marginal, necessitating a batch dishwashing operation. Although more labor intensive, batching was effective since the dishwasher had a much greater capacity than was required.

At the breakdown table, trays with their contents were removed from the transporters and food scraps and waste were rinsed into a high capacity garbage disposal with an overhead reel spray hose. Trays and dishes were collected, then placed directly on the dishwasher conveyor while silverware, glasses, and plastic glasses, cups and bowls were sorted and collected in dishwasher baskets. Filled baskets were placed on the conveyor to travel through the dishwasher. Silverware was soaked, then washed twice. First, it was loaded into dishwasher baskets and run through the dishwasher; then it was transferred into plastic cylinders, with handles up, and the cylinders run through the dishwasher again.

Pots and pans usually required soaking and hand cleaning before being sent through the dishwasher. Baking pans and the steam table pans used for shipping, heating and serving the food had to be soaked and hand washed to remove the burned food particles created during the heating at the dining hall, before they were run through the dishwasher.

When empty, the transporters were moved to an outside area, steam cleaned, sanitized with a quaternary ammonium rinse and placed in holding areas until loaded for shipment to dining halls.

The sanitized tableware and utensils were examined as they were removed from the dishwasher. Those pieces found to be dirty were placed in the soak tank, soaked, hand cleaned, and then sent through the dishwasher again. This procedure was usually required when washing breakfast tableware, where egg yolk congealed on the trays and silverware, was baked on during the pre-wash cycle, and not removed during the rest of the cycle. On the average, about 5% of the tableware sent through the dishwasher was rewashed.

The tableware and utensils were placed in holding racks until loaded into the clean transporters for shipment back to the dining halls. To prevent contamination of the clean tableware and utensils, packers wore plastic gloves.

CLEAN TABLEWARE

Plastic Service: The transporters for clean plastic tableware held enough tableware for 168 customers. The loading pattern, shown in **Figure 6**, was standardized at two stacks of compartmented trays (total 168), one stack of bowls (total 50), three stacks of cups (total 39), 23 stacks of glasses (total 253), two cylinders of knives (total 140),

five cylinders of forks (total 175), and three cylinders of spoons (total 150). To account for variable demand caused by weather, type of meal, etc., extra packs of tableware consisting of 20 cups and 20 glasses in polyethylene bags with twist-ties, were shipped with each transporter and the dining hall steward could accept or reject them depending on his supply of extra cups and glasses. In addition, a supplement consisting of 20 trays, cups and bowls, 60 glasses, and one cylinder each of knives, forks and spoons, all in polyethylene bags with twist-ties, were packed in a fiberboard box and kept in each facility.

Glass Service: Standard self-leveling dish, glass, and tray dispensers were used to transport glass dishes and trays back to the dining halls. The silverware was transported in cylinders within polyethylene bags closed with twist-ties and packed in a dishwasher basket.

Pots and pans: The mobile plastic tubs were very satisfactory for returning the clean pots and pans to the dining halls. During the experiment, it was possible to batch pots and pans for each of the dining halls. In a larger operation, such batching would not be possible, and pots and pans would have to be standardized between dining halls.

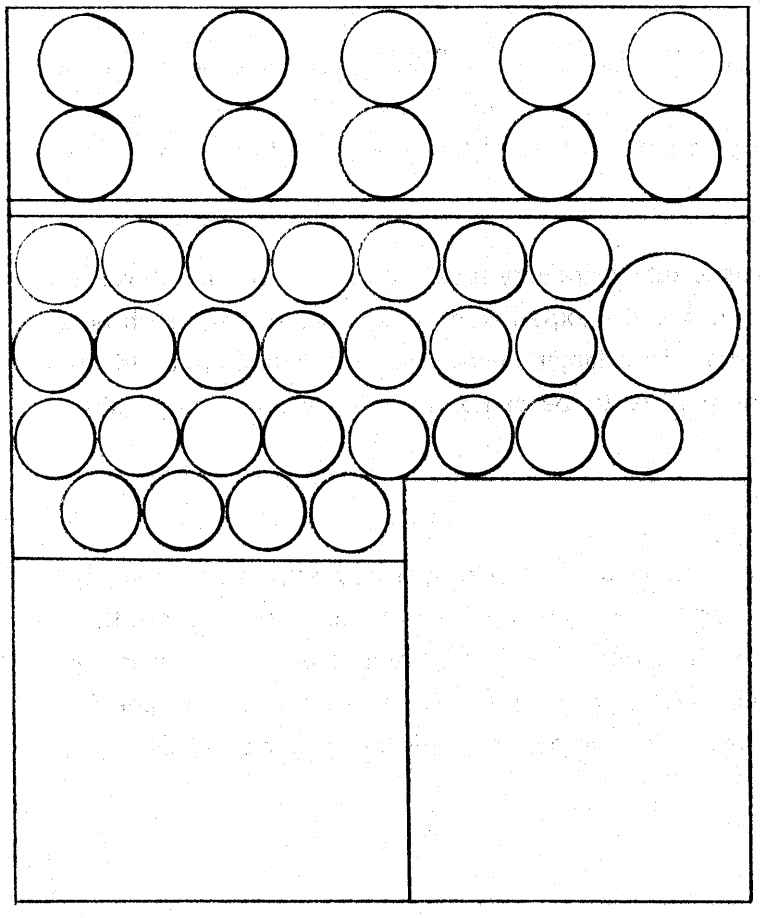
DISCUSSION

The central warewashing portion of the CAFe experiment was extremely successful. Plastic tableware, glass dishes, pots and pans can be effectively cleaned and sanitized centrally and transported to and from the serving line without requiring stacking, handling, or cleaning by dining hall personnel. Extra tableware was required to allow time for cleaning and transporting to and from the dining hall, but this cost was more than offset by labor savings at the dining halls.

Figure 6

PLASTICWARE TRANSPORTER/DISPENSER LOADING PATTERN

Silverware



Trays and Plastic Dishware

Silverware
- 140 Knives (2 dispensers)
- 175 Forks (5 dispensers)
- 150 Spoons (3 dispensers)

Trays and Plastic Dinnerware
- 168-trays (2 stacks of 84)
- 50-Bowls (1 stack of 50)
- 39-cups (3 stacks of 13)
- 253-glasses (23 stacks of 11)

Top View
(See Figure 5 for Isometric View)

VIII. SATELLITE FOOD OUTLETS

Under the CAFe system much of the cooking function and virtually all of the dishwashing function currently carried out in the dining halls was centralized. Thus, for the foods which were centrally prepared, the dining hall personnel were only concerned with the final preparation steps, often only heating, and with its presentation and merchandising. Self-service was utilized, so that the customer was allowed to decide for himself the portion size of the foods desired. The types of facilities, equipment and staffing, and food service are presented.

FACILITIES

Six dining facilities participated in the experiment. They were selected to represent a cross-section of the TO&E troop units in the division area. These units were: 864th Engineers; 176th and 268th Signal Companies; 1st of the 3rd Armored Calvalry Regiment; 58th Signal Battalion and 62nd Medical Group; and 2nd of the 19th Field Artillery Group. The six dining halls were: Buildings 3114, 3218, 3224, 3279, 3122, and 3161. **Figure 7** shows a typical layout of those facilities which were 1953 vintage permanent buildings. Their locations with respect to the central facility are shown on the maps shown in **Figures 8**, and **9**. Each dining hall was brought into the CAFe system one week apart starting 14 August 1972. Each started CAFe service on the weekend, Saturday, to allow adjusting to the new system when headcounts were the lowest.

One outlet in building 3218 provided short order service only, between 1100 and 1330 and 1500 and 2300 hours daily. Another outlet in building 3161 functioned as a specialty CAFe providing Mexican, Italian and seafoods between 1630 and 2200 hours daily. The remaining four outlets served A-ration meals and the troops assigned to them were encouraged to take advantage of the short order and specialty facilities as often as they wished. One of the A-ration facilities, building 3114, was located some distance from the special facilities. This facility was provided with a mobile serving line for the A-ration meals. The standard serving line provided a limited short order service during the noon and evening meal periods.

EQUIPMENT

Each satellite food outlet was modified to add the equipment needed for the experimental system at a cost of approximately $1,500. Total cost for the six outlets

was approximately $9,000. The specialized equipment was purchased and furnished by Natick Laboratories; however, standard military kitchen equipment was used to the maximum extent possible. The most important heating device was a roll-in type forced hot air convection oven which would accommodate 24 half-size steam table pans. The prepared food, in the half-size steam table pans, was loaded and heated for serving. The other important heating device was a high pressure steamer used for extremely rapid heating of frozen vegetables. This device also served as a backup method for the heating of entrees. It was faster but of limited capacity. **Table 3** lists the major equipment in the various facilities showing its cost and utility requirements. A brief description of the equipment and operation of the outlets follows.

A-ration: Three satellite outlets in buildings 3224, 3279, and 3122 offered regular meal service. They had standard serving lines – single line steam table and counter set-up with no refrigerated sections. A forced hot air convection oven, a food warmer and a high pressure steamer were added to each kitchen to assist in heating and holding the food. The rotary toaster was replaced by a 4-slice pop-up toaster. Two kitchen ranges were removed to allow electrical power for the new equipment. The grill, deep fat fryer, one range and the meat slicer were the items of standard equipment retained in the kitchen for use in the new system. A carbonated beverage dispenser and a soft-serve ice cream machine were added in the dining area. The refrigerated salad bar and milk dispenser already located in the dining area were retained. The dining area decor of these outlets was not renovated as was the decor of the short order and specialty facilities. They operated normal meal hours: 0615 to 0700 for breakfast, 1130 to 1215 for lunch and 1630 to 1730 for supper. **Appendix I** contains the 20-day cycle menu used during most of the experiment.

A-ration and limited short order: This outlet, building 3114, had a new mobile, double line, all stainless steel steam table with refrigerated sections at either end of a center hot section which had heating lamps over hot wells to keep the food warm. The standard single line steam table and counter set-up had been left in place and was utilized for short order service during the noon and evening meal periods and for breakfast service. Troops served themselves from either side of the mobile line or went to the short order line markedly increasing the rate of service and practically eliminating waiting lines. Except for the mobile line, the kitchen and dining area had the same equipment as the A-ration outlets. This outlet was open for the normal meal hours, and served the A-ration menu plus hamburgers, cheeseburgers, and the short order special of the day shown in **Appendix I.**

Short order: This outlet, building 3218, was converted to short order facility designed to accommodate 500 customers per day. Because of the overwhelming customer acceptance, it was necessary to accommodate up to 800 customers in one day. This level of participation did not present any serious problems. The supplemental equipment, added to assist in preparing hot and cold food, included a sandwich bar, a continuous hamburger broiler, a hot dog broiler, a bun warmer, a deck oven, a second deep fat fryer and a microwave oven. Two kitchen ranges were removed to allow installation of these items of equipment. One carbonated and one non-carbonated beverage dispenser; a soft-serve machine; a milk shake machine and a silex coffee maker were added to the salad bar and milk dispensers (2) in the dining area. This outlet was renovated with bright colors, movable partitions, carpeting and a juke box. It was open extended hours: 1100 to 1330 and 1500 to 2300 hours. It also offered unlimited quantities of food and offered self-service in most foods. The menu provided 12 standard and one rotating entree items in addition to french fries, onion rings and the salads and desserts offered on the standard A-ration menu. **Appendix I** contains the short order menu used during the experiment.

This outlet used disposable tableware. In general, an all disposable system was unsatisfactory because the paper plates used stained and softened with wet food; and the plastic knives, forks and spoons broke very easily. The plastic compartmented tray, that will be replaced by dishware currently being introduced within the Army, could be very effectively used for the short order facilities of the future. One item of equipment that was used, the continuous hamburger broiler, was not completely satisfactory because it was very difficult to clean. A char-broiler will be recommended for future systems.

Specialty: This outlet, building 3161, was converted to a specialty facility designed to accommodate 250 customers per day. Overwhelming customer acceptance made it necessary to accommodate up to 400 customers per day. This level of participation did not present any serious problems. Heating lamps were added above the standard single line steam table counter to keep food warm. Freestanding partitions separated the serving area from both the dining area and the kitchen. Soft colors, a dinner music sound system and various size booths were added. A forced hot air convection oven, a food warmer, deck oven and an extra deep fat fryer were added to the kitchen area in place of two of the kitchen ranges. A carbonated beverage dispenser, soft serve machine, an instant coffee dispenser and a beer vending machine were added in the dining area. This outlet offered self-service for many foods and used the call-a-number system for prepared-to-order foods.

It was open 1630 to 2200 hours and offered six standard and one rotating entree items in addition to french fries, spanish rice, and the salads and desserts offered on the standard A-ration menu. **Appendix I** contains the menu used during most of the experiment. The facility operated solely with glass dishware. It was the most successful part of the experiment from the customer point of view.

STAFFING

The food outlets in the CAFe system operated effectively with one steward, four cooks, and three dining attendants each working a 40-hour workweek with headcounts averaging 150. The short order facility required one additional cook because of its longer hours of operation (essentially 1100 to 2300). However, the specialty facility required one less cook because of its shorter hours of operation (1630 to 2200). A more detailed discussion of staffing is presented in the section covering work measurement.

FOOD SERVICE

Approximately 50 percent of the items served were prepared in the central facility with no additional work, other than heating, being required in the dining hall. Those items that were not centrally prepared were not expected to require much attention since the preparation of these foods was familiar to dining hall personnel. However, it was found that significant problems occurred with these non-centrally prepared foods.

During the first part of the experiment, the available food technologists were assigned to the central facility with the primary mission of seeing that the food was produced with the proper quality and delivered on schedule. It very soon became evident that technical help in preparation and presentation of the food was needed in the dining halls more than in the central facility; and the technologists were instructed to spend as much time as possible there, particularly during serving hours. If Army food service is to become really consumer-oriented, which was one of the intents of the CAFe experiment, a great deal of attention and effort will have to be placed on improving performance at the food outlet level.

Serving: Proper serving of the food in the dining halls was an area needing a good deal of attention. There appeared to have been very little training in how to present the food in an attractive manner or in any of the basic "selling" points. For example,

although most of the cooks were willing if not eager to add garnishments they knew very little about how to do it. Much too often the lines ran out of various food items for sometimes only one or two customers, but usually for the rest of the meal period. Dining hall personnel were often slow to replace empty pans with full pans when a food ran out on the serving line. In addition, there was a prevailing attitude that if a customer got something to eat the service was satisfactory. Therefore, it was very difficult to encourage the stewards to insure that the correct ratios of different foods were ordered to provide the majority of customers a reasonable choice of items.

Waste: During the experiment, there was some unavoidable food wastage caused by the need to obtain valid data on a free selection meal system. Although plate waste was not measured during the experiment, informal observations indicated that it was considerably less than would be expected with most regular dining halls. After the first few days of self service, the consumers appeared to take only the items and quantity they wanted. In addition the quality was normally high enough so that they were not disappointed. One of the more important aspects of the CAFe system was the direct transfer of trays and dishes with waste on them back to the central facility. This provided management with the opportunity to observe the quantity of waste and to correct poor preparation practices.

YAKIMA

During the experiment, Fort Lewis requested centrally prepared food for a weekend exercise at the Yakima firing range some 90 miles from Fort Lewis. Original plans called for shipping chilled food by helicopter, weather permitting, or freezing the food and shipping by truck in the event of bad weather. Since salads cannot be frozen, fruit was substituted for green salads; and frozen french fried potatoes were selected as the starch vegetable. The weather was bad and the food was frozen (required less than 1/2 hour in the liquid nitrogen units). The frozen food was placed in insulated containers and shipped by truck to Yakima. The food was received solidly frozen, stored and served for the weekend meals. Standard kitchen ranges were used to heat the entrees. The foods were very acceptable and well received by the customers. This minor support exercise demonstrated the capability of central preparation to support Field exercises.

DISCUSSION

The most important problem encountered with the satellite outlets was one of management. It was not possible to establish standards for food service. Hours of

operation, presentation of food, standards of sanitation, workweek of the personnel and quality of service tended to vary between dining halls. This made some of the CAFe innovations difficult to initiate and evaluate. From a systems standpoint, it would be most desirable to have all dining halls and kitchen personnel under control of the central facility with the kitchen personnel being returned to the unit when needed for exercises, etc.

The most important success of the experiment was the overwhelming favorable reaction of the consumers to the new system of food outlets which allowed the consumer three separate and distinct types of facilities, i.e., A-ration, short order and specialty. The results of the prior consumer surveys indicated that the troops did not like the requirement of eating all consumer meals in a single facility. The experimental results more than confirmed the superior acceptability of a system which allowed the consumer a choice of facilities and menus. The results obtained at Fort Lewis in this regard were also confirmed at Fort Carson where similar choices of different type facilities and menus were tried under the VOLAR concept.

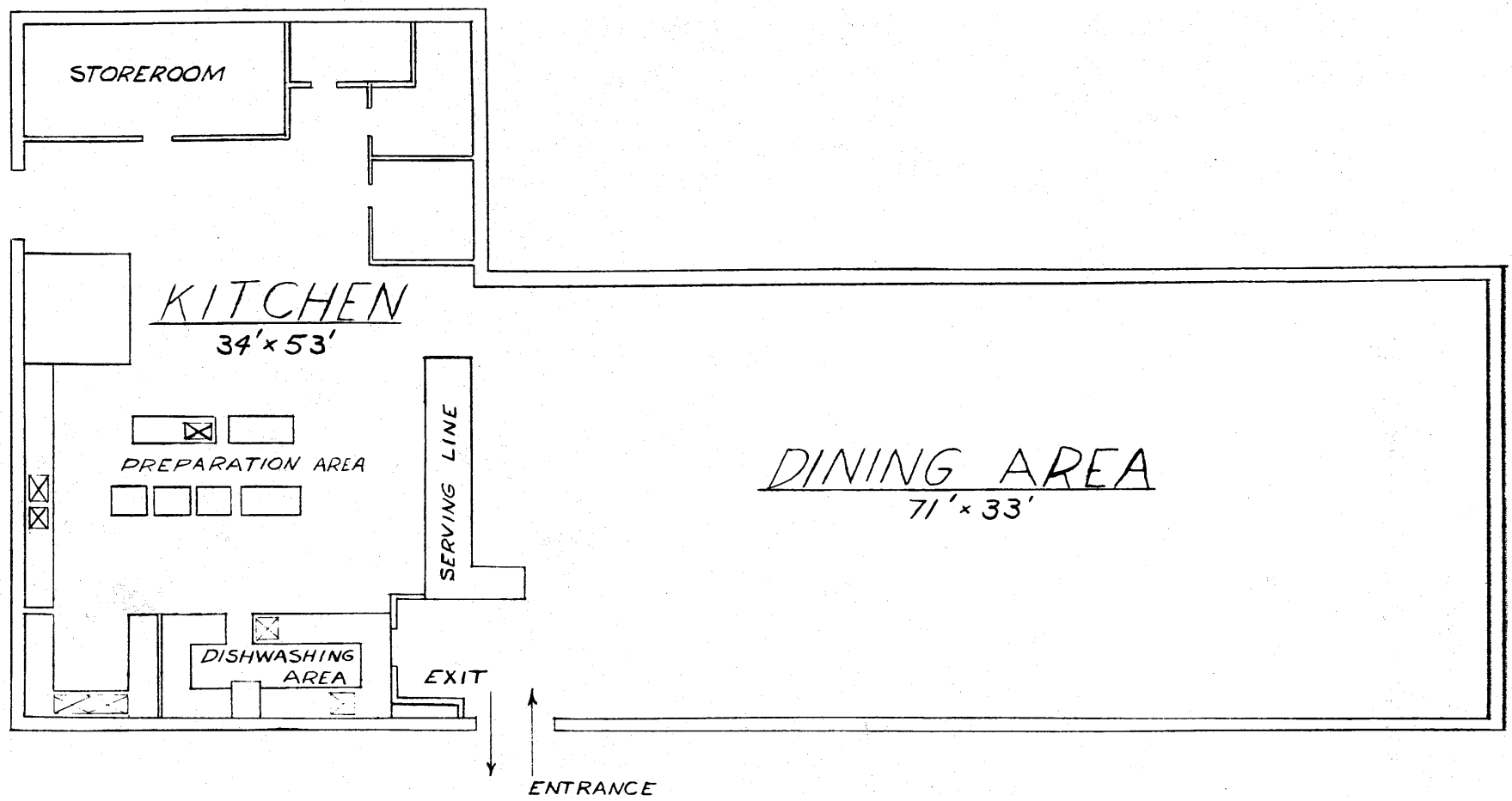


Figure 7 TYPICAL DINING HALL 1953 TYPE

Figure 8

MAP SHOWING PARTICIPATING DINING HALLS

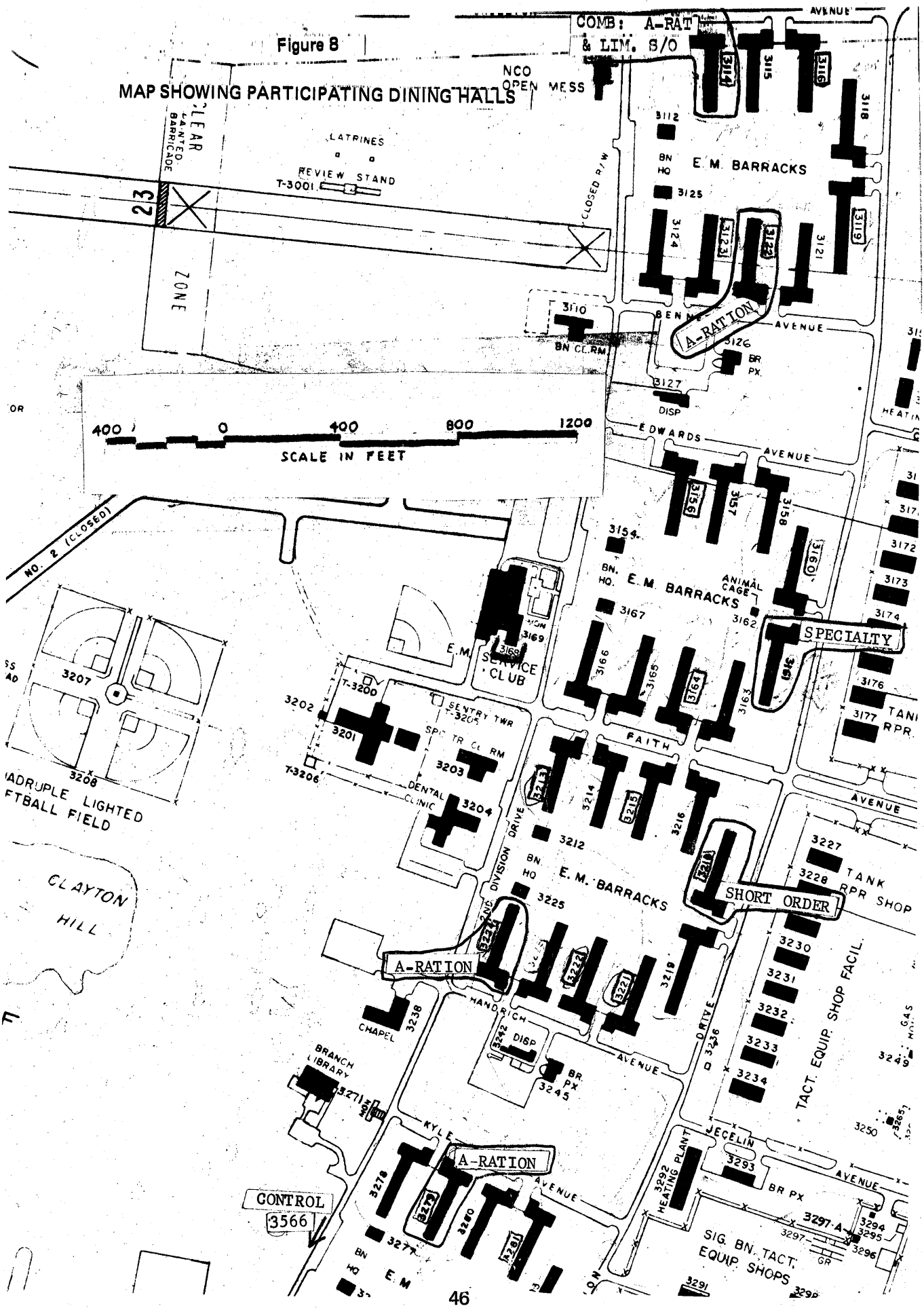


Figure 9

MAP SHOWING LOCATION OF CENTRAL FACILITY

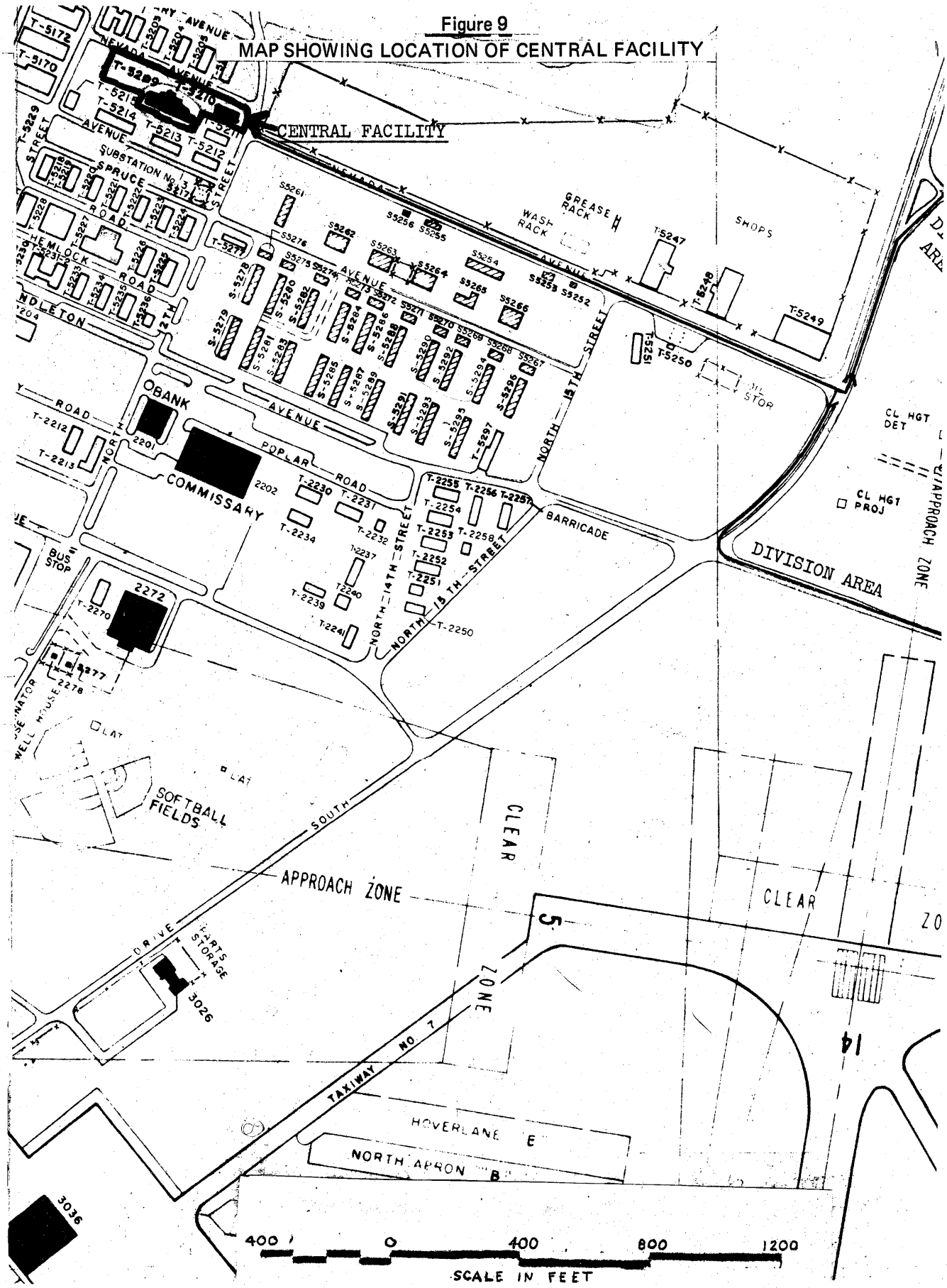


TABLE 3

SATELLITE FACILITY EQUIPMENT

Equipment	Qty	FSN	Utilities Req (ea)	Cost (ea)	Total Cost
Class A Facilities:					
1. Convection Oven	1	NSN	208V,60H,3ϕ,15KW	1500	1500
2. Jet Cooker	1	NSN	Water, Drain, Steam	1755	1755
3. Carbonated Bev Dispenser	1	NSN	115V,60H,1ϕ,1.5KW	1217	1217
4. Soft Serve Ice Cream	1	NSN	115V,60H,1ϕ,2.6KW	1500	1500
5. Deep Fat Fryers	2	7310-809-9390	208V,60H,1ϕ,12KW	250	500
6. Grill Elec	2	7310-271-1685	208V,60H,1ϕ,9KW	156	312
7. Holding Cabinet	1	NSN	115V,60H,1ϕ,1.5KW	525	525
8. Badge Reader	1	NSN	115V,60H,1ϕ,0.5KW	1200	1200
Specialty CAFe:					
1. Convection Oven	1	NSN	208V,60H,3ϕ,37.5KW	2377	2377
2. Oven, Baking & Roasting	1	7310-237-1880	208V,60H,3ϕ,12KW	585	585
3. Deep Fat Fryers	2	7310-809-9390	208V,60H,1ϕ,12KW	250	500
4. Carbonated Bev Dispenser	1	NSN	115V,60H,1ϕ,1.5KW	1217	1217

Continued

TABLE 3 (cont'd)

SATELLITE FACILITY EQUIPMENT

Equipment	Qty	FSN	Utilities Req (ea)	Cost (ea)	Total Cost
Specialty CAFe: (cont'd)					
5. Infrared Lights	6	NSN	115V,60H,1ϕ,1.2KW	60	360
6. Soft Serve Ice Cream	1	NSN	115V,60H,1ϕ,2.6KW	1500	1500
7. Badge Reader	1	NSN	115V,60H,1ϕ,0.5KW	1200	1200
Short Order CAFe:					
1. Microwave Oven	1	NSN	115V,60H,1ϕ,1KW	640	640
2. Sandwich Bar	1	7310-494-6795	115V,60H,1ϕ,0.5KW	700	700
3. Deep Fat Fryers	2	7310-809-9390	208V,60H,3ϕ,12KW	250	500
4. Hot Dog Grill	1	7310-482-6348	115V,60H,1ϕ,1.6KW	225	225
5. Roll Warmer	1	NSN	115V,60H,1ϕ,1KW	156	156
6. Grill Elec	1	7310-271-1685	208V,60H,3ϕ,9KW	156	156
7. Oven Baking & Roasting	1	7310-275-1880	208V,60H,3ϕ,12KW	585	585
8. Ice Maker	1	NSN	Water, Drain 115V,60H,1ϕ,2KW	3000	3000
9. Carbonated Bev Dispenser	1	NSN	Water, Drain 115V,60H,1ϕ,1.5KW	1217	1217

Continued

TABLE 3 (cont'd)

SATELLITE FACILITY EQUIPMENT

Equipment	Qty	FSN	Utilities Req (ea)	Cost (ea)	Total Cost
Short Order CAFe: (cont'd)					
10. Soft Serve Machine	1	NSN	115V,60H,1ϕ,2.6KW	1500	1500
11. Milk Shake Machine	1	NSN	208V,60H,1ϕ,2.4KW	1500	1500
12. Non Carbonated Bev Dispenser	1	7310-997-3726	115V,60H,1ϕ,1KW	350	350
13. Badge Reader	1	NSN	115V,60H,1ϕ,0.5KW	1200	1200
Combined A-Ration & Limited Short Order CAFe:					
1. Convection Oven	1	NSN	208V,60H,3ϕ,37.5KW	4480	4480
2. Holding Oven	1	NSN	115V,60H,1ϕ,1.5KW	975	975
3. Range, Elec	1	7310-282-6626	208V,60H,3ϕ,21KW	402	402
4. Jet Cooker	1	7310-948-4751	Water, Drain 208V,60H,3ϕ,24KW	1755	1755
5. Deep Fat Fryers	1	7310-809-9390	208V,60H,3ϕ,12KW	250	250
6. Grill Elec	2	7310-271-1685	208V,60H,1ϕ,9KW	156	312
7. Mobile Serving Line (hot)	1	NSN	208V,60H,1ϕ,4.5KW	2600	2600
8. Mobile Serving Line (cold)	2	NSN	115V,60H,1ϕ,0.5KW	3100	6200
9. Soft Serve Machine	2	NSN	115V,60H,1ϕ,2.6KW	1500	3000
10. Carbonated Bev Dispenser	1	NSN	Water, Drain 115V,60H,1ϕ,1.5KW	1217	1217

IX. QUALITY CONTROL AND INSPECTION

The quality control function was responsible for assuring food quality and food safety. It was designed and supervised by Natick Laboratories' personnel. In a normal operation a separate quality control activity would have concentrated on food quality. However, the continuing presence of experienced food technologists in the central facility and the satellite dining halls made it unnecessary to have technical personnel assigned to a separate food quality section of quality control. Physical properties, such as, fill of the container, proportion of meat or vegetables to gravy, piece size, proper texture, proper degree of browning, etc., could be controlled visually by the technologists in the preparation and serving areas. This effort along with raw materials inspection and organoleptic evaluation comprised the food quality portion of the quality control program.

Since chilled foods can present significant food safety problems, a major effort was directed toward determining microbiological safety and ensuring that the food was prepared and served under sanitary conditions. Most of this section is devoted to the data collected while fulfilling this food safety aspect. Since microbiological analysis is not rapid enough to prevent certain types of food poisoning outbreaks, primary emphasis for food safety was placed upon temperature controls and sanitation.

For the experiment, a small laboratory was established to perform microbiological tests. The few chemical tests that could not be performed by simple methods at the central facility were performed by the Fort Lewis Branch of the Sixth Army Area Laboratory, Madigan Hospital Annex.

REQUIREMENTS

Raw materials: The incoming raw materials had been subject to the normal source inspection by the Veterinary Corps. In addition, a veterinary NCO was assigned to the CAFe operation throughout most of the experiment to determine exact condition at receipt. This allowed adjustment of preparation procedures when quality deficiencies were present in the raw materials.

Temperature: Temperature constraints were established by Natick Laboratories, with the approval of the Office of the Surgeon General, based upon the results of preliminary experiments conducted at Natick Laboratories[4]. For cooked food items, the central facility

cooked the food to an internal temperature of not less than 165°F., chilled it to 45°F. or below within two hours, and maintained it at no higher than 40°F. Foods served hot were heated to an internal temperature of 165°F. and served at not less than 150°F. in the dining facilities.

Raw vegetables for salads, etc., were produced under sanitary conditions and maintained at 50°F. or below. Constraints were also imposed upon temperature during transportation and in the dining hall; and on the shelf-life of the product. Utilization of foods that had been heated for a succeeding meal, or the use of outdated food items were strictly forbidden.

At a later stage of the experiment, constraints also had to be developed for the processing and storage of frozen entree items. Overproduction was frozen and held for the succeeding menu cycle.

Microbiological: The microbiological test procedures were designed to quantify total aerobic organisms, *Staphylococcus (S.) aureus, Clostridium (C.) perfringens* and the Enterobacteriaceae. Also, the laboratory had a limited potential for verifying the identity of *S. aureus*, Salmonellae, *Eschericia (E.) coli* and *C. perfringens.* Generally, however, where verification was required, this was done at Natick Laboratories. Details of the analytical and monitoring procedures will be discussed in a technical report to be published in 1973. The microbiological criteria were:

1) Total aerobic plate counts (TPC) should not exceed 100,000 organisms per gram for cooked items and 250,000 organisms per gram for uncooked vegetables.

2) The Enterobacteriaceae count should not exceed 1,000 organisms per gram with no confirmed Salmonellae present.

3) Neither *S. aureus* or *C. perfringens* should exceed 100 confirmed organisms per gram.

Organoleptic: A panel consisting of the chief of operations, the veterinary NCO, the kitchen supervisor, a quality control representative and a Natick Laboratories representative determined organoleptic acceptability. This activity was not completely successful since the group did not meet often enough. It tended to the first casualty when workload increased. Where deficiencies in quality were found, the technical members of this panel determined the corrective action required.

MONITORING

During the experiment, the following items were monitored:

1) Microbiological quality of raw and prepared foods.

2) Temperatures of refrigerators, freezers, the dishwasher, and other equipment in the central preparation/central warewashing facility and satellite dining halls.

3) Temperature profiles of prepared foods.

4) Sanitation of the central preparation/central warewashing facility and satellite dining halls.

5) Organoleptic quality of the prepared foods.

6) Physical quality, such as, appearance, fill of container and proportion of ingredients for such foods as stews, pies, etc.

7) Heating and serving temperatures at the satellite dining halls.

8) Chilled, ambient and frozen storage periods, and the return of expired items.

9) Spot checks on food waste in returning soiled dish transporters.

RESULTS

The results indicate that when food is prepared, stored and served so as to meet the above constraints, there will be no safety or quality problems. Similarly, sanitation requirements can be met at both the central facility and at the dining halls. As discussed below sanitation required continuous surveillance.

Cooked items: Little difficulty was encountered with cooked items in regard to meeting microbiological standards, as shown in **Table 4**. Ninety-eight percent of the entree items complied with the standards imposed as did all of the sauces and gravy examined. Cooked vegetables had the poorest compliance, 17% of the samples failing total plate count and Enterobacteriaceae. No *S. aureus* or *C. perfringens* or Salmonellae were found to be present. It should be noted that both vegetables and soups would be expected to possess indigenous soil organisms, many of which grow on media used to enumerate Enterobacteriaceae.

The cooking process was effectively lethal, as summarized in **Table 5**, for all cooked foods except vegetables which are often blanched instead of being fully cooked. Of the entree items, soups, sauces and gravies only one sample out of 123 tested had a total aerobic plate count of more than 10,000 organisms per gram. Vegetables with their more heat resistant soil organisms showed poorer compliance and required more care during preparation.

The cooked products were rendered stable during subsequent storage at 40°F., as shown in **Table 6**. When properly prepared the counts remained extremely low for five days.

Sandwich items: The difference in microbiological quality between sandwich items served hot and served cold is apparent from the data in **Tables 4** and **5**. **Table 4** shows that most of the cooked sandwich items complied with the microbiological criteria. *S. aureus* was found in one hamburger sample, which demonstrated that even the noncentrally prepared foods required monitoring. Where *S. aureus* was found during the experiment, the numbers never exceeded 1,000 per gram. In contrast, many of the cold sandwich ingredients failed to comply. With the exception of tunafish salad, which was prepared in the satellite dining hall, the sandwich ingredients were as purchased from commercial sources. *C. perfringens* was found in both liverwurst and ham, and excessive

Enterobacteriaceae were detected in three food items. *S. aureus* was also found in four tunafish salad samples and in three other food items. The source of this contamination was due to improper handling during preparation and the difficulty was finally corrected by education and surveillance.

Total aerobic plate counts for sandwich items served hot easily complied with the microbiological criteria, as shown in **Table 5**. However, seven samples from the served cold portion of this group exceeded the 10^5/g constraint.

Raw vegetables: The majority of raw vegetables sampled failed to comply with imposed standards, as shown in **Table 4**. The nature of the noncompliance was, in most cases, not of a serious nature being either in total plate count or Enterobacteriaceae (no Salmonellae). *S. aureus* was detected in one mixed salad sample and in two onion samples, and problably originated from the handlers. Most likely the constraint of 2.5×10^5 organisms per gram for a total plate count was too low, but as shown in **Table 6**, these items increased in total plate count after five days of storage of 40°F. In practice the storage temperature constraint was 50°F., and the increase can be expected to be greater than that shown in **Table 6**.

Temperature: The major problem with compliance to temperature constraints was not in the cooking but in the holding of the chilled foods. **Table 7** shows the control of cooking temperatures was extremely effective at the central facility throughout the experiment for the six classes of food items. However, large portions of the samples failed to be maintained at 40°F. or below. Reference to preceding tables indicate that this violation had little effect on microbiological quality, and, when violations occurred, it was rarely in excess of 5°F. An additional point of interest is that, with the exception of soups, gravies and sauces, there was a dramatic improvement in temperature compliance as the experiment progressed.

The control of temperatures was not nearly as satisfactory in the satellite dining halls, as shown in **Table 7**. In many instances where incorrect temperatures were detected, microbiological indices were not excessive, indicating that previous handling had effectively limited the number and sequence of violations which could result in a dangerous condition.

Equipment: In contrast to temperature, the sanitary condition of equipment and utensils, as measured by Rodac plates, was better in certain satellite dining halls than

it was in the central facility. As seen in **Figure 10**, sanitation in the central preparation entree area, vegetable preparation area and dessert area were sometimes very poor. An interesting fact is the periodicity of non-compliance. When surveillance was increased and standards enforced, conditions dramatically improved, to be followed by another cycle of non-compliance indicating the necessity for constant supervision. Equipment surfaces were considered unsanitary when counts on half of the Rodac plates used to test the surface exceeded 100 colonies.

Sanitation in the satellite dining halls demonstrated extremes in performance, **Table 8**. Dining halls A and B displayed, with a few exceptions, excellent sanitary quality. The other dining halls were erratic in their accomplishments. This is evident when a comparison is made of the sanitary quality of the more difficult items of equipment for the six dining halls. Certain dining halls demonstrated an ability to maintain tables, shelves and meat slicer in a sanitary condition, while others could not. **Figure 11** presents this data graphically. It is obvious that proper supervision was the key to achieving an acceptable level, and that the standards imposed are not excessive.

Warewashing: Quality control in the warewashing area consisted mainly of checking operating conditions of the dishwasher, condition of the washed ware, and condition of the transporters. The supply of steam to the whole operation, cooking and warewashing, was marginal so that temperatures in the various stages of dishwashing had to be checked continually and non-compliances were frequent. However, Rodac plates on the tableware showed very few non-compliances, but the more frequent visual inspections did find approximately 5% of the tableware that had to be rewashed because of visible food particles on the surfaces. Transporters, on the other hand, while usually free from visible dirt, were often not sanitary to Rodac plates even after the quaternary ammonia rinse.

DISCUSSION

During the experiment, it was necessary to exercise tight control over food quality and food service so data could be obtained from a stable situation. Prepared food, once heated, could not be reheated and served at a succeeding meal since this would downgrade quality; and, if not carefully handled, could present a health hazard. By the same token centrally prepared food which exceeded the storage time limits was not used in the experiment. This food was returned to the central facility and destroyed. These restrictions

resulted in some food wastage during the experiment which could be eliminated in normal situations. A low level of rework similar to that permitted by the U. S. Department of Agriculture in food plants would be instituted by the central facility technical staff as one of their main functions.

The quality control function effectively provided the customers with high quality and safe food. Deficiencies were found, but quickly corrected by the engineering and technical problem solving support provided by Natick Laboratories. Quality control would not be necessary if deficiencies did not exist. The important thing is to recognize potentially dangerous or undesirable situations and rapidly correct them. The technical staff administering quality control, engineering support and technical problem solving averaged eight people with half at the lower technical and technician levels and half at the higher more experienced levels. Larger central preparation systems must possess an internal personnel structure that can consistently detect and correct deficiencies.

TABLE 4

COMPLIANCE WITH MICROBIOLOGICAL CRITERIA

Class and Food Item	No. of Items	No. of Samples	Number of Samples Complying: Total Count $\leq 10^5$ /g	Entero-bacteriaceae $\leq 10^3$ /g	*Staph. aureus* $\leq 10^2$ /g	*Clostridium perfringens* $\leq 10^2$ /g	% Complying with all Criteria
Cooked Centrally (>165°F.):							
Entrees	31	123	122	122	122	123	98
Soups	5	9	9	8	9	9	89
Sauces	4	8	8	8	8	8	100
Gravies	2	9	9	9	9	9	100
French Toast	–	4	4	4	4	4	100
Vegetables	13	29	25	25	29	29	83
Taco Meat	–	2	2	2	2	2	100
Sloppy Joe	–	8	8	8	8	8	100
Sandwich Meats Served Hot:							
Corned Beef	–	1	1	1	1	1	100
Turkey	–	8	8	7	8	8	87
Meatballs	–	2	2	2	2	2	100
Frankfurters	–	4	4	4	4	4	100
Hamburgers	–	7	7	7	6	7	86
Sandwich Meats Served Cold:							
Tunafish	–	23	21	20	19	23	63
Turkey	–	9	8	9	8	9	78
Liverwurst	–	6	2	5	5	5	33
Salami	–	1	1	1	1	1	100
Pimiento	–	3	2	3	3	3	67
Ham	–	8	8	8	8	7	87
Assorted Cold Cuts	–	9	9	7	7	9	67

Continued

TABLE 4 (cont'd)

COMPLIANCE WITH MICROBIOLOGICAL CRITERIA

Class and Food Item	No. of Items	No. of Samples	Number of Samples Complying: Total Count $\leqslant 10^5$ /g	Entero-bacteriaceae $\leqslant 10^3$ /g	*Staph. aureus* $\leqslant 10^2$ /g	*Clostridium perfringens* $\leqslant 10^2$ /g	% Complying with all Criteria
			≤250,000				
Vegetable Salads:							
Mixed Salad	18	73	27	29	72	73	23
Chopped Onions	—	6	4	4	4	6	50
Cut Tomatoes	—	3	1	1	3	3	0

TABLE 5

TOTAL AEROBIC PLATE COUNTS

Class and Food Item	No. of Samples	Percent Samples Containing $\leq 10^2$/g	$\leq 10^3$/g	$\leq 10^4$/g	$\leq 10^5$/g	$\leq 10^6$/g
Cooked Centrally (>165°F.):						
Entrees	123	81	96	99	100	
Soups	9	67	89	100		
Sauces	6	67	100			
Gravies	15	80	93	100		
Vegetables	29	55	83	86	100	
Sandwich Meats Served Hot:						
Corned Beef	1	100				
Turkey	8	88	100			
Meatballs	2	100				
Frankfurters	4	50	50	100		
Hamburger	7	57	71	100		
Sandwich Meats Served Cold:						
Tunafish Salad	23	35	74	91	91	100
Turkey	9	33	89	89	89	100
Liverwurst	6	0	0	50	50	100
Salami	1	0	0	100	100	100
Pimiento	3	0	0	67	67	100
Ham	8	50	88	100		
Assorted Cold Cuts	9	22	44	100		

TABLE 6

TOTAL AEROBIC PLATE COUNTS AT ZERO AND FIVE DAYS STORAGE AT 40°F.

Food Items	Organisms Per Gram	
	0 days	5 days
Cooked Foods (165°F.):		
Veal Parmesan	100	100
Salisbury Steak	3200	3100
Brown Gravy	150	4600
Scalloped Potatoes	4200	2600
Breaded Veal Steak	100	100
Tartar Sauce	1200	100
Oven Fried Chicken	100	100
Swiss Steak	100	100
Ham Steak	5100	100
Spaghetti	100	100
Barbeque Chicken	100	100
Turkey Pot Pie	100	100
Buttered Carrots	100	100
Turkey	3100	6600
Beef Pot Roast	300	450
Beef Pot Pie	1100	450
Baked Tomato and Onion	3200	300
Raw Foods:		
Cole Slaw	3.1×10^5	1.7×10^6
Lettuce (Sample A)	4.5×10^4	1.0×10^3
Lettuce (Sample B)	3.8×10^5	8.9×10^5
Green Peppers	2.0×10^6	3.0×10^8
Salad	1.5×10^6	1.0×10^7
Vealburger	3.0×10^4	2.6×10^5
Tuna Salad	6.5×10^2	4.0×10^2

TABLE 7

INCIDENCE OF NON-COMPLIANCE WITH TEMPERATURE CONSTRAINTS AT THE CENTRAL FACILITY AND THE SIX SATELLITE DINING HALLS

Month	Food State	Incidence of Non-compliance with Temperature Constraints by Food Group I Ratio (%)	II Ratio (%)	III Ratio (%)	IV Ratio (%)	V Ratio (%)	VI Ratio (%)	Total % Non-compliance
Central Facility:								
August	Cook	1/46(2)	–	0/3	–	0/7	–	2
	Chill	30/69(43)	8/25(32)	0/1	1/5(20)	9/12(75)	2/8(25)	42
September	Cook	1/81(1)	–	0/1	–	0/13	–	1
	Chill	20/83(24)	28/52(54)	4/6(67)	2/3(67)	8/17(47)	1/1(100)	39
October	Cook	2/85(2)	–	0/1	–	0/14	–	2
	Chill	23/110(21)	3/38(8)	0/1	0/11	3/16(19)	–	16
November	Cook	5/102(5)	–	0/1	–	0/16	–	4
	Chill	18/111(16)	2/54(4)		0/10	4/12(33)	–	13
Satellite Facilities:								
–	Chilled	8/75(11)	0/33	2/6(33)	1/1(100)	1/17(6)	0/8	9
–	Heated	12/43(28)	–	–	–	1/5(20)	–	27
–	Served	83/357(23)	18/78(23)	21/40(53)	5/18(28)	9/49(18)	7/14(50)	26

*Group I: Entree items, hot sandwich meat, cooked vegetables, sloppy joe, taco sauce, tuna salad.
II: Raw salads, raw vegetables, cottage cheese, fruit salad (unjelled).
III: Cold sandwich meat, chilled sandwiches, pizza sauce and pizza.
IV: Jellied salads.
V: Soup, gravy, sauce.
VI: Dressing, relish.

Figure 10

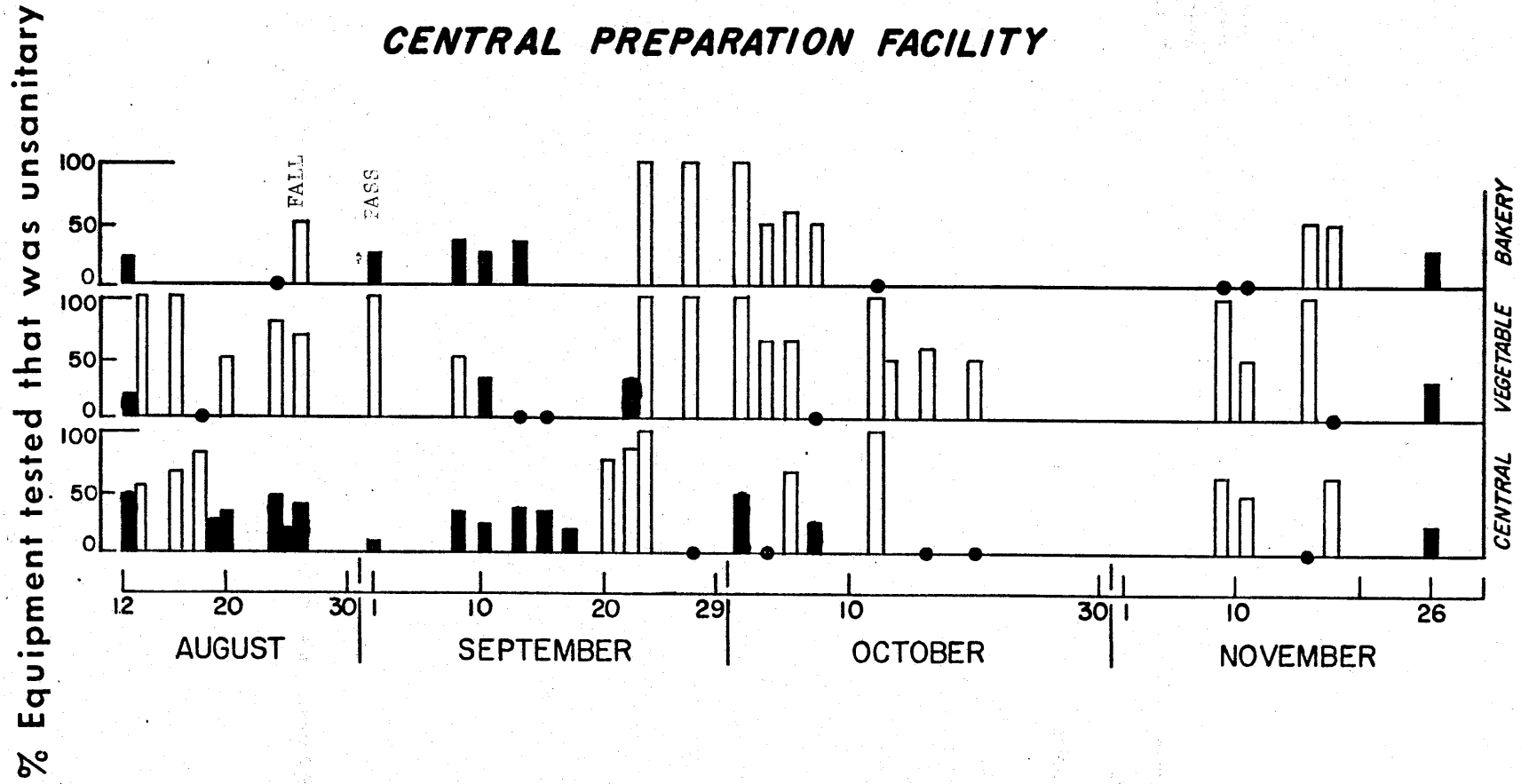

CENTRAL PREPARATION FACILITY
% Equipment tested that was unsanitary
100
50
0
FAIL
PASS
CENTRAL
VEGETABLE
BAKERY
12
20
30
1
10
20
29
10
30
1
10
26
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER

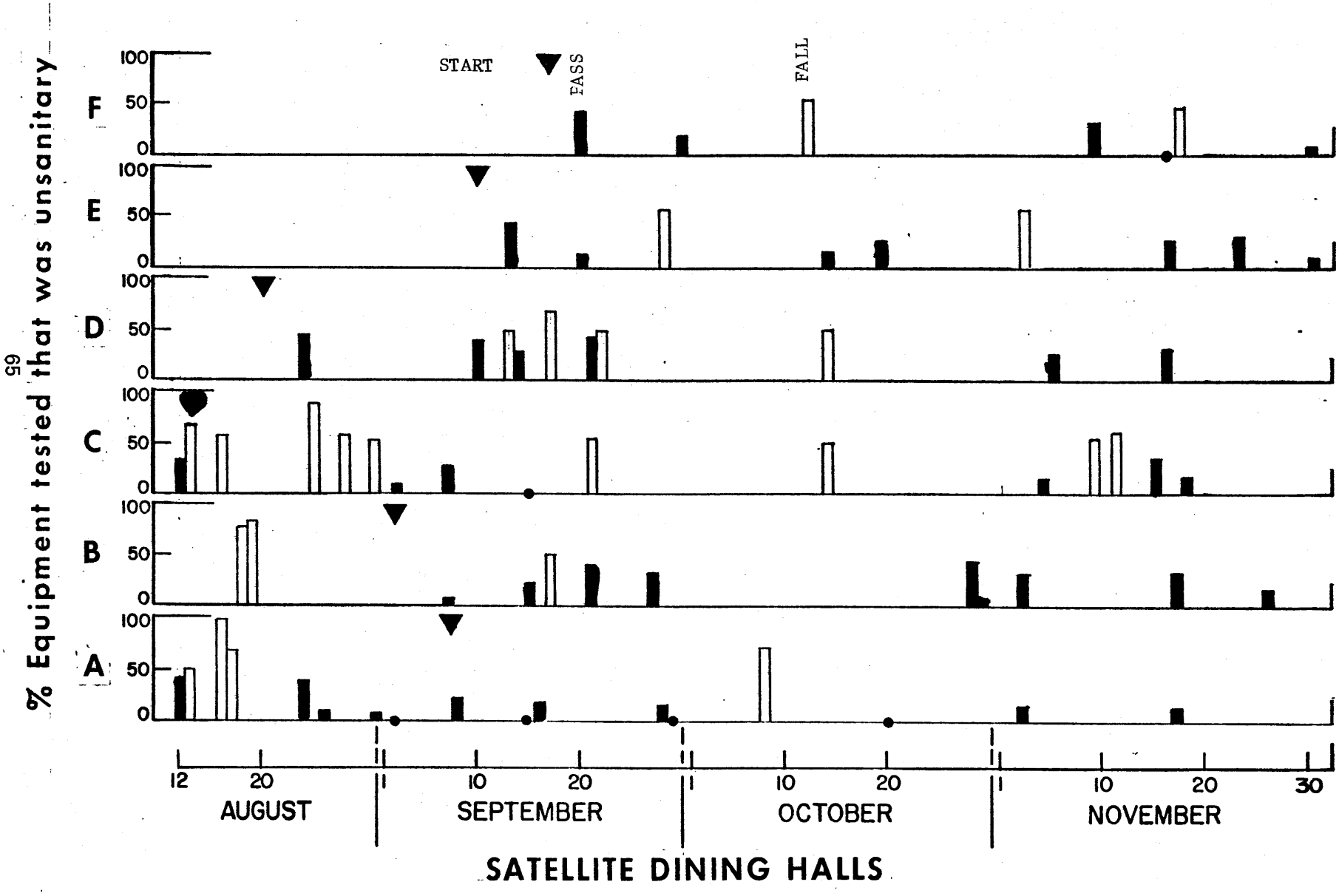
TABLE 8

INCIDENCE OF UNSANITARY EQUIPMENT SURFACES IN DINING HALLS
(Half of the Rodac Contact Plates Exceeded 100 Colonies)

Location	Percent of Unsanitary Surfaces*						Overall Percentage of Unsanitary Surfaces
	A	B	C	D	E	F	
Serving Tables	7	20	39	39	33	50	29
Preparation Tables	14	0	55	67	56	71	43
Dining Tables	21	64	58	23	27	30	38
Refrigerator Shelves (walk-in)	0	0	63	89	100	67	62
Milk Dispenser	27	67	89	27	56	60	51
Meat Slicer	0	—	20	80	0	0	29
Utensils	20	25	20	50	—	—	24
Overall Percentage of Unsanitary Surfaces	15	41	50	48	47	50	

*Each letter represents one of the participating dining halls (3224, 3279, 3114, 3218, 3122 or 3161).

Figure 11


% Equipment tested that was unsanitary
START
PASS
FALL
F
E
D
C
B
A
100
50
0
12
20
10
20
10
20
10
20
30
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
SATELLITE DINING HALLS

X. AUTOMATED HEADCOUNT SYSTEM AND ADP SUPPORT

This section describes the automated headcount system and data processing services tested during the experiment. Signature headcount was automated by means of a source data collection system, and the computer produced the dining hall headcount records. The food preparation function was partially computerized through use of several pre-processed documents developed to minimize the clerical work required for ration control. In addition, food selection data were collected and analyzed for preparation and issue planning. As the automatic data processing requirements became more clearly defined, a management information system concept was found to be essential and has been proposed for centralized food service operations.

The headcount and ADP support phase of the experiment did not go according to schedule. Testing the headcount system was delayed as will be discussed later. Some of the information that follows was collected after the experiment had officially ended, but is presented here for completeness.

AUTOMATED HEADCOUNT SYSTEM

The primary motivation for the automated headcount system derived from an Army requirement to establish an acceptable alternative to the existing signature headcount procedures. Based on a preliminary analysis of the existing headcount system, it was concluded that an automated system which would also support ration management would best satisfy the total requirement.

Two essentially different concepts of an automated headcount system were evaluated during the experiment. Both utilized machine-readable plastic meal cards in lieu of the present paper card and provided the capability to record individual meal attendance without the signature requirement. Yet, the two systems differed markedly in the method of recording data and in the procedures that would be required to subsequently analyze and/or report the data.

Cassette Headcount Recorder: For a period of approximately one week, a "card-input/cassette-output" system was utilized in the short order CAFe. In this case the equipment configuration consisted of card reading stations with cassette tape recorders attached. As individuals entered the dining facility, they handed their plastic meal cards

to the headcounter. Embossed on the card was a series of numbers unique to each individual. When the card was inserted into the reader, the data field of the card was scanned mechanically and the data was temporarily displayed in a register. This enabled the headcounter to visually scan the information before it was transferred to the magnetic tape cassette. If the machine detected a reading error, an error light appeared. The headcounter/operator could then correct erroneous data by means of a card-reader keyboard. The keyboard could also be used to enter actual food items chosen by individuals. When used in this manner, the equipment was located at the end of the serving line rather than at the entrance.

Before each meal the headcount operator was instructed to enter the date, meal and dining facility numbers on the cassette. After each meal the headcount operator was instructed to enter the total headcount, from a mechanical counter installed in the card reader, and an end-of-file mark.

In order to convert the data from cassette to hard copy, the cassettes were collected from the dining halls, inserted into a specially developed converter which translated the cassette magnetic tape code onto punched paper tape. The paper tape was entered into an ASR 33 teletypewriter to produce a list of attendees at each meal. The paper tape could also be input to a computer when attendance or food selection information was required.

While one week of operating experience cannot be considered as an adequate basis for system evaluation, some interesting performance results can be reported:

1) The card reading stations and the converter were constantly plagued by malfunctions.

2) One day of headcount data was lost through the operator's failure to add required beginning and ending label records to the cassette tape.

3) Equipment required to convert the cassettes to computer-readable magnetic tape was not readily available, requiring the punched paper tape intermediate.

4) Conversion of the cassette records to punched paper tape required at least one man-hour per day for only six dining halls with a total headcount of 500-700.

5) The time required to record individual meal cards at the card reader was approximately seven seconds; about the same rate as the present signature headcount procedures.

More sophisticated cassette-output systems than that tested during the experiment would probably not present the above problems. Reliability might be increased and the conversion from cassette to computer input might be made more efficient. However, this type of system does not preclude the intervention of human operators, the attendant problems of misplaced cassettes, failure to comply with directions, etc.

The particular cassette system used in the experiment was a prototype which proved to be so unreliable that testing beyond the initial one week period was not attempted.

REAL-TIME HEADCOUNT RECORDER

The second concept of an automated headcount system became operational in November. The system collected headcount and meal data in real-time, when the meal card was entered, but computer processing of this data was performed the next day. The source data collection system is shown schematically in **Figure 12.** The two types of data collection terminals were located in the dining facilities. A card-reader was placed at the entrance of each facility. Each card-reader was wired directly to a central polling station equipped with a date/time generator. The central polling station was connected to magnetic tape drives. As an individual entered the dining facility, he inserted a plastic meal card into the card reading station. The card contained his social security number, ration status and unit identification number encoded with punched holes. The data were immediately and automatically transmitted to the central polling station which, in turn, copied the data on computer compatible magnetic tape for later computer processing. In addition to the information on the meal card, the central polling station recorded the date, time, and dining hall location with each record. If any part of the information was not received and written correctly, a red light appeared on the card reader and the individual re-inserted his card. All of these transactions occurred within a fraction of a second. The particular equipment used was capable of receiving 1000 meal cards each second.

Figure 12 also depicts a variable entry data collection terminal. This device was utilized to record food selection data. When used in this manner, it was placed at the

end of the serving line. As individuals came out of the line, their cards were inserted into the terminal. An operator then added the actual food items chosen by means of a number code on the terminal keyboard. A punched card in a terminal reading station translated the number code back into the actual food items for recording purposes. This information was transmitted directly to the central polling station and written on computer compatible magnetic tape. A brief summary of the performance of this data collection system follows:

1) Waiting lines at the headcount station were drastically reduced. Insertion of the plastic meal card required but a fraction of a second, whereas use of the signature sheets requires a much longer time.

2) The automatic system was very well received by the customers, i.e., 88% of the 583 customers surveyed who had experience with this system preferred the automated procedures.

3) Data loss due to operator error was greatly reduced compared to the off-line cassette-output system. During 16 weeks (448 meals) of direct observation, headcounts for 8 meals were lost due to equipment failures or operator errors.

MEAL ATTENDANCE ANALYSIS

The headcount data collected by the real time system was used to develop two reports. These were the utilization report and unusual usage report.

Utilization report: **Figure 13** presents a computer print-out of the Utilization Report devised for both management and research purposes. Given the dining hall free access concept, it was important to determine how many meals were consumed, which types of facilities proved most popular, and what kinds of eating patterns characterized the Fort Lewis military consumer. While the information revealed in the Utilization Report can be an important management tool – as, for example, in determining when a dining hall is performing poorly and losing customers or when the ratio of specialty, short order and A-ration outlets on an installation needs to be changed – during the experiment it was used only for data collection and analysis of attendance patterns. The report was printed every two weeks for each participating unit and for all units summarized together.

Unusual usage report: **Figure 14** presents a computer print-out of the Unusual Usage Report. This report was developed to assist in identifying potential meal card abuses and printed weekly for each participating unit. Loaning a card to a friend on separate rations is one example. This type of information is simple to obtain from a real time system. Since the CAFe experiment was primarily a food experiment and the headcount system did not become operational until after the experiment was completed, no attempt was made to investigate whether cards inserted within short time intervals were legitimate entries, or did, in fact, represent cases of card loaning.

ADP SUPPORT TO FOOD OPERATIONS

Food preparation documents utilized during the CAFe experiment were at first, limited to computer-printed forms developed to minimize the clerical work. The Logistics Division was required to perform the necessary arithmetic calculations to convert the dining steward's estimated headcounts into product quantities. As happened in other areas of the experiment, once the initial forms were introduced their usefulness was accepted with some enthusiasm and further time-saving applications were developed. Three documents were produced, on computer, from a combination of the Armed Forces menu and recipe files which had been previously loaded onto computer tapes. The recipe file was the standard Army Recipe Cards, modified for central preparation and satellite cooking procedures. The CAFe menu was coded to match the recipes and loaded onto computer tape to create the menu file. This file was ordered by menu day and meal and listed every food item to be served for the particular day and meal.

Ration Issue Slip: **Figure 15** presents the Ration Issue Slip (RIS) developed during the CAFe experiment. A RIS was computer-printed for each meal at each dining hall ten days prior to the consumption date, showing the food items which were to be prepared centrally. It was forwarded to the dining hall stewards who entered the number of portions required for each food item. The Logistics Division extracted the portions required from the RIS's; computed the preparation quantities for central facility; then entered the number of pans, bags, etc. to be delivered to each dining facility. The completed RIS accompanied delivery, was signed by the dining hall steward after he verified the quantities; and then it was returned to the central facility for costing.

Ingredient issue/production record: **Figure 16** presents the Ingredient Issue, Production Record (II/PR) developed during the CAFe experiment. This document was computer-printed with the quantities required for 100 portions of each menu item. The Logistics Division extended these quantities to reflect the portions required for all the

dining halls. The II/PR was forwarded to the ingredient supervisor who weighed and issued the ingredients specified by each II/PR – one for each menu item prepared centrally each day. The kitchen supervisor used this document to prepare food items, plan personnel and equipment schedules, and verify preparation quantities. It was then returned to the Logistics Division where the cost for each menu item was computed.

Cooks worksheet: To decrease the portion of the dining hall steward's time spent performing clerical work the cook's worksheet was automated as shown in **Figure 17.** This form is nearly identical to that prescribed in Army Regulation 30-1, The Army Food Service Program[13]. With the changes in recipes dictated by the requirements of the central preparation-chill storage system, certain new instructions had to be included in the cook's worksheet to assure maintenance of quality during heating and serving. The CAFe version also incorporated minor changes in format. This form – one for each meal for each participating dining hall – was pre-printed on the computer and utilized throughout the CAFe tests by dining hall stewards for the scheduling of their personnel and equipment.

Food item selection data: The key to effective and efficient food service is the knowledge of how many portions to prepare so that every consumer – the last as well as the first – has a complete menu from which to select his food. With this knowledge, the tedious extracting and extending calculations for the RIS, II/PR and Cook's Worksheet could be performed by computer further minimizing clerical work. To do this the total headcount and the portions of each food item required to assure each individual a complete menu selection must be accurately predicted. Because the experiment included self-service and did not impose portion control, the issue factors associated with the existing Armed Forces Master Menu were unusable.

Initially, selection data were collected manually by recording the food items on each tray after the individual went through the serving line. A simple numeric code was used to represent food items. Completed data sheets were collected after the meal and the ratios were tabulated. This procedure was followed for approximately two weeks, during which time the results were less useful than anticipated. One of the difficulties in collecting useful data occurred because no controls were exercised with respect to serving food not used from a previous meal. The presence of these extra items made comparisons between menu food item choices rather tenuous. Since the extra food item would not necessarily be present when the menu was repeated, the percentages associated with each menu item were not sufficiently precise to control preparation quantities for any given meal.

During October, an attempt was made to prevent the serving of these extra food items and to collect food selection data on entrees only. Rather than monitor the choices of each individual, the number of pans were counted up to the point of running out of one of the entrees. The total headcount at run out, divided by the number of pans yielded the approximate servings per pan. This procedure proved more successful, but was not extended beyond one menu cycle since food costs were higher when entrees from a previous meal could not be utilized. The results obtained during this menu cycle were utilized to estimate preparation and issue requirements for the period of operation following the experiment. The computer was able to actually enter the expected number of portions for each dining hall and the quantities of ingredients required to prepare each centrally prepared food item, thus it perfomred much of the clerical work that the Logistics Division had to perform during the experiment.

DISCUSSION

The headcount system proved very popular with the customers. Sign-in lines were reduced drastically. Such a system is essential for control in a system that offers the customers free access to all food outlets in the food service system. It represents a positive headcount control procedure that allows customers to select the foods and/or dining facility environment they desire, while providing the means to minimize abuses to the system. In addition, choice of the proper headcount equipment can eliminate the guess work in determining how much of each food item to prepare, inventory, and issue; and can minimize the tedious clerical work required to effectively operate a food service syste. It can also provide the data base, or routine reports, for nutritional analysis and menu planning.

Figure 12

DATA COLLECTION SYSTEM

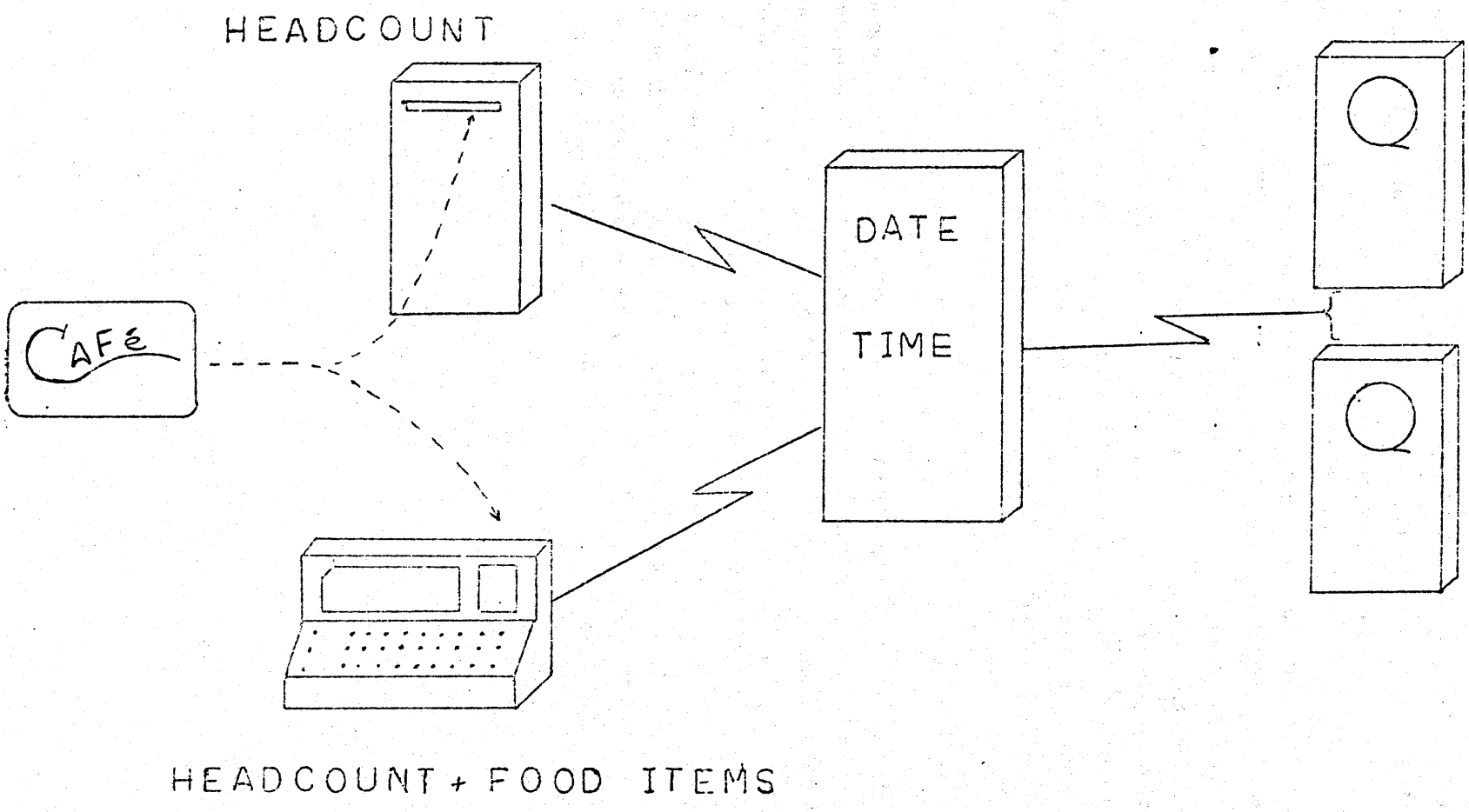


Figure 13

UTILIZATION REPORT

PERIOD COVERED

DAY 335 TO DAY 341

OVERALL UTILIZATION

TOTAL MEALS AUTHORIZED	MISSING	
TOTAL MEALS ATTENDED	9558	PREVIOUS RATE
CASH MEALS ATTENDED	0	
GUEST MEALS ATTENDED	0	

INDIVIDUAL UTILIZATION SUMMARY

MEALS/DAY	FREQUENCY	PERCENT
8	2	0.0
7	0	0.0
6	12	0.2
5	19	0.3
4	170	3.1
3	841	15.5
2	1784	32.8
1	2604	47.9

SPECIAL FACILITIES UTILIZATION BREAKDOWN

PERCENT USING A-RATION ONLY	50.6
PERCENT USING SPECIAL FACILITIES ONLY	33.4
PERCENT USING BOTH	16.1

MAJOR EATING PATTERNS

		SPEC	14.4 PERCENT
		S.O.	8.9 PERCENT
		EVNG	8.4 PERCENT
		NOON	8.2 PERCENT
		BKFS	7.4 PERCENT
BKFS	NOON	EVNG	6.6 PERCENT
	NOON	EVNG	6.2 PERCENT
	S.O.	S.O.	5.0 PERCENT
	BKFS	NOON	4.6 PERCENT
	BKFS	EVNG	4.1 PERCENT
	BKFS	S.O.	2.5 PERCENT

Figure 14

UNUSUAL USAGE REPORT

62 MED GRP

AS SHOWN BELOW, THE FOLLOWING SSANS WERE RECORDED AN EXCESSIVE NUMBER OF TIMES AT A GIVEN MEAL OR WERE RECORDED MORE THAN ONCE WITHIN A PERIOD OF 1 HOUR(S) AND 0 MINUTES

DAY	SSAN *	DINING HALL	TIME
335		3218	22:16
		3161	22:22
335		3218	22:16
		3161	22:22
335		3218	22:16
		3161	22:22
335		3218	11:27
		3218	11:27
336		3218	11:21
		3218	11:21
336		3218	11:20
		3218	11:20
		3218	11:20
337		3161	19:20
		3161	19:21
338		3279	8:17
		3279	9: 6
338		3161	19: 4
		3161	19: 5
339		3218	20:34
		3218	20:34
340		3279	17:15
		3161	18: 2
340		3218	11:14
		3279	11:48
340		3218	10:59
		3218	10:59
341		3161	16:39
		3161	16:39
		3161	16:39
341		3279	6:36
		3279	6:39
341		3279	11:43
		3279	11:56

*Social Security Numbers removed to prevent identification of individuals.

Figure 15

RATION ISSUE SLIP

FIELD RATION ISSUE SLIP	INSTALLATION	ORGANIZATION	ISSUE DATE
	BLDG #3161 Site#6	2/18th ARTY	

CONSUMPTION DATE					
MENU ITEM	PORTIONS	UNITS ISSUED	UNITS USED	UNITS RETURNED	UNITS ON HAND
BAKED LASAGNA					
VEAL PARMESAN					
SPANISH RICE					
TACO HAMBURGER					
TACO CHEESE					
SPAGHETTI & MEAT SAUCE					
PIZZA SAUCE					
TACO SAUCE					
SALADS OF THE DAY					

REQUESTED BY:	VERIFIED BY:	RECEIVEDBY:

USING OUTPUT DATED 24 SEP 71

Figure 16

INGREDIENT ISSUE/PRODUCTION RECORD

REQUIRED FOR SERVING DATE, 16 SEP NOON MEAL — DATE

RECIPE NO. | ITEM, MIXED FRUIT SALAD | PRODUCTION RECORD
PORTION SIZE,
PORTIONS/PAN/PACK, | PANS BAGS, OTHER,
FULL, HALF, | FULL, HALF,

UNIT SIZE	COST	INGREDIENT	FOR 100 PORTIONS	PORTIONS REQD	NO. UNITS REQD	KITCHEN CHECK	WEIGHT PER UNIT	TOTAL WT	TOTAL COST
		APRICOTS CANNED #10	1.50 CN						
		PEARS CANNED #10	1.50 CN						
		PINEAPPLE CND CH/TDBT #10	1.50 CN						
		LETTUCE FRESH	5.50 LB						
						TOTALS			

KITCHEN SUPERVISOR SIGNATURE

COOKS/BAKERS INSTRUCTIONS — COST PER UNIT,

DISTRIBUTION RECORD — DIST'N ISSUE

UNIT OF ISSUE	UNITS ISSUED	CHECK	WEIGHT/ UNIT	TOTAL WEIGHT	BLDG. NO.	U/I	ISSUE CHECK	COST
					13114			
					13218			
					13224			
					13279			
					13122			
					13161			

50015 USING OUTPUT DATED 30 AUG 71

DISTRIBUTION NCO SIGNATURE

Figure 17

COOK'S WORKSHEET

USE PROGRESSIVE COOKERY COOKING TIMES MAY VARY WITH DIFFERENT OVENS FOODS MUST BE HEATED TO INTERNAL TEMP OF 165° F.

COOK'S WORKSHEET EVENING MEAL	ORGANIZATION	DAY MONTH	MEAL HRS	DAY OF WEEK

(A) MENU	(B) PERSON ASSIGNED	PORTIONS (C) NO. TO PREP.	PORTIONS (C) SIZE	(D) RECIPE SOP	(E) SPECIAL INSTRUCTIONS TO COOKS	(F) START TIME	LEFTOVER (G) TO USE	LEFTOVER (G) RE-TURN	(H) RESULTS
MIXED SWEET PICKLES	SD								
APPLESAUCE	SD								
ASSORTED SALAD DRESSING	SD				SERVE AT LEAST THREE TYPES				
ASSORTED BREADS	SD								
BUTTER	SD								
ICE CREAM	SD								
MILK	SD								
PARSLEY BUTTERED CARROTS	CK				HEAT COVERED IN STEAMER FOR 7 TO 10 MINUTES				
BUTTERED LIMA BEANS	SD								
COFEEE	SD								
ICED TEA	SD								
VANILLA WAFERS	CK				SERVE				
MEAT LOAF	CK				HEAT COVERED IN STEAMER OR 375 F OVEN 1 HOUR, SLICE AND SERVE				
BREADED PORK SLICES	CK				HEAT COVERED IN 375 F CONV OVEN FOR 45 MIN. UNCOVER, HEAT 5 M				
COTTAGE CHEESE SALAD	CK				SERVE CHILLED ON LETTUCE				
TOSSED VEGETABLE SALAD	CK				CUT TOMATOES INTO WEDGES, COMBINE ALL INGRED. SERVE CHILLED.				
MUSHROOM GRAVY	CK				HEAT TO 165 F W/ STIRRING ON STOVE OR COVERED IN STEAMER				
POTATOES AU GRATIN	CK				HEAT COVERED IN STEAMER-25 MIN OR IN 375 F CONV OVEN-40 MIN				

(I) BOX LUNCHES	BOX LUNCHES (J) ISSUED TO AND NUMBER ISSUED	REMARKS (K)	MESS STEWARD MEETING (L)
NUMBER TO PREPARE: _____			
MADE UP BY: _____			
MENU: _____			

MEAL	(M) NO. AUTH TO SUB	(N) AVERAGE NO. EXPECTED	(O) NUMBER FED
BREAKFAST			
NOON MEAL			
EVENING MEAL			

_____
SIGNATURE AND GRADE OF DINING HALL STEWARD

_____
SIGNATURE AND GRADE OF DINING HALL OFFICER

MENU DAY 01 (CURRENT AS OF: 20 OCT 71)

XI. CUSTOMER SATISFACTION

Increasing customer satisfaction was a major goal of the systems studies which precipitated the CAFe experiment. A detailed presentation of the customer reactions to the CAFe system and to the specific foods served during the experiment is given in a separate report.[8] A summary of this report is covered herein.

The improved aspects of the new CAFe system were derived from consumer survey work.[3,6] It was considered necessary in the experiment to obtain a "before" and "after" consumer response to these changes. To accomplish this goal a questionnaire was developed and a series of face to face interviews were scheduled both before any system changes were made and during the CAFe experiment.

INTERVIEWS

The interview protocol used is shown in **Figure 18**. The customer reactions are considered under three headings which allow related questions to be grouped. Questions 6, 7, and 8 measured customer reaction to CAFe food; questions 4 and 5 measured reaction to the non-food CAFe changes; and questions 1, 2, and 3 were unstructured allowing the respondent to say what he wanted about the food service system.

Of the 2471 total interviews, 2279 were customer reactions from participants in the experiment and 192 were control interviews which served as the basis for comparison when analyzing the effectiveness of the CAFe system. **Table 9** presents the schedule of the collection of the interviews, indicating the weekly numbers of interviews obtained from each dining facility at each meal. Each day of the week was equally represented during the collection of the interviews. All interviews indicated below and to the left of the bold line through **Table 9** comprise the reactions to the traditional food service system; all other interviews provided feedback to the CAFe system.

The interviewers were female dependents of military personnel stationed at Fort Lewis. They were trained in use of the protocol and instructed to select respondents with regard to balance of races, ages, and number of men sitting together to avoid a biased selection pattern. Interviewers were systematically rotated over all days, meals, and dining facilities. The interviews each required 8 to 10 minutes and were conducted in the dining hall with customers who had just finished or nearly finished their meal. Each interviewer obtained 5 or 6 interviews during a visit to the dining facility.

CUSTOMER REACTION TO THE FOOD

The 9-point hedonic scale was used to determine customer ratings of the foods and meals. **Table 10** presents the mean hedonic rating of the overall meal (question 7). It is apparent that the specialty CAFe (#3161) food was rated highest on the 9-point hedonic scale across all the weeks than any other facility, and the short order CAFe (#3218) food was rated the second highest on the scale. The limited short order foods in CAFe #3114 were rated third, while the food from the A-ration line in this facility and from the three CAFes which served A-ration only were rated lower, and very close to each other. The mean rating across all the weeks for all CAFe facilities was 7.22, which is between "liked moderately" and "liked very much" on the hedonic scale. The mean rating for the control (#3566 and pre-CAFe) interviews was 5.66, which is between the categories "neither liked nor disliked" and "liked slightly". These data reflect the higher acceptability of meals prepared and served in the CAFe system compared to controls, which represent the typical Army meals. These data also show the popularity of specialty and short order service in the separate facilities designed for these purposes.

As a general expression of reaction to the meals served during the CAFe experiment, the customers were also asked to compare the meal they just consumed to other Army meals they have had (question 8). When the responses were analyzed as a function of dining facility, these responses portrayed exactly the same pattern as presented above: the specialty CAFe, receiving the most favorable reaction, followed by the short order CAFe, the combination CAFe, then the three A-ration CAFes and, as a poor last, the controls. **Figure 19** presents a summary of these ratings across all weeks and across all dining facilities. The distribution of ratings of control customers is similar to the normal distribution with a large clustering of responses at the middle and small percentages of responses at the extremes; whereas, the distribution of the CAFe customer responses was skewed as follows:

1) Over half indicated the meal just consumed was much better than other Army meals,

2) Over three-quarters indicated it was at least a little better than other Army meals, and

3) Only 5% indicated it was worse than other Army meals.

This is further substantiation that food in the CAFe system was highly acceptable and much better received than in the traditional Army food service system represented by the control ratings. These results also reiterate the importance of the separate specialty and short order facilities in achieving substantial improvements in customer satisfaction.

Question 6 provided detailed information of the consumer acceptance of the individual foods served during the experiment. **Table 11** presents the average hedonic ratings for some of the foods served during the experiment for comparisons of customer acceptance of centrally prepared foods against the same foods prepared on site. Selection of foods for inclusion in this table was based only upon it being centrally prepared in the CAFe system, and having three or more control ratings. This comparison is biased toward the traditional system since the weighted average for the site prepared foods is 0.28 higher than the overall average for the control meals, 5.94 versus 5.66; and the weighted average for the comparable CAFe foods is 0.36 lower than the overall average for the CAFe meals, 6.86 versus 7.22. Nevertheless, in spite of conservative selection of food items for inclusion in this table, the centrally prepared foods received higher ratings in 29 instances, and lower ratings in only five instances (cole slaw, tossed vegetable salads, cottage fried potatoes, devil's food cake, and hot or cold rolls).

These results tend to confirm observations during the experiment. Pastry items presented problems until the pastry personnel were trained in proper baking techniques, and until proper packaging of cakes and rolls were implemented to prevent rapid staling. Similarly, salad preparation personnel required additional training. Often they did not spin dry the greens thoroughly, and would allow the prepared salads to stand at room temperature for long periods of time. These conditions generally produce browning and lack of crispness, thus reducing acceptability. The lower rating for cottage fried potatoes is not supported by preliminary experiments at Natick Laboratories, and is the exception.

CUSTOMER REACTION TO NON-FOOD FEATURES

Two surveys conducted prior to the experiment measured the degree of favorability with which certain changes in the Army food service system would be received[3,6]. On the basis of these surveys, a number of changes were introduced. **Table 12** lists the features which were evaluated by dining facility. Three of the changes shown in question 4 of the interview protocol were not introduced in time to be evaluated. They were the

automated headcount system, cold snacks (sandwiches) in the evening, and quick hot meals available anytime. In addition, three other features which are listed in **Table 12** (redecorating, the mobile line, and disposable trays and tableware) were not evaluated by question 4.

Table 13 ranks the customer reactions to the actual non-food features evaluated by percent of the respondents liking the feature after the CAFe changes were introduced. The order of importance to the customer can be inferred from this ranking. Use of dishes, use of plastic trays, and uniforms were the least important features to the military customer; continental breakfast was marginal. Use of plastic trays was not a CAFe change; yet, the customers considered them less important than 11 other features. Contrary to popular belief, dishes were only one step ahead of plastic trays. For nine out of the twelve actual changes (extended hours of operation; music; use of dishes; new uniforms for cooks and attendants; a specialty CAFe to serve Mexican, Italian and seafood; a separate short order CAFe; a separate short order line in the regular facility; soft serve ice cream; and unlimited second helpings) the percentage of consumers who liked the change increased after its introduction. That is, the change was even more highly rated than its anticipation.

Table 14 summarizes the overall reactions to the CAFe system elicited by question 5. The totals across both facilities and weeks indicated that 94% of the CAFe customers liked the system.

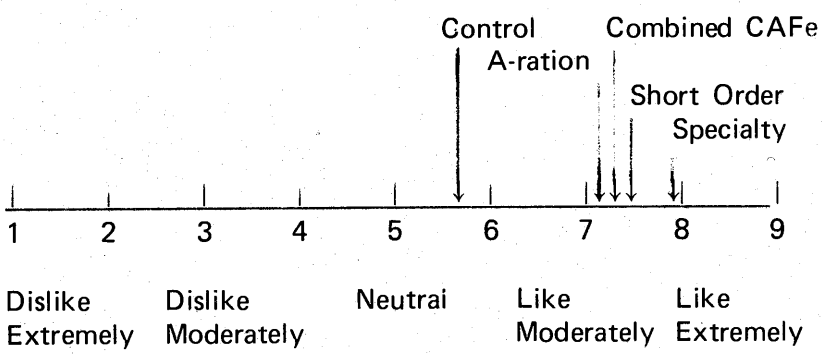
CUSTOMER RESPONSES TO THE UNSTRUCTURED QUESTIONS

The unstructured questions (1, 2 and 3) provide customer reactions to aspects of the total food service system on which they wanted to comment. **Table 15** summarizes these reactions, listing them in descending order by frequency of mention. For both the CAFe and the control customers, the importance of the factors mentioned are nearly identical. That is, when commenting about the food, everyone is concerned about quality, variety, quantity, and serving procedures in that order. When commenting about other aspects of the food service system, the customer focuses on the rules and procedures, (e.g., lines and hours), miscellaneous factors (e.g., convenience and cost), atmosphere, decor, and the dining facility personnel. The only ranking difference between the systems was personnel being more important than atmosphere and decor in the traditional system. **Table 15** also demonstrates that the CAFe system made great improvements in all the food-related factors as indicated by the percentage of customers who freely offered a compliment: 71% on the quality; 59% on the variety; 84% on the quantity; and 36% on the serving procedures.

A distinctive feature of the CAFe system was the separation of short order service from the regular A-ration service. For three dining halls this separation was accomplished by providing a separate short order CAFe (#3218), and in the one instance (#3114) where distance was a factor, the separation was accomplished by providing separate A-ration and short order lines in the dining hall. An analysis of the comments concerning the speed of service and the lines revealed that many did not like both short order and A-ration meals being served from the same line because this tended to aggravate an already much disliked situation of having to wait in lines. Hence, both of the CAFe system solutions were very well received.

DISCUSSION

The CAFe food service system was designed for the customer; and, therefore, the customer's rating of the quality of the overall meal provides the most representative result. In graphic form, the reader can see the most important food acceptance result from the CAFe experiment, a 7.22 CAFe hedonic rating versus a 5.66 control hedonic rating. For perspective, the specialty short order and A-ration ratings of the CAFe system are also shown in the figure below.



The graphic results of the customer responses to the question "How did this meal compare to other army meals you have had" shown in **Figure 19** confirm these hedonic results. In the before case, the majority of respondents could see no difference because no changes had been made to the system. After the CAFe changes were accomplished, the majority of the respondents perceived a very significant change for the better in meal service.

In summary, the desired improvements in customer satisfaction were measured quantitatively and achieved. When this information is considered in conjunction with the increase in attendance which was and can be achieved with a CAFe type system, it seems apparent to the contributors of this report that greatly improved troop morale and a new revitalized garrison system of food service can be achieved if the existing system of food service is modified to provide CAFe type service.

A follow-up study[17] was conducted with 642 customers a few weeks after the experiment had ended. The results were essentially the same as previously presented, indicating that customer acceptance of this system can hold over time.

Figure 18

INTERVIEW PROTOCOL

UNIVERSITY OF WASHINGTON
OFFICE OF INSTITUTIONAL EDUCATION RESEARCH

Date _____ Mess Hall _____ Meal (Circle) Br Lunch Supper

1. Now that some changes have been made in this mess hall, what do you like about eating here?

   a. _____ c. _____

   b. _____ d. _____

2. Do you dislike any of the changes?

   _____ No

   _____ Yes – Which ones? _____

3. What further changes would you like to see made in the eating system?

   a. _____ b. _____

4. I am going to read a list of some of the changes which have been made or could be made in the eating system here. For each, will you tell me if you have had experience with it, and if you like or dislike it? (Note: do not read items which have been mentioned in questions 1, 2, or 3.)

		Experience? Yes	No	Like	Dislike	No Difference
a.	New ID Card system of head counts	___	___	___	___	___
b.	Extended hours of operation	___	___	___	___	___
c.	Continental breakfast (rolls and coffee) served after regular hours	___	___	___	___	___
d.	Cold snacks (sandwiches) in the evenings	___	___	___	___	___
e.	Jukebox (or music)	___	___	___	___	___

Continued

Figure 18 (Cont'd)

INTERVIEW PROTOCOL

		Experience? Yes	No	Like	Dislike	No Difference
f.	Use of plastic trays	___	___	___	___	___
g.	Use of china dishes	___	___	___	___	___
h.	New uniforms for mess personnel	___	___	___	___	___
i.	Civilian mess attendants	___	___	___	___	___
j.	Specialty houses to serve Mexican, Italian, and sea foods	___	___	___	___	___
k.	Separate short-order houses	___	___	___	___	___
l.	Short-order line in the regular mess facility	___	___	___	___	___
m.	Soft-serve ice cream	___	___	___	___	___
n.	Quick hot meals available any time on week-ends	___	___	___	___	___
o.	Unlimited second helpings	___	___	___	___	___

5. Overall, do you like, dislike, or are indifferent to this new cafe system?

____ Like ____ Dislike ____ Indifferent

6. Now I am going to ask you to rate the food you just ate. For each food, will you tell me if you liked it extremely, liked it very much, liked it moderately, liked it slightly, neither liked nor disliked it, disliked it slightly, disliked it moderately, disliked it very much, or disliked it extremely. This card has a list of these ratings. (Interviewer circle number.)

a. What main dish?

_____ 1 2 3 4 5 6 7 8 9

b. Any other main dish?

_____ 1 2 3 4 5 6 7 8 9

Continued

Figure 18 (Cont'd)

INTERVIEW PROTOCOL

c. Vegetable(s)?

_____	1	2	3	4	5	6	7	8	9
_____	1	2	3	4	5	6	7	8	9

d. Drink(s)?

_____	1	2	3	4	5	6	7	8	9
_____	1	2	3	4	5	6	7	8	9

e. Breads or cereals?

_____	1	2	3	4	5	6	7	8	9
_____	1	2	3	4	5	6	7	8	9

f. Potatoes or starches?

_____	1	2	3	4	5	6	7	8	9

g. Salads?

_____	1	2	3	4	5	6	7	8	9
_____	1	2	3	4	5	6	7	8	9

h. Soup?

_____	1	2	3	4	5	6	7	8	9

i. Desserts?

_____	1	2	3	4	5	6	7	8	9
_____	1	2	3	4	5	6	7	8	9

(For breakfast, ask only for main dishes, beverages, breads and cereals, and fruits.)

7. Overall, how would you rate the meal you just ate, using the same scale? (Circle)

1 2 3 4 5 6 7 8 9

Continued

Figure 18 (Cont'd)

INTERVIEW PROTOCOL

8. How did this meal compare with other Army meals you have had?

____ Much better?	____ About the same	_____ A little worse?
____ A little better?	____	_____ Much worse?

Respondent's Name _____ Number _____

Interviewer _____

TABLE 9

SCHEDULE AND NUMBER OF INTERVIEWS OBTAINED AT FORT LEWIS DURING THE CAFe EXPERIMENT

Dining Hall No.	Meal Type and Hours	Dining Period	Week during 11 week period between 14 Aug 71 and 29 Oct 71											Subtotals	Totals
			1	2	3	4	5	6	7	8	9	10	11		
#3114	A-Ration	Breakfast	22	21	23	21	20	18	0	21	0	15	21	182	
	Two lines open	Noon	14	13	14	15	15	14	0	22	0	15	17	139	
	regular meal hours	Evening	21	21	16	20	21	21	0	21	0	21	21	183	504
	Limited Short Order	Noon	14	15	15	13	13	14	0	6	0	13	7	110	110
#3218	Full Short Order	Noon		21	6	21	21	21	0	21	0	15	16	142	
	only	After Noon		8	4	8	9	8	0	8	0	7	7	59	
	Open 1100-1330	Evening		21	10	22	21	21	0	21	0	14	17	147	
	and 1500-2300	Late Evening		8	4	5	7	4	0	4	0	4	2	38	386
#3224	A-Ration only	Breakfast	0	0	22	21	16	24	0	22	0	21	18	144	
	Regular hours	Noon	10	15	19	20	21	21	0	15	0	21	17	159	
		Evening	10	14	14	15	21	21	0	20	0	19	18	152	455
#3279	A-Ration only	Breakfast		0	6	21	20	21	21	0	21	0	15	125	
	Regular hours	Noon		9	6	21	21	21	21	0	21	0	20	140	
		Evening		9	9	15	20	18	21	0	18	0	21	131	396
#3122	A-Ration only	Breakfast				9	21	22	15	21	14	0	18	120	
	Regular hours	Noon				9	22	19	21	21	21	0	18	131	
		Evening				9	19	21	20	21	20	0	18	128	CAFe 379 INTERVIEWS
#3161	Specialty only	Evening						22	19	22	19	22	18	122	
	Open 1630-2200	Late Evening						6	9	6	9	6	6	42	164
			CONTROL INTERVIEWS												
#3566	Control: A-Ration/	Breakfast						0	0	0	0	6	3	9	
	lim. Short Order	Noon (A only)						4	7	8	6	6	6	37	
	Regular Hours	Evening (A only)						4	9	7	6	5	0	31	77
	Total	Breakfast	22	21	45	63	77	85	36	64	35	36	72	556	
	Test	Noon	28	49	54	90	113	110	42	85	42	64	95	772	
	Interviews	After Noon	0	8	4	8	9	8	0	8	0	7	7	59	
		Evening	21	42	40	72	102	124	60	105	57	76	113	812	
		Late Evening	0	8	4	5	7	10	9	10	9	10	8	80	2279
	Total	Breakfast	0	0	6	9	0	0	0	0	0	6	3	24	
	Control	Noon	10	24	6	9	0	4	7	8	6	6	6	86	
	Interviews	Evening	10	23	9	9	0	4	9	7	6	5	0	82	192

TABLE 10

RESPONSES TO THE QUESTION: OVERALL, HOW WOULD YOU RATE THE MEAL YOU JUST ATE?

Dining Facility	Type of Facility	Hedonic ratings with number of respondents in parentheses Week: 1	2	3	4	5	6	7	8	9	10	11	Totals Across All Weeks Controls	CAFe
#3114	A-Ration Line	7.34 (56)	7.38 (52)	7.23 (53)	7.38 (55)	6.67 (55)	6.92 (52)	–	7.13 (64)	–	7.31 (51)	6.88 (59)		7.13 (497)
#3114	Limited Short Order Line	7.21 (14)	6.73 (15)	7.07 (15)	7.38 (13)	7.73 (11)	7.43 (14)	–	8.00 (6)	–	7.54 (13)	7.29 (7)		7.31 (108)
								CAFe RESPONSES						
#3218	Full Short Order only		7.74 (58)	7.46 (24)	7.38 (55)	7.68 (56)	7.38 (53)	–	7.13 (54)	–	7.03 (39)	7.40 (42)		7.41 (381)
#3224	A-Ration only	5.10 (20)	5.17 (29)	7.11 (55)	7.16 (56)	7.10 (58)	7.14 (66)	–	7.14 (57)	–	6.66 (61)	7.30 (53)	5.14 (49)	7.08 (406)
#3279	A-Ration only		5.11 (18)	4.81 (21)	6.91 (57)	6.57 (60)	7.08 (60)	7.40 (63)	–	7.43 (60)	–	7.07 (56)	4.95 (39)	7.08 (356)
#3122	A-Ration only				5.96 (27)	7.16 (62)	6.93 (61)	7.18 (56)	7.15 (62)	6.87 (55)	–	7.15 (53)	5.96 (27)	7.07 (349)
#3161	Specialty only						8.11 (28)	7.86 (28)	8.14 (28)	7.57 (28)	8.00 (28)	7.96 (24)		7.94 (164)
			CONTROL RESPONSES											
#3566	Control A-Ration only						5.25 (8)	6.50 (16)	6.33 (15)	6.25 (12)	6.06 (17)	6.78 (9)	6.23 (77)	
	Totals Across Dining Facilities:												5.66 (192)	7.22 (2261)*

*Eighteen erroneous interviews excluded.

Figure 19

DISTRIBUTION OF CUSTOMER RESPONSES TO THE QUESTION: HOW DID THIS MEAL COMPARE WITH OTHER ARMY MEALS YOU HAVE HAD?

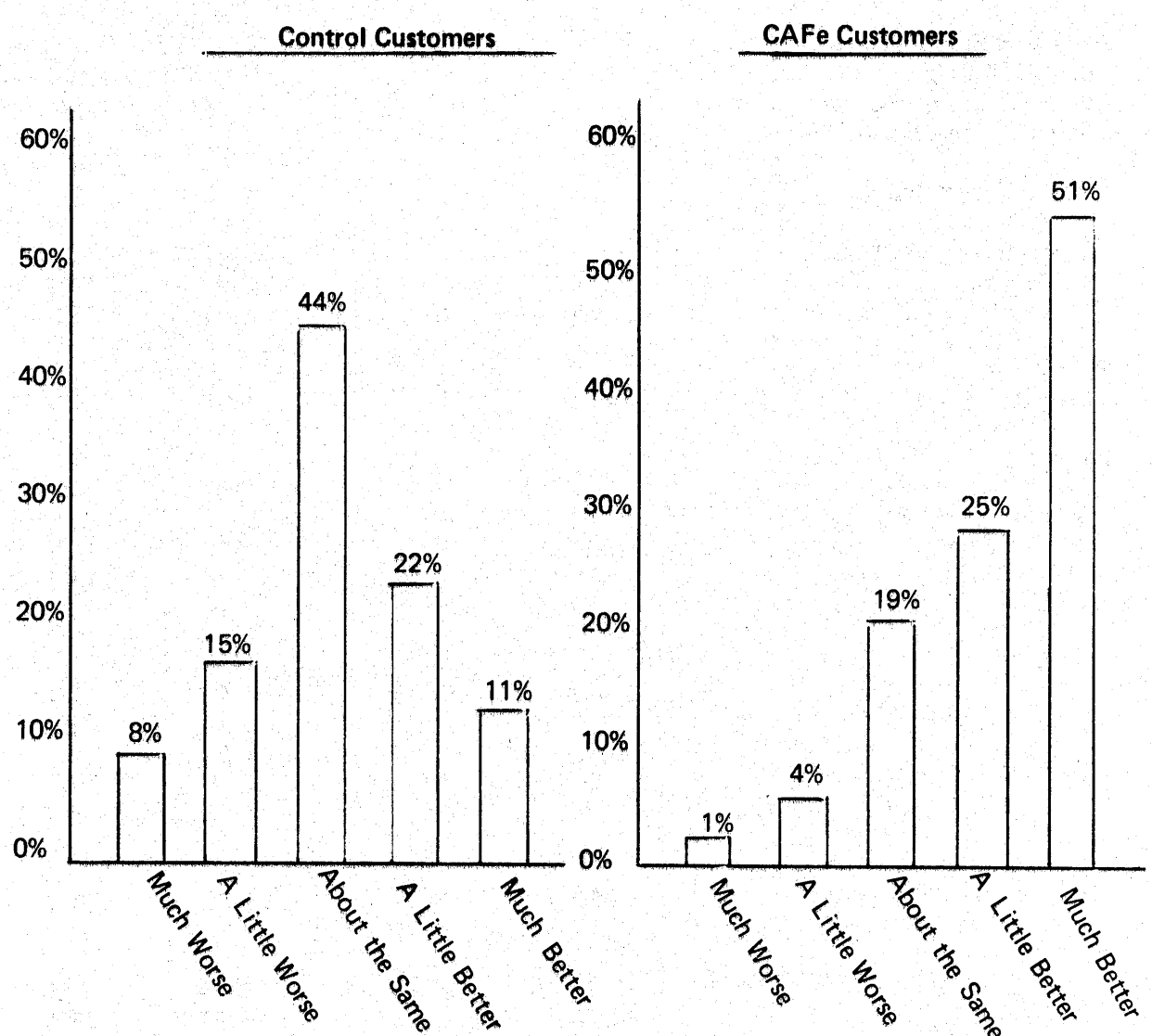


TABLE 11
CUSTOMER RATINGS OF FOOD ITEMS WHICH ALLOW CAFe AND NON-CAFe FOOD COMPARISONS

Food Group and Item	Control Ratings (Site Preparation Only)		CAFe Ratings (Centrally Prepared Only)	
Breakfast Foods:				
Bacon Slices	5.53	(15)	6.98	(317)
Creamed Beef on a Biscuit	5.75	(4)	6.58	(29)
French Toast	5.67	(3)	6.81	(129)
Breakfast Rolls	6.00	(4)	7.52	(79)
Noon and Evening Dishes:				
Beef BBQ Cubes	6.00	(5)	6.04	(33)
Chicken, Country Style	5.78	(9)	6.91	(64)
Chicken, Oven Fried	5.86	(7)	6.78	(88)
Lasagna	5.33	(3)	6.91	(47)
Macaroni and Cheese	4.67	(6)	7.18	(21)
Meatloaf	5.00	(5)	7.03	(73)
Spaghetti and Meatballs	4.89	(9)	7.14	(55)
Steak, Swiss	6.40	(5)	6.76	(26)
Turkey	3.75	(4)	6.41	(76)
Soups:				
Vegetable Soup	5.33	(3)	6.87	(16)
Salads:				
Cole Slaw	6.80	(5)	6.61	(44)
Garden Cottage Cheese	6.17	(6)	8.04	(23)
Lettuce Salad	6.02	(13)	6.97	(79)
Tossed Vegetable Salad	7.13	(23)	6.98	(142)
Other Vegetable Salads	7.33	(3)	7.64	(11)
Starches:				
Beans, Baked	6.00	(3)	6.47	(19)
Potatoes, Baked	6.18	(11)	7.19	(52)
Potatoes, Cottage Fried	6.86	(7)	6.29	(66)
Potatoes, Hashbrowns	4.00	(4)	5.69	(13)
Potatoes, Boiled	5.08	(12)	6.11	(35)
Vegetables:				
Cent. Prep. Vegetables	5.60	(5)	6.82	(40)
Pastries:				
Brownies, Chocolate	3.33	(3)	6.48	(25)
Cake, Devil's Food	7.14	(7)	6.93	(59)
Strawberry Shortcake	7.33	(9)	7.49	(16)
Cake, White	5.89	(27)	7.06	(112)
Cookies, Chocolate Chip	3.33	(3)	7.60	(30)
Other Cookies	5.56	(9)	6.93	(39)
Pie, Apple	5.73	(11)	7.05	(82)
Rolls, Hot and Cold	6.75	(16)	6.40	(143)
Weighted Averages	5.94	(262)	6.86	(2124)

TABLE 12

CHARACTERISTICS OF DINING FACILITIES PARTICIPATING IN THE CAFe SYSTEM EXPERIMENT AT FORT LEWIS

Feature	Facility Number						
	3114	3218	3122	3224	3279	3161	3566
CAFe Food:	X	X	X	X	X	X	
Soft Serve Ice Cream	X	X	X	X	X	X	
Carbonated Beverages	X	X	X	X	X	X	
Food Type:							
Short Order	X	X					X
A-Ration	X		X	X	X		X
Specialty						X	
Continental Breakfast	X				X		
Evening Sandwiches	X				X		
Redecoration (carpet, drapes, and partitions)		X				X	
Music System		X				X	
Mobile Serving Line	X						
Plastic Compartmented Trays	X		X	X	X		X
Dishes						X	
Disposable Trays and Tableware		X					
Civilian Mess Attendants	X	X	X	X	X	X	
Self-Service	X	X	X	X	X	X	
Unlimited Seconds	X	X	X	X	X	X	
Special Uniforms for Cooks		X				X	
Operating Hours:							
Normal Meal Hours	X		X	X	X		X
1100-1330; 1500-2300 hours		X					
1630-2200 hours						X	

TABLE 13

CUSTOMER REACTIONS TO SPECIFIC NON-FOOD CAFe FEATURES

Change	Where Introduced	Number and Percentage of Responses: Before Introduction — No. Responses	Like	Indifferent	Dislike	No Response	After Introduction — No. Responses	Like	Indifferent	Dislike	No Response
Civ. Attendants	All	182	95%	4%	1%	0%	2193	94%	4%	1%	2%
Jukebox or Music	Specialty Short Order	1457	85	6	6	3	514	93	4	3	1
Soft Serve Ice Cream	All	185	81	15	4	0	2199	91	5	2	2
Separate S/O CAFe	Short Order	440	86	10	3	0	1671	90	4	3	3
Carb. Bev.	All	181	94	4	1	0	1212	89	7	4	0
Second Helpings	All	184	86	11	2	0	2053	89	6	2	2
Extended Hours of Operation	Short Order Specialty	182	84	8	8	0	520	89	5	4	2
Spec. CAFe Mexican, Italian and Seafood	Specialty	805	85	12	4	0	1067	88	5	3	4
Separate A-ration S/O Lines	Combined A. & Lim. S/O	1324	64	11	23	3	562	85	8	6	2
Continental Breakfast	Combined A. & Lim. S/O	1233	80	12	5	3	426	75	18	6	2
Use of Dishes	Specialty	1599	34	20	44	3	162	72	17	12	0
Use of Plastic Trays	All except Specialty	348	40	29	31	0	2057	61	21	16	2
New uniforms for cooks	Short Order Specialty	1614	43	46	9	2	237	60	34	4	1

TABLE 14

RESPONSES TO THE QUESTION: OVERALL, DO YOU LIKE, DISLIKE OR ARE YOU INDIFFERENT TO THIS NEW CAFe SYSTEM?

Percentage of like with Number of Respondents in Parentheses

Dining Facility	Type of Facility	Week: 1	2	3	4	5	6	7	8	9	10	11	Totals Across All Weeks: Controls	Totals Across All Weeks: CAFe
#3114	A-Ration Line	96% (57)	96% (55)	91% (53)	95% (56)	96% (56)	90% (52)	–	95% (58)	–	88% (50)	95% (59)		94% (496)
#3114	Limited Short Order Line	93 (14)	100 (15)	93 (15)	100 (13)	92 (12)	100 (14)	–	100 (6)	–	100 (13)	100 (7)		97* (109)
							CAFe RESPONSES							
#3218	Full Short Order Only		98 (58)	100 (24)	91 (56)	100 (57)	93 (54)	–	100 (54)	–	100 (40)	98 (42)		97 (385)
#3224	A-Ration Only	100 (20)	86 (29)	91 (55)	96 (56)	93 (58)	97 (64)	–	91 (55)	–	90 (61)	94 (53)	92 (49)	93 (402)
#3279	A-Ration Only		100 (18)	86 (21)	95 (57)	89 (61)	85 (60)	90 (62)	–	100 (59)	–	82 (51)	92 (39)	90 (350)
#3122	A-Ration Only				85 (27)	95 (62)	95 (62)	89 (55)	89 (62)	93 (55)		91 (54)	85 (27)	92 (350)
#3161	Specialty Only						100 (28)	100 (28)	93 (28)	93 (28)	100 (28)	100 (23)		98 (163)
				CONTROL RESPONSES										
#3566	Control A-Ration Only						88 (8)	94 (16)	93 (15)	83 (12)	94 (17)	100 (09)	92 (77)	
	Totals Across Dining Facilities:												91 (192)	94 (2255)*

*Twenty-three erroneous interviews excluded.

TABLE 15

CUSTOMER RESPONSES TO THE UNSTRUCTURED QUESTIONS

Feature		CAFe	Control
Food:			
Quality (overcooked, undercooked, poor preparation)	Number	1374	206
	Like	71%	22%
	Dislike	20%	57%
	Suggestion	9%	21%
Variety (ethnic, specialty, soft serve, alcoholic beverages)	Number	1120	176
	Like	59%	17%
	Dislike	10%	31%
	Suggestion	31%	52%
Quantity (too little, too much of some items)	Number	775	76
	Like	84%	18%
	Dislike	11%	58%
	Suggestion	5%	24%
Serving Procedures (hot, cold, dried out)	Number	167	22
	Like	36%	0%
	Dislike	42%	73%
	Suggestion	22%	27%
Non-food:			
Rules/Procedures (headcount, lines, dress, KP, late opening, self-bussing, hours)	Number	1961	205
	Like	44%	6%
	Dislike	22%	41%
	Suggestion	34%	53%
Miscellaneous (cleanliness, convenience, cost, soft drinks)	Number	1020	157
	Like	83%	87%
	Dislike	9%	8%
	Suggestion	9%	6%
Atmosphere (music, crowds, rush, noise, friends)	Number	944	51
	Like	33%	24%
	Dislike	14%	24%
	Suggestion	53%	53%
Decor (drapes, pictures, size, tables, chairs)	Number	459	26
	Like	20%	35%
	Dislike	10%	12%
	Suggestion	70%	54%
Personnel (cooks, steward, mess attendants)	Number	119	59
	Like	30%	10%
	Dislike	27%	37%
	Suggestion	43%	53%

XII. ATTENDANCE ANALYSIS

Attendance rates were compiled for the month of July and the first two weeks of August for units that would be included in the CAFe experiment to provide a base-line with which attendance during the experiment could be compared.

During the experiment, each unit participating in the experiment provided copies of its DA form 2970, Subsistence Report and Field Ration Request[14]. The total number of non-cash-paying personnel that attended each meal divided by the total number of personnel authorized to subsist without reimbursement (including attached personnel) allowed computation of a monthly percent attendance for each meal, as well as the overall monthly attendance rate for each unit.

Attendance rates for each month of the experiment will be presented and the factors affecting them discussed. Secondly, attendance for the entire experiment will be analyzed and expected attendance at various meals and various types of facilities will be projected to provide planning information.

ATTENDANCE RATES

August: During the first two weeks of the experiment, only two CAFe facilities were opened: a combination A-ration/limited short order dining facility in building 3114 and a short order facility in building 3218. Since the 268th and 176th Signal Companies were housed in the area, they staffed the short order facility and were allowed to use it, even though they were not participating units.

Including the attendance data for the Signal units, the overall attendance rate for August was 86%. The Signal units comprised most of the CAFe population at the time and, because of newness of the system and close proximity to the short order facility, showed almost 100% attendance during August. If the Signal units are excluded, and only the data from building 3114 used, the attendance rate was 54%. It must be noted, however, that building 3114 was made a combination facility primarily because of the considerable distance (3000 feet) from the short order facility in building 3218. Distance was postulated as having a significant impact on dining hall attendance.

September: Three CAFe dining facilities were operational for the entire month of September: the combination facility in building 3114, an A-ration facility in building 3224, and the short order facility. A-ration facilities in buildings 3279 and 3122 operated during most of the month, and a specialty facility in building 3161 operated the latter half of September. The overall attendance was 60% for the month. Except for the Signal units, as discussed above, all participating units were assigned to an A-ration facility, but were permitted unrestricted use of the short order and specialty facilities.

October: All six of the CAFe dining facilities were operational for the entire month of October. The attendance rate for all the CAFe units was 55% for the month of October. However, in 1971, October had five weekends and two holidays. Thus, only 18 out of 31 days were weekdays. A normal month has 22 weekdays. This lower number of weekdays is responsible for the lower overall attendance rate. In October attendance on weekdays was 68% and on weekends and holidays it was 39%. If the attendance rate for October is adjusted for this holiday and weekend effect, it becomes 59%. In addition, attendance in the A-ration facility to which the signal units were assigned decreased to 19%. Fort Lewis considered this number of customers too low to justify a dining hall, and the facility was closed. These units were assigned to a CAFe facility over 600 feet distant, and their A-ration attendance decreased further to 5%, again demonstrating the affect of distance on attendance.

November: Attendance data were collected for the first two weeks of November to evaluate the effects of the continental breakfast and the evening sandwich features introduced late in the experiment. The overall attendance for this period was 62%.

ANALYSIS

Overall: As shown in **Table 16**, overall attendance increased from 51% to 60% during the experiment. **Table 16** also shows the meal attendance patterns by type of facility for the experimental period.

Additional meals: As previously mentioned, two additional meals were introduced in November. Dining halls 3114 and 3279 served a continental breakfast between 0800 and 1000 hours on weekdays and a sandwich meal between 2000 and 2200 hours daily.

For the period these extra meals were offered, data were collected to determine their effect on the other A-ration meals, namely breakfast and supper. The attendance at the continental breakfast meal was about 10% of the average breakfast attendance, and the sandwich meal attendance was nearly 20% of the supper rate. It was found that the two additional meals did not reduce the average attendance of the traditional A-ration meals, and contributed about 2 1/2% of the 62% attendance rate for November. If implemented in all four A-ration facilities, these additional meals would have contributed approximately 4% to the total November attendance, raising it to 64%.

Projected attendance: Data from the experiment allow a projection of attendance that can be used for planning the mix of A-ration, short order and specialty meals. **Table 17** presents this projection rounded to the nearest 5%.

Utilization rates: With the automatic headcount collection equipment, data was collected on the utilization rates within the CAFe dining facilities. Data for December are presented in **Table 18.** The percentages show the average number of times a customer entered one of the dining facilities each day during December. There was no evidence to support the allegation that customers would take 5, 6, 7 or more meals in one day if they had a free access system. The 2.6% attending dining halls four times a day was expected since the short order and specialty facilities were open in the evenings. The 0.5% attending dining halls five or more times a day is small and probably insignificant when realizing that individuals may not eat a full meal every time they enter a dining hall.

DISCUSSION

The attendance is one of the important measures of the performance of the CAFe system. During the experiment actual attendance increased from 51% to 60%. The features of continental breakfast and late evening sandwich snacks, evaluated near the end of the experiment, showed promise for increasing attendance by an additional 4% to a total of 64% if they were in effect in all A-ration dining halls for the whole experiment.

The CAFe experiment increased attendance, verifying the results of the consumer survey analysis conducted prior to experimentation[6]. It is evident that with the higher pay scales and more liberal off post policies in the modern military services, the military

customer must be attracted to a food outlet much the same way civilian customers are attracted to a civilian cafeteria. It is apparent that a customer-oriented system such as the CAFe system can attract a very significant increase in customers over a traditional system; thereby, improving general troop morale.

TABLE 16

OVERALL ATTENDANCE FOR CAFe EXPERIMENT

A-ration Facilities			Special Facilities		
Breakfast	Dinner	Supper	Short Order	Specialty	Overall*
38%	44%	40%	41%	16%	60%

*Pre-CAFe overall attendance was 51%.

TABLE 17

PROJECTED ATTENDANCE PATTERNS

	A-ration	Short Order	Specialty
Breakfast	35%	–	–
Dinner	50%	25%	–
Supper	40%	15%	15%

Overall (not including continental breakfasts or late evening snacks) is 60%

TABLE 18

AVERAGE DAILY ATTENDANCE FOR INDIVIDUALS

Times per Day	Percent of Daily Attendance
1	49.3
2	33.1
3	14.5
4	2.6
5 or more	0.5

XIII. FOOD COST ANALYSIS

Food costs were determined throughout the period of experiment and compared to the basic daily food allowance (BDFA), for each month and for the total experiment. In some instances excessive costs were incurred that can be directly attributed to the experiment. Since these costs would not reasonably be expected to occur during normal operation of the system, an adjusted food cost is also provided for comparative purposes. Also included is a brief discussion of the variances from the BDFA of food costs obtained during the experiment, their implications with respect to the feeding system concept, and the expected effect on food costs in an operational CAFe System.

RATION COSTS

The ration costs for each month of the experiment are summarized in **Tables 19, 21, 23,** and **25.** The cost elements are defined below:

Starting inventory: The starting inventory or value of inventory carried over from the previous month, is defined as equal to the closing inventory for the preceding month.

Costs of food issued: The cost of food issued is the actual expenditure for all food acquisitions during the inventory period. As much as possible, costs for non-food items (cleaning material, soap, etc.) purchased from the commissary have been excluded. Sources of the food costs were:

- Commissary items issued from ration breakdown or purchased directly from the commissary store.
- Vendor delivered items, i.e., dairy products (milk, ice cream, etc.) and bread products (bread, hamburger rolls, etc.).
- Condiment store purchases.

Closing inventory: Closing inventory is the value of the inventory at the end of the current month. Except for the final month of the experiment, this did not include in-process inventories such as the prepared food items in the central food preparation

facility or in the dining halls. The in-process inventory in the central facility became quite large and quite variable. Initially, it consisted mostly of prepared food items that were ready-for-distribution. However, to prevent running out of certain food items in the dining hall, the central facility produced to a maximum predicted level for each item on the menu and froze excess product for use in a succeeding cycle. This practice caused large in-process inventory fluctuation and is responsible for some of the month-to-month variation in food cost.

Total ration costs: The value of starting inventory plus the cost of food issued less the value of the closing inventory equals the total ration cost.

RATION ALLOWANCE

The ration allowance is the total food allowance permitted for the actual man days fed during the month. The allowances for each month of the experiment are shown in **Tables 20, 22, 24,** and **26.**

The meal value as defined by AR 31-200, Army Commissary Operating Procedures[15], is the monetary value of a meal obtained by multiplying the BDFA by the corresponding meal conversion factors, which are specified as follows:

Meal	Factor
Breakfast	.20
Dinner	.45
Supper	.35
	1.00

Total ration allowance is then determined by multiplying the number of each type of meal during the month by the appropriate meal value and summing over all meals.

It must be emphasized at this point that the proportions of breakfasts, dinners, and suppers are not in the established ratios. The situation is created by the large number

of short order and specialty meals served. These had to be assigned one of the computed meal values. Anything else, such as a daily average, would not be in accordance with regulation. The higher dinner value should apply to the specialty meal which is more expensive; it is served in the third meal time period. The lower supper value should apply to the short order meal. However, Fort Lewis had already set precedent by using the dinner values for a short order facility and a steak house previously established in the personnel center for returning overseas servicemen. Thus, all short order and specialty meals are included in the dinner headcounts.

RATION COST INDEX

The ration cost index is a multiplier that can be applied to the BDFA to give a comparable CAFe cost. It is defined simply as the ratio of the total ration costs to the total ration allowance and presented in **Table 27** for each month of the experiment. The amount by which the index value is greater than 1.00 is the percentage increase in food costs for the CAFe System as compared with the conventional food service system at Fort Lewis, during the period of the experiment. **Table 27** contains an adjusted ration cost index in which ration costs not reasonably expected to occur during normal operation of the system have been deducted.

ANALYSIS

The data are examined separately each month. The actual costs incurred are shown, and various factors affecting these costs are discussed. Cost of supplies, cleaning materials, packaging materials, soaps, rug shampoos, etc. purchased from the commissary are included in the food cost. Since the exact cost of these items is not known, a flat rate of 5% of the ration cost was deducted after any of the extraordinary costs discussed under the applicable month had been deducted, to arrive at an adjusted ration cost. None of the costs of raw and prepared foods used for chemical, organoleptic and microbiological testing were deducted since they are a necessary cost to any central preparation system.

August: **Tables 19** and **20** show the ration costs and ration allowance for 14-31 August. Prior to start-up of actual food service operations from the central facility, a 5-day full production training period was conducted for production personnel. The food prepared was transferred at no cost to dining halls in the training center or dining halls

that would be participating in the experiment. The food costs for training, calculated (5/23) to be $3,384.26, were deducted; then the 5% flat rate for non-food supplies and materials were deducted. Both are reflected in the adjusted ration costs figure for the month.

September: Ration costs and allowance for the month of September are shown in **Tables 21**, and **22**. It was during this month that most of the dining facilities were introduced into the CAFe System. Menus were not strictly controlled, allowing the dining hall stewards maximum flexibility to adjust to the new customer service policies being evaluated during the experiment: self-service, no portion control, unlimited second helpings on all items, and more food choices. The dining hall stewards lacked specific experience in predicting the consumer demand under these policies, and were encouraged to order items in excess of the anticipated consumption to prevent run-out of any scheduled foods. The 5% flat rate of adjustment for non-food supplies is $2,054.33.

October: For the month of October, the ration costs and allowance are shown in **Tables 23**, and **24**. Food costs increased during October principally as a result of three factors. First, a number of new non-standard food items were evaluated with respect to their effect on improved consumer acceptance and/or increasing productivity. These items were not available through the Army supply system and had to be purchased locally at a somewhat higher price than would likely be the case if acquired through Defense Supply Agency. The incremental costs of these items, as compared to similar items from the Defense Supply Agency, was computed to be $3,060.93, and the ration costs were reduced accordingly. Secondly, once the CAFe System was in full operation it was desired to collect data and information pertaining to customer food selection and eating habits. Therefore, the menu at each meal had to be rigidly controlled, and the dining hall steward was not allowed to serve any unused (not heated or cooked) items from a previous meal. Items issued, but unused, were returned to the central preparation facility for disposal. Because most of the dining hall stewards were not proficient at predicting consumer demand, the net effect was a substantial increase in food costs. The third important factor affecting food costs was the adoption, in the middle of the month, of a shortened menu cycle designed primarily to provide foods with a high degree of consumer acceptance. Until that time, the menu being used was the Army-Air Force 42-day menu cycle as modified to replace some of the less preferred food items with more highly preferred food items and to provide at least two choices in all the menu item food classes. This

menu was planned to approximate the existing BDFA. The new menu, prepared for a 20-day cycle, included a variety of items that were indicated to have a high preference, and cost was not a constraining factor. It was estimated that this menu resulted in nearly a 40% increase in food costs. These costs were not deducted. The 5% deduction for non-food costs is $2,308.26 for October.

November: The final month's ration costs and allowance are included in **Tables 25**, and **26**. Besides being the first full month of operation with the 20-day menu, three additional features of the new system were being evaluated during this period. A continental breakfast, between the normal morning and noon meals, and a fixed sandwich menu late in the evening were tested in two of the A-ration dining halls. These services had been implemented earlier in the experiment but were discontinued due to resistance from the participating units. An analysis of the food costs involved indicated a slightly higher cost per customer than allowed by the evening meal allowance to which it was chargeable, hence an increase in ration costs. The difference in cost between continental breakfast and regular breakfast was negligible. Also, in November, a different method of distributing prepared items to the dining halls was attempted. Instead of the dining hall steward specifying the amounts of each item desired, the issue quantity was determined by the central preparation facility, using the consumption data collected during October to predict the proportion of customers that would select competing menu items. Restrictions on serving unused items (not heated or cooked) at a later meal were eliminated. However, the dining hall steward was encouraged to retain only one unused entree item for a subsequent meal. While the effect of this procedure could not be precisely determined, it apparently contributed to lower total ration costs. The 5% deduction for non-food costs is $2,626.57 for November.

DISCUSSION

Food costs for each month and the total experiment are compared in **Table 27**. The adjusted ration cost index range varies from 1.01 to 1.35, for an average daily food cost per man-day of $1.55 to $2.08 as compared with the BDFA which was $1.53 to $1.56 for the same period. For the entire experiment, the adjusted ration cost index was 1.20 giving an average food cost per man-day of $1.85 relative to an average BDFA of $1.54. Using the unadjusted food costs, the average food cost per man-day fed was 18 cents higher, $2.03. Prior to initiation of the experiment, authority was obtained from the Department of the Army to exceed the current BDFA by up to 50%, which

was considered to be necessary to conduct the experiment. The largest margin by which the BDFA was exceeded was 68% for unadjusted ration costs in August, the month of start-up, and 32% over the whole experiment. When the adjusted ration costs are used, the BDFA was exceeded by only 20% over the whole experiment, and by only 1% during September.

These results do not necessarily imply that food costs in the proposed new garrison food service system will exceed present costs. Even with all cost-contributing experimental factors operating simultaneously, the food costs were considerably lower than would be expected from the 40% increase in food costs for the new menu calculated during October. Thus, it appears reasonable and likely that it will be possible to operate within the corresponding BDFA constraint. Further, with the greater efficiencies of central preparation higher yields, economies of bulk purchase of food items, more effective prediction of demand and other such refinements – it should be possible to reduce food costs by as much as 15%. Such savings have been the reported by institutional and industrial food service with this type of system.

TABLE 19

RATION COSTS FOR AUGUST

Starting inventory	$ 0.00
Costs of rations issued:	
Condiments	928.68
Dairy products	1,143.78
Bakery products	710.92
Commissary items	23,266.38
	$26,049.76
Closing inventory	10,482.13
Total ration costs	$15,567.63
Adjusted ration costs	$11,574.20

TABLE 20

RATION ALLOWANCE FOR AUGUST

Meal	Headcount	Meal Value	Ration Allowance
Breakfast	2,197	$0.31	$ 681.07
Dinner	9,222	0.70	6,455.40
Supper	3,833	0.55	2,108.15
Total	15,252	$1.56	$9,244.62

TABLE 21

RATION COSTS FOR SEPTEMBER

Starting inventory	$10,482.13
Costs of rations issued:	
Condiments	4,249.85
Dairy products	2,821.75
Bakery products	1,908.01
Commissary items	44,110.66
	$63,572.40
Closing inventory	22,485.89
Total ration costs	$41,086.51
Adjusted ration costs	$39,032.18

TABLE 22

RATION ALLOWANCE FOR SEPTEMBER

Meal	Headcount	Meal Value	Ration Allowance
Breakfast	11,215	$0.31	$ 3,476.65
Dinner	39,215	0.69	27,058.35
Supper	15,124	0.53	8,015.72
Total	65,554	$1.53	$38,550.72

TABLE 23

RATION COSTS FOR OCTOBER

Starting inventory	$22,485.89
Costs of rations issued:	
Condiments	4,042.12
Dairy products	3,650.55
Bakery products	1,998.28
Commissary items	41,794.04
	$73,970.88
Closing inventory	24,744.77
Total ration costs	$49,226.11
Adjusted ration costs	$43,856.92

TABLE 24

RATION ALLOWANCE FOR OCTOBER

Meal	Headcount	Meal Value	Ration Allowance
Breakfast	12,235	$0.31	$ 3,792.85
Dinner	36,604	0.69	25,256.76
Supper	10,216	0.54	5,516.64
Total	59,055	$1.54	$34,566.25

TABLE 25

RATION COSTS FOR NOVEMBER

Starting inventory		$24,774.77
Costs of rations issued:		
Condiments		4,856.25
Dairy products		4,168.91
Bakery products		1,276.80
Commissary items		43,130.79
		$78,207.52
Closing inventory:		
Stock	$21,173.95	
In-process	4,502.21	25,676.16
Total ration costs		$52,531.36
Adjusted ration costs		$49,904.79

TABLE 26

RATION ALLOWANCE FOR NOVEMBER

Meal	Headcount	Meal Value	Ration Allowance
Breakfast	13,264	$0.32	$ 4,111.84
Dinner	38,216	0.69	26,369.04
Supper	13,427	0.53	7,116.31
Total	64,907	$1.53	$37,597.19

TABLE 27

COMPARISON OF FOOD COSTS

	a	b	c	d	e	f=b÷e	g=c÷e	dxf	dxg
		Ration Costs			Ration	Ration Cost Index		Cost Per Ration	
Period	Headcount	Unadjusted	Adjusted	BDFA	Allowance	Unadjusted	Adjusted	Unadjusted	Adjusted
August	15,252	$15,567.63	$11,574.20	$1.56	$9,244.62	1.68	1.25	2.62	1.95
September	65,554	41,086.51	39,032.18	1.53	38,550.72	1.07	1.01	1.64	1.55
October	59,055	49,226.11	43,856.92	1.54	32,566.25	1.51	1.35	2.33	2.08
November	64,907	52,531.36	49,904.79	1.53	37,597.19	1.40	1.33	2.14	2.03
Total	204,768	$158.411.61	$144,368.09	$1.54	$119,958.78	1.32	1.20	2.03	1.85

XIV. WORK MEASUREMENT ANALYSIS

A work measurement analysis was conducted in conjuction with the CAFe experiment to determine the extent to which central food preparation and warewashing could reduce manpower requirements in the dining halls. All dining halls participating in the work measurement analysis served A-ration meals. The short order and specialty facilities were excluded since they had no counterpart for comparison in the conventional system. In addition, the central preparation facility, which could not be efficiently designed and operated during the experiment because of cost, time and the small number of dining halls participating was not included in the analysis. This section discusses in detail the work sampling data for the three major job classifications within the dining halls--dining hall steward, cooks, and KP/dining attendants--and presents a dining hall productivity comparison of the conventional food service system to the CAFe system.

PROCEDURES

The methodology employed was a variation of the ratio-delay work sampling technique, which consists of taking periodic observations of the activities observed. Given a sufficiently large number of observations, accurate estimates of the percentage of time spent on each activity and the pattern of activities can be calculated, including idle time. The results can then be analyzed to determine a basis for objective decisions on required staffing levels. The definitions of the various activities observed, format of the data collection and recording, and a sample computer print-out of the results are provided in **Appendix V**. The summaries of the results are shown in **Tables 28** through **30**.

Work sampling data were obtained on dining hall operations in three phases:

1) Prior to installation of the CAFe system, observations were made (during July and August) of conventional operations in four dining halls with the existing staffing levels to establish a base line against which the CAFe system dining hall operations could be compared.

2) During the second phase (in September) the CAFe system was initiated in each of the dining halls. Staffing levels were virtually the same as had existed prior to the experiment with the exception of military KP's being replaced with civilian dining attendants.

3) For the third phase (in October) the data obtained from the previous observations were used to establish recommended levels of staffing for CAFe system: one steward, four cooks, and three dining attendants. These new manpower requirements were based on a 40-hour workweek for all personnel and were implemented in two of the dining halls for evaluation.

ANALYSIS

Personnel requirements: During the first phase of the study (conventional system), the following personnel were observed: one dining hall steward working an average of 60 hours per week, six military cooks each working an average of 60 hours per week, and five military KP's each working the equivalent of 94 hours per week. The total man-hours per week for the dining hall personnel were: dining hall steward--60 hours; cooks--360 hours; and KP's--470 hours. In the second phase of the study the dining hall steward and the cooks remained at the same levels. However, the military KP's were replaced by three civilian dining attendants each working a 40-hour week for a total of 120 man-hours. For the third phase, all the personnel were working a 40 hour week. The total man-hours per week for each job classification was: dining hall steward--40 hours; four cooks--160 hours; and three civilian attendants--120 hours.

The three major job classifications were considered in the analysis and are discussed below.

Dining hall steward: The total man-hours per week for the three phases were: 60, 60, and 40, respectively. No separate work sampling data are available for the dining hall steward from the conventional phase. During this phase the steward was included in the cook category of observations. Data from the initial phase of the CAFe experiment shows the dining hall steward functioning primarily in a supervisory capacity, as exhibited by the 32% level of communication activity in **Table 28**. As more experience and confidence were gained, and his role was better defined, an even greater proportion of time was devoted to communication, increasing from 32% to 49% with the reduced staffing levels in the third phase. The effect of this greater concern with, and involvement in, management of the dining hall was reflected in the higher quality service and operation of the dining hall.

One matter of concern is the proper interpretation of idle-time for this job, which appears to be quite large. As defined, idle-time includes the time that the dining hall steward was "out-of-site", i.e., away from the dining hall and could not be observed. However, many of the functions performed by the steward, e.g., ration requisitioning, condiment store purchases, submission of reports, etc., required him to spend a significant part of his time outside the dining hall.

Cooks: The total man-hours for the three phases were: 360, 360, and 160, respectively. A comparison of the results from the three phases of work sampling for the cooks, **Table 29**, shows some very distinct changes in types and levels of activity between the conventional and CAFe system operations. The amount of time devoted to meat and vegetable preparation in the dining hall was considerably decreased, from 16% to 8-9%, in the CAFe system, as would be expected. Delay time increased from 28 to 33% between the first and second phases since the number of cooks remained unchanged but the workload had diminished. However, when staffing was reduced to appropriate levels in the third phase, the delay time was 22%, substantially smaller than in either of the first two phases. In terms of actual man-hours this decrease from 28 to 22% was a reduction from 101 to 35 man-hours of idle time per week resulting from the significant reduction in man-hours in the CAFe system. The proportion of time for each of the other activities either changed very little or was slightly higher, reflecting the decreased idle time.

Kitchen police and dining attendants: The total man-hours for the three phases were: 470, 120, and 120, respectively. **Table 30** shows that the civilian attendants spent considerably more time (about triple) on sanitation, while the military KP's exhibited much greater idle time, 34% versus 20-21%. This represents a reduction from 160 to 25 man-hours of idle time when comparing the conventional system with the CAFe system. The proportion of time spent on clean-up activities decreased by one-half when dishwashing in the dining hall was eliminated by central warewashing. On the other hand, preparation activities doubled between the first and third phase. This resulted from the attendants being enlisted to replenish the serving lines and help with some of the simpler food preparation when cook staffing levels were reduced.

Dining hall productivity: Productivity as referred to in this section of the report is used as a basis for comparison of output for the conventional system versus the CAFe system in the dining halls only. The measure used is man-hours per week required to

feed a fixed number of meals per day for both systems. For the conventional system the number of personnel authorized by AR 570-2, Organization and Equipment Authorization Tables--Personnel[16], is used in lieu of the number of personnel actually observed. For headcounts in the range of 126-164, the regulation authorizes one dining hall steward, four cooks, one apprentice cook, and four military KP's for a seven day operation. (The additional cook and KP observed in the dining halls during the first phase of the study were present because of the extra personnel available when Table of Organization and Equipment units are in garrison.)

Table 31 presents a typical conventional system work schedule based on the number of personnel observed during the first phase of the study. During the third phase of the study, staffing levels in two of the dining halls were fixed at four cooks and three dining attendants for a seven day operation. **Table 32** shows the work schedule instituted for the reduced staffing levels. The loading chart in Table 33 shows the personnel present during meal hours with the proposed staffing levels.

Analysis of productivity by job classification shows the labor savings attributable to the CAFe system. Although the dining hall steward is essentially concerned with administrative matters, the reduction in man-hours from 60 to 40 is an increase of 50% in his productivity. For the cooks, the CAFe system realized an increase of 87% in productivity based on the reduction of man-hours from 300 (authorized) to 160 per week. The shifting of food preparation activities to the central facility made possible this highly significant increase in dining hall productivity of cooks. The use of dining attendants to replace military KP's in the CAFe system allowed an increase of 213% in productivity. This is based on the reduction of man-hours from 376 (4 KPs, each at 94 hours per week) to 120 (three dining attendants, each at 40 hours per week). Centralizing the warewashing was the primary source of this extremely large increase.

DISCUSSION

The analysis of the work measurement data collected before and during the CAFe experiment show specific results for each particular job classification, but it should be noted that the CAFe system affected all operating personnel to some degree. Approximately 50% of the actual food preparation labor and all dishwashing, except for a few utensils, were taken out of the dining halls and performed in the central facility.

Thus, there was a distinct shift from these types of activities with a correspondingly greater emphasis on service to the customer, sanitation, and administrative functions. In certain instances, the work actually performed by various personnel was quite different during the CAFe experiment than it was in conventional dining hall operations.

The manning levels proposed for the operation of the CAFe food outlets proved sufficient, and greatly reduced the total man-hours required from the 890 actually observed (736 authorized) in the conventional system to 320 in the CAFe system. For meal headcounts of approximately 150, one dining hall steward, four cooks, and three civilian attendants effectively operated the dining hall. In addition, a 40-hour workweek was achieved for all dining hall personnel, even with the reduced staffing levels.

Increased productivity by job classification was calculated to be: dining hall steward--50%; cooks--87%; and KP/dining attendants--213%. These increases in dining hall productivity are extremely high. The increase due to total hours per workweek is apparent after inspection of **Table 34**, which shows a projected work schedule for the conventional system when constrained by a 40-hour workweek. This schedule was never actually used, but is merely a hypothetical example of the 19 people required if everyone worked 40 hours per week.

The overall system productivity of the total CAFe system was not obtainable under the experimental conditions at Fort Lewis. Overall productivity, including central facility personnel, cannot be measured until an efficiently designed central facility servicing more than six food outlets is staffed and operating. The report covering the modern food service system[10] includes projected staffing levels for a highly efficient system designed to be implemented at a large military base, and indicates the large cost savings made possible by central food preparation and warewashing.

TABLE 28

WORK SAMPLING DATA FOR STEWARDS

(All values are in percentages)

CAFe SYSTEM — **3029 OBSERVATIONS**

	Walking	Communication	Delay	Other	Total
Menu		25			25
Equipment				4	4
Empty	3	7	57		67
Other	2			2	4
Total	5	32	57	6	100

PROPOSED STAFFING LEVELS — **1625 OBSERVATIONS**

	Walking	Communication	Delay	Other	Total
Menu		45		2	47
Equipment				3	3
Empty	4		35	5	44
Other	1	4	1		6
Total	5	49	36	10	100

TABLE 29

WORK SAMPLING DATA FOR COOKS
(All values are in percentages)

CONVENTIONAL FEEDING SYSTEM — 8298 OBSERVATIONS

	Prepare	Walking	Clean-Up	Delay	Communication	Other	Totals
Meats	8					4	12
Vegetables	8					5	13
Menu					3		3
Bakery	3					2	5
Equipment		4	6			2	12
Empty		9		28	10		47
Other	2	4	2				8
Total	21	17	8	28	13	13	100

CAFe SYSTEM — 9715 OBSERVATIONS

	Prepare	Walking	Clean-Up	Delay	Communication	Other	Total
Meats	6					4	10
Vegetables	2					3	5
Menu					7		7
Equipment		5	7			6	18
Empty		9		33	5	2	49
Other	6	5					11
Total	14	19	7	33	12	15	100

PROPOSED STAFFING LEVELS — 4292 OBSERVATIONS

	Prepare	Walking	Clean-Up	Delay	Communication	Other	Total
Meats	7					5	12
Vegetables	2					2	4
Menu					13		13
Equipment		5	4		4	6	19
Empty		9		22		7	38
Other	6	6	2				14
Total	15	20	6	22	17	20	100

TABLE 30
WORK SAMPLING DATA FOR MILITARY KITCHEN POLICE OR CIVILIAN ATTENDANTS

(All values are in percentages)

CONVENTIONAL FEEDING SYSTEM (KP) — **7481 OBSERVATIONS**

	Prepare	Walking	Clean-up	Delay	Sanitation	Other	Total
Vegetables	4					1	5
Equipment		4	31			5	40
Empty		5		34		3	42
Other	1	1	1		10		13
Total	5	10	32	34	10	9	100

CAFe SYSTEM (CIVILIAN) — **4421 OBSERVATIONS**

	Prepare	Walking	Clean-up	Delay	Sanitation	Other	Total
Condiments						3	3
Equipment	3	5	15		18	2	43
Empty		7		21		2	30
Other	4	2	1		17		24
Total	7	14	16	21	35	7	100

PROPOSED STAFFING LEVELS (CIVILIAN) — **2300 OBSERVATIONS**

	Prepare	Walking	Clean-up	Delay	Sanitation	Other	Total
Condiments						3	3
Equipment	8	5	12		8	4	37
Empty		7		20		5	32
Other	2	4	4		18		28
Total	10	16	16	20	26	12	100

TABLE 31

TYPICAL CONVENTIONAL DINING HALL PERSONNEL WORK SCHEDULE

Title	Grade	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Total Hours Worked/Week
Mess Steward	E-7	0600 1730	0600 1730	0600 1730	0600 1730	0600 1730	Off	Off	57 1/2
First Cook	E-6	Off	0500 1730	0500 1730	0500 1730	0500 1730	0630 1830	Off	62
Cook	E-6	0500 1730	0500 1730	0500 1730	0500 1730	Off	Off	0630 1830	62
Cook	E-5	0800 1900	0800 1900	0800 1900	Off	Off	0600 1830	0600 1830	58
Cook	E-5	Off	Off	0800 1900	0800 1900	0800 1900	0600 1830	0600 1830	58
Ass't Cook	E-4	0430 1730	0430 1730	0430 1730	0430 1830	0430 1730	Off	Off	62
Ass't Cook	E-4	0800 1900	0800 1900	Off	Off	0800 1900	0600 1830	0600 1830	58
KP-1,2,3,4,5	E-2	0500 1900	0500 1900	0500 1900	0500 1900	0500 1900	0630 1900	0630 1830	94

TABLE 32

CAFe DINING HALL PERSONNEL WORK SCHEDULE

Title	Mon.	Tue.	Wed.	Thur.	Fri.	Sat.	Sun.	Days-Hours/Week
Dining Manager	0530 1430	0530	0530	0530	0530	Off	Off	5—40
Cook 1	Off	1100 2000	1100 2000	1100 2000	1100 2000	0730 1630	Off	5—40
Cook 2	1100 2000	Off	Off	Off	0500 1400	0700 1900	0700 1900	4—38
Cook 3	0500 1600	0500 1400	0500 1400	0500 1400	Off	Off	0730 1630	5—40
Cook 4	1100 2000	1100 2000	1100 2000	1100 2000	1100 2000	Off	Off	5—40
Dining Attend. 1 (morn)	Off	0500 1400	0500 1400	0500 1400	0500 1400	0730 1630	Off	5—40
Dining Attend. 2 (eve)	1100 2000	1100 2000	1100 2000	1100 2000	Off	Off	1000 1900	5—40
Dining Attend. 3 (swing)	0500 1400	Off	Off	1100 2000	1100 2000	1100 1900	0730 1630	5—40

Dining Hall Personnel Meal Times- (All personnel allowed two 1/2 hour meal periods).

	BREAKFAST	LUNCH	DINNER
Weekdays:	0515-0545	1000-1030/1500-1530	1745-1815
Weekends:	0715-0745	1000-1030/1400-1430	1700-1730

TABLE 33

CAFe DINING HALL STAFF LOADING AT MEAL HOURS

(Manning level: 1-manager, 4-cooks, and 3-dining attendants)

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
BREAKFAST	Manager-1	Manager-1	Manager-1	Manager-1	Manager-1	--	--
	Cook-1	Cook-1	Cook-1	Cook-1	Cook-1	Cook-2	Cook-2
	Attendant-1	Attendant-1	Attendant-1	Attendant-1	Attendant-1	Attendant-1	Attendant-1
DINNER	Manager-1	Manager-1	Manager-1	Manager-1	Manager-1	--	--
	Cook 3	Cook-3	Cook-3	Cook-3	Cook-3	Cook-2	Cook-2
	Attendant-2	Attendant-2	Attendant-2	Attendant-3	Attendant-2	Attendant-2	Attendant-2
SUPPER	Cook-2	Cook-2	Cook-2	Cook-2	Cook-2	Cook-1½	Cook-1½
	Attendant-1	Attendant-1	Attendant-1	Attendant-2	Attendant-1	Attendant-1½	Attendant-½

TABLE 34
PROJECTED DINING HALL PERSONNEL WORK SCHEDULE WHEN CONVERTING CONVENTIONAL SYSTEM TO A 40 HOUR WORKWEEK

Title	Grade	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Days-Hours/Week
Mess Steward	E-7	0530 1430	0530 1430	0530 1430	0530 1430	0530 1430	Off	Off	5-40
First Cook	E-6	Off	1000 1900	1000 1900	1000 1900	1000 1900	0730 1630	Off	5-40
Second Cook	E-6	0500 1400	0500 1400	0500 1400	0500 1400	Off	Off	0730 1630	5-40
Cook	E-5	1000 1900	Off	Off	Off	0500 1400	0630 1830	0630 1830	4-38
Cook	E-5	1000 1900	Off	Off	Off	0430 1330	0630 1830	0630 1830	4-38
Cook	E-5	1000 1900	1000 1900	1000 1900	1000 1900	1000 1900	Off	Off	5-40
Cook	E-5	1000 1900	1000 1900	1000 1900	1000 1900	1000 1900	Off	Off	5-40
Assistant Cook	E-4	Off	1000 1900	1000 1900	1000 1900	1000 1900	0930 1830	Off	5-40
Assistant Cook	E-4	0430 1330	0430 1330	0430 1330	0430 1330	Off	Off	0930 1830	5-40
Assistant Cook	E-3	Off	Off	0500 1400	0500 1400	0430 1330	0930 1830	0930 1830	5-40
KP-1		Off	0430 1330	0430 1330	0430 1330	0430 1330	0730 1630	Off	5-40
KP-2		Off	0430 1330	0430 1330	0430 1330	0430 1330	0730 1630	Off	5-40
KP-3		Off	0430 1330	0430 1330	0430 1330	0430 1330	0730 1630	Off	5-40
KP-4		1000 1900	1000 1900	1000 1900	1000 1900	Off	Off	0930 1830	5-40
KP-5		1000 1900	1000 1900	1000 1900	1000 1900	Off	Off	0930 1830	5-40
KP-6		1000 1900	1000 1900	1000 1900	1000 1900	Off	Off	0930 1830	5-40
KP-7		0430 1330	Off	Off	1000 1900	1000 1900	0930 1830	0730 1630	5-40

TABLE 34 (cont'd)

PROJECTED DINING HALL PERSONNEL WORK SCHEDULE WHEN CONVERTING CONVENTIONAL SYSTEM TO A 40 HOUR WORKWEEK

Title	Grade	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Days-Hours/Week
KP-8		0430 1330	Off	Off	1000 1900	1000 1500	0930 1830	0730 1630	5-40
KP-9		0430 1330	Off	Off	1000 1900	1000 1500	0930 1830	0730 1630	5-40

Dining Hall Personnel Meal Times

(All personnel allowed two ½-hour meal periods.)

	Breakfast	Lunch	Dinner
Weekdays:	0515-0545	1000-1030/1500-1530	1745-1815
Weekends:	0715-0745	1000-1030/1400-1430	1700-1730

XV. SUMMARY AND CONCLUSIONS

The results of the CAFe experiment, the experimental phase of the systems studies of military garrison feeding, have been presented. The experiment was extremely successful. It incorporated many new features which increased customer satisfaction and reduced operating costs. Among these features were: improved menus, improved food quality, free access to three different types of facilities (A-ration, Short Order and Specialty), longer operating hours, unlimited quantities of food, better decor and a credit card system which eliminated headcount signature requirements.

The food service system experiment conducted at Fort Lewis provided the following conclusions:

- Central food preparation and central warewashing is feasible for the Army in a garrison food service situation. Food can be prepared centrally, chilled or frozen, stored and transported to satellite food outlets for heating and serving. Soiled tableware can be picked-up, cleaned and sanitized centrally, and returned to the outlets for use.

- Staffing and labor at the dining hall can be significantly reduced while maintaining a 40-hour work week for all personnel. The CAFe experiment achieved a reduction from 890 to 320 manhours at the food outlet. The extent of the reduction makes this system cost effective allowing approximately a 2.0 million dollar[6] annual saving at Fort Lewis when compared to conventional system.

- Customer satisfaction can be significantly improved. Using the 9-point hedonic scale, customer acceptance of the food in the CAFe system improved remarkably to a rating of 7.22 from a control rating of 5.66, for an increase of 28%. Features such as the specialty and short order facilities, more highly preferred food items in the menu, self-service, and improved food quality combined to produce the high degree of customer acceptance of the system.

- Customer attendance can be significantly increased. An increase from 51 to 60% was actually recorded during the experiment. Adding the

continental breakfast and late evening snack features can be expected to further increase attendance to 64%. This is a gain of 13 percentage points or a 25% increase over the pre-CAFe attendance.

- Food cost will increase if the customer is provided new menus with higher cost foods served more frequently, such as in the CAFe menu. This increase, however, will be small in an efficient central preparation system. The adjusted food cost for September was $1.55 versus a BDFA of $1.53. A small increase, such as this, will be offset by the increased yields made possible by volume preparation and the decreased waste made possible by sophisticated quality control and management information systems.

- The technical expertise needed to cope with the increased sophistication of a central food service system is not available in Army Food Service and will have to be obtained through military training and recruitment from the civilian sector.

- An alternative to the present signature headcount system is available and will provide an important cornerstone in a modern management information system that will allow automated ration management while offering the customer free access to any food outlet on post.

- Further systems development, and refinement should be conducted on a larger central preparation system. The CAFe experiment provided the data for establishing a food service system at a large Army base. A proposed system is described in a separate report[10].

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NOTE: Copies of technical reports that have "AD" numbers assigned may be obtained from (1) the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314, or (2) the National Technical Information Service, Springfield, Virginia 22151. The "AD" number should be cited when ordering copies of reports.

APPENDIX I

CAFe MENUS

SHORT ORDER CAFe
FORT LEWIS, WASHINGTON

— MENU —

DAILY MENU ITEMS

HOT ITEMS:

French Fries
Onion Rings
Chili
Pizza

COLD ITEMS:

Lettuce and Tomato
Pickles and Olives
Cole Slaw
Assorted Dressings

HOT SANDWICHES:

Hamburger
Cheeseburger
Hot Dog
Grilled Ham and Cheese
Sloppy Joe

COLD SANDWICHES:

Tuna Fish Salad
Ham and Cheese
Bacon, Lettuce and Tomato
Bologna
Salami

ACCESSORY ITEMS:

Potato Chips
Pastries of the Day
Milk
Coffee
Non-Carbonated Orange Drink

Milkshake (Vanilla and Chocolate Alternating)
Soft Serve Ice Cream (Vanilla, W/Rotation of Sauces — Chocolate, Pineapple and Butterscotch)
Carbonated Beverages (Cola, Fanta and Sprite)

SPECIAL ITEMS:

Mon — Cold Roast Beef on Bun
Hot Fish Sticks

Tue — Cold Sliced Turkey Sandwich
Western Sandwich

Wed — Cold Salmon Salad on Bun
Fried Ham and Egg Sandwich

Thu — Salami and Cheese Sandwich
Pepper Burger on Bun

Fri — Ham, Lettuce and Tomato Sandwich
Hot Fishwich on Bun

Sat — Bologna and Cheese Sandwich
Hot Franks and Beans

Sun — Denver Sandwich
Breaded Veal Cutlet

SPECIALTY CAFe
FORT LEWIS, WASHINGTON

— MENU —

Tacos
Fish-N-Chips
Assorted Pizza
Chili with Beans
Golden Fried Shrimp
Italian Spaghetti with Sauce
Oven Fried Chicken with Cranberry Sauce
Spanish Rice French Fries
Assorted Breads with Butter
Assorted Salads and Dressings
Assorted Pastries and Soft Serve with Assorted Sauces
Milk-Coffee-Assorted Soft Drinks-Beer

ADDITIONAL DAILY SPECIALTY ITEMS:

Mon — Enchiladas

Tue — Baked Lasagna

Wed — Tortillas

Thu — Ravioli With Tomato Sauce

Fri — Seafood Platter With Tartar Sauce

Sat — Pork Chop Suey With Steamed Rice

Sun — Barbecued Chicken (Omit Fried Chicken)

NOTE: In the event a scheduled food item is not available an appropriate substitute will be furnished as determined by CAFe Logistics System.

Day 1

BREAKFAST

A La Carte Breakfast
Chilled Orange Juice
Fresh Plums
Hot Hominy Grits
Butterfly Rolls

DINNER

Corned Beef Hash
Oven Fried Chicken
Chicken Gravy
Cranberry Sauce
Catsup
Mashed Potatoes
Buttered Mixed Vegetables
Blackeyed Peas
Mixed Fruit Salad
Lettuce Salad
Assorted Salad Dressings
Celery Sticks
Assorted Breads
Butter
White Cake
Coconut Butter Cream Frosting
Ice Cream
Iced Tea
Coffee
Milk

SUPPER

Breaded Pork Slices
Meat Loaf
Mushroom Gravy
Applesauce
Potatoes au Gratin
Buttered Lima Beans
Parsley Buttered Carrots
Cottage Cheese Salad
Tossed Vegetable Salad
Assorted Salad Dressings
Mixed Sweet Pickles
Assorted Breads
Butter
Ice Cream
Vanilla Wafers
Coffee
Iced Tea
Milk

Day 2

BREAKFAST

A La Carte Breakfast
Chilled Grapefruit and Orange Juice
Fresh Bananas
Home Fried Potatoes

DINNER

Beef Pot Pie
Tuna Salad Plate
Potato Chips
French Fried Potatoes
Buttered Peas
Buttered Whole Grain Corn
Cole Slaw w/Vinegar Dressing
Lettuce and Tomato Salad
Assorted Salad Dressings
Assorted Breads
Butter
Ice Cream
Coconut Drop Cookies
Coffee
Tea
Milk

SUPPER

Grilled Steak
Sauteed Mushrooms
Baked Potatoes
Buttered Mixed Vegetables
Buttered Green Beans
Tossed Green Salad
Assorted Salad Dressings
Jellied Fruit Salad
Ripe Olives
Pan Rolls
Butter
White Cake
Butter Cream Frosting
Ice Cream
Coffee
Iced Tea
Milk

Day 3

BREAKFAST

A La Carte Breakfast
Chilled Pineapple Juice
Chilled Cantaloupe
Baked Sausage Links
Pecan Rolls

DINNER

Bean Soup
Crackers
Sweet Sour Pork
Chow Mein Noodles
Veal Parmesan
Fried Rice
Buttered Carrots
Buttered Cauliflower
Cottage Cheese and Apricot Salad
Chef's Salad
Assorted Salad Dressings
Assorted Breads
Butter
Chilled Pears
Strawberry Shortcake w/Whipped Topping
Ice Cream
Iced Tea
Milk
Coffee

SUPPER

Beef Pot Roast
Seafood Platter
Tartar Sauce
Lemon Wedges
Mashed Potatoes
French Fried Potatoes
Buttered Broccoli
Corn on Cob
Mixed Fruit Salad
Cole Slaw w/Vinegar Dressing
Carrot Sticks
Assorted Breads
Butter
Ice Cream
Cantaloupe
Pineapple Pie
Coffee
Tea
Milk

Day 4

BREAKFAST

A La Carte Breakfast
Chilled Grape Juice
Chilled Grapefruit
Creamed Ground Beef on Biscuits
Cottage Fried Potatoes

DINNER

Minestrone Soup
Crackers
Pizza
Hot Roast Beef Sandwich
Brown Gravy
O'Brien Potatoes
Buttered Wax Beans
Buttered Spinach with Bacon
Tossed Green Salad
Assorted Salad Dressings
Jellied Banana Salad
Assorted Breads
Butter
Ice Cream
Apple Pie
Chilled Pears
Iced Tea
Coffee
Milk

SUPPER

Salisbury Steak
Roast Pork
Brown Gravy
Applesauce
Grilled Potato Cakes
Parsley Buttered Carrots
Buttered Peas and Mushrooms
Lettuce Salad
Assorted Salad Dressings
Cottage Cheese and Tomato Salad
Pan Rolls
Butter
Ice Cream
Peanut Wafers
Coffee
Tea
Milk

Day 5

BREAKFAST

A La Carte Breakfast
Chilled Grapefruit Juice
Chilled Applesauce
Cake Muffins

DINNER

Grilled Ham and Cheese Sandwich
Turkey Pot Pie
Potato Chips
French Fried Potatoes
Buttered Cabbage
Buttered Green Beans
Lettuce, Tomato Salad
Jellied Fruit Cocktail Salad
Assorted Salad Dressings
Assorted Breads
Butter
Fresh Peaches
Banana Cake
Butter Cream Frosting
Ice Cream
Coffee
Tea
Milk

SUPPER

Vealburgers
Mushroom Gravy
Spaghetti w/Meat Sauce
Grated Cheese
Cottage Fried Potatoes
Buttered Cream Style Corn
Buttered Broccoli
Mixed Fruit Salad
Spring Salad
Assorted Salad Dressings
Radishes
Pan Rolls
Butter
Orange Gelatin
Whipped Topping
Fruit Cocktail
Ice Cream
Iced Tea
Coffee
Milk

Day 6

BREAKFAST

A La Carte Breakfast
Chilled Orange Juice
Chilled Pineapple
Grilled Sausage Link
Swedish Tea Ring

DINNER

Barbecue Chicken
Breaded Pork Slices
Baked Beans
Oven Browned Potatoes
Southern Style Greens
Buttered Peas
Jellied Fruit Salad
Assorted Salad Dressings
Garden Vegetable Salad
Celery Sticks
Assorted Breads
Butter
Ice Cream
Cantaloupe
Brownies
Iced Tea
Coffee
Milk

SUPPER

Roast Beef
Brown Gravy
Buttered Noodles
Mashed Potatoes
Buttered Carrots
Buttered Cauliflower
Cottage Cheese and Tomato Salad
Chef's Salad
Assorted Salad Dressings
Assorted Breads
Butter
Strawberry Gelatin
Chilled Fruit Cocktail
Ice Cream
Pumpkin Pie
Coffee
Iced Tea
Milk

Day 7

BREAKFAST

A La Carte Breakfast
Chilled Grapefruit and Orange Juice
Fresh Plums
Hot Farina
Sugar Rolls

DINNER

Hot Turkey Sandwich
Chicken Gravy
Cranberry Sauce
French Fried Fish Portions
Lemon Wedges
Tartar Sauce
French Fried Potatoes
Parsley Buttered Potatoes
Whole Kernel Corn
Blackeyed Peas
Jellied Pear Salad
Tossed Green Salad
Assorted Salad Dressings
Assorted Breads
Butter
Ginger Bread
Whipped Topping
Ice Cream
Iced Tea
Coffee
Milk

SUPPER

Baked Ham
Brown Gravy
Swiss Steak w/Gravy
Mashed Potatoes
Baked Onions with Tomatoes
Buttered Mixed Vegetables
Banana Salad
Tossed Vegetable Salad
Chiffonade Dressing
Assorted Breads
Butter
Hermits
Ice Cream
Grapeade
Tea
Coffee
Milk

Day 8

BREAKFAST

A La Carte Breakfast
Chilled Orange Juice
Bananas
Hominy Grits
Raisin Toast

DINNER

Chicken Noodle Soup
Crackers
Simmered Frankfurters
Barbecued Beef Cubes
Catsup, Mustard
Home Fried Potatoes
Steamed Rice
Sauerkraut
Corn on Cob
Cole Slaw w/Cream Dressing
Lettuce Salad
Assorted Salad Dressings
Carrot Sticks
Frankfurter Rolls, Assorted Breads
Butter
Ice Cream
Cherry Pie
Chilled Fruit Cocktail
Coffee
Tea
Milk

SUPPER

Breaded Pork Slices
Meat Loaf
Brown Gravy
O'Brien Potatoes
Buttered Peas
Buttered Broccoli
Garden Vegetable Salad
Assorted Salad Dressings
Mixed Fruit Salad
Pan Rolls
Butter
Ice Cream
Yellow Cake
Butter Cream Frosting
Coffee
Tea
Milk

Day 9

BREAKFAST

A La Carte Breakfast
Grapefruit and Apple Juice
Cottage Fried Potatoes
Quick Coffee Cake

DINNER

Corned Beef Hash
Oven Fried Chicken
Chicken Gravy
Cranberry Sauce
Catsup
Mashed Potatoes
Buttered Mixed Vegetables
Buttered Green Beans
Cottage Cheese and Peach Salad
Spring Salad
Assorted Salad Dressings
Assorted Breads
Butter
Ice Cream
Yellow Cake
Peanut Butter Cream Frosting
Iced Tea
Coffee
Milk

SUPPER

Salisbury Steak
Mushroom Gravy
Veal Parmesan
Oven Browned Potatoes
Carrots Normandie
Buttered Cabbage
Tossed Green Salad
Assorted Salad Dressings
Jellied Fruit Salad
Assorted Breads
Butter
Raspberry Shortcake w/Whipped Topping
Ice Cream
Coffee
Iced Tea
Milk

Day 10

BREAKFAST

A La Carte Breakfast
Chilled Tomato Juice
Fresh Bananas
Cinnamon Raisin Rolls

DINNER

Lasagna
Swedish Meat Balls
Scalloped Potatoes
Buttered Spinach w/Lemon Wedges
Peas w/Onions
Cole Slaw w/Vinegar Dressing
Garden Vegetable Salad
Assorted Salad Dressings
Assorted Breads
Butter
Marble Cake
Chocolate Fudge Frosting
Watermelon
Ice Cream
Orangeade
Milk
Coffee
Tea

SUPPER

Grilled Steak
Sauteed Mushrooms
French Fried Onion Rings
Baked Potatoes
Creole Squash
Buttered Green Beans
Lettuce Salad
Assorted Salad Dressings
Jellied Fruit Salad
Ripe Olives
Pan Rolls
Butter
Chewy Nut Bars
Ice Cream
Iced Tea
Coffee
Milk

Day 11

BREAKFAST

A La Carte Breakfast
Chilled Orange Juice
Chilled Honey Dew Melon
Baked Sausage Links
Glazed Nut Coffee Cake

DINNER

Fried Ham Steaks
Brown Gravy
Mustard
Barbecued Beef on Buns
Mashed Potatoes
Baked Beans
Buttered Whole Kernel Corn
Buttered Peas
Tossed Vegetable Salad
Assorted Salad Dressings
Mixed Fruit Salad
Assorted Breads
Butter
Pineapple Upside Down Cake
Ice Cream
Grape Lemonade
Coffee
Tea
Milk

SUPPER

Country Style Chicken
Baked Pork Slices
Brown Gravy
Applesauce
Potatoes au Gratin
Buttered Mixed Vegetables
Stewed Tomatoes
Garden Cottage Cheese Salad
Spring Salad
Assorted Salad Dressings
Mixed Sweet Pickles
Pan Rolls
Butter
Ice Cream
Chocolate Chip Cookies
Iced Tea
Coffee
Milk

Day 12

BREAKFAST

A La Carte Breakfast
Chilled Orange Juice
Chilled Applesauce
Grilled Ham
Blueberry Muffins

DINNER

Turkey Rice Soup
Crackers
Beef Pot Pie w/Biscuit Topping
Tuna Salad Plate
Potato Chips
French Fried Potatoes
Buttered Broccoli
Buttered Green Beans
Lettuce, Tomato Salad
Jellied Fruit Cocktail Salad
Assorted Salad Dressings
Assorted Breads
Butter
Fresh Peaches
Ice Cream
Apricot Pie
Coffee
Tea
Milk

SUPPER

Beef Pot Roast
Braised Spareribs
Sauerkraut
Mashed Potatoes
Buttered Cream Style Corn
Chef's Salad
Assorted Salad Dressings
Cottage Cheese and Apricot Salad
Green Olives
Assorted Breads
Butter
Butternut Refrigerator Cookies
Ice Cream
Limeade
Coffee
Tea
Milk

Day 13

BREAKFAST

A La Carte Breakfast
Chilled Grapefruit Juice
Fresh Bananas
Home Fried Potatoes

DINNER

Salisbury Steak
Veal Parmesan
Brown Gravy
Scalloped Potatoes
Oven Browned Potatoes
Baked Onions w/Tomatoes
Buttered Cauliflower
Cole Slaw w/Vinegar Dressing
Lettuce and Tomato Salad
Assorted Salad Dressings
Assorted Breads
Butter
White Cake
Chocolate Butter Cream Frosting
Ice Cream
Coffee
Tea
Milk

SUPPER

Roast Turkey
Giblet Gravy
Cranberry Sauce
Sausage Dressing
Mashed Potatoes
Buttered Peas
Buttered Whole Kernel/Corn
Tossed Vegetable Salad
Assorted Salad Dressings
Mixed Fruit Salad
Green Olives
Pan Rolls
Butter
Chilled Pears
Ice Cream
Fruit Bars
Coffee
Tea
Milk

Day 14

BREAKFAST

A La Carte Breakfast
Chilled Orange Juice
Chilled Grapefruit
Hot Hominy Grits
Hot Cross Buns

DINNER

Corned Beef Hash
Oven Fried Chicken
Chicken Gravy
Cranberry Sauce
Buttered Noodles
Mashed Potatoes
Buttered Asparagus
Buttered Mixed Vegetables
Jellied Banana Salad
Lettuce Salad
Assorted Salad Dressings
Celery Sticks
Assorted Breads
Butter
Blueberry Pie
Ice Cream
Iced Tea
Coffee
Milk

SUPPER

Swedish Meat Balls
Roast Fresh Ham
Brown Gravy
Applesauce
Parsley Buttered Potatoes
Glazed Sweet Potatoes
Sauerkraut
Buttered Cream Style Corn
Lettuce and Tomato Salad
Garden Vegetable Salad
Assorted Salad Dressings
Assorted Breads
Butter
Yellow Cake
Brown Sugar Frosting
Ice Cream
Iced Tea
Coffee
Milk

Day 15

BREAKFAST

A La Carte Breakfast
Chilled Grapefruit and Orange Juice
Chilled Pineapple
Grilled Sausage Links
Twist Coffee Cake

DINNER

Minestrone Soup
Crackers
Pizza
Hot Roast Beef Sandwich
Brown Gravy
Hash Brown Potatoes
Buttered Wax Beans
Glazed Carrots
Jellied Fruit Cocktail Salad
Tossed Vegetable Salad
Assorted Salad Dressings
Assorted Breads
Butter
Butterscotch Brownies
Ice Cream
Coffee
Iced Tea
Milk

SUPPER

French Fried Shrimp
Swiss Steak w/Gravy
Tartar Sauce
Seafood Cocktail Sauce
Mashed Potatoes
French Fried Potatoes
Buttered Broccoli
Corn on Cob
Mixed Fruit Salad
Cole Slaw w/Vinegar Dressing
Carrot Sticks
Assorted Breads
Butter
Chilled Cantaloupe
Peach Pie
Ice Cream
Coffee
Tea
Milk

Day 16

BREAKFAST

A La Carte Breakfast
Chilled Grape Juice
Chilled Grapefruit
Creamed Ground Beef on Biscuits
Home Fried Potatoes

DINNER

Beef Stew
Barbecued Spareribs
O'Brien Potatoes
French Fried Onion Rings
Buttered Spinach w/Bacon
Tossed Green Salad
Assorted Salad Dressings
Jellied Fruit Salad
Assorted Breads
Butter
Blackberry Pie
Chilled Pears
Ice Cream
Iced Tea
Coffee
Milk

SUPPER

Grilled Steak
Sauteed Mushrooms
Baked Potatoes
Buttered Carrots
Buttered Peas
Cottage Cheese and Tomato Salad
Chef's Salad
Assorted Salad Dressings
Pan Rolls
Butter
Strawberry Gelatin
Chilled Fruit Cocktail
Peanut Butter Cookies
Ice Cream
Coffee
Tea
Milk

Day 17

BREAKFAST

A La Carte Breakfast
Chilled Orange Juice
Fresh Plums
Cottage Fried Potatoes
Crumb Cake

DINNER

Vegetable Soup
Crackers
Baked Ham Steak
Meat Ball Sandwich
Glazed Sweet Potatoes
Grilled Potato Cakes
Lyonnaise Green Beans
Buttered Cabbage
Jellied Fruit Cocktail Salad
Tossed Vegetable Salad
Assorted Salad Dressings
Assorted Breads
Butter
Ice Cream
Devils Food Cake
Butter Cream Frosting
Coffee
Tea
Milk

SUPPER

Beef Pot Roast
Seafood Platter
Seafood Cocktail Sauce
Buttered Noodles
French Fried Potatoes
Buttered Mixed Vegetables
Southern Style Greens
Lemon Wedges
Tartar Sauce
Tossed Green Salad
Assorted Salad Dressings
Jellied Pear Salad
Dill Pickle Slices
Assorted Breads
Butter
Peach Shortcake w/Whipped Topping
Ice Cream
Coffee
Iced Tea
Milk

Day 18

BREAKFAST

A La Carte Breakfast
Chilled Pineapple Juice
Fresh Bananas
Grilled Ham Slices
Stollen Coffee Cake

DINNER

Veal Loaf
Brown Gravy
Deep Fat Fried Fish
Tartar Sauce
Lemon Wedges
Mashed Potatoes
Baked Macaroni and Cheese
Buttered Peas
Buttered Lima Beans
Cole Slaw w/Cream Dressing
Spring Salad
Assorted Salad Dressings
Hard Cooked Eggs
Assorted Breads
Butter
Ice Cream
Apple Pie
Coffee
Tea
Milk

SUPPER

Roast Beef
Natural Pan Gravy
Oven Browned Potatoes
French Fried Onion Rings
Baked Onions w/Tomatoes
Banana Salad
Tossed Vegetable Salad
Assorted Salad Dressings
Pan Rolls
Butter
Crisp Toffee Bars
Ice Cream
Coffee
Tea
Milk

Day 19

BREAKFAST

A La Carte Breakfast
Chilled Tomato Juice
Chilled Honeydew Melon
French Quick Coffee Cake

DINNER

Vegetable Soup
Crackers
Grilled Ham and Cheese Sandwich
Breaded Veal Steaks
Potato Chips
Cottage Fried Potatoes
Buttered Broccoli
Buttered Mixed Vegetables
Jellied Fruit Salad
Lettuce Salad
Assorted Salad Dressings
Assorted Breads
Butter
Spice Cake
Butter Cream Frosting
Chilled Apricots
Ice Cream
Coffee
Tea
Milk

SUPPER

Salisbury Steak
Roast Pork
Brown Gravy
Applesauce
Grilled Potato Cakes
Parsley Buttered Carrots
Buttered Peas and Mushrooms
Garden Vegetable Salad
Assorted Salad Dressings
Cottage Cheese and Peach Salad
Assorted Breads
Butter
Ice Cream
Chocolate Drop Cookies
Coffee
Tea
Milk

Day 20

BREAKFAST

A La Carte Breakfast
Chilled Apple Juice
Chilled Cantaloupe

DINNER

Beef Barley Soup
Crackers
Baked Lasagna
Hot Turkey Sandwich
Chicken Gravy
Mashed Potatoes
Buttered Asparagus
Buttered Spinach w/Bacon
Spring Salad
Assorted Salad Dressings
Cole Slaw w/Cream Dressing
French Bread
Butter
Ice Cream
Oatmeal Cookies
Fresh Pears
Coffee
Tea
Milk

SUPPER

Baked Ham
Applesauce
Swiss Steak w/Gravy
Hash Brown Potatoes
Steamed Rice
Buttered Cabbage
Buttered Wax Beans
Tossed Greens
Assorted Salad Dressings
Cottage Cheese and Apricot Salad
Pan Rolls
Butter
Ice Cream
Boston Cream Pie
Coffee
Tea
Milk

A LA CARTE BREAKFAST ITEMS*

Pancakes
Cereal
Maple Syrup
Jam
Jelly
Scrambled Eggs
Omelet with or without Ham, cheese and/or Onions
Eggs to order
French Toast
Bacon
Steak**

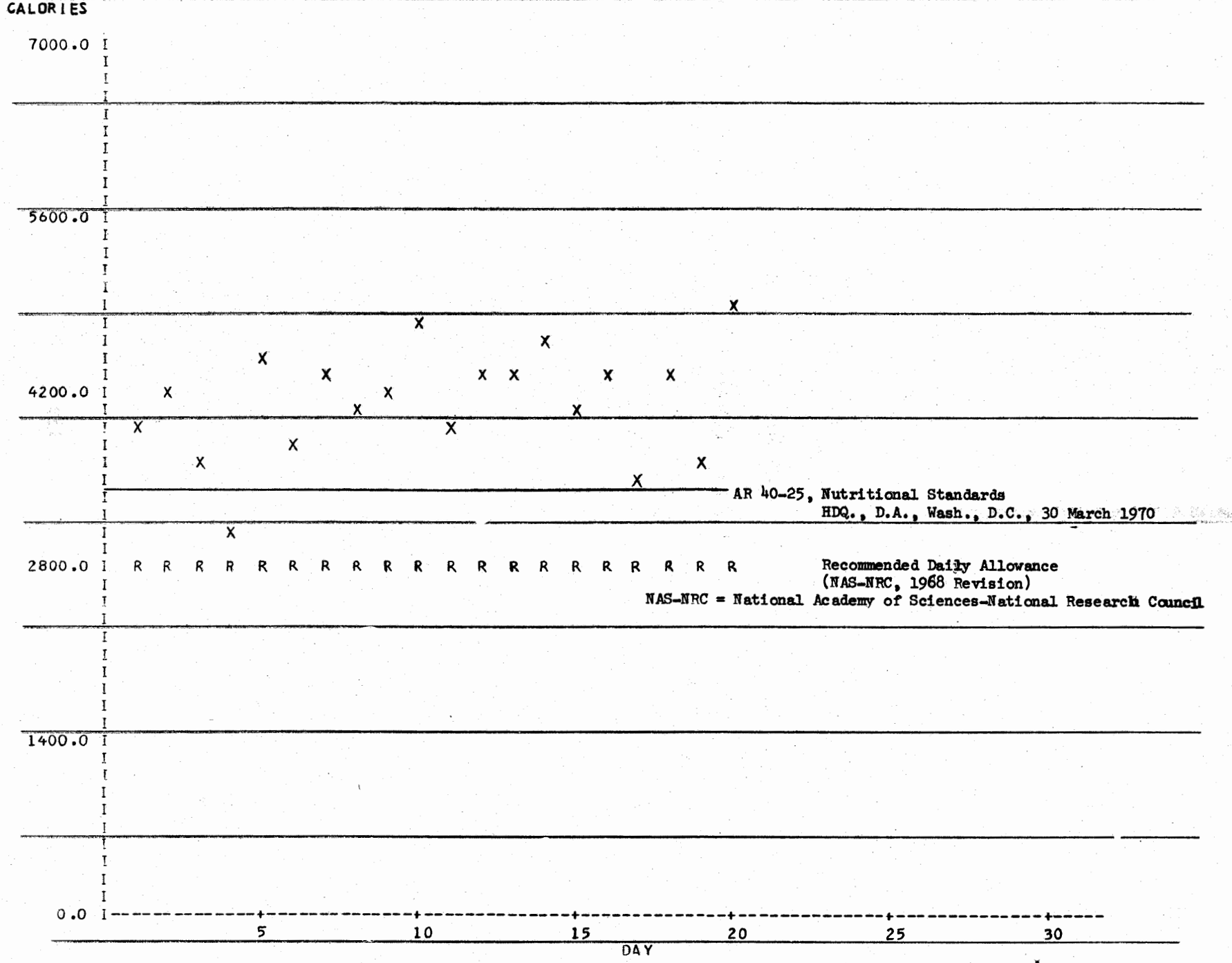
*The A La Carte Breakfast Items supplement fruits, juices, potatoes, sausage, ham, and baked items which are listed on the daily menu.

**Steak will be served for breakfast on Saturdays, Sundays, and Holidays only.

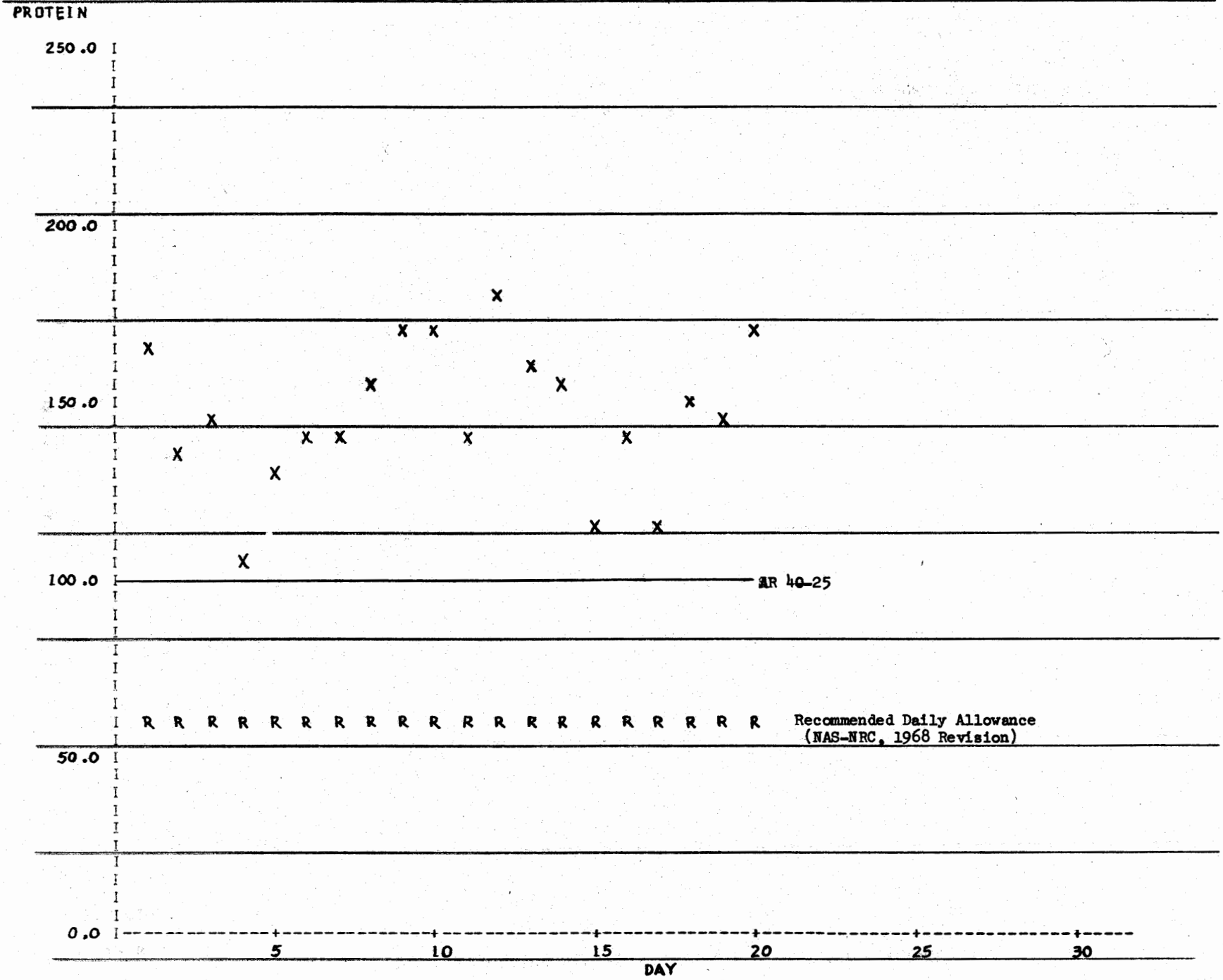
APPENDIX II

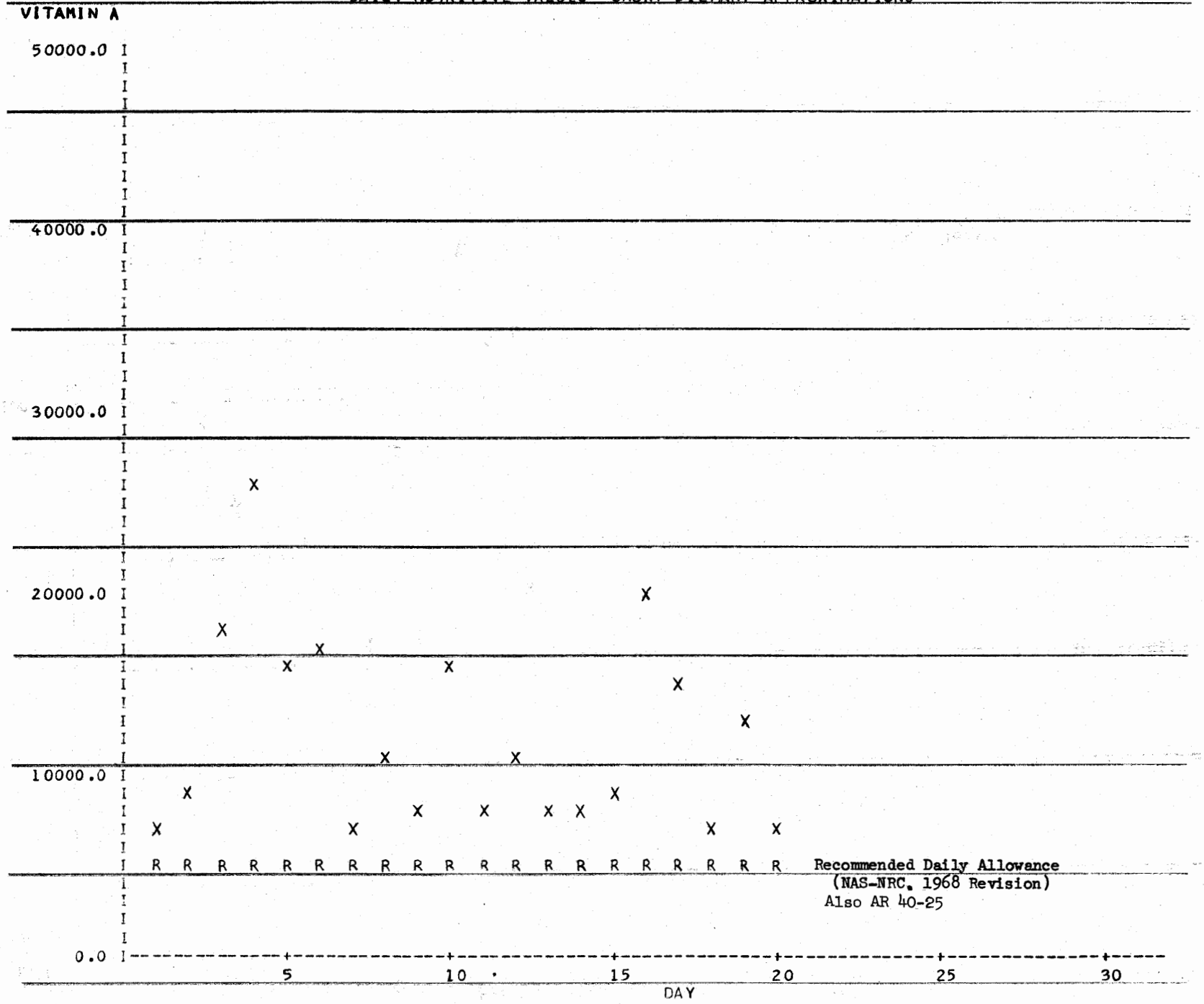
NUTRITIVE VALUES

DAILY NUTRITIVE VALUES--SHORT DIETARY APPROXIMATIONS



DAILY NUTRITIVE VALUES--SHORT DIETARY APPROXIMATIONS

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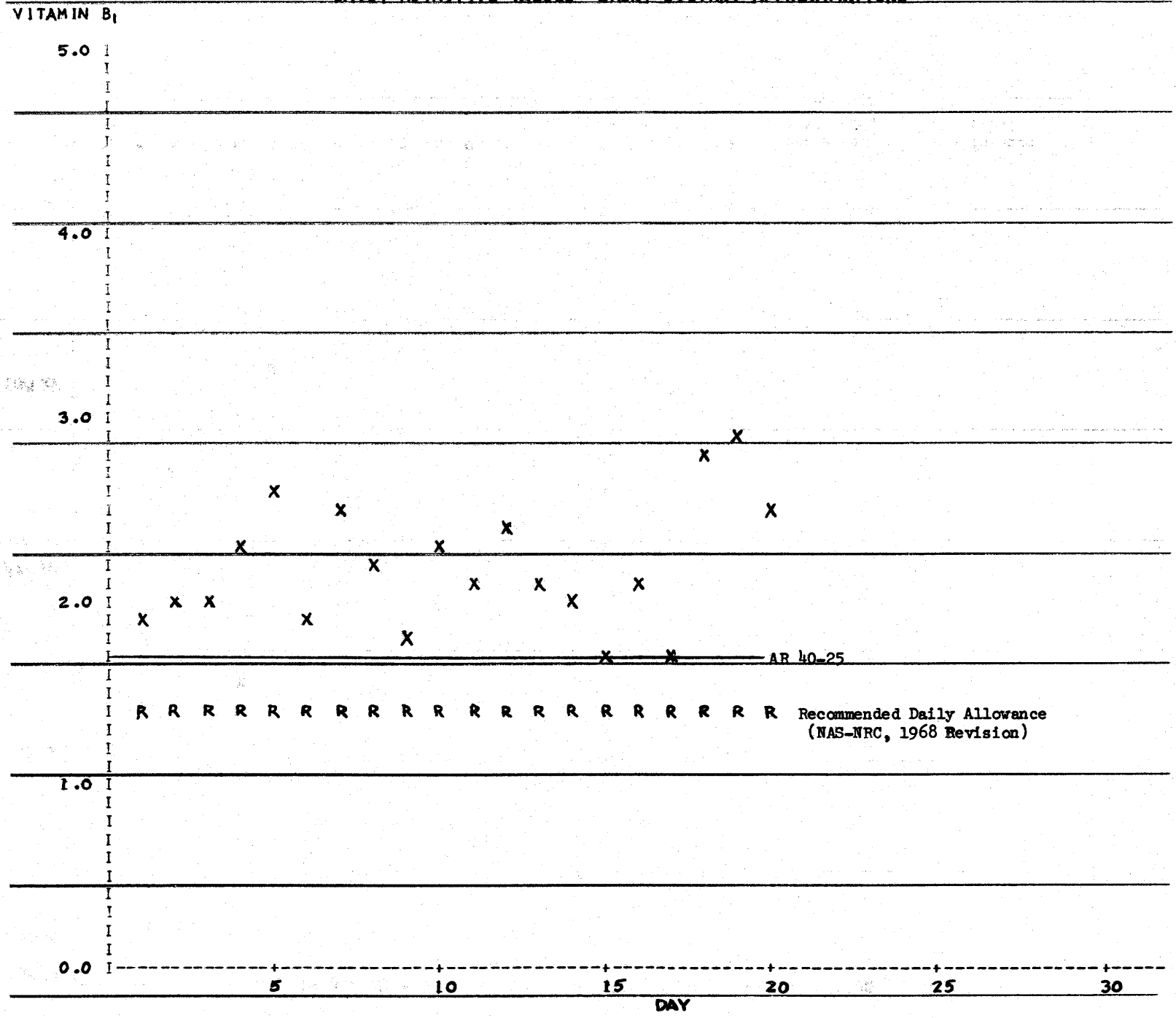
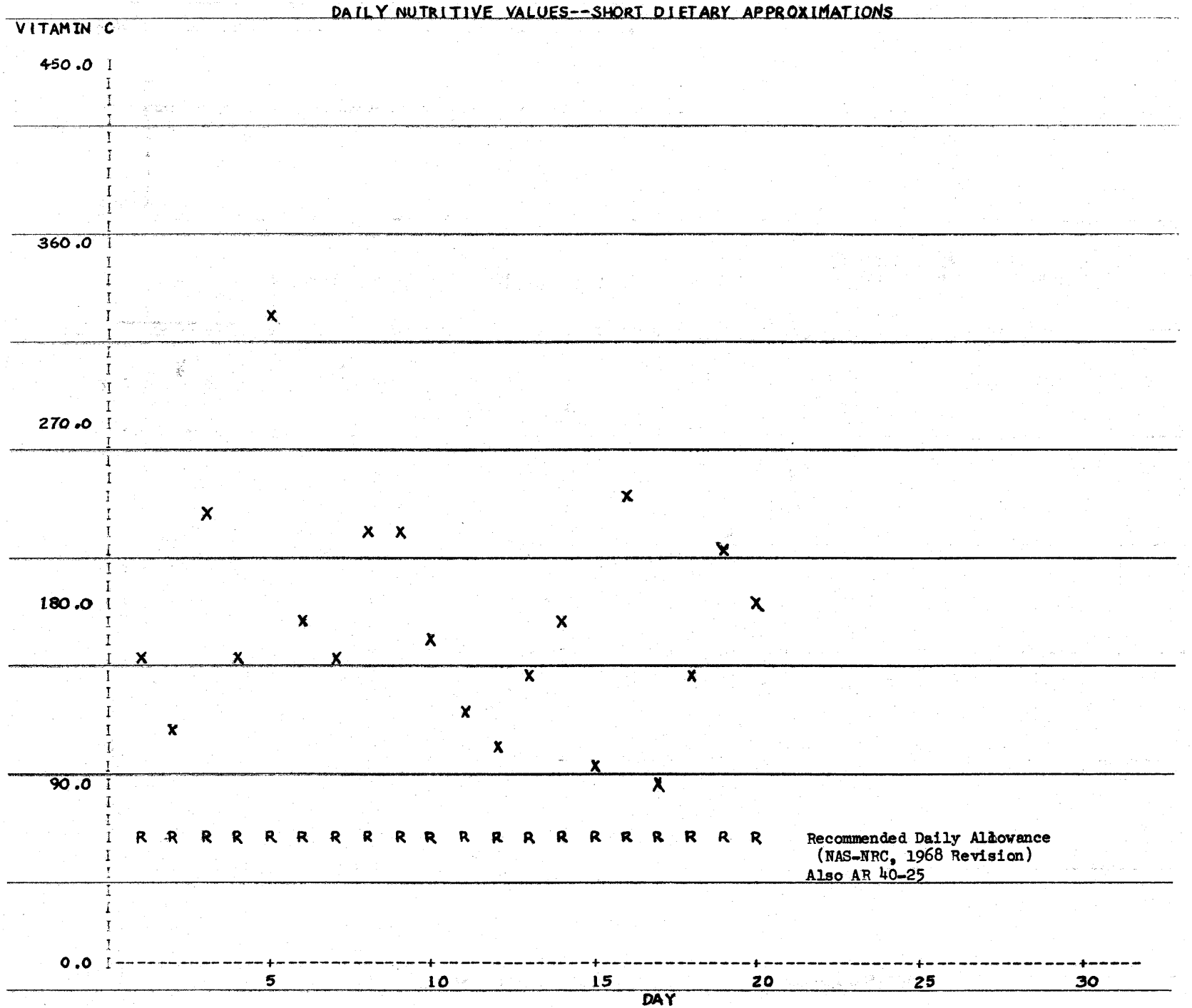
DAY
Recommended Daily Allowance
(NAS-NRC, 1968 Revision)
Also AR 40-25

DAILY NUTRITIVE VALUES--SHORT DIETARY APPROXIMATIONS

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R R R R R R R R R R R R R R R R R R R R
Recommended Daily Allowance
(NAS-NRC, 1968 Revision)
Also AR 40-25
5
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25
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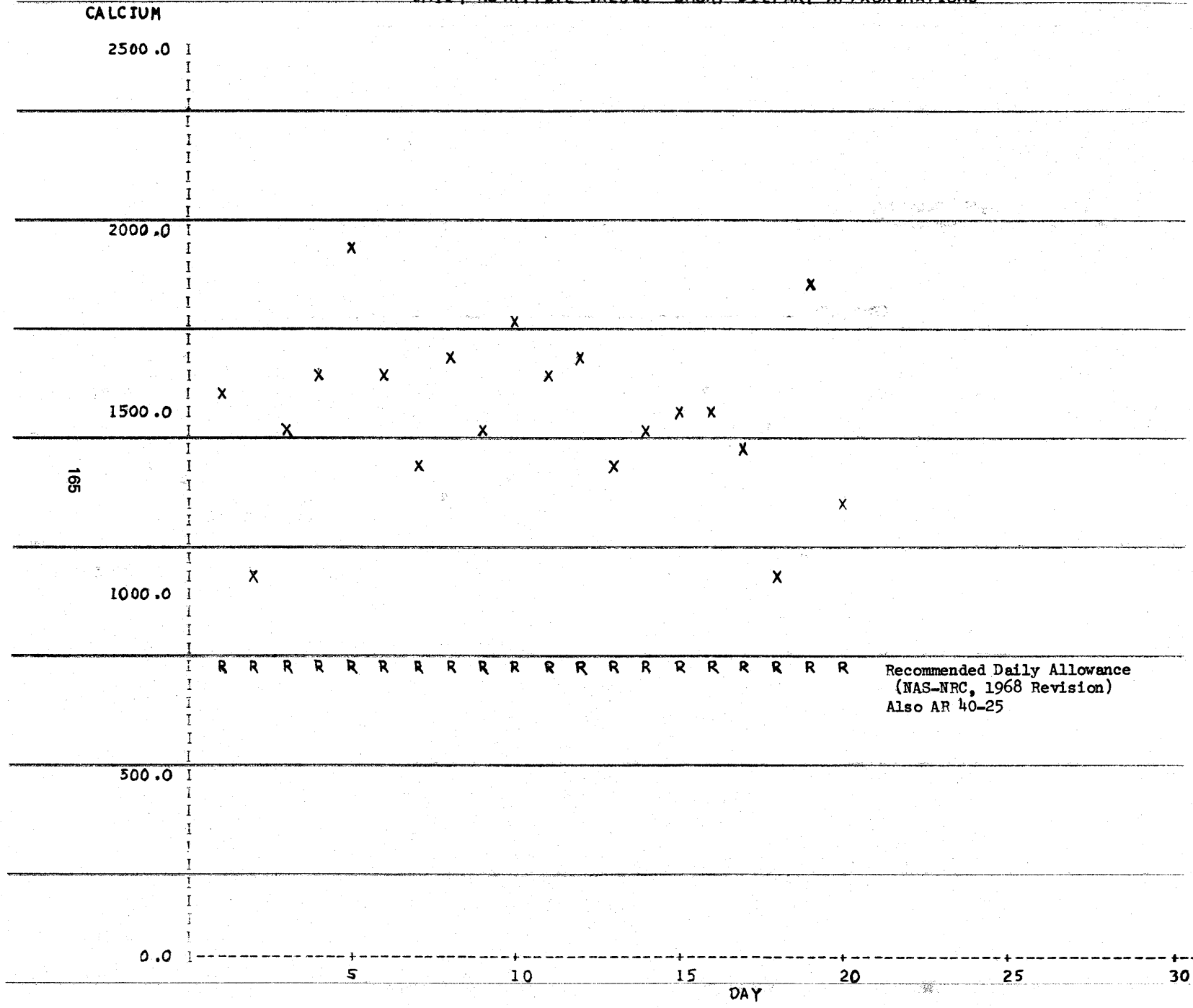
DAY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Recommended Daily Allowance
(NAS-NRC, 1968 Revision)
Also AR 40-25
5
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20
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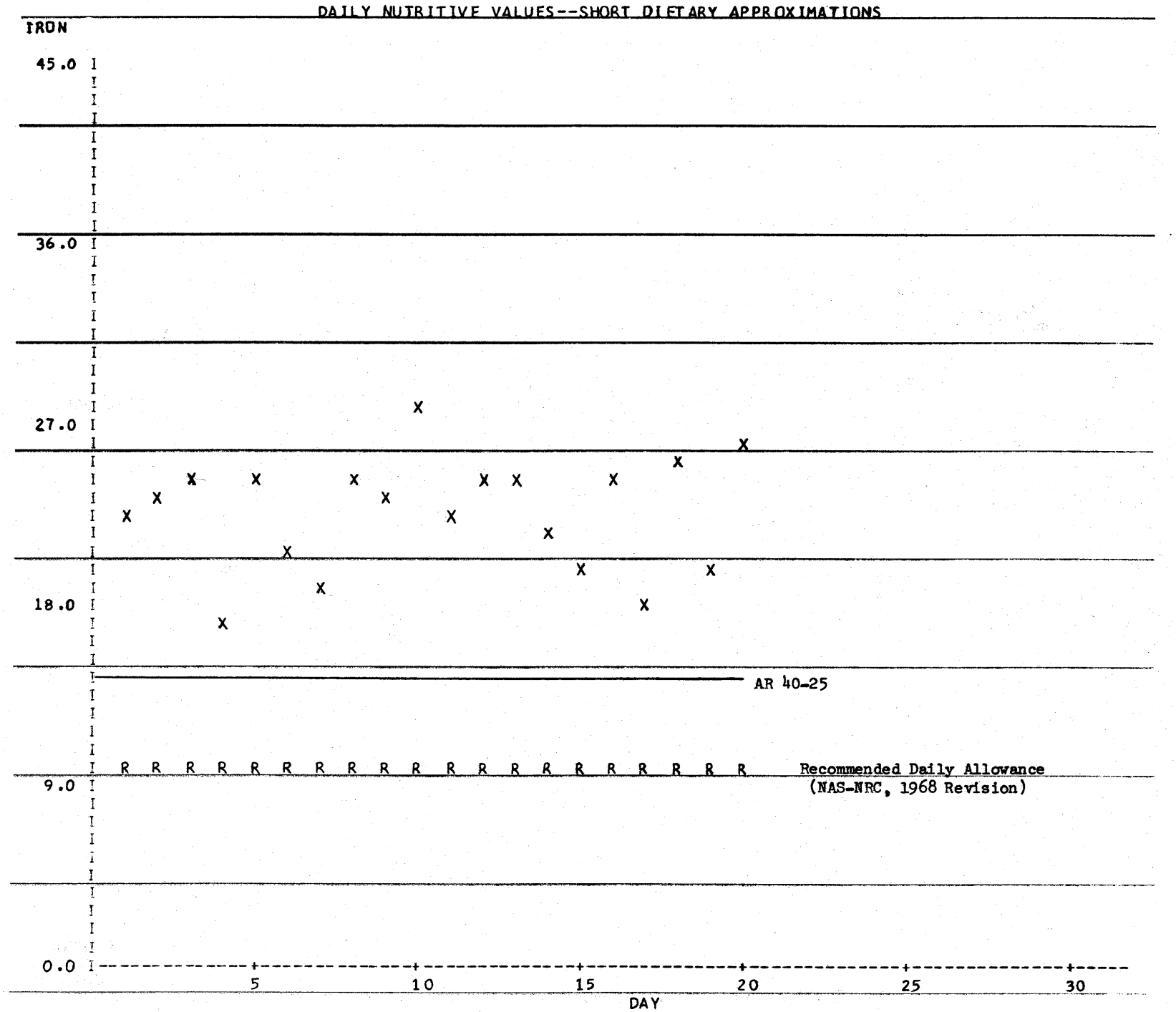
DAY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18.0
9.0
0.0
AR 40-25
Recommended Daily Allowance
(NAS-NRC, 1968 Revision)
5
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20
25
30
DAY

APPENDIX III

SAMPLE MENU GUIDE AND PREPARATION GUIDES

MENU GUIDE DATE: _____

Menu Item	Recipe No.	Central Prep.	Bakery	On Site
BREAKFAST				
A La Carte Breakfast				
Chilled Pineapple				Open can, serve
Chilled Orange Juice				Prepare, serve
Grilled Sausage Links	L-88			Prepare, serve
Swedish Tea Ring	D-G-7(4)		Prepare	Serve
DINNER				
Barbecue Chicken	L-128	Prepare, cook, chill		Heat, serve
Breaded Pork Slices	L-86	Prepare, cook, chill		Heat, serve
Baked Beans	Q-2	Prepare, cook, chill		Heat, serve
Oven Browned Potatoes	Q-50	Prepare, chill		Cook, serve
Southern style greens	Q-G-3			Heat, serve
Buttered Peas	Q-G-3			Heat, serve
Jellied Fruit Salad	M-25	Prepare, chill		Serve
Assorted Salad Dressings				Serve
Garden Vegetable Salad	M-19	Prepare ingred., chill		Combine, serve
Celery Sticks		Prepare		Serve
Assorted Breads				Serve
Butter				Serve
Ice Cream				Self Service
Cantaloupe				Serve
Brownies	H-2		Prepare	Serve
Iced Tea	C-14			Prepare, serve
Coffee	C-5			Prepare, serve
Milk				Serve

MENU GUIDE (Cont'd) DATE: _____

Menu Item	Recipe No.	Central Prep.	Bakery	On Site
SUPPER				
Roast Beef	L-5			Prepare, cook, serve
Brown Gravy	O-16(1)	Prepare, chill		Heat, serve
Buttered Noodles	E-4			Cook, serve
Mashed Potatoes	Q-57			Rehydrate, serve
Buttered carrots	Q-G-2	Prepare carrots		Cook, serve
Buttered Cauliflower	Q-G-3			Heat, serve
Cottage Cheese and Tomato Salad	M-14	Prepare ingred., chill except tomatoes		Slice tomatoes, combine, serve
Chef's Salad	M-7	Prepare & pkg ingred. except tomatoes		Slice tomatoes, combine, serve
Assorted Salad Dressings				Serve
Assorted Breads				Serve
Butter				Serve
Strawberry Gelatin	J-10	Prepare		Whip topping, serve
Chilled Fruit Cocktail				Open can, serve
Ice Cream				Self Service
Pumpkin Pie	J-45		Prepare	Serve
Coffee	C-5			Prepare, serve
Iced Tea	C-14			Prepare, serve
Milk				Serve

PREPARATION GUIDE
MINESTRONE SOUP CONCENTRATE (1 : 1)

YIELD: 3 1/8 Gallons Concentrate **P-19** **EACH PORTION:**

Ingredients	Weights	Measures
Onions, dehydrated sliced	4 oz	
Water	1 lb 1 oz	2 2/3 cups
Butter or margarine	1 lb	
Garlic, dry, minced	1 oz	
Cabbage, fresh, chopped	1 lb	
Carrots, fresh, chopped	2 lb	
Celery, fresh, chopped	2 lb	
Parsley, dehydrated	½ oz	
Potatoes, white, fresh, chopped	2 lb	
Tomatoes, canned	6 lb 6 oz.	3 qt (1 No. 10 can)
Beef, soup and gravy base	1 lb	
Water, boiling	12 lb 7 oz	1½ gal
Beans, green, canned, drained	1 lb	2 qt (2/3 No. 10 can)
Beans, kidney, canned, drained	3 lb	6 cups (½ No. 10 cn or 3 No. 303 cn)
Macaroni	1 lb 8 oz	3 qt
Bay Leaves		2 leaves
Pepper, black	2.4 gm/	1 tsp
Salt	2 oz	

Method

1. Cover onions with water and allow to stand 20 to 30 minutes until rehydrated. Drain. Save rehydrated onions for use in Step 2.
2. Saute garlic and onions in butter or margarine until onions are light yellow. Do not brown onions.
3. Add vegetables; mix well. Cover and cook at low heat 15 minutes, stirring occasionally.
4. Add beef soup and gravy base to boiling water. Stir well.
5. Add remaining ingredients. Mix well.
6. Bring to a boil; reduce heat, simmer 30 minutes or until vegetables are tender. More water may be added if necessary to result in final yield of 3 1/8 gallons of soup concentrate.

NOTE: To reconstitute soup add 3 1/8 gallons of water to 3 1/8 gallons of concentrate. Stir well and heat to 160°F.
Yield: 100 portions. EACH PORTION: 1 Cup

PREPARATION GUIDE

VEGETABLE SOUP CONCENTRATE (1:1)

YIELD: 3 1/8 Gallons Concentrate **P- 7** **EACH PORTION: 1 Cup**

Ingredients	Weights	Measures	Method
Tomatoes, canned	12 lb 12 oz	2 No. 10 cn	1. Heat tomatoes and water to boil.
Water	2 lb	1 qt	
Beef soup and gravy base	1 lb 4 oz		2. Add beef soup and gravy base to boiling mixture of tomatoes and water. Stir well to dissolve.
Carrots, fresh diced	2 lb		3. Add remaining ingredients. Stir and bring to a boil. Cover and simmer 40 minutes or until vegetables are tender. Stir occasionally. More water may be added if necessary to result in a final yield of 3 1/8 gallons soup concentrate.
Onions, dry chopped	2 lb		
Celery, fresh chopped	2 lb		
Peppers, sweet, fresh chopped	8 oz		
Potatoes, white, fresh chopped	3 lb		
Cabbage, fresh, chopped	2 lb		
Salt	3 oz		
Pepper, black	4.7 gm	2 tsp	

Mess Hall Preparation: To reconstitute soup add 3 1/8 gallons of water to 3 1/8 gallons of concentrate. This will yield 100 portions. EACH PORTION: 1 Cup Stir well and heat product temperature to 160°F.

PREPARATION GUIDE

GARDEN VEGETABLE SALAD – Central preparation

YIELD: 100 Portions M-19 **EACH PORTION: 1 Cup (2 ¼ oz)**

Ingredients	Weights	Measures	Method
Lettuce, fresh, trimmed	7 lb		Wash lettuce and tear into pieces.
Carrots, fresh, sliced	2 lb	6 ½ cups	Combine lettuce with other vegetables.
Celery, fresh, chopped	3 lb	2 ¼ qt	
Peppers, sweet, fresh chopped	2 lb	1 ½ qt	
Antioxidant compound	10 gm/ gal		Dip into antioxidant solution for 2 to 4 minutes, drain and centrifuge. Place 3 ½ lb in poly bags, and refrigerate.
Water, cold			

Yield: 4 bags

PREPARATION GUIDE

COLE SLAW – Central Preparation

YIELD: 100 Portions, 4 Bags	M-9		EACH PORTION : ½ Cup
Ingredients	**Weights**	**Measures**	**Method**
Cabbage, fresh, finely shredded	12 lb	5½ gal	1. Wash shredded cabbage, drain and centrifuge; place approximately 3 lbs in polyethylene bags and refrigerate.
Salad dressing	4 lb	2 qt	2. Combine salad dressing, salt, sugar, and vinegar. Place in stainless steel container, cover and refrigerate.
Salt	1.3 oz	2 tbsp	
Sugar, granulated	12 oz	1½ cups	
Vinegar	4 oz	½ cup	
Paprika (optional)	2.3 gm/	1 tsp	

Mess Hall Preparation:

1. Salad to be combined with salad dressing and garnished at Mess Halls according to recipe.
2. 15 lb fresh cabbage A.P. will yield 12 lb finely shredded cabbage.
3. 2 lb shredded red cabbage may be substituted for 2 lb cabbage.
4. 4 lb (2 qt) Cole Slaw Dressing may be used for ingredients in Step 2.

PREPARATION GUIDE

HOMEFRIED POTATOES -- Central Preparation

YIELDS: 100 Portions, 4 Bags Q-47		EACH PORTION: 2/3 Cup (6 oz)
PAN SIZE: Stainless steel -- ½ Steam Table		TEMPERATURE: 400°F. Griddle
Ingredients	**Weights**	**Method**
Potatoes, white, fresh (in season), 3/16 inch slice	35 lb	Peel potatoes in carborundum peeler for 1 minute and hand finish. Slice. Keep potatoes submerged in antioxidant solution while not being processed.
Antioxidant compound	10 gm/	
Water, cold	10 gal	
Water boiling		Bring fresh water to boiling and blanch potatoes 2–3 minutes. Cool with running water to wash off starch and then continue cooling with chilled water circulating through jacketed kettle until product temperature reaches about 50°F. Drain well, place 8-3/4 lb in poly bags and refrigerate.

Mess Hall Preparation: Place one layer of potatoes on well greased griddle. Cook about 25 minutes, turn occasionally to insure even browning. Sprinkle with salt and pepper. Potatoes can also be fried in case of absence of griddle.

PREPARATION GUIDE

POTATOES AU GRATIN -- Central Preparation

YIELD: 100 portions Q-51			EACH PORTION: 1 Cup (7 oz)
Yield: 10 pans			TEMPERATURE: 375°F. Oven
Ingredients	**Weights**	**Measures**	**Method**
Potatoes, white, fresh (in season), ½-inch slices	35 lb		Peel potatoes in carborundum peeler for 1 minute and hand finish. Slice. Keep potatoes submerged in antioxidant solution while not being processed.
Antioxidant compound	10 gm/		
Water, cold	10 gal		
Water, boiling	24 lb.	3 gal	Bring fresh, salted water to a boil and cook potatoes 20 minutes or until tender. Quickly cool in running cold water for a few minutes and then continue cooling with chilled water running through kettle jacket until product temperature reaches 50°F. Drain and place 3½ lb potatoes in each stainless steel roasting pan. Or place 1½ lb of fresh sliced potatoes in each stainless steel roasting pan and steam for 7–10 minutes. Cut the salt in halve and distribute evenly on the pans.
Salt	5 oz.		
Milk, nonfat, dry	1 lb 4 oz	4 1/3 cups	Reconstitute milk. Heat to just below boiling. Do not boil.
Water, warm	11 lbs	5½ qts	
Butter or margarine, melted	1 lb 8 oz	3 cups	Blend butter or margarine and flour together until smooth. Add roux and salt to milk, stirring constantly. Simmer 5 minutes or until thickened.
Flour, wheat, hard	12 oz	3 cups	
Salt	2 oz	3 tbsp	
Cheese, cheddar, ground	3 lb	2¼ qt	Add cheese and mustard to sauce. Stir until cheese is melted. Pour 1½ lb sauce evenly over potatoes in each pan.
Mustard, ground	2.2 gm/	1 tsp	
Bread crumbs, dry	1 lb	3 cups	Blend crumbs and butter or margarine. Add cheese. Sprinkle 2 cups of mixture over each pan of potatoes. Cool until product temperature reaches 50°F. and then refrigerate.
Butter or margarine, melted	8 oz	1 cup	
Cheese, cheddar, ground	8 oz	1½ cups	

Mess Hall Preparation: Bake uncovered at 375°F. 45 Minutes or until browned, in a convection oven.

NOTE: 45 lbs of white potatoes A.P. yield 35 lbs peeled potatoes.

PREPARATION GUIDE

PAPRIKA BUTTERED POTATOES – Central Preparation

YIELD: 100 Portions			EACH PORTION: 2 med potatoes (6 oz)
YIELD: 10 Pans			TEMPERATURE 350°F. Oven
Ingredients	**Weights**	**Measures**	**Method**
Potatoes, white, fresh, (in season)	35 lb		Peel potatoes in carborundum peeler for 1 minute and hand finish. Quarter to approximately 1 inch. Keep potatoes submerged in antioxidant solution while not being processed.
Antioxidant compound	10 gm/		
Water, cold	10 gal		
Water, boiling	16–25 lb	2–3 gal.	Bring fresh, salted water to boiling and boil potatoes 25–30 minutes. Cool with running cold water to wash excess starch and then continue cooling with chilled water circulating through jacketed kettle until product reaches about 50°F. Drain well.
Salt	5 oz		
Butter, melted	1¼ lb	2½ cups	Place potatoes in pans in a single layer. Pour butter equally over potatoes. Sprinkle paprika over potatoes, cover with aluminum or mylar and refrigerate.
Paprika			

Mess Hall Preparation: Heat in a convection oven with covers on, to 150°F.–160°F.

NOTE: 45 lbs of white potatoes yield 35 lbs peeled potatoes.

PREPARATION GUIDE

BAKED POTATOES -- Central Preparation

YIELD: 100 Portions Q-44			EACH PORTION: One Potato
			TEMPERATURE: 400°F
Ingredients	**Weights**	**Measures**	**Method**
Potatoes, white, fresh A.P.	55 lb		Select medium size potatoes. Cut in halves large potatoes. Scrub potatoes thoroughly removing any blemishes. Cut potatoes should be placed in antioxidant solution for 2–3 minutes before wrapping. Brush with shortening, wrap with aluminum foil, place in polyethylene bags and refrigerate.
Shortening, melted or meat drippings	1 lb	2 cup	

Mess Hall Preparation: Bake at 350°F. for 1 hour or until done. Serve.

PREPARATION GUIDE

SPANISH RICE — Central Preparation

YIELD: 100 Portions, 10 Pans E-9 **EACH PORTION: 3/4 Cup**

Ingredients	Pounds	Ounces	Grams
Rice	6		
Water, cold	14		
Salt		2	
Bacon, chopped	2		
Onions, dry, chopped	4		
Peppers, sweet, fresh chopped	2		
Shortening or bacon drippings		8	
Bay leaves, crumbled			2 leaves
Garlic, dry, minced			3 cloves
Pepper, black			9
Salt		2	
Sugar, granulated		8	
Tomato, canned, crushed	19	2	

Method

1. Combined all ingredients in steam kettle. **Cover** and simmer 10 minutes. Uncover and **allow rice** to steam dry 3–5 minutes. Set aside **for use** in step 4.
2. Saute bacon until crisp; add onions, peppers **and** shortening; saute until lightly browned.
3. Combine sauteed mixture with **spice and** tomatoes. Heat to boiling.
4. Add rice; stir to mix.
5. Place approximately 5 lb in ½ steam **table pan.** Chill to 40°F. Cover and label properly.

Reconstitution at Mess Hall: Reconstitute in oven set at 375°F. for 45 minutes or until a center temperature reaches **165°F.** or higher.

NOTE: 8 oz dehydrated onions and 5 1/3 oz dehydrated green peppers (properly rehydrated and drained) may be **used in** step 2.

PREPARATION GUIDE

CARROTS NORMANDIE – Central Preparation

YIELD: 100 Portions, 10 Pans Q-17(2) | **EACH PORTION: ½ Cup (4 7/8 oz)**

PAN SIZE: Stainless Steel -- ½ Steam Table | **TEMPERATURE: 400°F. Oven**

Ingredients	Weights	Measures	Method
Carrots, fresh, cut in 2–inch strips	20 lb		Add carrots and sugar to salted water. Bring to a boil and boil 15 minutes. Drain and reserve 1 gallon of the liquid. Pour cold water over carrots and continue cooling by running chilled water through jacketed kettle until product temperature reaches about 50°F. Drain. Place drained carrots in pans and refrigerate. Or place approximately 4 lbs of uncooked carrots in pan and steam for 3–5 minutes.
Sugar, granulated	4 oz	½ cup	
Salt	2 oz	3 tbsp	
Water, boiling	16 lb	2 gal	
Butter or margarine, melted	1 lb	2 cups	Blend butter or margarine with flour and stir until smooth. Add to reserved liquid, stirring constantly.
Flour, wheat, hard	8 oz	2 cups	
Sugar, granulated	4 oz	½ cup	Add sugar and nutmeg. Simmer 5 minutes, or until thickened, stirring constantly. Cool 50°F. and refrigerate.
Nutmeg, ground	2.3 gm	1 tsp	
Parsley, chopped	1 oz	½ cup	

Mess Hall Preparation: Combine sauce and carrots and sprinkle with parsley, bake at 375°F. for 30 minutes and serve.

PREPARATION GUIDE

BROWN GRAVY **Recipe: Modified 0-16**

Yield = 100 portions **Portion = 1/3 cup**

Ingredients	Percentage	Pounds	Ounces	Grams	Procedure
Meat drippings and clearfat or shortening	6.22	1	10	737	1. Heat fat in steam kettle. 2. Sprinkle flour evenly over fat and cook 10 mins.
Flour, wheat, hard	5.01	1	5	594	3. Add the modified starch to water and stock and mix well.
Modified starch	.92	—	3¾	108	
Stock or water	85.50	22	5	10120	4. Add remaining seasonings to stock mix and heat to 180°F.
Pepper, black	0.07	—	1/4	8	5. Add heated stock slowly to flour, fat mixture and cook for 30 min. at 200°F.
Caramel coloring	0.36	—	1½	43	6. Place 5 pounds to each pan.
Soup and gravy base beef	1.92	—	8	228	7. Cool, cover and refrigerate.
Total	100.00	24	33½	11838	

Pan Yield: 5 pans

To Reconstitute:

1. Preheat convection oven to 375°F.
2. Heat pan, covered, until internal temperature reaches 165°F.

PREPARATION GUIDE

TURKEY POT PIE **Recipe: L-132(2)**

Portion: 1 cup plus topping
Yield: 100 portions; 15 pans
Temperature: 425°F. oven

Ingredients	Percentage	Pounds	Ounces	Grams
Turkey	38.08	45	–	20405
Water	11.36	13	7	6086
Salt	0.30	–	6	161
Bay leaves	0.01	–	1/6	5
M.S.G.	0.15	–	3	80
Butter	0.80	–	15	429
Flour	1.00	1	3	536
Turkey stock	19.18	22	10	10275
Pepper, black	0.02		1/3	10
Celery salt	0.02		1/3	10
Salt	0.04		1	24
Potatoes, raw, diced	3.18	3	12	1704
Carrots, raw, diced	3.18	3	12	1704
Peas, frozen or canned	5.18	6	2	2775
Modified starch	0.80	–	15	429
Batter	16.70	19	12	8947
Total	100.00	112	99	53580

Procedure

1. Place turkey water and seasoning in steam kettle, heat until turkey reaches 160°F. Drain and save stock. Dice cooked turkey 3/4 by 3/4 inch. Set aside for step 6.
2. Melt butter in kettle. Add flour slowly, mix and heat for 10 minutes.
3. Add turkey stock and seasonings. Mix thoroughly.
4. Add potatoes, carrots, and peas. Cook until vegetables are slightly undercooked. NOTE: If using canned peas, add in step 3.
5. Mix starch with a small amount of water in a separate container to make a solution. Slowly add solution stirring constantly.
6. Add diced turkey and mix thoroughly. Heat contents to 200°F.
7. Place 4½ lbs. turkey to each pan. Pour ½ lb. batter over. Bake at 425°F. for 30 minutes or until golden brown.

Batter Mix

Ingredients	Percentage	Pounds	Ounces	Grams
Nonfat dry milk	4.36	–	14	390
Water	43.57	8	10	3898
Eggs, beaten	21.78	4	5	1948
Sugar	0.33	–	1	30
Flour	21.79	4	5	1949
Baking powder	1.36	–	4	122
Salt	1.36	–	4	122
Shortening	5.45	1	1	488
Total	100.00	17	44	8947

Procedure

1. Reconstitute milk. Combine with eggs and sugar.
2. Sift flour, baking powder and salt together. Combine with liquid mixture.
3. Add shortening. Mix well.

Note: Reheat 30-40 minutes or until temperature reaches 165°F. in convection oven at 375°F.

PREPARATION GUIDE

SALISBURY STEAK **Recipe: Modified L-37**

Yield = 100 portions **Oven – 325°F.**

Ingredients	Percentage	Pounds	Ounces	Grams
Milk, nonfat, dry	0.67	–	6½	186
Water, warm	6.18	3	12	1704
Bread, soft, broken	3.29	2	–	908
Beef, boneless, ground	49.36	30	–	13620
Onion, fresh, finely ground or dehydrated	4.94	3	–	1362
Eggs, whole	1.64	1	–	454
Pepper, black	0.03	–	1/3	9
Salt	0.62	–	6	172
Worcestershire sauce	0.31	–	3	86
Meat drippings or fat	2.06	1	4	568
Flour, wheat, hard	1.64	1	–	454
Water or stock	27.94	17	–	7710
Modified starch	0.31	–	3	86
Pepper, black	0.02	–	1/4	6
Caramel coloring	0.31	–	3	86
Soup and gravy base	0.62	–	6	172
Total	100.00	58	44	27830

Procedure

1. Reconstitute milk.
2. Add milk to bread. Let stand 5 mins.
3. Combine bread mixture with beef and remaining ingredients; mix lightly but thoroughly.
4. Shape into oval portions 3/4 inches thick weighing 5½ ounces on Hollymatic.
5. Place on lightly greased pans. Bake 1 hour or until temperature of 165°F is reached, save drippings.
6. Add oil or drippings to steam kettle. Heat to 200°F.
7. Sprinkle flour over oil, mix and heat 10 mins.
8. Combine water, starch and remaining seasonings together, mix well and add to flour, fat mixture. Heat for 15 mins at 200°F.
9. Place 15 Salisbury steaks into each pan. Pour two pounds of gravy over steaks. Cool, cover, mark and refrigerate.

Note: Formula makes 7 pans.

Reconstitution:
1. Preheat convection oven to 375°F.
2. Heat pans, covered, until internal temperature reaches 165°F., approximately 35-40 mins.

Note: Substitute 6 ozs. dehydrated for 3 pounds of fresh onions.

PREPARATION GUIDE

BEEF STEW **Recipe: Modified L-22(1)**

Yield: 100 portions
Portion: 1¼ cups
Temperature: 350°F. oven

Ingredient	Pounds	Ounces	Grams	Procedure
Beef, boneless, diced in 1 to 1½ inch pieces	30	–	13620	1. Diced beef is dredged in seasoned flour. Shake off excess.
Flour, wheat, hard	–	8	227	
Salt, table	–	5	142	
Pepper, black	–	1/2	18	
Garlic, dehydrated, granulated	–	3/4	22	
Shortening	1	–	454	2. Beef is braised in hot fat until brown.
Water	17	–	7718	3. After meat is browned, it is placed in field range pans, covered, and fully cooked in a 350°F. oven.* Stir or mix to keep meat from sticking.
				4. Add water once the meat starts cooking.
				5. Save all broth.
				*May also be cooked on top of range. Time required about 1-1½ hours in either case.
Carrots, fresh ½ in. slices	8	–	3632	6. In separate steamer pans place potatoes, carrots and cook until finished – about 15-20 minutes for carrots and 25-30 minutes for potatoes. Save potato water for inclusion in step 7.
Celery, fresh 1 inch pieces	4	–	1816	
Onions, dry, cut in quarters	3	–	1362	
Potatoes, white, fresh, 1-1½ inch pieces	8	–	3632	
Water, hot	2	–	908	7. Add all the meat with broth to a steam jacketed kettle. Add tomatoes, thyme, crumbled bay leaves, celery and onions. Add the potato water and salt. Heat.
Salt	–	2	57	
Tomatoes, canned	6	6	2894	
Thyme, ground	–	1/6	5	
Bay leaf, crumbled	–	1/9	2	
Flour, wheat, hard	–	10	284	8. To thicken gravy, make a slurry of flour, starch and water. Add to the stew.
Modified starch	–	8	227	
Water, cold	3	–	1362	9. Heat to 195°F. and hold for about 15 minutes.
				10. Add carrots and potatoes.
				11. Place 5 pounds per pan, cool, cover, mark and refrigerate.
Total	82	40½	38382	

Note: 1. Reconstitute in a convection oven at 375°F. for 45 minutes to a center temperature of 165°F.
2. Yields 12 pans.

PREPARATION GUIDE

SWISS STEAK **Recipe: Modified L-16(1)**

Yield = 100 portions
Portions: 1 steak + ¼ cup sauce

Ingredients	Pounds	Ounces	Grams	Procedure
Beef, bnls, swiss steak (100 steaks)	40	—	18160	1. Dredge steaks in seasoned flour.
Flour, wheat, hard	2	—	908	
Pepper, black	—	—	6	
Salt, table	—	2	57	
Shortening	2	—	908	2. Brown steaks on well greased grill. 3. Shingle 50 steaks in a field stove pan, add about 15 pounds of water, cover and place in a 350°F. oven until meat temperature reaches 165°F. 4. When steaks are finished place in pans and save broth.
Garlic, dry, chopped	—	1/3	8	5. Place garlic cloves with water in a Waring blender and mix for 2 minutes.
Onion, dry, chopped	3	—	1362	
Black pepper	—	1/4	6	
Salt	—	4	114	
Worcestershire sauce	—	6	170	
Beef stock and water	16	8	7491	6. Skim off some fat from the meat broth about 3/4 pound and add to a steam jacketed kettle.
Soup & gravy base, beef	—	3	85	7. Cook onions. 8. Weigh stock and make up difference with water. 9. Add to the cooked onions. 10. Add the remaining ingredients, garlic, pepper, salt, Worcestershire sauce and soup and gravy base beef. 11. Heat to 200°F.
Total	63	23½	29275	

Handling:
1. Place 12 steaks per pan and add two pounds gravy.
2. Cool to 40°F. in nitrogen cooler.
3. Cover pans, identify and place in cooler.

Reconstitution:
1. Place in convection oven set at 375°F. for 45 minutes—approximately to a center temperature of 165°F.

Notes:
1. Formula yields 9 pans.
2. About a 10% reconstitution loss.

PREPARATION GUIDE

BAKED LASAGNA — **Recipe: Modified L-25**

Yield = 100 portions — **Temp. 325°F.**

Ingredients	Percentage	Pounds	Ounces	Grams	Procedure
Sauce A					
Tomato paste, canned	13.80	9	8	4313	1. Add all ingredients together in large steam kettle. Mix thoroughly and heat to a boil. Simmer for 1½ hours.
Tomatoes, canned, crushed	18.90	13	—	5902	
Water	15.20	10	7	4740	
Bay leaves, crumbled	0.01	—	1/9	3	
Oregano, ground	0.09	—	1	28	
Thyme, ground	0.05	—	1/2	14	
Pepper, cayenne	0.03	—	1/4	8	
Salt	0.36	—	4	114	
Pepper, black	0.03	—	1/4	8	
Cheese, grated, parmesan	1.19	—	13	371	
Modified starch	0.27	—	3	85	
Onions, chopped	6.06	4	3	1902	2. Saute onions and garlic in steam kettle with oil until brown. Add beef and cook until meat loses red color. Drain excess oil and discard. Add remaining product to Step 1.
Garlic, chopped	0.07	—	3/4	22	
Oil or shortening	0.64	—	7	200	
Beef, boneless, ground	12.50	8	10	3916	
Filling B					
Eggs, whole, beaten	4.00	2	12	1248	3. Combine and mix thoroughly eggs, water, cheeses and parsley. Set aside for use when panning Lasagna.
Cheese, cottage	9.54	6	9	2981	
Cheese, grated, parmesan	1.19	—	13	371	
* Parsley, fresh, mixed	0.18	—	2	57	
Water	0.73	—	8	227	
Noodles, Lasagna	8.72	6	—	2724	4. Cook in excess water (5 oz. salt to 6 gals. water) until tender. Rinse in hot water.
Cheese, mozzerella, ground	4.80	3	5	1505	5. Pan as directed.
Cheese, grated, parmesan	1.64	1	2	511	
Total	100.00	62	109	31251	

* Note: Substitute 10 grams of dehydrated parsley for fresh parsley.

PREPARATION GUIDE

BAKED LASAGNA (cont'd) **Recipe: Modified L-25**

Layer 1	= Sauce	1 pound	Spread evenly over pan.
Layer 2	= Noodles	6 ozs.	" " " "
Layer 3	= Filling	6 ozs.	" " " "
Layer 4	= Mozzerella cheese	2 ozs.	" " " "
Layer 5	= Sauce	1 pound	" " " "
Layer 6	= Noodles	6 ozs.	" " " "
Layer 7	= Filling	6 ozs.	" " " "
Layer 8	= Mozzerella cheese	2 ozs.	" " " "
Layer 9	= Noodles	6 ozs.	" " " "
Layer 10	= Sauce	1 pound	" " " "
Layer 11	= Parmesan cheese	1 oz.	" " " "

Bake pans at 325°F. to reach an internal temperature of 165°F. (1 hour).

Reheating: Use 375°F. oven and heat back to 165°F. (45-50 mins.)

Notes:
1. 8 oz. dehydrated onions may be used in Step 2.
2. 1 oz. dry parsley may be used for 2½ oz. fresh.

YIELD: 12 pans

PREPARATION GUIDE

BARBECUED SPARERIBS — **Recipe: Modified L-92**

Yield: 100 portions

Ingredients	Percentage	Pounds	Ounces	Grams
Pork spare ribs	71.16	75	—	34050
Chili sauce	1.90	2	—	908
Catsup, tomato	21.82	23	—	10442
Worcestershire sauce	1.90	2	—	908
Mustard, prepared	0.95	1	—	454
Vinegar	1.90	2	—	908
Pepper, black	0.11	—	2	54
Pepper, cayenne	0.03	—	1/2	14
Salt	0.23	—	4	113
Total	100.00	105	6½	47851

Procedure

1. Place ribs in single layer, fat side up in pans.
2. Bake 30 minutes or until golden brown. Pour off excess fat.
3. Combine ingredients, bring to boil. Reduce heat and simmer 5 minutes.
4. Pour simmered sauce on ribs making sure all ribs are covered. Cover pans.
5. Bake at 325°F. 1 hour. Uncover and bake 1 hour longer basting frequently.
6. Remove excess fat.
7. Place 4 lbs of pork to each pan and 1½ lbs sauce.

Note: Formula makes 10 pans.

Reconstitution:

1. Place trays in convection oven preheated to 375°F. heat until internal temperature reaches 165°F. (35-45 minutes).
2. Keep pans covered.

YIELD: 10 pans

PREPARATION GUIDE

SWEDISH MEAT BALLS — **Recipe: Modified L-41**

Yield = 100 portions — **Temp. 400°F and 300°F. oven**

Ingredients	Percentages	Pounds	Ounces	Grams
Milk, nonfat, dry	0.45	–	5	143
Water	3.92	2	12	1250
Bread, dry, broken	5.69	4	–	1816
Onions, fresh, chopped 1/8"	4.27	3	–	1362
Shortening	0.45	–	5	143
Beef, boneless, ground	43.21	30	6	13789
Eggs, whole	1.42	1	–	454
Pepper, black	0.02	–	1/6	5
Salt	0.35	–	4	113
Drippings or fat	2.85	2	–	908
Flour, hard, wheat	1.77	1	4	566
Water	34.14	24	–	10896
Modified starch	0.27	–	3	86
Soup and gravy base, beef	1.03	–	12	342
Garlic powder	0.02	–	1/6	5
Nutmeg, ground	0.02	–	1/6	5
Oregano, ground	0.06	–	3/6	15
Pepper, black	0.02	–	1/6	5
Paprika, ground	0.04	–	2/6	10
Total	100.00	67	52½	31913

Procedure

1. Reconstitute milk (add milk to water) and stir.
2. Pour milk over bread; let stand 5 mins.
3. Saute onions in shortening until light yellow.
4. Combine bread mixture and sauteed onions, with beef, eggs, salt and pepper.
5. Shape into 3/4 oz. meat balls by Hollymatic.
6. Bake in flat pans at 400°F. until brown. Set aside for use in step 9. Save drippings.
7. Heat fat to a boil and add flour slowly with constant stirring. Cook 10 minutes.
8. Combine all seasonings with water and heat to 180°F. Add slowly to flour and mixture in step 7. Heat for 15 mins. at 300°F.
9. Add 3 pounds 8 ozs. meatballs to each pan.
10. Add 2 pounds of gravy to each pan.
11. Sprinkle with paprika.
12. Cool, cover, mark and refrigerate.

Reconstitution:

1. Heat in 375°F. oven until internal temperature of 165°F. is reached (35-40 mins.)

Notes:
1. 3 pounds of meatballs equal approximately (85 meatballs).
2. Above formula makes 12 pans.
3. 6 ozs. dehydrated onions can be substituted for 3 pounds fresh onions.

PREPARATION GUIDE

MEAT LOAF **Recipe: Modified L-35**

Yield = 100 portions
Temperature = 325° F. oven

Ingredients	Percentage	Pounds	Ounces	Grams
Bread, dry, broken	7.42	4	–	1816
Water	27.83	15	–	6810
Onions, dry, finely chopped	2.31	1	4	566
Peppers, sweet fresh chopped	0.93	–	8	227
Celery, fresh, finely chopped	1.86	1	–	454
Shortening, melted	0.93	–	8	227
Beef, boneless, ground	55.66	30	–	13620
Eggs, whole, beaten	2.31	1	4	566
Salt, non iodized	0.69	–	6	168
Pepper, black	0.06	–	–	18
Total	100.00	52	30	24472

Procedure

1. Moisten bread with water; press out and discard excess water.
2. Whip bread until large pieces are unidentifiable. Set aside for step 4.
3. Saute vegetables in shortening until lightly browned. Set aside for step 4.
4. Combine moistened bread, sauteed vegetables, beef, eggs, and seasonings. Mix lightly but thoroughly.
5. Shape into two, 2 lb. 12 oz. loaves and place in pans.
6. Put slices of bacon over top and bake in 325° F. oven until internal temperature reaches 165° F. (1 hr. 10 min.).
7. Cool, cover, mark and refrigerate.

Reconstitute: Place in convection oven at 375° F. until internal temperature reaches 165° F. (50–60 minutes).

Note: 2½ ozs dehydrated onions and 1-1/3 oz dehydrated green peppers may be used in step 3.

YIELD: 9½ pans

PREPARATION GUIDE

CREAMED GROUND BEEF **Recipe: Modified L-30**

Yield = 100 portions

Ingredients	Percentage	Pounds	Ounces	Grams
Butter	3.33	1	12	804
Flour, hard, wheat	1.88	1	—	454
Nonfat, dry milk	6.25	3	5	1509
Water	40.51	21	9	9786
Modified starch	0.70	—	6	170
Onion salt	0.10	—	3/4	24
Celery salt	0.05	—	1/2	13
Onion powder	0.05	—	1/2	13
Pepper, black	0.03	—	1/4	7
Soup, gravy, base, beef	1.66	—	14	402
Caramel coloring	0.47	—	4	114
Beef, boneless, ground, raw	44.97	23	15	10862
Total	100.00	49	67	24158

Procedure

1. Heat butter in steam kettle, add flour, mix and cook 10 mins.
2. Add milk and starch to water. Mix well.
3. Combine all seasoning and add to milk, starch, water mixture.
4. Add to flour-butter mixture, mix thoroughly.
5. Add beef to flour, butter-seasoning mixture and heat to a boil. Simmer 10 mins.
6. Place 5 pounds to a pan.

Reheat: Heat product in oven at 375°F. until internal temperature reaches 165°F. (35–45 minutes).

YIELD: 10 pans

APPENDIX IV

STORAGE CONSTRAINTS FOR CENTRALLY PREPARED FOOD

CONSTRAINTS FOR CHILLED AND FROZEN FOODS PRODUCED IN THE CENTRAL PREPARATION FACILITY AT FT. LEWIS, WASHINGTON

All supervisory personnel at the Central Preparation Facility and Satellite Kitchens are responsible for following the constraints as indicated herein.

1. The internal temperature of food items cooked at the Central Preparation Facility (CPF) is to be not less than 165°F (beef roasts can be cooked to 150°F rather than 165°F).

2. Food items, after cooking, must be chilled to 45°F within 2 hours and subsequently stored at not more than 40°F. The temperature during transportation should not exceed 45°F for more than 2 hours or 50°F for more than 1 hour. Raw vegetables will be stored at 50°F or below.

3. Food items cooked and chilled at the CPF will be stored at the satellite mess halls at 40°F or below if the storage period is to exceed 8 hours or 45°F if it is to be used within 8 hours.

4. The storage periods of items prepared by the Central Preparation Facility may be found as follows: Chilled storage – columns 2 and 4 of Table I; ambient storage (bakery items only) – columns 2 and 4 of Table II; and frozen storage column 3 of Tables I and II. Each item must be labelled to show the expiration date. Chilled foods (does not include bakery products) which have not been held in the chill system at the CPF more than one calendar day may be frozen (–20°F for 1 to 1½ hours or until thoroughly frozen) at the CPF and held at 0 to 10°F or lower for periods shown in Tables I and II. When chilled foods are frozen the label must be changed to indicate the expiration date for frozen storage. Bakery products to be frozen by the CPF shall be frozen within eight hours after production by the CPF. When frozen items are removed from frozen storage and are to be placed in chill storage their label must be changed to indicate the expiration date for chilled storage (see Tables I and II).

5. The internal temperature attained during heating of chilled and frozen items in the Satellite Kitchen for serving shall be 165°F or above.

6. All roasts, except beef, cooked in the Satellite Kitchen shall be cooked to an internal temperature of at least 165°F. Beef roasts can be cooked to an internal temperature of 150°F.

7. During serving the temperature of heated items shall be not less than 150°F.

8. A chilled or frozen food that has been heated for serving at a Satellite Kitchen cannot be rechilled or frozen for use. Prefried bacon if not placed on the serving line may be held 24 hours after heating if properly refrigerated (not more than 45°F) and then used for garnish.

9. All frozen food items must be thawed either in a refrigerator below 45°F or by cooking.

All responsible personnel must check the cooking and chilling procedures and temperatures. Malfunctioning equipment must be repaired immediately. All legitimate requests for a proper dial thermometer should be honored.

TABLE I

MAXIMUM TIMES FOOD PRODUCTS, EXCLUDING BAKERY ITEMS, MAY BE HELD IN INVENTORY AFTER PROCESSING IN CENTRAL PREP. FACILITY OF CAFe SYSTEM[1]

	Products in Chill System (Days)	Products Frozen in Central Prep. Fac. Freezer Storage (Days)	Chill Storage-after thawing (Days)
MEATS:			
Breaded Pork Slices	4	21	3
Baked Pork Slices	4	21	3
Sweet and Sour Pork	4	21	3
Braised Spareribs	4	21	3
Barbecued Spareribs	4	21	3
Fried Ham Steak	4	21	3
Baked Ham Steak	4	21	3
Sliced Ham for Sandwich	4	21	3
Veal Parmesan	4	21	3
Breaded Veal Steak	4	21	3
Veal Loaf	4	21	3
Vealburger	Freeze only	21	Cook from frozen state
Meat loaf	4	21	3
Salisbury steak	4	21	3
Swedish Meat Balls	4	21	3

DAY OF PRODUCTION IS DAY ZERO

(cont'd)

TABLE I (cont'd)

MAXIMUM TIMES FOOD PRODUCTS, EXCLUDING BAKERY ITEMS, MAY BE HELD IN INVENTORY AFTER PROCESSING IN CENTRAL PREP. FACILITY OF CAFe SYSTEM[1]

	Products in Chill System (Days)	Products Frozen in Central Prep. Fac. Freezer Storage (Days)	Products Frozen in Central Prep. Fac. Chill Storage-after thawing (Days)
MEATS:			
Meat balls in gravy (for sandwich)	4	21	3
Ground beef in barbecue sauce	4	21	3
Lasagna	4	21	3
Meat sauce for spaghetti	4	21	3
Taco sauce	4	21	3
Ground beef for tacos	4	21	3
Pizza sauce	4	21	3
Barbecued beef cubes	4	21	3
Beef stew	4	21	3
Beef pot pie	4	21	3
Beef pot roast	4	21	3
Sliced roast beef in gravy (for sandwiches)	4	21	3
Swiss steak	4	21	3
Country style chicken	2	21	1
Oven fried chicken	2	21	1

DAY OF PRODUCTION IS DAY ZERO

(cont'd)

TABLE I (cont'd)

MAXIMUM TIMES FOOD PRODUCTS, EXCLUDING BAKERY ITEMS, MAY BE HELD IN INVENTORY AFTER PROCESSING IN CENTRAL PREP. FACILITY OF CAFe SYSTEM[1]

	Products in Chill System (Days)	Products Frozen in Central Prep. Fac. Freezer Storage (Days)	Chill Storage-after thawing (Days)
MEATS:			
Barbecued chicken	2	21	2
Sliced turkey with gravy for sandwich	2	21	2
Turkey pot pie	2	21	2
Pizza	4	21	3
Corned beef hash	4	Do not freeze	—
Prefried bacon	4	15	4
Creamed ground beef	4	21	3
GRAVIES:			
All types made in Central Prep. Fac.	4	21	3
POTATOES:			
Cottage Fried	4	Do not freeze	—
Potatoes au gratin	4	Do not freeze	—
Baked	4	Do not freeze	—
O'Brien	4	Do not freeze	—
Oven browned	4	Do not freeze	—

DAY OF PRODUCTION IS DAY ZERO.

(cont'd)

TABLE I (cont'd)

MAXIMUM TIMES FOOD PRODUCTS, EXCLUDING BAKERY ITEMS, MAY BE HELD IN INVENTORY AFTER PROCESSING IN CENTRAL PREP. FACILITY OF CAFe SYSTEM[1]

	Products in Chill System (Days)	Products Frozen in Central Prep. Fac. Freezer Storage (Days)	Chill Storage-after thawing (Days)
POTATOES:			
Parsley buttered	4	Do not freeze	–
Glazed sweet	4	21	3
Hashed brown	4	Do not freeze	–
Grilled potato cakes	Freeze only	21	1
Home fried	4	Do not freeze	–
Escalloped	4	21	3
POTATO SUBSTITUTES:			
Fried rice	4	21	3
Spanish rice	4	21	3
Baked beans	4	21	2
Baked macaroni and cheese	4	21	2
Spaghetti (without sauce)	4	Do not freeze	–
Spaghetti (with sauce)	4	21	2

DAY OF PRODUCTION IS DAY ZERO

(cont'd)

TABLE I (cont'd)

MAXIMUM TIMES FOOD PRODUCTS, EXCLUDING BAKERY ITEMS, MAY BE HELD IN INVENTORY AFTER PROCESSING IN CENTRAL PREP. FACILITY OF CAFe SYSTEM[1]

	Products in Chill System (Days)	Products Frozen in Central Prep. Fac. Freezer Storage (Days)	Chill Storage-after thawing (Days)
VEGETABLES:			
Stewed tomatoes	4	21	3
Baked onions with tomatoes	4	21	3
Creole squash	4	21	3
Peas with onions	4	21	3
Lyonnaise green beans	4	21	3
Buttered carrots and others (Normandie, parsley buttered and glazed)	4	21	3
Buttered cabbage	4	21	3
SOUPS:			
All soups made in Central Prep. Fac.	4	21	3
SANDWICHES:			
Prepared for immediate consumption	6 hours	Do not freeze	–
Prepared ahead for freezer storage	–	14	18 hours
SALADS AND SALAD INGREDIENTS:			
Gelatin salads (with bananas)	4	Do not freeze	–
Gelatin salads (with bananas)	3	Do not freeze	–
Mixed fruit salads (without bananas)	4	Do not freeze	–

DAY OF PRODUCTION IS DAY ZERO.

(cont'd)

TABLE I (cont'd)

MAXIMUM TIMES FOOD PRODUCTS, EXCLUDING BAKERY ITEMS, MAY BE HELD IN INVENTORY AFTER PROCESSING IN CENTRAL PREP. FACILITY OF CAFe SYSTEM[1]

	Products in Chill System (Days)	Products Frozen in Central Prep. Fac. Freezer Storage (Days)	Chill Storage-after thawing (Days)
SALADS AND SALAD INGREDIENTS:			
Mixed fruit salads (with bananas)	2	Do not freeze	–
Lettuce	3	Do not freeze	–
Combination salad ingredients (Chef's, garden veg., spring, tossed vegetable)	3	Do not freeze	–
Cabbage for cole slaw without dressing	3	Do not freeze	–
RELISHES:			
Celery sticks, carrot sticks and radishes	2	Do not freeze	–
SAUCES:			
Tartar sauce and sea food cocktail sauce	3	Do not freeze	–
MISCELLANEOUS ITEMS:			
French toast	Freeze only	21	Cook from frozen state
Cheese – grated or shredded in in Central Prep. Facility	4	21	3

DAY OF PRODUCTION IS DAY ZERO.

FOOTNOTES: TABLE I

1/ The times indicated begin counting the day of preparation in the Central Preparation Facility (CPF) as day zero and cover storage in both CPF and Satellite Kitchen facilities. They are based on:

a. proper handling of all food

b. intact packaging (bags and pan covers)

c. proper refrigeration or freezer temperatures

Chilled foods – must be brought down to 45°F within 2 hours of preparation and held at not more than 40°F until reheating for serving.

Frozen foods – must be frozen at –20°F for 1 to 1-1/2 hours or until thoroughly frozen, and then held at 0 to 10°F or lower until time of shipment to the satellite kitchen. Satellite kitchen storage shall be at 40°F or under (chill storage) except that items to be cooked from a frozen state must be kept in a freezer. Items intended to be delivered to the satellite kitchens frozen (vealburgers, prefried bacon, and French toast) and all reserve stocks of any other foods produced specifically for freezer storage shall be frozen within two hours after production by the CPF. When necessary, excess CPF stocks of chilled foods may be frozen, if appropriate, and held in freezer storage as indicated. However, chilled foods to be frozen by CPF shall not have been held in the chill system more than one calendar day before freezing. When reserve stocks of previously frozen items are issued by CPF they should not be thawed before shipping.

d. Products to be heated for serving must be heated to 165°F internal temperature directly from the chilled (or frozen) state. They should **not** set at room temperature before heating.

e. Once any CAFe processed product has been delivered to a satellite kitchen, it **may not** be returned to the Central Preparation Facility for redistribution. All

foods returned from satellite kitchen to CPF are discarded. Therefore, careful and proper ordering is essential.

f. Any food item which has been heated in the satellite kitchen or held on the serving line must be discarded after the meal. Food cannot be held and served as a leftover at the next meal.

g. All freezing of food products must be done at CPF – none may be frozen by the Satellite Kitchen.

TABLE II
MAXIMUM TIMES BAKERY PRODUCTS MAY BE HELD IN INVENTORY
AFTER PROCESSING IN CAFe SYSTEM[1]

ITEM:	Products in Ambient Storage (Days)	Products Frozen in Central Bakery Freezer Storage (Days)	Products Frozen in Central Bakery Ambient storage (after thawing) in Bakery Storage Cabinet (Days)
Frosted cakes	3	21	3
Unfrosted cakes (for shortcakes)	2 (wrapped in plastic or foil)	21	1
Fruit pies	2	21	1
Cookies (bars and drop type)	4	21	4
Pan rolls	2	21	2
Coffee cakes, sweet rolls, etc.	2	21	2
Biscuits	2	21	2

1/ The times indicated begin counting the day of preparation in the Central Preparation Facility (CPF) as day zero and cover storage in both CPF and Satellite Kitchen facilities. They are based on:

a. Proper handling of all food

b. Intact packaging (bags and covers)

c. Proper freezer temperatures – frozen foods must be frozen at –20°F for 1 to 1–1/2 hours or until thoroughly frozen, and then held at 0 to 10°F or lower until time of shipment to the satellite kitchens. Bakery products to be frozen by CPF shall be frozen within eight hours after production by the CPF.

d. Once any CAFe processed product has been delivered to a satellite kitchen it may not be returned to the Central Preparation Facility for redistribution. All foods returned from satellite kitchen to CPF are discarded. Therefore, careful and proper ordering is essential.

e. Any food item which has been heated in the satellite kitchen or held on the serving line must be discarded after the meal.

f. All freezing of bakery items must be done by the Central Bakery – none may be frozen by the satellite kitchen.

APPENDIX V

WORK MEASUREMENT DEFINITIONS AND FORMATS

MARK SENSE CODING SYSTEM

First Digit "Personnel"

Cook – Designated military cooks.

KP – Military personnel temporarily assigned.

Civilian – Civilian personnel employed in other than a supervisory position.

Sgt. Admin – Mess Sgt. performing the duties of a cook.

Second Digit "Action Verbs"

Prepare – A worker participating in the direct shaping or assembling of food or equipment (i.e. slicing vegetables, finishing, opening cans).

Combine – A worker involved in combining, mixing, or stirring of food.

Walking – A worker moving about the area, loaded or unloaded.

Clean-up – The renovation of equipment, materials, or work area, such as dish, pot, utensil clean-up.

Serve – The distribution and portioning of food products or the distribution of eating utensils.

Communicate – Oral, visual, or written exchange of information.

Attending – To observe material or equipment at a state of readiness; also checking food, food preparation, or preparation equipment.

Restore – The preparation of that food, received from transporters, to a servable condition (i.e. restore by heating or finishing semi-prepared food).

Packaging — Placing into or out of, (i.e. receiving transporter, loading transporter, boxes, bags, bottles, or wrapping perishable foods).

Delay — Personnel not engaged in any of the above action verbs or non-productive operation (i.e. personal, waiting, etc.).

Sanitation — A worker involved in routine scheduled area clean-up (i.e. mopping the floor, washing under side of preparation tables, partial disassemble and cleaning of coolers and ovens).

Third Digit "Descriptive Nouns"

Meat — Any meat, fish, or poultry products.

Vegetable — Any fruit, vegetable, or soup product.

Condiment — Any beverage or condiment (i.e., any substance used to make the food savory, such as catsup, relish, cheese, ice milk, spices, or salad dressing).

Transporter — Any mobile shipping unit.

Menu — Any document pertaining to the activities of the mess.

Soup and Salads — Any soup or vegetable or fruit salad.

Bakery — Any food having a flour substance.

Equipment — Any machine or utensil used for preparing, distributing, or preserving food products, excluding transporters.

Miscellaneous — Any activity not defined above; primarily used to designate floors, walls and windows.

Empty — Void of burden, (i.e., oneself).

Fourth Digit "Location"

Refrigeration — Any area associated with refrigeration equipment.

Storage — Food storage other than refrigeration.

Preparation Table – Work surfaces used in the preparation of food (i.e. vegetable sinks, meat chopping block)

Dish Washing – Dish and pot washing areas and associated equipment; also, any area where "clean-up" takes place.

Range – That area including ovens, range, and fat-fry along with their specified work area (i.e. approximately three feet of floor space surrounding ranges and fat-fry).

Loading – Back porch and its vestibule, and garbage racks.

Dining – Dining area, self-serve dispensers, and vestibule.

Serving – Distribution, short order grill, coffee, and eating utensil storage area.

Records – Menus, work sheets, and recipe file areas.

Out – Out of site.

Convection – Convection ovens used in restoring food received from Central Preparation Facility.

MARK SENSE CODING FORM

1. _____ 3. _____

2. _____ 4. _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
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21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
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41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
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GENERAL CODING FORM
BUREAU OF TESTING

ALPHABETIC SECTION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
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WORK SAMPLING DATA FOR STEWARDS

TOTAL= 570 OBSERVATIONS FOR THIS PERSON

STEWARDS	PREPARE	COMBINE	WALKING	CLEAN UP	SERVE	COMMUNICA.	ATTENDING	RESTORE	PACKING	DELAY	SANITATION	
MEATS	.0000	.0000	.0070	.0000	.0018	.0000	.0053	.0000	.0018	.0000	.0000	.0158
VEGETABLES	.0035	.0000	.0246	.0000	.0000	.0000	.0053	.0000	.0035	.0000	.0000	.0368
CONDIMENTS	.0035	.0000	.0070	.0000	.0000	.0000	.0035	.0000	.0000	.0000	.0000	.0140
TRANSPORT	.0000	.0000	.0070	.0000	.0000	.0018	.0000	.0000	.0000	.0000	.0000	.0088
MENU	.0000	.0000	.0053	.0000	.0000	.1895	.0018	.0000	.0000	.0000	.0000	.1965
SOUP-SALAD	.0018	.0000	.0000	.0000	.0000	.0000	.0018	.0000	.0000	.0000	.0000	.0035
BAKERY	.0018	.0000	.0000	.0000	.0070	.0000	.0000	.0000	.0000	.0000	.0000	.0088
EQUIPMENT	.0123	.0000	.0263	.0105	.0018	.0018	.0544	.0000	.0000	.0000	.0105	.1175
MISC.	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
EMPTY	.0000	.0000	.0579	.0000	.0000	.1000	.0035	.0000	.0000	.4368	.0000	.5982
	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
TOTAL	.0228	.0000	.1351	.0105	.0105	.2930	.0754	.0000	.0053	.4368	.0105	

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Director, Pioneering Research Laboratory	3
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13. ABSTRACT

This report concerns the Centralized Army Feeding (CAFe) system experiment conducted at Fort Lewis, Washington between 14 August – 29 October 1971, describing the overall experiment and summarizing the results obtained. As a result of this experiment, it was concluded that the new, modern food service system concept under evaluation can substantially increase customer satisfaction and significantly reduce operating costs.

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Food Cost						
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