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ANALYSIS OF THE IMPACT OF CONVENIENCE FOODS ON NAVY FOOD SERVICE OPERATIONS

by
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13. ABSTRACT *(Maximum 200 words)*

As part of the Department of Defense Food and Nutrition Research, Development, Test Evaluation and Engineering Program (DoD Food Program), a project "Navy Food Service 2000-Task 1" (U.S. Navy Requirement MSR N95-14), was conducted from October 1993 to September 1995 at the U.S. Army Natick Research, Development and Engineering Center. The purpose of the study was to test and evaluate the impact of the use of convenience foods (CF) on Navy shipboard operations. The in-depth assessment included consumer acceptance, food service personnel opinions, labor utilization, cost, equipment, storage and nutrition. The overall conclusion is that selective use of CFs in place of prepared foods which require extensive labor preparation is acceptable to both the consumer and food service personnel, results in both labor hour and cost savings and may result in reduced storage requirements. This report was prepared to record the results of that study. This is one of four reports related to the effort. The others are: "Convenience Food Logistics Model (CFLM) Design," J. Miller, S. Saraf, and K. Evangelos, NATICK/TR-96/016; "Convenience Food Logistics Model (CFLM) User's Manual," J. Miller and K. Evangelos, NATICK/TR-96/017; "Logistical Analysis of Convenience Food Substitution in a Typical Navy Menu for a Wasp-Class Amphibious Assault Ship (LHD)," S. Saraf, K. Evangelos, and B. Hill, NATICK/TR-96/018.

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PREFACE AND ACKNOWLEDGEMENTS

As part of the Department of Defense Food and Nutrition Research, Development, Test Evaluation and Engineering Program, a project "Navy Food Service 2000-Task 1" (U.S. Navy requirement N95-14), was conducted from October 1993 to September 1995 at the U.S. Army Natick Research, Development and Engineering Center (henceforth referred to as "Natick"). The purpose of the study was to evaluate the impact of a convenience foods (CF) menu on Navy shipboard food service operations. This report was prepared to record the results of that study.

The comprehensive nature of the project required a diverse, multidisciplinary technical project team of operations research analysts, food technologists, dietitians, systems analysts, engineers, statisticians, behavioral scientists, technicians, etc. Personnel involved throughout the course of the study included: members of the Sustainability Directorate, Science and Advanced Technology Directorate and the Advanced Systems Concepts Directorate at Natick. Overall project responsibility and management was provided by Ms. Kathy-Lynn Evangelos, Operations Research Analyst, of Natick's Sustainability Directorate. Contractors involved in the conduct of the study included: GEO-CENTERS, INC, Newton Centre, MA; General Technical Services (GTS) LLC, Natick, MA and Information Technology Solutions, Inc., Reston, VA. The cooperation and assistance provided by all assigned personnel resulted in a true team effort which brought this study to a successful completion.

The authors wish to extend their appreciation to the many participants in the various tests and evaluations conducted during the course of the study, including: Mr. Mark Smith, Ms. Ruth Roth, Ms. Ann Curran, Ms. Carol Shaw, Mr. Robert Stark, SGT Thomas Buchan, Ms. Barbara Daley, Mr. Robert Auer, Mr. Joseph C. Venezia, Mr. Dean-Michael Sutherland, Ms. Mary Friel, Mr. Robert Kluter, Mr. Norman Roberts and Mr. Steve Yuhaski of Natick; Ms. Ellen Jasset, Mr. Michael Aylward, Mr. William Morelli and Ms. Leslie Green, student contractors; Mr. Philip Niro, Ms. Esther Rodofsky, Ms. Gail Vanca, and Mr. Larry Lesher, GEO-CENTERS, INC. and Mr. Dave Dillon, General Technical Services LLC. The authors also want to acknowledge personnel from the S-2 Divisions of the USS Bainbridge CGN-25, the USS South Carolina CGN-37, and the USS Scott DDG-995 for furnishing critical data for the study.

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The Navy Supply Systems Command (NAVSUP), Division 51, formerly the Navy Food Service Systems Office, (NAVFSSO), the sponsor of this study, provided direction and assistance in securing test facilities. Appreciation is especially given to CAPT Robert Bird, Commanding Officer; Mr. Jack Hastings, (formerly, Chief, Equipment Division); Ms. Genie Wagner, Joint Technical Staff (JTS) Representative to the DoD Food Program and LT Lola Borgemeister, former Navy JTS representative.

The Enlisted Dining Facility at the Naval Amphibious Base, Little Creek, (NABLC) Norfolk, VA, was the test site for the first convenience foods (CF) test during FY94. The outstanding assistance provided by LT Fuchs, Food Service Officer, and Mess Specialist Chief Master (MSCM) Compuesto, Assistant Food Service Officer, permitted testing to run smoothly and with great efficiency. Special thanks are extended to the entire mess management crew who willingly accepted test personnel and displayed pride and professionalism throughout the course of the test.

The USS Puget Sound AD-38 was selected as the site for the at sea tests after an international incident caused cancellation of the ship originally tasked by the NAVSUP. A request was made in January 1994 for a March-April 1994 test. The willingness of the personnel on the USS Puget Sound to serve as a test site, on short notice, was especially appreciated. Special thanks are given to CAPT Linda Bird, Supply Officer; ESN Hamilton, Food Service Officer; Mess Specialist Chief (MSC) Manning, Galley Chief and Mess Specialist Chief (MSC) Moran, without whose assistance, the test would not have been conducted. As the result of the enthusiasm, cooperation and outstanding contributions of the S-2 Division, the test program was successfully completed.

Finally, thanks are extended to the Navy Food Management Team, Norfolk, VA, for their assistance throughout the course of this study. They provided vital information for the study and organized ship visits for data and information collectors.

This report is one of four reports published as a result of this project. The three other reports focus on the development of a logistics model which will be used to analyze the impact of CFs on Navy menus. The report titles are: "Convenience Food Logistics Model (CFLM) Design", Miller, J., Saraf, S., and Evangelos, K., NATICK/TR-96/016; (Reference 1), "Convenience Food Logistics Model (CFLM) User's Manual", Miller, J. and Evangelos, K., NATICK/TR-96/017; (Reference 2) and "Logistical Analysis of Convenience Food Substitution in a Typical Navy Menu for Wasp-Class Amphibious Assault Ship (LHD)", Saraf, S., Evangelos, K. and Hill, B., NATICK/TR-96/018, (Reference 3).

EXECUTIVE SUMMARY

DoD directives to reduce the size of the military force prompted a study aimed at exploring future food service system concepts which could result in downsizing the scope of food service operations aboard 21st Century Navy warships. The potential of reducing food preparation manpower, space and equipment requirements by introducing more convenience foods (CF) into food service operations was identified in earlier studies, Reference 4, "Food Service Systems for Navy Forces in the 1990s", Short, P., Bell, B., Popper, R., Quigley, B., Porter, R., Rosado, J., NATICK/TR-91/009 and Reference 5 "Feeding Concept, Military vs Civilian System", Salter, C.A., Adams, S.O., Rock, K.L., NATICK/TR-91/011. The purpose of the "Navy Food Service 2000-Task 1" (U.S. Navy requirement N95-14) study was to design, test and evaluate a new concept for Navy food service operations. To achieve this objective, an in-depth study of the effects of a convenience foods (CF) menu on consumer acceptance, food service personnel opinions, labor utilization, cost, equipment requirements, storage requirements and nutrition was conducted.

The test design consisted of testing CF menus in an ashore dining facility and aboard a ship both inport and at sea. The Enlisted Dining Facility at the Naval Amphibious Base, Little Creek (NABLC) in Norfolk, VA. was selected as the ashore test site. The afloat test was conducted aboard the USS Puget Sound (AD-38) while the ship was inport at Norfolk, VA, and at sea. Nearly 100 commercial CF items were used in place of standard Navy menu items during the study. Data collection focused on labor and equipment utilization, consumer acceptance and food service personnel opinions. Supplemental data were collected during the at sea tests. These data included food manager opinions regarding CF substitution for standard Armed Forces Recipe Service (AFRS) A-Rations and the level of effort in the preparation of CFs. Analyses of these data along with storage requirements, nutrition and cost were completed to provide a total systems analysis to evaluate the impact of the use of CFs on Navy food service.

The results of the analyses indicate that shipboard food service equipment, as it now exists, is capable of handling the introduction of CFs as part of the Navy's food menu; however, the at sea testing indicated the need for more oven and freezer space and that all available equipment must be operational and functioning properly when at sea. Since it is expected that more CFs will be used onboard ships in the future, the quantity and types of equipment required onboard ship will need to be adjusted to take full advantage of CF items. While the use of CFs may increase the need for more oven space, their use will potentially reduce the use of kettles, fryers, and griddles. Although microwave technology has been in existence for many years, it is not the method of choice for bulk food preparation and heating. Future developments in both microwave technology and packaging may lead to the increased use of microwave equipment.

Storage requirements for basic ingredients needed to prepare selected A-Ration menu items and comparable CF substitute items are an important consideration. However, it is doubtful that a decision as to whether to prepare and serve a CF item would be based solely on storage considerations. In preparation for the analysis, CF items were divided into 4 categories: those

which save space and cost less (in terms of total food and labor costs); those which save space but cost more; those which cost less but require more storage space and finally, those which cost more and require more storage space. The analysis of the data indicates that total space savings attributable to CFs is offset to some extent by the need for additional freezer space and supporting mechanical equipment.

Both labor hour and total cost savings were demonstrated when a number of CFs were substituted for A-Ration items. It is recommended that in the future, management decisions be made based upon the aggregate cost perspective, considering the relationship between food service labor expenditures and the cost of CFs rather than analyzing each factor independently. Since these data were developed based upon the NABLC and USS Puget Sound (AD-38) menu cycles and specific AFRS recipes, they have limited application. As part of this multifaceted study, a decision management modeling tool was developed which determines the logistics impact of the substitution of A-Ration menu items with CFs. This model includes storage space requirements, food costs, labor and equipment requirements and will optimize labor requirements and overall operational cost resulting in a mix best suited to each command's particular circumstances. The results of the 3 related efforts are reported in 3 technical reports: "Convenience Food Logistics Model (CFLM) Design", Miller, J., Saraf, S., and Evangelos, K., NATICK/TR-96/016 (Reference 1), "Convenience Food Logistics Model (CFLM) User's Manual", Miller, J. and Evangelos, K., NATICK/TR-96/017 (Reference 2) and "Logistical Analysis of Convenience Food Substitution in a Typical Navy Menu for Wasp-Class Amphibious Assault Ship (LHD)", Saraf, S., Evangelos, K. and Hill, B., NATICK/TR-96/018 (Reference 3).

Food consumers and food service personnel were surveyed to evaluate the impact on food acceptance when CFs were substituted for food prepared in accordance with AFRS recipes. Consumers rated many of the CFs as "acceptable". They rated the majority of CFs between "just the same" to "somewhat better" for quality and appearance. Food service personnel recommended substituting CFs "often" for the ones usually prepared in the dining hall because CFs "took less time to prepare, tasted better, reduced the stress level of the food service personnel, were efficient, and the consumers liked them." Food service personnel believed that the use of selected CFs would raise the morale of the food service personnel by allowing them more time to properly prepare other food items from scratch.

To assess the nutritional impact of substituting CFs for AFRS prepared foods, 5-day menus using the AFRS and CFs were developed and analyzed separately and then compared as an " average day." Analyses of the data showed that the nutrient levels of both the AFRS and CFs on an "average day" met or exceeded the Military Required Dietary Allowances (MRDA) for all nutrients with the following exceptions: zinc at (68%) and sodium at (84%) were below the MRDA for the AFRS "average day" with zinc at (49%), magnesium at (77%) and Vitamin B6 at (77%) for the CF "average day." It must be noted that the nutritional deficits can be easily remedied by the addition of sufficient sources of fresh vegetables and whole grain products to the diet.

The overall conclusions of this study are that the selective use of CFs in place of labor-intensive

prepared A-Rations, are (1) acceptable to both the consumers and the food service personnel, (2) results in both labor and cost savings and (3) may result in overall reduced storage space requirements.

I. INTRODUCTION

A. Background

As downsizing continues to affect the military, reductions in the workforce have resulted in increased workload on the remaining personnel. In effect, individuals will strive to "do-more-with-less" as the military continues to find solutions to future and further reductions in the workforce. The Navy is striving to examine systems which would allow the reduction in the number of shipboard personnel required to provide food service and permit future ships to be smaller in size. In theory, one of the most important criteria in ship design is the complement or number of personnel required to be carried on a ship, thus, by reducing the number of shipboard food service personnel, one can theoretically reduce the ship size.

Applying this theory, the Navy Sea Systems Command (NAVSEA), in conjunction with the Navy Supply Systems Command (NAVSUP), Division 51, formerly the Navy Food Service Systems Office (NAVFSSO), sponsored the project, "Navy Food Service 2000", to design and evaluate a new concept for Navy food service operations. As part of this project, the following statement-of-need was developed: "There is a need to downsize the scope of food service operations aboard 21st Century Navy warships by examining shipboard food service, both inport and at sea and to identify potential areas where food service operations might achieve greater efficiencies."

Downsizing is often perceived in terms of reducing the number of personnel required to do a job. Food service, being a highly labor-intensive function as compared to other functions which support onboard mission systems, is comprised of many functions and sub-functions that better lend themselves to "downsizing" than by other means. This may include more efficient galley layouts and design, state-of-the-art equipment, new menus, automation, etc. Also, while warfighting mission requirements are the primary focus in the design of all military systems, shipboard food service systems have their own unique design criteria. Navy food service exists not only to sustain the sailor, but it also contributes significantly to crew morale, particularly while a ship is at sea. Considering the above, the intent of this project was to view, not only future food service systems, but existing systems which may be affected by decisions that may be implemented and affect existing operations.

In study reports published by Natick in 1991, Reference 4, "Food Service Systems for Navy Forces in the 1990s" and Reference 5, "Feeding Concept, Military vs Civilian System", opportunities for new and innovative approaches and programs in Navy food service were identified. Results from extensive surveys of both Navy and civilian food service resulted in 2 options; (1) implement civilian food service concepts or (2) conduct further studies based on available or future food service technologies. The comprehensive systems analysis also

considered future requirements for Navy food service and identified many potential areas for resource investment regarding food, equipment and food service system designs. Recommendations which resulted from this study were: follow changing commercial trends and take cues from industry regarding food service, especially for those trends thought to be long-term in nature.

In the studies noted above, one of the specific recurring themes in the survey results focused on the potential and increasing use of convenience foods (CF). As stated in the report, "the potential implications of reducing manning levels aboard ships extend well beyond having fewer people to feed. There will also be fewer mess management specialists (MS) to feed the sailors as well as fewer food service support personnel..... In theory, the use of CFs would reduce the need for food service labor, thereby reducing manpower requirements".

Some of the other findings were as follows:

- CFs should be more aggressively exploited to allow MSs more time in such areas as entree preparation

- some ships took advantage of at least some convenience bakery items

- many MSs indicated that they would like to use more CFs but storage space onboard ships was prohibitive

- the improvement of the overall working conditions in food service is essential to keep the workforce satisfied; one method of potentially obtaining relief would be through the use of CFs

- the increased use of CFs is seen as a long-term civilian trend

Civilian trends, advances in technology, packaging, new marketing strategies, coupled with today's busy lifestyles have dramatically increased the demand for CF items. The average consumer can testify to the increasing number of CF products present on local supermarket shelves. The use of CFs extends beyond the supermarket and the individual consumer. Civilian feeding establishments and institutions now rely on the significant use of preprepared CFs in their menus. Restaurants often use many prepared batters, prepackaged items and ready-made desserts. Preprepared items are often incorporated as meal components in hospital food service. Food service journals and trade publications continually highlight various institutions such as hospitals, college food services and institutional facilities whose menus and facilities have been modified to attract consumers by developing and implementing marketing strategies which often incorporate CFs in their menus.

While the above findings and civilian trends advocate the use of CFs for Navy food service, they also have identified the need for further investigation. The incorporation of CFs or any new

system component, albeit equipment, layout, menu, etc., affects the whole food service system and the design of ships. This study has attempted to explore and analyze the impact of the use of CFs on existing and future shipboard feeding systems.

B. Project History

Prior to the initiation of this project, Natick representatives met with the NAVFSSO and NAVSEA's Concept Formulation Group to discuss the design of future ships. Several critical points that came out of the discussions included:

- the design and quantity of future ships may change; however, there will be little change in the basic mission requirements that drive fleet makeup; in other words, there will always be an analogous class of amphibious ships to perform the missions of today's LHDs, LHAs, LPDs, etc.

- ship designers take a cautious approach to the application of automation since it is felt that it can create more problems than it solves

- manpower accounts for over 50% of the overall operating costs of a ship and each sailor adds 3 tons to the overall weight of an aircraft carrier and 11 tons to the weight of a minesweeper in the form of billeting and other support activities

- the Supply Department (which includes the food service operation) staff accounts for 22-25 % of the ship's total onboard complement of sailors

As a result of these discussions, a new project entitled, "Systems Analysis of Downsizing Navy Food Service Operations", was initiated. Shortly after project initiation, NAVFSSO restructured this project along with another project, "Phased Repair and Renovation of Shipboard Food Service Equipment" and combined the 2 projects into 1 project which has 2 separate taskings under the title "Navy Food Service 2000". The 2 original projects were redesignated as Task 1 and Task 2, respectively, under the "Navy Food Service 2000 Program". The results of Task 2, completed in FY95, are documented in 2 separate technical reports, Reference 6, "An Analysis of Navy Food Service Equipment Management Afloat Phase I-Survey Results", Rosado, J. and Hill, B. M., NATICK/TR-95/029 and Reference 7, "An Analysis of Navy Food Service Equipment Management Afloat Phase II-Concept Development", Rosado, J.E. and Hill, B. M., NATICK/TR-96/003.

C. Objective and Approach

The objective of the Navy Food Service 2000 Task 1 project, is to design and evaluate a new concept for Navy food service operations. Several preliminary concepts were studied including: the use of CFs, cook-chill systems, centralized systems, self-service systems and vending machines. The CF concept was ultimately selected due to its potential to support food service

downsizing, particularly its potential for reducing manpower requirements and other components of the food service system. While the CF concept focused on manpower reductions, additional factors which were brought out during a meeting held with the NAVFSSO at the initiation of the project were: global resupply, product cost, consumer acceptance, nutritional adequacy, quality control and system versatility. Also, while the original project direction was to only conduct a full-scale afloat test, it was suggested that an ashore test be conducted prior to the afloat test to work out unforeseen problems and reduce the logistical/operational impact of an afloat test. As project planning progressed, a technical approach was developed to execute the project objectives and address all of the concerns brought forth. The final technical approach is stated as follows:

(1) evaluate the impact of a CF menu on labor requirements, mess support equipment and storage requirements, during ashore and afloat tests

(2) determine opinions regarding CFs from both consumer and food service personnel

(3) develop a model to predict the impact of CFs on Navy food service

In addition to the above objectives, the technical approach would address both cost and nutrition and all the remaining concerns, such as future product quality control issues or how the Basic Daily Food Allowance (BDFA) would be recomputed. The scope of the test program could be expanded or reduced as directed by the NAVFSSO.

A plan was developed to evaluate several potential methods of validating the project's objectives. The final determination of the method of data collection affected the direction and design of the ashore and afloat tests. Several approaches were developed which included (1) limiting or reducing the number of MSs on a watch, (2) predetermining preparation times, or (3) taking a comprehensive item-by-item approach. Advantages and disadvantages of each method were weighed along with the constraints of conducting a test utilizing the existing Navy food service system. This, along with an analysis of food preparation and cost considerations, resulted in a selection of an abbreviated item-by-item approach. This approach involved the measuring of the total preparation time for a labor-intensive A-Ration menu item, substituting a CF item and conducting a comparative analysis of the preparation times. Not only would this method best suit the preparation time and cost constraints, but it would be the least intrusive on a facility and its food service operation. This method would also provide results which would allow for generalized conclusions that could be extrapolated and duplicated to determine potential labor requirement reductions through simulation. It would also allow for the collection of data in other facets of the food service system, namely equipment utilization and consumer and food service personnel opinions.

II. METHODOLOGY

A. Market Search and Evaluation of Convenience Foods

During the early stages of the project, a comprehensive market search was conducted to identify commercial market CFs which could be used during the test program. It was necessary to examine the term "convenience" not only for establishing an accepted definition but to differentiate between the various levels of "convenience" to consider for testing. By definition, the term "convenience" means, "suitable, advantageous, or anything that saves or simplifies work". However, applying this definition to food service, the scope is broadened as it implies that "convenience foods" not only save time and simplify work, but also that they are easier to use and require little or no preparation.

Convenience foods eliminate one or more of the preparation steps associated with labor-intensive functions such as measuring, mixing, forming, panning, assembling, etc. Canned chicken may be used to prepare a casserole or may be an ingredient in a premade casserole which only requires heating. Yeast dough products such as cinnamon rolls include several CF alternatives: premade formed frozen dough which requires shaping, filling, proofing, baking and finishing (icing); frozen formed rolls which require proofing, baking and finishing or frozen thaw/serve items. Cookies, which are often prepared from a mix are also available as premade frozen cookie dough which require scooping, panning and baking or as preformed frozen cookies which only require panning and baking.

Packaging contributes not only to the degree of convenience associated with particular items, but can also dictate the equipment required for heating or preparation. Many items are packaged in half-size (12 x 10 inch) aluminum steam table pans which require only heating in a conventional oven. Soups and stews, typically canned, are also available in plastic containers suitable for microwaving. Premade salads and salad bar items are becoming increasingly popular and require no equipment for slicing, chopping or dicing. Both packaging and processing define the type of storage required. Most CFs can be or must be kept frozen; whereas, salads and salad bar products require refrigeration. Dry storage items generally tend to be canned items and are widely used as ingredients or finished products such as condensed soups, tamales, sauces, puddings, etc.

The market search identified over 350 food items which could potentially serve as substitutes for labor-intensive AFRS items. A database was developed and populated with these items. Information placed in the database included item names, descriptions, costs and logistics information (case size, pack, etc.). In considering the varying degrees of "convenience", only those entrees, starches, side dishes, desserts, breads and rolls that required only heating or very little preparation were included in the database. All of the items were bulk packaged, as opposed to individually packaged, and were not generally available or widely used by the Navy. Prepackaged salads were not included in this study. Other food items not included in the study were hamburgers and french fries, since they are part of a unique food service subsystem used in Navy galleys and are served from a separate food service line or separate galleys on larger ships

and in ashore facilities. Lastly, all items had to be able to be prepared or heated using conventional ovens (as opposed to microwave ovens) and the other typically available shipboard food service equipment.

An in-house panel of experts was convened at Natick to evaluate the CFs in the database to determine potential substitutes for items on the Navy menus. The panel consisted of the Project Officer, 2 behavioral scientists, 2 food technologists, a recently retired Master Chief, who was also a past member of the Navy Food Management Team (FMT) and several consumers. Convenience items were identified which were either a direct "match", e.g., commercial macaroni and cheese for AFRS macaroni and cheese, or were similar, based on the main ingredients, e.g., commercial chicken and oriental vegetables for the AFRS chicken a la king. Over 250 items were evaluated on an accept/reject basis. If similar items were available from more than 1 manufacturer, all the items were evaluated at the same time and the 1 which most closely resembled the AFRS item was identified. For example, 3 different chicken chow mein products from 3 different manufacturers were tested. All were considered to be acceptable; however, the products which had all or many of the same ingredients as compared to the AFRS item would ultimately be selected for study. Only those items which were found acceptable by the panel, and for which there was a comparable AFRS item, were selected for the study. Portion sizes were considered and compared with the AFRS portion sizes. Since manufacture's portion sizes tended to be smaller than those obtained from the AFRS, adjusted portion sizes and adjusted servings per case were added to the database information so that a sufficient amount of the CF product would be purchased for testing. Drained weight analyses were also conducted on many of the meat/gravy items to assess the ratios of each as compared to the AFRS items which would be used in the test program.

B. Test Design

The ashore test was conducted at the enlisted dining facility at the Naval Amphibious Base, Little Creek (NABLC) in Norfolk, VA and the afloat tests were conducted aboard the USS Puget Sound, AD-38. Prior to testing, baseline data were collected from each test facility. These data included the facility's cycle menu, recent food preparation worksheets, watch bills, attendance patterns, facility layout, equipment, etc. Utilizing this information, test plans were developed and sent to the NAVFSSO for approval. Each test plan included test objectives, menus, test dates, data collection plans, sample copies of consumer and food service personnel opinion surveys, documentation required by Natick at the completion of the tests and plans for the procurement of the test items. Upon NAVFSSO approval of the test plans, a list of CFs to be procured was provided to the Food Service Officer so that proper amounts of each item could be determined by the Watch Captains/Galley Chiefs based on their own knowledge of attendance estimates and consumer preferences. During both the ashore and afloat tests, nutrition information was provided to each facility for all CFs served in the tests so that it could be displayed on the serving line as is customarily done by the Navy. Also, the galley ovens were calibrated at the NABLC facility and onboard the USS Puget Sound by Natick engineers prior to the start of each test. While both tests were similar in design, specific information for each test is indicated below:

(1) Ashore Tests

Baseline data and site visits provided information necessary to plan and design the ashore test program. The facility at NABLC contained a main galley area, bake shop, vegetable preparation room, walk-in chill box, a food service office, 2 sculleries, deep sink, dry sink and chill storage areas, an issue room and 3 separate mess decks, (1 for chiefs, 1 for officers and another for enlisted sailors). The frozen food storage area was undergoing renovation and was replaced with a freezer trailer for temporary frozen food storage. Typical attendance patterns at this galley were: breakfast 250, lunch 600 and dinner 400 with decreased attendance on weekends and the first few days after paydays. Salad bars (including beverages) were located in each of the mess decks. Plated desserts were self-serve from the main and speed lines or salad bars. A microwave oven and toaster were located in each mess deck for self-serve items.

The test menu was derived from NABLC's 5-week menu cycle. Testing was conducted during January and February 1994. The test consisted of a 2-week period in January to assess A-Ration preparation and a 2-week period in February when CFs were used. Convenience foods were substituted for 64 A-Ration menu items. Since the menus for the 2 test periods were identical, the test periods were planned to correspond with the normal 5-week menu cycle. Convenience food items were procured from local commercial food distributors in the Norfolk area.

Data collection focused on manpower requirements, equipment utilization, consumer acceptance and food service personnel opinions. General observations were also made, particularly regarding the preparation of CFs. For each test item, data collected included the number of portions prepared, equipment utilized, the number of personnel involved in food preparation and the total preparation time. More information, related to specific data collection, is detailed in other sections of this report. Consumer acceptance data were collected via the administration of surveys on the mess decks. Opinions from MSs were obtained through surveys and focus group interviews. Storage requirements and cost data were available from various sources associated with the preparation of A-Rations. These sources included Food Preparation Worksheets (NAVSUP 1090), Post Daily Breakout Sheets (NAVSUP 1282) and convenience item manufacturers' marketing information.

(2) Afloat Tests

After the initial baseline data collection had begun, menus obtained, site visits completed and test dates established, the originally assigned ship was deployed to another mission as a result of a change in the world's situation, thereby resulting in the need to obtain an alternate ship for the conduct of the afloat test. Due to the rapid work of the NAVFSSO, in collaboration with the study Project Officer, a replacement ship was identified. The USS Puget Sound, AD-38, a destroyer tender, accepted the invitation to host the afloat tests

and the baseline data collection was immediately scheduled for January 1994. During a 4-day period at sea, baseline data were collected and the test dates were set for March and April 1994 to coincide with the ship's inport and at sea schedule and its ability to accommodate test personnel for the at sea period.

The USS Puget Sound has 4 separate food preparation areas: the Enlisted Galley, the Chief's Mess, the Ward Room and the Captain's Mess. The Enlisted Galley, which feeds approximately 1000 consumers/day located on the third deck, was selected as the test site. The food preparation and storage areas on that deck included the galley, bake shop, vegetable preparation room, issue room, a small walk-in chill box in the galley and a large portside walk-in chill box adjacent to the issue room. Two mess decks with a deep sink (port) and a scullery (starboard) are located fore of the galley. A separate E-6 dining area is located adjacent to the first mess deck on the starboard side. Salad bars, dessert cases and beverage dispensers are located in each mess deck.

Attendance patterns varied between inport and at sea periods and are significantly reduced on weekends (inport only). Typical inport attendance is: breakfast 300-350, lunch 650-750, dinner 250-300 and at sea: breakfast 350-500, lunch 700-1000, dinner 800-900 and Midnight Rations (MIDRATS) 200-300.

The afloat test consisted of 3 separate test periods. The first 2 were conducted much like the ashore test, with 35 CF items replacing matching A-Ration items over a 5-day period (Monday-Friday). Similar data were collected for the afloat tests as during the ashore tests. The third test period was scheduled for 3 days at sea during which data collection focused on food preparation at sea vs. inport and MS/management opinions through surveys and focus groups.

The Chief's Mess on the USS Puget Sound operates under the Commuted Rations (COMRATS) system and it was found that many CFs similar to those used in the tests were used in the Chief's Galley. Upon discovering that CFs were routinely prepared and served in the galley, test personnel took the opportunity to interview MSs assigned to this galley and discuss their experiences with the use of CFs as they were already being procured, prepared and served by food service personnel on a regular basis in this mess.

III. RESULTS AND DISCUSSION

Data and information collected during the ashore and afloat tests were subjected to various analyses including statistical analyses. In reviewing all of the raw data, it was noted that some data were missing and other data were generally inadequate as a result of real life situations which occurred during testing. As a result, data items may or may not be consistent as reported in each of the following sections. Each reported section, however, presents results which are appropriate for drawing conclusions based on that specific analysis. Many conclusions reached from the ashore test are applicable to the afloat food service as well. Also, although data were collected on

a specific class of ship, the results are directed to general shipboard food service, unless specifically stated otherwise. The methodology for each analysis is explained in its corresponding section. Ultimately, this report will attempt to bring the results together for the purposes of drawing conclusions which will portray the potential impact of CFs on food service systems for all classes of ships.

A. General Observations-Food Preparation

Throughout the Navy, there are many AFRS items which are characteristically categorized as "most popular" or "typical" menu items. This was the case in comparing the menus of NABLC and the USS Puget Sound. As such, the majority of the A-Ration and CF items tested ashore and afloat were the same since every effort was made to utilize each facility's menus. The length of time for each test and the available CF substitutions also contributed to the similarity of menus. In order to facilitate afloat testing, lessons learned during the ashore tests for the preparation and serving techniques of CFs, were communicated to the MSs onboard ship. This was critical since the afloat test was only 5 days long as compared to the ashore test and there was not much time to acclimate test personnel or time for a long CF preparation learning curve.

During the 2-week ashore test period, some menu items were repeated, particularly starches. With the exception of a few A-Ration recipe variations and type of convenience items used, the method of preparation and serving basically remained the same between the ashore and afloat tests. The following sections describe the observations made by test personnel, the methods of preparation established for CFs and information derived from informal discussions held throughout the tests between the MSs and test personnel.

(1) A-Ration Preparation

During both the ashore and afloat tests, MSs were encouraged to prepare the A-Ration test items as they would be typically prepared. The method of preparation and ingredients used were dependent on several factors which included the individual preference of the MS doing the preparation and the available ingredients. Some recipes were prepared entirely from scratch, whereas others were prepared with mixes or prepared ingredients, thereby eliminating preparation steps that normally increased total preparation time. Entrees were prepared with frozen, dry and canned ingredients and many required the preparation of fresh vegetables prior to their use. Items requiring yeast were typically made using sweet dough mix; whereas, cakes and cookies were made both from scratch and from mixes. The use of individual recipes, i.e., those which were the specialities of certain MSs and were not part of the AFRS were discouraged, so that data analysis could be verified later using AFRS recipe cards. Discussions were held with MSs throughout the testing to determine the usual or typical methods of preparation and the ingredients used. Notes from these discussions are presented in Appendix A.

(2) Convenience Foods Preparation

The results presented in this discussion are generally limited to the methods and procedures used in the afloat test. Food preparation in an ashore facility has many advantages over food preparation aboard ship. These include more oven space, (described in Section III B), sheet tray racks and pass-through food warmers, etc., which are not typically used aboard ship. Preparation instructions for all CF items were provided by their manufacturer. These instructions were printed on the outside of the packing case or on a separate enclosed instruction sheet. This included baking times, temperatures and procedures.

Most of the entrees, starches and vegetables were packaged in half-size (12 x 10 inch) aluminum steam table pans with varying depths. Most required very little or no preparation other than heating. The CFs packaged in these pans were capable of being heated directly from a frozen state or after tempering (usually for 24 hours or less). It was observed that CFs cooked more evenly and produced a better appearance (fewer burnt edges) when tempered prior to heating. Entrees were tempered overnight in the 40°F refrigerated box. Manufacturers recommended that the pan lids be punctured or removed prior to baking. It was determined that most of the CF items required a longer time to heat/cook than what the manufacturers' instructions had indicated. This cooking time increased as much as 45 minutes for some convenience items due to ovens being fully loaded. Typically, 4 pans were placed directly on an oven rack, allowing 20 pans to be heated at one time in each oven. Those CF items, such as lasagna and stuffed peppers, which have greater density, were more easily handled and easier to remove when done. Those CF items which were baked without lids and had a high percentage of sauce or gravy, such as beef stew or sweet-and-sour chicken, were difficult to remove from the oven as the pans were extremely flexible, particularly when hot. It was found that bending the 4 corners of the aluminum foil pan prior to heating increased the stability of the pan and facilitated removal from the oven. To further increase the stability of the aluminum pans, the pans could be placed on a sheet tray; however, this method required more oven space and reduced oven capacity.

To serve CF items baked in foil pans, 2 foil pans were either placed directly into a full-size stainless steel 2-inch steam table insert or the product itself was transferred directly into the insert. Items such as lasagna, au gratin potatoes or products with crumb toppings could not be transferred. For those which could be transferred, it was the method of choice. Typically, the contents of 2 aluminum pans would fit into 1 full-size insert, depending on the type of product and the depth of the selected insert. In some cases, the contents of up to 7 pans were transferred into 1 deeper (4 or 6-inch) insert, if the product was conducive to being transferred. Transferring the product from the aluminum pans to the inserts facilitated serving the product, since some of the pans could not easily accommodate the utensils required to serve the correct portion size due to the shallow depth of some of the aluminum pans.

Convenience entrees and side dishes which were not packaged in aluminum pans were prepared and served as their A-Ration counterparts would have been. For example, stuffed chicken breasts were placed on standard sheet trays and heated for the required amount of time and then transferred to inserts for serving. In one case, a foil packaged pan item (escalloped apples) was steamed, as that option was indicated in the directions from the manufacturer. Typically, the preparation method for almost all of the entrees and side dishes was by heating in an oven, regardless of the packaging method.

Convenience food bakery products were prepared similarly to their A-Ration counterparts with the elimination of most of the initial preparation steps. Most of the cookie products were frozen, preformed and required placement on sheet trays for baking. One type of cookie product came as a prepared batter in a plastic tub. The batter was scooped out and placed onto sheet trays and baked. Frozen muffin mixes which could also be prepared as a coffee cake, were used as substitutes for A-Ration coffee cakes, and were usually served as breakfast pastries. These frozen muffin mixes were packaged in 8-lb plastic tubs which required 24 hours of thawing in a refrigerator prior to use. It was found that the batters had to be thoroughly defrosted and even then, they were thick and could be difficult to spread. Yeast products such as dinner rolls were preformed which required only placement on sheet trays, proofing and baking. Some rolls required finishing (i.e., glazing), hence the preparation and application of an AFRS glaze was recommended by the manufacturer. Frozen pies were used during the ashore tests. These required baking which was accomplished by placing them on sheet trays similarly as A-Ration pies are prepared. Due to the potential for limited oven space aboard ship, pies selected for the afloat test were prebaked and required only thawing. The number of CF items placed on each sheet tray was similar to the quantities suggested in the AFRS.

Breakfast items used in the test were, preformed 2-egg omelets, creamed chipped beef and frozen French toast and pancakes. The omelets were packaged in formed plastic trays (14 per tray x 5 trays per case). Concerned with the Navy's issue of disposing of plastic at sea, the MSs immediately reacted to the large amount of plastic used in the packaging of the omelets. Note: Some MSs and management personnel felt that plastic buckets (cookie dough), when emptied, could be used for other purposes aboard ship. The omelets were heated on trays or in inserts and were able to be stacked in inserts for serving because of their cohesiveness. The creamed chipped beef was heated in the same manner as most of the entrees. The French toast and pancakes were similar to those found in supermarkets, though packaged in larger quantities for large-scale food service. These items were packaged in groups of 8 or 10 and there was a significant amount of labor required to open and place the items on the trays. Preparation of the French toast and pancakes was slightly difficult since they had to be watched carefully to prevent overheating and scorching. These items were placed on trays and when heated, were transferred to inserts for serving. As with French toast and pancakes prepared from scratch, the French toast and pancakes had to be covered tightly if they were held for any length of time prior to serving as they would quickly dry out and harden. It was noted that breakfast preparation

can be particularly confusing due to the time schedule and the shorter period of time available for preparation. Since omelets can not be "set up" too far in advance, the night watch, which normally plays a significant role in setting up for breakfast, could not prepare the omelets in advance. Preparation of the omelets was accomplished by the breakfast crew just prior to serving to insure the freshness of the served omelets.

The learning curve for the preparation of all convenience products was very slight. Overall, most of the MSs were familiar with the items and had prepared the A-Ration version many times. Instructions to determine product doneness were provided by the manufacturers and were easily accomplished using a standard kitchen thermometer. The proper handling of the convenience products during both breakout and tempering was an issue, since breakout requires that the product be hand-carried from one or more lower decks, and convenience items like many products, had specific instructions for handling. This was particularly important if products were tempered, since the aluminum pans would become flexible once the food product softened.

B. Analysis of Equipment

The objective of this portion of the study was: (1) to determine the equipment requirements for CFs, (2) to assess if shipboard equipment could accommodate CFs and (3) to consider the potential equipment requirements for future shipboard food service systems. Data collection on equipment utilization involved comprehensive inventories of the types and quantities of major equipment available at both test sites. Major equipment items considered were ovens, kettles, griddles, fryers and mixers. The data collected for each item, involved recording the type of equipment required for preparation as well as the quantity, i.e., 2 ovens, 3 fryers etc. Since the tests took place within the constraints of an existing food service system, there is an assumed bias that the equipment in any facility would have to be adequate to conduct the tests. While this is partially true, conducting the tests revealed specific circumstances and issues regarding equipment that could have only been found in real life situations. At both test sites (ashore and afloat), data collection focused on observing the use of major types of equipment and collecting specific quantitative data regarding the amount of oven space required for each of the A-Rations and CF products. The quantitative data collected were used in the development of the Convenience Food Logistics Model (CFLM). Discussion of the facilities/equipment and observations made in both tests follow:

(1) Ashore and Afloat Facilities

During site visits to each galley prior to testing, existing equipment was evaluated to assess (1) the design and layout of all food preparation space and equipment, (2) the operational status of the equipment and (3) the available oven space. The ashore test facility was typical of most ashore galleys and contained adequate room for movement of personnel and menu preparation. Food preparation and storage spaces included a main galley, bake shop, butcher shop (40°F), vegetable preparation room (40°F), walk-in chill

room, storage area (dry, chill and frozen storage), an issue room, and 3 serving lines. Oven space was plentiful and consisted of 4 standard convection ovens in the galley, 2 banks of pizza type ovens in the bake shop and 2 large "walk-in" ovens, 1 in the galley and 1 in the bake shop. Principal galley equipment consisted of portable fryers, 2 steamers, a floor mixer (bake shop), 5 steam-jacketed kettles, 1 Frispo, and vegetable preparation equipment. The galley also had several pass-through warming cabinets and chill boxes connecting the galley with each of the 3 serving lines where the griddles were located. The warmers also functioned as proof boxes. Toasters and microwave ovens were located on the mess decks. There were 2 reach-in refrigerators in the galley and 1 in the bake shop. A reach-in freezer was also located in the galley. All equipment was operational and there were no serious equipment problems. Storage areas (dry, chill and frozen) were located at the rear of the building and were easily accessible for breakouts.

The general (enlisted) mess on the USS Puget Sound was located on the third deck. The physical layout of the galley, as typical on many ships, permitted limited space and walkways for food preparation and movement. Food preparation and storage space on this deck included the main galley, bake shop, vegetable preparation and salad bar room and 2 walk-in refrigerators (1 in the galley and 1 adjacent to an issue room). Frozen, chill and dry storage areas were located on the lower decks (6th, 7th, and 8th). Galley equipment consisted of 8 convection ovens, 5 steam-jacketed kettles, 4 deep fat-fryers, 1 Frispo and a steamer. Griddles were located on the port and starboard serving lines in the galley. Bake shop equipment included a 3-section storage cabinet, bread slicer, dough divider, bread rack, floor mixer, 6 convection ovens and 3 worktables. There were no warming or proofing cabinets. Each of the 14 ovens could hold up to 5 racks but most had only 4 or fewer due to damage and/or loss. Four of the ovens were not operational. Other pieces of equipment were also down and required repair.

(2) Equipment Utilization

One of the objectives for the ashore test was to work out any unforeseeable problems before conducting the afloat test. In addition to determining the oven space requirements, it was necessary to determine the specific types of equipment that were required for the preparation of the convenience items on the test menu. As already noted, CFs were found to cook better when tempered. The use of trays on rolling racks together with the available chill storage spaces in the galley facilitated the handling and tempering of frozen food in aluminum pan containers and their transport from the chill box to the oven. The "walk-in" oven in the galley was used for cooking most of the convenience products if they required heating for a half hour or longer. Two large "roll-in" oven racks held a total of 72 sheet pans on which the convenience items were placed for heating. All products in half-size aluminum pans were placed 2 to a sheet and prepared in this oven. Fryers were used to fry pre-breaded frozen fried chicken and similar items. Breakfast and bakery items

were prepared using the galley convection ovens since they had shorter heating times and had to be carefully watched. Most breads, desserts and pastries were baked during the night watch with the exception of dinner rolls which were baked prior to lunch and dinner, after proofing in the warming cabinets. Refrigerators in the bake shop were used to thaw frozen batters. Freezer space available in the galley was used to store items which were required to be heated from a frozen state and needed to remain frozen until it was time to cook them.

Lessons learned from the ashore test were applied to the afloat test. An analysis of oven space was conducted prior to shipboard testing. Based upon this analysis, the test menu was planned around oven capacity available aboard ship. During the first 2 test periods, which were inport, all food preparation was done during the day watch beginning at 0400 hours. Breakout was carried out twice a day, mid-morning and mid-afternoon, due to the location and accessibility of the storage areas. The handling and tempering of the convenience products became more of an issue and necessitated that the cases containing aluminum foil pans be stacked carefully in the galley chill boxes so that when thawed, the tops of the foil pans were "right-side-up". Many foil pans had to be removed from their shipping containers because the weight of stacked foil pans caused spillage from the lower pans once the product became sufficiently thawed. Though refrigeration space was adequate, the placement of the CFs on the shelves used up much of the available space in the chill box. Transportation of tempered items from the chill box to the galley through doors and hatches required careful handling, since rolling racks are not used aboard ships. The entire breakout and tempering process was cumbersome, but achievable with the CF test menu items. It was noted that the amount and location of galley refrigeration were as much an issue as were the oven space requirements for CF preparation.

The actual use of oven space differed from those assumed and the analyses performed during the planning phase. It had been assumed that each oven would hold 5 racks with 4 foil pans per rack. This turned out not to be the case due to the lack of oven racks. As a result, production scheduling required precise planning in order to prepare all the portions required for each meal. Staggering the cooking of the convenience items was necessary to maximize the use of available oven space and to allow all of the necessary portions to be prepared in a timely fashion. This was done for those items which could be transferred to inserts (as described in the Convenience Food Preparation section above) for holding when they had finished cooking. For example, 20 foil pans per oven (4 per rack) could be transferred into 6 inserts, thus using 3 racks for holding, as opposed to 5 for cooking. This method was highly product dependent and was not possible in all cases. A more significant issue was the lack of warmers which resulted in products being held in ovens whether they could be transferred or not. However, had all of the ovens been functional, the overall problem would have been lessened.

Some of the convenience items which were to be kept frozen until heated or baked were allowed to thaw because of the lack of freezer storage space in the galley and the time of the breakouts as related to the scheduled mealtime. Even though this did not adversely

impact the quality of the items (omelets, pancakes, French toast, bakery items), they should have been kept frozen. Yeast products were proofed on top of the bakeshop's heated convection ovens. It was observed that this method is typically used when no proofing or warming cabinets are available. Pies were "thawed and served", thus no specific equipment was required. Breakfast items were prepared as in the ashore test with the exception of French toast which was heated on the griddle and was the preferred method of the MSs.

The at sea test period revealed no unusual circumstances regarding equipment. Also, the learning curve for CF handling and preparation was established and the MSs were better able to facilitate the overall galley production schedule. The most noteworthy observations were the higher headcounts at all meals. This emphasized the need for more oven and refrigeration space and the requirement that all equipment be in fully operational condition when at sea.

(3) Results and Discussion

Analysis of the data showed that CFs require the same basic types of equipment for preparation as A-Rations or items prepared from scratch. The analyses also showed that although some types of equipment such as kettles, mixers, etc. would not be required for CF preparation, they are still required for the menu food preparation as a whole.

Shipboard galley equipment as it exists today is capable of handling the introduction of CFs into complete Navy menus. The quantity of ovens, refrigeration and freezer storage space are important factors to consider when planning a CF menu. As equipment availabilities/capabilities/capacities are already factored into existing menu planning processes, the use of CFs in any existing galley can be done based upon the specific galley equipment using the same factors. While the afloat test demonstrated that the existing equipment on the test ship was sufficient, it is possible that existing oven space and refrigeration capacity may not be adequate to support the introduction of CF menu items on all other classes of ships, particularly smaller ships.

The design of shipboard galleys of the future are undergoing considerable research by the NAVSEA's Affordability Through Commonality (ATC) Program. While future galleys will still require the same basic types of equipment for food preparation, introduction of new food service technologies, equipment and methods of cooking will likely affect galley design. The increased use of CFs will affect the quantities required for different equipment. Expanded use of CFs will require more onboard oven and freezer space, while at the same time reducing the use of kettles, griddles and fryers. Many other factors will drive the design of future galleys and their equipment requirements as well; particularly, nutrition (the elimination of high fat-fried items from menus), Prime Vendor, cook-chill systems, overseas resupply capabilities, etc. While microwave technology has been in existence for many years, it is still not the method of choice for bulk food preparation. However, developments in both microwave and packaging technologies may lend

themselves to the increased use of microwave cookery for CFs. Since microwaveable food products are more conducive to individual servings, small ships or specific feeding situations (e.g., self-serve) may lend themselves to the use of those types of CFs. As CFs are incorporated into Navy menus, the assessment of equipment utilization over time will further provide the knowledge and experience to consider what types of equipment can be eliminated, replaced or increased. Analyses for determining the quantities of components needed in galleys are currently being carried out in the ATC program. Simulations of Navy menus using the CFLM may also provide information on the types and quantity of equipment needed for future galleys on various classes of ships. Finally, based on current Navy policy, galleys must be designed to accommodate preparation of A-Rations unless CF systems or other systems become the accepted standard.

C. Food and Labor Cost Analyses

Comparative analyses were conducted between the cost of CF counterpart food items and the labor costs associated with the preparation of A-Ration menu items. These analyses were conducted to assist decision makers in choosing the optimal mix of these food items to support their particular food service operations. Historically, making cost comparisons between A-Rations and commercial CFs have been a challenge. The issue centers on how different expenses are funded. The cost of utilizing CFs includes both food and labor. The military, however, funds food purchases and labor out of completely different and separate accounts. While the analyses cannot change military accounting procedures, they do however, make an attempt to establish a cost comparison based upon normalized data.

(1) Approach

For the ashore phase of the project, 64 AFRS items from the cycle menu of the enlisted dining facility at the NABLC were matched with commercially available CF products. For the afloat phase of the study, 35 AFRS items from the USS Puget Sound cycle menu were matched with available CF items. The AFRS recipe identification numbers along with their comparable commercial items and manufacturers for the ashore and afloat tests are shown on Tables 1 and 2, respectively.

Although a deliberate effort was made to insure that food item titles remained consistent throughout the report, there may be instances where the same food item may be identified by a different title.

TABLE 1. A-RATION MENU ITEMS WITH CONVENIENCE FOOD SUBSTITUTES - NABLC

No.	A-RATION	A.F.R.S. #	SUBSTITUTE ITEM	SUPPLIER
1	ASST OMELETS	F-8-3	AWARD CHEDDAR OMELET	CONAGRA
2	ASST OMELETS	F-8-10	AWARD WESTERN OMELET	CONAGRA
3	ASST OMELETS	F-8-4	AWARD GARDEN OMELET	CONAGRA
4	MINCED/CHIPPED BEEF	L-52	ARMOUR CREAMED CHIPPED BEEF	CONAGRA
5	STUFF, CHICKEN BREASTS	L-158	CHICKEN W/WILD RICE STUFFING	BARBER FOODS
6	CHICKEN W/BROCCOLI	L-143	CHICKEN BROCCOLI/CHEESE STUFFING	BARBER FOODS
7	VEAL PARMESAN	L-103-1	VEAL PARMESAN	CAMPBELLS
8	BAKED MEATLOAF	L-35	BAKED MEATLOAF	CAMPBELLS
9	CHILI MAC	L-28-2	MACARONI & BEEF	CAMPBELLS
10	ROAST TURKEY	L-162	ARMOUR SLICED TURKEY	CONAGRA
11	MOCK FILLET STEAK	L-178-1	ARMOUR BEEF SIRLOIN TIPS	CONAGRA
12	BEEF STEW	L-22	ARMOUR BEEF STEW	CONAGRA
13	BAKED STUFFED FISH	L-120	HEALTHY CHOICE SHRIMP CREOLE	CONAGRA
14	SWEET & SOUR CHICKEN	L-79-1	CHUN KING SWEET & SOUR CHICKEN	CONAGRA
15	SWEET & SOUR PORK	L-82	CHUN KING SWEET & SOUR PORK	CONAGRA
16	BEEF AND CORN PIE	L-20	CHUN KING BEEF AND PEPPERS	CONAGRA
17	CHICKEN CHOW MEIN	L-160	CHUN KING CHICKEN CHOW MEIN	CONAGRA
18	BAKED TUNA & NOODLES	L-153	TUNA NOODLE CASSEROLE	STOUFFERS
19	BEEF STROGANOFF	L-53	BEEF STROGANOFF	STOUFFERS
20	MEX FAJITAS	L-43	BEEF/BEAN ENCHANADAS	STOUFFERS
21	TURKEY POT PIE	L-150	TURKEY DIJON	STOUFFERS
22	HAM & NOODLES	L-68	TURKEY TETRAZZINI	STOUFFERS
23	SPINACH LASAGNA	L-9	VEGETABLE LASAGNA	STOUFFERS
24	STUFFED PEPPERS	L-40	STUFFED PEPPERS W/SAUCE	STOUFFERS
25	OVEN FRIED CHICKEN	L-156	CHICKEN PRIMAVERA	STOUFFERS
26	BBQ CHICKEN	L-146	GLAZED CHICKEN	STOUFFERS
27	SALISBURY STEAK	L-37-1	SALISBURY STEAK	STOUFFERS
28	CHICKEN A LA KING	L-147	CHICKEN & VEGETABLE ORIENTAL	STOUFFERS
29	CHILI CON CARNE	L-28	CHILI CON CARNE	STOUFFERS
30	MEX TAMALES	L-57-1	CHICKEN ENCHILADAS	STOUFFERS
31	CHICKEN CACCIATORE	L-148	CHICKEN ITALIENNE	STOUFFERS
32	TURKEY & NOODLES	L-144	HOMESTYLE CHICKEN & NOODLES	STOUFFERS
33	LASAGNA	L-25	CLASSIC LASAGNA	STOUFFERS
34	YANKEE POT ROAST	L-10-2	CAJUN SEASONED STEW	STOUFFERS
35	MACARONI & CHEESE	F-1	MACARONI & CHEESE	CAMPBELLS
36	ESCALLOPED POTATOES	Q-53	ARMOUR ESCALLOPED POTATOES	CONAGRA
37	CANDIED SWEET POTATOES	Q-67	ARMOUR SWEET POTATO CASSEROLE	CONAGRA
38	LYONAISSE GREEN BEANS	Q-7	GREEN BEAN MUSHROOM CASSEROLE	STOUFFERS
39	AU GRATIN POTATOES	Q-51	AU GRATIN POTATOES	STOUFFERS
40	RICE	E-5	CONFETTI RICE	STOUFFERS
41	CLUB SPINACH	Q-60	SPINACH SOUFFLE	STOUFFERS
42	STIR FRY VEGETABLES	Q-25	VEGETABLE CHOW MEIN	STOUFFERS
43	MASHED SWEET POTATOES	Q-69	WHIPPED SWEET POTATOES	STOUFFERS
44	BROCCOLI AU GRATIN	Q-18-1	BROCCOLI AU GRATIN	STOUFFERS
45	EGG NOODLES	E-4-1	NOODLES ROMANOFF	STOUFFERS
46	BISCUIT	D-1-1	OLD FASHION BISCUIT 1-1/2 OZ	READI-BAKE
47	HOT DINNER ROLL	D-33	SOFT DINNER ROLL	READI-BAKE
48	BUTTERSCOTCH BROWNIE	H-3	BLONDIE BROWNIE BATTER	KARPS
49	BROWNIES	H-2-1	GOURMET BROWNIE BATTER W/NUTS	KARPS
50	CHOCOLATE CHIP COOKIE	H-20	FRZN COOKIE DOUGH CHOC CHIP	RICH'S
51	OATMEAL COOKIE	H-23	FRZN COOKIE DOUGH OATMEAL RAISIN	RICH'S
52	PEANUT BUTTER COOKIE	H-24	FRZN COOKIE DOUGH PEANUT BUTTER	RICH'S
53	COCONUT COOKIE	H-14	FRZN COOKIE DOUGH COCONUT MACAROON	KARPS
54	BLUEBERRY PIE	I-16	BLUEBERRY PIE 10	CHEF PIERRE
55	LEMON MERINGUE PIE	I-33-1	LEMON MERINGUE PIE 10	CHEF PIERRE
56	APPLE PIE	I-9-1	APPLE PIE 10	CHEF PIERRE
57	BANANA CREAM PIE	I-6-1	BANANA CREAM PIE 10	CHEF PIERRE
58	CHERRY COBBLER	I-10-3	CHERRY TURNOVER	REDI-BAKE
59	CINNAMON HONEY ROLL	D-G-7-3	CINNAMON ROLL 4 OZ	PILLSBURY
60	ICED SNAIL	D-G-7-12	TWISTED SNAIL 2-1/2 OZ	PILLSBURY
61	BEAR CLAW	D-G-7-11	BEAR CLAW -ALMOND FILLED	PILLSBURY
62	ORANGE/COCO COFFEE CAKE	D-37-4	GOOD MORNING MUFFIN BATTER	KARPS
63	QUICK COFFEE CAKE	D-37	BLUEBERRY MUFFIN BATTER	KARPS
64	APPLE COFFEE CAKE	D-37-1	GRANNY-APPLE & CINNAMON BATTER	KARPS

TABLE 2. A-RATION MENU ITEMS WITH CONVENIENCE FOOD SUBSTITUTES - USS PUGET SOUND

No.	A-RATION	A.F.R.S.#	SUBSTITUTE ITEM	SUPPLIER
1	BAKED MEAT LOAF	L-35	MEAT LOAF/GRAVY	CAMPBELLS
2	CHICKEN POT PIE (CANNED CHICKEN)	L-15-1	HOMESTYLE CHICKEN & NOODLES	STOUFFERS
3	CHILI MAC	L-28-2	MAC & BEEF IN TOM SAUCE	CAMPBELLS
4	STUFFED PEPPERS	L-4	STUFFED PEPPERS W/SAUCE	STOUFFERS
5	MACARONI & CHEESE	F-1	MACARONI & CHEESE	CAMPBELLS
6	MEX TAMALES	L-57-1	CHICKEN ENCHANADAS	STOUFFERS
7	TACOS	L-34	BEEF & BEEF ENCHANADAS	STOUFFERS
8	SAVORY BAKED CHICKEN	L-158	CHICKEN W/WILD RICE STUFFING	BARBER FOODS
9	VEAL PARMESAN	L-103-1	VEAL PARMESAN	CAMPBELLS
10	SWEET & SOUR CHICKEN	L-79-1	SWEET & SOUR CHICKEN	CHUN KING/CONAG
11	BEEF STEW	L-22	BEEF STEW/POT	ARMOUR/CONAG
12	BEEF STROGANOFF	L-53	BEEF STROGANOFF	STOUFFERS
13	SALISBURY STEAK	L-37-1	SALISBURY STEAK	STOUFFERS
14	CHICKEN CHOW MEIN	L-160	CHICKEN CHOW MEIN	STOUFFERS
15	LASAGNA	L-25	LASAGNA	STOUFFERS
16	POTATOES AU GRATIN (DEHY SLICES)	Q-51-1	POTATOES AU GRATIN	STOUFFERS
17	CREAMED GROUND BEEF	L-3	CREAMED CHIPPED BEEF	ARMOUR/CONAG
18	ASST OMELETS	F-8-3	CHEDDAR OMLET	AWARD/CONAGRA
19	ASST OMELETS	F-8-4	GARDEN OMLET	AWARD/CONAGRA
20	ASST OMELETS	F-8-10	WESTERN OMLET	AWARD/CONAGRA
21	BAKING POWDER BISCUITS (BISCUIT MIX)	D-1-1	BUTTERMILK BISCUITS	PILLSBURY
22	CHERRY PIE (PIE FILLING, PREPARED)	I-22-1	CHERRY PIE	CHEF PIERRE
23	CHOCOLATE CHIP COOKIE	H-20	CHOCOLATE CHIP COOKIE	RICH'S
24	SWEET POTATO PIE	I-12	SWEET POTATO PIE	CHEF PIERRE
25	PEANUT BUTTER COOKIES	H-11	PEANUT BUTTER COOKIE	RICH'S
26	LEMON MERINGUE PIE (FILLING MIX)	I-33-2	LEMON MERINGUE PIE	CHEF PIERRE
27	CINNAMON HONEY ROLL	D-G-7-3	CINNAMON ROLLS	PILLSBURY
28	PEACH PIE (PIE FILLING, PREPARED)	I-24-1	PEACH PIE	CHEF PIERRE
29	HOT ROLLS	D-33	PARKER HOUSE ROLLS	RICH'S
30	ICED SNAIL	D-G-7-12	TWISTED SNAIL	PILLSBURY
31	PECAN PIE	I-4	PECAN PIE	CHEF PIERRE
32	CHOCOLATE DROP COOKIES (MIX)	H-12-1	BROWNIE NUT COOKIE	RICH'S
33	BROWNIES	H-2-1	GOURMET BROWNIE	RICH'S
34	SUGAR COOKIES (SUGAR COOKIE MIX)	H-13-1	SUGAR COOKIE	RICH'S
35	GARLIC BREAK STICKS	D-39-2	BREAK STICKS	RICH'S

(2) Data Collection

The following is a brief description of how labor hours, labor costs and food costs were calculated for the NABLC and USS Puget Sound tests:

(a) Labor Hour Calculations:

Data collection focused on the labor hours required to prepare each A-Ration and CF product from start to finish. This involved monitoring both time spent and the quantity

of food service personnel required during food preparation. The "start time" for the preparation of A-Ration items began when all required ingredients were assembled and were ready to be opened/unpacked and prepared. Items were considered to be "prepared" when the product had been transferred to steam table inserts and were ready to be served. The "start time" for convenience items began when the product was removed from the packing cases for thawing/tempering. The "finish time" for the CF items was when the products were removed from ovens and transferred into an appropriate serving container. CF bakery items were "finished" when baking/heating and any additional preparation such as applying frosting had been completed.

Labor hours were determined for each A-Ration and convenience product based on the time spent by all food service personnel directly involved in the preparation of the specific product. Raw vegetable and meat preparation data were collected separately and incorporated into the overall time. Cleanup time that occurred during preparation was also collected and incorporated into the total labor hours for each product. With the exception of those convenience items which were deep fat-fried, preparation times for commercial products were minimal. Management/supervisory data was not collected but was incorporated into the analysis and is explained later in the methodology.

(b) Labor Cost Calculations:

Labor costs were determined according to the Composite Standard Rates for Costing Military Personnel Services. The FY93 hourly rates for NABLC and FY94 rates for the USS Puget Sound shown in Table 3 were used, since these represent the respective years in which the tests were conducted.

TABLE 3. MILITARY PAY RATES

Pay Grade	FY93 Hourly Rate (NABLC)	FY94 Hourly Rate (USS Puget Sound)
O-3 (LT)	$37.56	$34.94
O-1 (ENS)	$19.40	$21.13
E-9 (MSCM)	$30.70	$31.41
E-7 (MSC)	$22.73	$23.10
E-6 (MS1)	$19.52	$19.79
E-5 (MS2)	$16.86	$16.36
E-4 (MS3)	$13.92	$13.52
E-3 (SN)	$11.97	$11.50
E-2 (SA)	$11.20	$10.45

Note: No attempt was made to calculate and adjust for the effects of annual inflation (with regards to food and labor costs) during the FY93/94 tests. Pay grades of personnel involved in all of the preparation steps were used in determining personnel costs. Because the vegetable preparation and scullery functions at NABLC were staffed with civilian contractor personnel, a rank of E-3 was assumed for the vegetable preparation personnel and E-2 scullery personnel. Table 4 indicates the rank and quantity of individuals who

staffed the NABLC and the USS Puget Sound food service function.

TABLE 4. COMPARATIVE LABOR MIX

Pay Grade	Number of personnel (NABLC)	Number of personnel (USS Puget Sound)
E-2 (MSSA)	1	0
E-3 (MSSN)	6	1
E-4 (MS3)	5	3
E-5 (MS2)	0	10
E-6 (MS1)	1	4

(c) Food Cost Calculations:

A-Ration costs were derived from the actual cost of each of the ingredients used in each recipe. Figure 1 indicates an example of an ingredient cost breakdown. Recipe breakdown sheets were used to detail each ingredient and the amount of ingredients required for the number of portions that were prepared. The ingredients were verified according to the NABLC's Food-Item Request/Issue Document (NAVSUP 1282). Costs were then calculated using appropriate quarterly Food Item Report/Master Food Code List (NAVSUP 1059).

CODE	RECIPE #	NSN	INGREDIENT NAME	AMOUNT	UNIT	U/PRICE	COST	COOK UNIT	CONV FACTOR
C29	L00900	891500149	GARLIC, DEHYDRATED, 12 OZ	1.25 OZ	JR	$1.75	$0.18	LB	0.750
D76	L00900	891500582	TOMATOES, #10	2.5 CN	CN	$2.06	$5.15	LB	6.375
F64	F00100	892000140	FLOUR, WHEAT, GENERAL PURPOSE	2.5 LB	BG	$2.17	$0.54	LB	10.000
K98	L00900		SHORTENING COMP., GENERAL PUR	5 CP	CN	$17.16	$1.07	LB	7.656
M12	L00900	895000170	BAY LEAVES, WHOLE, 1-2 OZ	10 LEAVE	JR	$0.83		LB	0.009
N46	F00100	895000127	PEPPER, BLACK, GROUND, 1 LB	1.5 OZ	CN	$1.70	$0.16	LB	1.000
N87	L00900	895001079	SALT, TABLE, 5 LB	7.5 OZ	BG	$0.95	$0.09 (4.38 OZ)	LB	1.000
P05	L00900	895000616	THYME, GROUND, 1-2 OZ	2.5 TBSP	JR	$0.74	$0.16 (0.42 OZ)	LB	0.125
Q28	L02200	890500177	BEEF FOR STEWING, DICED	75 LB	LB	$1.95	$146.25	LB	1.000
S72	L02200	891500162	CARROTS, SLICES, 2-5 LB	16.25 LB	LB	$0.40	$1.30	LB	1.000
V29	L02200	891500926	CELERY, INDIVIDUALLY PACKAGED	10 LB	LB	$0.38	$3.80	LB	1.000
V84	L00900	891500616	ONIONS, DRY, SPANISH, 2 INCH DIA	7.5 LB	LB	$0.25	$1.88	LB	1.000
W15	L02200	891500226	POTATOES, WHITE, 50 LB BAG	25 LB	LB	$0.25	$6.25	LB	1.000
T26	L02200	891500127	PEAS, 2-5 LB	7 LB	LB	$0.55	$3.85		
	L02200	000000000	WATER, TAP		GL			GL	8.000
	L02200	000000000	WATER, TAP		GL			GL	8.000
						TOTAL	$170.68		

FIGURE 1. ITEM: BEEF STEW, RECIPE #: L02200, PORTIONS 260

Convenience products were purchased for the test directly from the manufacturers or through local distributors in the Norfolk, VA. area. All ordering was accomplished through established Navy supply channels. Quantities purchased reflected the adjustments made in the manufacturer's recommended portion size to those of the

AFRS. Many of the purchase prices represented only the manufacturer's prices, while a few items included a distributor markup in the range of 8-30%. For the purposes of this analysis, these markups were identified and deleted so that costs could be compared on an equal basis. As DoD moves towards implementing the Prime Vendor concept and markups become more standardized, these costs would be factored in across-the-board.

Price lists obtained from each of the vendors indicated that costs also varied based upon the quantities purchased. The costs used in this analysis were determined using the most economical "bulk purchase" rate. The assumption was made that all military purchases would be for large quantities.

(3) Methodology

As previously noted, the primary objective of these analyses was to put convenience and A-Ration costs on an equal basis for comparison. The following equations depict what costs were factored into deriving the "total" costs of convenience and A-Ration menu items:

--Total A-Ration End Product Cost=Food+Labor+Management+Overhead

--Total Convenience End Product Cost=Purchase Price+Labor+Management+Overhead

Since food and labor calculations were defined in III C(2) (a),(b) and (c) above, only management and overhead costs require definition. Management costs represent those funds required to pay for compensation of the Food Service Officer, Leading Mess Specialist (MS), Galley Supervisor, etc. Since these are real costs borne by the Navy, they must somehow be accounted for in the overall end product cost of the various menu items.

The hourly cost per management individual, based on the composite pay index, was identified. For those management personnel on duty during the day watch, the hourly cost of each supervisor was combined to derive an aggregate hourly management cost. This was then multiplied by the number of management hours worked during the watch. In a similar fashion, the total number of galley personnel on the same watch were multiplied by the number of watch hours to obtain the total number of personnel hours for that specific watch. This number was divided into the total management cost per watch to get a management cost assessment per labor hour worked.

To illustrate a hypothetical example, galley XYZ has a supervisory staff of one O-3, one E-9, one E-7, and two E-6s. The total of their hourly pay is $130.03 at the FY93 pay rates. The total management cost per 12-hour watch is $1560.36. These individuals supervise 18 food service personnel on the 12-hour watch. This means that they supervise

216 man-hours of food service personnel time over the course of the watch. By dividing $1560.36 by the 216 man-hours, the management cost assessment of $7.22 per hour worked is obtained. Therefore, if preparation of baked macaroni and cheese took a total of 2 man-hours, the associated management cost would be $14.44. A shortcoming of this particular approach is that it artificially penalizes CF food service operations, because there would most likely be fewer and less complex operations to supervise, therefore reducing the size and rank/grade of the management staff and hence, the hourly management charge could be reduced.

An overhead cost assessment should attempt to allocate expenses such as water, electricity, fuel, building maintenance, equipment purchases, contract support services, trash disposal, etc., to the actual end item cost of the menu items prepared. Since collecting such detailed data was beyond the scope of this project, textbook examples were used to determine typical food service operation overhead. The textbook range for overhead varied anywhere from 19.5% to 50% depending on the type of food preparation and service offered. For cook-from-scratch food service operations, it was concluded that 30% of total operating costs appeared to be a reasonable estimate. This overhead rate was applied to the preparation cost for A-Ration items. Because CFs tend to require less equipment, lower utility consumption, have less maintenance (smaller facility), etc., an overhead rate was estimated (by the authors) to cover CF overhead costs.

Since data were collected during 5 distinct test periods, i.e., NABLC A-Ration, NABLC CF, USS Puget Sound A-Ration and 2 tests, USS Puget Sound CF, the number of portions prepared differed for each item. Since the range for all items extended from a low of 50 to a high of 700 portions, it was necessary for comparative purposes, to settle on one normalized number. Because labor (1 of several variables considered) is not linear in many instances, e.g., 2 hours to prepare 400 portions of beef stew does not mean it will take only 30 minutes to prepare 100 portions; choosing a single portion quantity to work from, becomes a challenge.

If an arbitrary selection of 100 portions is established as the norm, it can be observed from the above example that there is a potential for error. This error can be greater or lower, depending on the product being prepared and the amount of labor required. Errors will tend to be less for CFs than for A-Rations due to the lower amount of labor required in the preparation of CF items. As a result, A-Ration portions were selected to identify a single number which would minimize the extent of the error.

Additional analyses would need to be completed to determine from which distributional approximation, labor hours are derived. For example, preparing 50, 75, 100 or 200 portions of an item would help determine a graphical representation of an item's labor hours expended. Of course, this process would be very time-consuming. Since the number of items in this statistical analysis is greater than 29, (explained in section below) a normal approximation will suffice. Anything less than 29 items would produce high variability and

error. The greater number of items used in an analysis would yield the greater number of degrees of freedom, which in turn, yields a better statistical analysis. However, in this case, there is a point where too many items will yield an unacceptable high statistical variance. Including all items in the analysis would increase the variance due to the increased range: 50 to 355 compared with 150 to 250. With an increased variance (as shown in Eq. 1.1 and 1.2) an increase in the error in the analysis is seen.

S_{52}^2 = *Variance of 52 items*
X_i = *number of portions for an item*
$\overline{X_{52}}$ = *mean number of portions for 52 items*

S_{29}^2 = *Variance of 29 items*
X_i = *number of portions for an item*
$\overline{X_{29}}$ = *mean number of portions for 29 items*

Eq. 1.1 $$S_{52}^2 = \frac{\sum_{i}^{52} (X_i - \overline{X_{52}})^2}{51}$$

$$S_{52}^2 = 4415.27$$

Eq. 1.2 $$S_{29}^2 = \frac{\sum_{i}^{29} (X_i - \overline{X_{29}})^2}{28}$$

$$S_{29}^2 = 1090.47$$

The variance of 52 items is shown to have 4 times the variance of 29 items. Since 29 is (1) the minimum number needed to have a normal approximation, (2) the maximum number of items found within a 100-portion range and (3) has only one-fourth the variance of using 52 items, we find that 29 items will provide the optimal solution for the analysis.

The objective was to identify the optimal range of prepared portions that included the largest number of menu items. The range width was set at 100 portions. Through analysis, it was determined that 29 of the 52 NABLC menu items fell within the 150 to 250 portions prepared range. Before proceeding further, a point of clarification is in order. Twelve of the original 64 items from Table 1 were eliminated for a variety of reasons. These included breakfast entrees (several were self-serve items that required no preparation); others turned out to be poor matches upon closer examination and 2 were convenience foods that already were available through the supply system. The normalizing portion data for these 29 items at the midpoint of this range was set at 200 (Table 5). This same approach was taken with Puget Sound data, resulting in 14 items falling within the 100 to 200 portions prepared range and normalizing on 150 (Table 6).

All subsequent food and labor analyses were performed using these data. While the relative order of the data varies depending on the particular analysis, the numbers to the left of each product as seen in Tables 5 and 6 remain the same throughout the analyses to simplify location.

If arbitrarily, 100 portions are chosen to normalize on, it can be seen from the above example, there is potential for error. This error can be greater or lesser depending on the product being made and the amount of labor involved. Errors would typically tend to be less for convenience foods than for A-rations due to the amount of labor. For this reason A-ration portions were chosen to identify a single number that would minimize error.

TABLE 5. A-RATION ACTUAL PORTIONS PREPARED - NABLC

NO.	ITEM	ACTUAL PORTIONS	NORMALIZED
1	CHICKEN CHOW MEIN	150	200
2	MEX FAJITAS	150	200
3	TURKEY & NOODLES	150	200
4	CHICKEN A LA KING	150	200
5	BROCCOLI AU GRATIN	160	200
6	BROWNIES	162	200
7	BUTTERSCOTCH BROWNIE	162	200
8	APPLE COFFEE CAKE	162	200
9	MEX TAMALES	168	200
10	CHICKEN CACCIATORE	174	200
11	MACARONI & CHEESE	175	200
12	APPLE PIE	176	200
13	LEMON MERINGUE PIE	176	200
14	CHILI CON CARNE	178	200
15	CINNAMON HONEY ROLL	180	200
16	STUFF. CHICKEN BREASTS	192	200
17	BLUEBERRY PIE	192	200
18	BAKED TUNA & NOODLES	200	200
19	TURKEY POT PIE	200	200
20	HAM & NOODLES	200	200
21	CHICKEN W/BROCCOLI	200	200
22	YANKEE POT ROAST	208	200
23	BANANA CREAM PIE	224	200
24	SPINACH LASAGNA	235	200
25	SALISBURY STEAK	240	200
26	SWEET & SOUR CHICKEN	243	200
27	DINNER ROLL	244	200
28	BEEF STEW	250	200
29	STIR FRY VEGETABLES	250	200

TABLE 6. A-RATION ACTUAL PORTIONS PREPARED - USS PUGET SOUND

NO.	ITEM	ACTUAL PORTIONS	NORMALIZED
1	OATMEAL COOKIE	108	150
2	CHOCOLATE CHIP COOKIE	108	150
3	SALISBURY STEAK	120	150
4	SWEET POTATO PIE	128	150
5	CHOCOLATE COOKIES	144	150
6	CHICKEN CHOW MEIN	144	150
7	BROWNIES	150	150
8	BEEF STROGANOFF	150	150
9	TACOS	150	150
10	VEAL PARMESAN	160	150
11	ENCHILADAS	176	150
12	PEANUT BUTTER COOKIE	180	150
13	CHICKEN POT PIE	192	150
14	AU GRATIN POTATOES	200	150

(4) Results and Discussion

Table 7 illustrates the difference between the labor hours for the preparation of A-Ration items and their CF counterparts at NABLC.

TABLE 7. IN-HOUSE LABOR HOURS DIFFERENCE - NABLC

NO.	A-RATION	CONVENIENCE FOOD	200 PORTIONS A-RATION LABOR HOURS	200 PORTIONS CONVENIENCE LABOR HOURS	LABOR HOUR DIFFERENCE
2	MEX FAJITAS	BEEF/BEAN ENCHANADAS	6.33	0.11	6.22
25	SALISBURY STEAK	SALISBURY STEAK	4.98	0.10	4.88
24	VEGETABLE LASAGNA	SPINACH LASAGNA	4.19	0.20	3.99
1	CHICKEN CHOW MEIN	CHICKEN CHOW MEIN	3.38	0.16	3.22
12	APPLE PIE	APPLE PIE	3.01	0.96	2.05
28	BEEF STEW	BEEF STEW	2.87	0.14	2.73
3	TURKEY & NOODLES	HOMESTYLE CHICKEN & NOODLES	2.77	0.11	2.66
10	CHICKEN CACCIATORE	CHICKEN ITALIENE	2.69	0.14	2.55
19	TURKEY POT PIE	TURKEY DIJON	2.57	0.13	2.44
13	LEMON MERINGUE PIE	LEMON MERINGUE PIE	2.52	0.37	2.15
26	SWEET & SOUR CHICKEN	SWEET & SOUR CHICKEN	2.30	0.21	2.09
4	CHICKEN A LA KING	CHICKEN & VEGETABLES - ORIENTAL	2.13	0.11	2.02
7	BUTTERSCOTCH BROWNIE	BLONDIE BROWNIE - BATTER	1.98	0.85	1.13
14	CHILI CON CARNE	CHILI CON CARNE	1.76	0.11	1.65
17	BLUEBERRY PIE	BLUEBERRY PIE	1.58	0.50	1.08
23	BANANA CREAM PIE	BANANA CREAM PIE	1.55	0.38	1.17
16	STUFF. CHICKEN BREASTS	STUFF. CHICKEN BREASTS	1.51	0.96	0.55
15	CINNAMON HONEY ROLL	CINNAMON ROLL	1.48	1.48	0.00
18	BAKED TUNA & NOODLES	TUNA NOODLE CASSEROLE	1.40	0.20	1.20
20	HAM & NOODLES	TURKEY TETRAZZINI	1.36	0.13	1.23
11	MACARONI & CHEESE	MACARONI & CHEESE	1.34	0.11	1.23
21	CHICKEN W/BROCCOLI	CHICKEN BROCCOLI/CHEESE STUFFING	1.28	0.92	0.36
29	STIR FRY VEGETABLES	VEGETABLE CHOW MEIN	1.28	0.06	1.22
27	HOT DINNER ROLL	SOFT DINNER ROLL	1.19	0.67	0.52
22	YANKEE POT ROAST	CAJUN SEASONED STEW	1.16	0.11	1.05
9	MEX TAMALES	CHICKEN ENCHANADAS	1.13	0.10	1.03
8	APPLE COFFEE CAKE	GRANNY-APPLE & CINNAMON BATTER	0.87	0.71	0.16
6	BROWNIE	GOURMET BROWNIE BATTER W/NUTS	0.78	1.15	-0.37
5	BROCCOLI AU GRATIN	BROCCOLI AU GRATIN	0.69	0.09	0.60
		TOTAL	62.08	11.27	50.81

Table 8 depicts similar data for the USS Puget Sound.

TABLE 8. IN-HOUSE LABOR HOURS DIFFERENCE - USS PUGET SOUND

NO.	A-RATION	CONVENIENCE	200 PORTIONS A-RATION LABOR HOURS	200 PORTIONS CONVENIENCE LABOR HOURS	LABOR HOUR DIFFERENCE
6	CHICKEN CHOW MEIN	CHICKEN CHOW MEIN	7.60	0.97	6.63
8	BEEF STROGANOFF	BEEF STROGANOFF	7.07	0.47	6.60
13	CHICKEN POT PIE	HOMESTYLE CHICKEN/NOODLES	6.26	0.83	5.43
9	TACOS	CHICKEN ENCHANADAS	5.88	1.17	4.71
3	SALISBURY STEAK	SALISBURY STEAK	3.88	0.70	3.18
10	VEAL PARMESAN	VEAL PARMESAN	3.04	0.68	2.36
4	SWEET POTATO PIE	SWEET POTATO PIE	2.73	1.43	1.30
5	CHOCOLATE DROP COOKIES (MIX)	BROWNIE NUT COOKIE	2.69	1.61	1.08
1	SUGAR COOKIES	SUGAR COOKIES	2.31	0.86	1.45
2	CHOC CHIP COOKIES	CHOCOLATE CHIP COOKIES	2.31	0.74	1.57
11	ENCHILADAS	BEEF & BEAN ENCHANADAS	2.18	1.50	0.68
14	POTATOES AU GRATIN (DEHY SLICES)	POTATOES AU GRATIN	2.00	0.44	1.56
12	PEANUT BUTTER COOKIES	PEANUT BUTTER COOKIES	1.59	0.67	0.92
7	BROWNIES	BROWNIES	1.09	0.64	0.45
		TOTAL	50.63	12.71	37.92

As expected, CFs require considerably less labor hours than A-Rations. Graphed data on labor requirements are shown in Figures 2 and 3. The utility of these figures as management tools becomes obvious. A-Ration items having high labor requirements are now easier to visualize. Once identified, the higher labor requirement spikes can be reduced through the selective use of CFs, thus providing greater efficiency in the food service workforce.

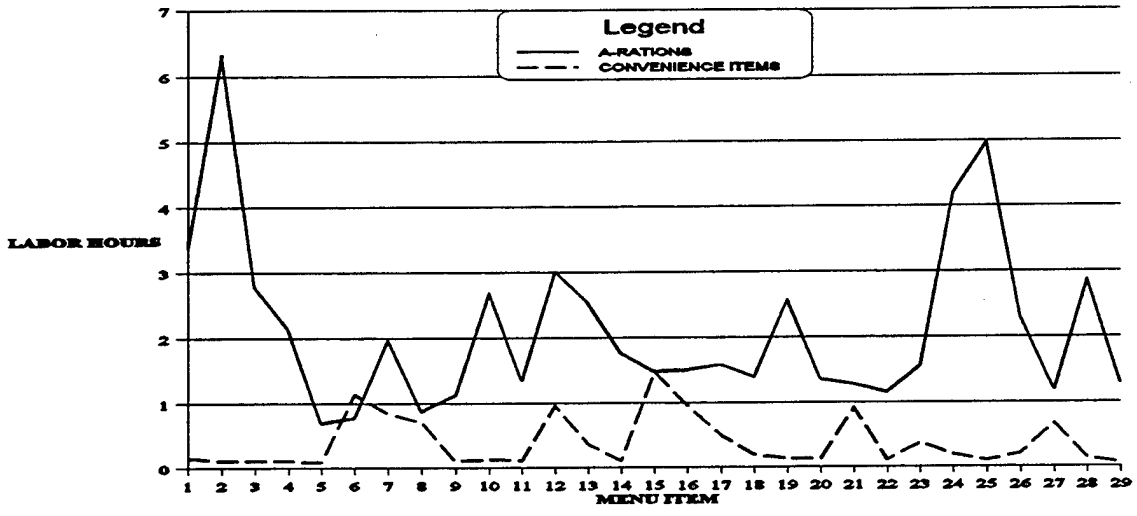

FIGURE 2. TOTAL LABOR HOURS PER MENU ITEM - NABLC

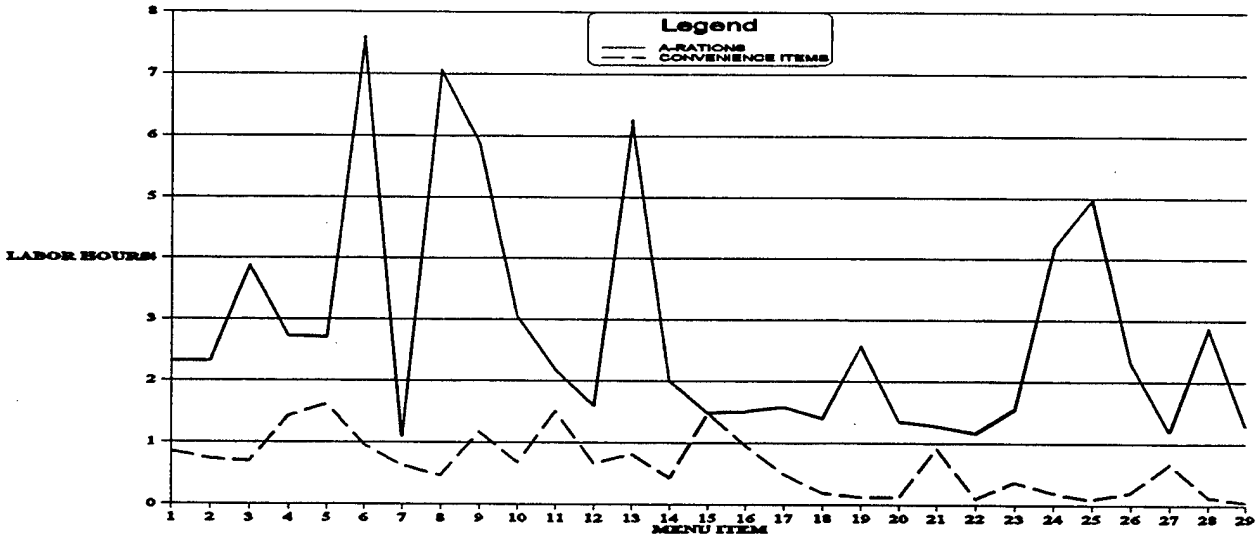

FIGURE 3. TOTAL LABOR HOURS PER MENU ITEM - USS PUGET SOUND

Tables 9-12 build up A-Ration and CF costs incrementally, starting with labor cost, then adding food cost, management cost and overhead cost to compute the total cost. Tables 9 and 10 show cumulative NABLC food and labor costs for A-Ration and convenience items based on 200 portions.

TABLE 9. A-RATION FOOD - TOTAL COST BUILDUP (200 PORTIONS) - NABLC

NO.	ITEM	LABOR HRS	LABOR COST	FOOD COST	MGMT COST[1]	OVER HEAD	TOTAL[2] COST
2	MEX FAJITAS	6.33	$109.34	$145.17	$45.70	$128.66	$428.87
26	SWEET & SOUR CHICKEN	2.30	$44.28	$168.72	$16.61	$98.40	$328.01
10	CHICKEN CACCIATORE	2.69	$54.60	$149.13	$19.42	$95.64	$318.79
28	BEEF STEW	2.87	$51.72	$145.25	$20.72	$93.30	$310.99
1	CHICKEN CHOW MEIN	3.38	$55.58	$132.99	$24.40	$91.27	$304.24
25	SALISBURY STEAK	4.98	$76.26	$88.78	$35.96	$86.14	$287.14
24	SPINACH LASAGNA	4.19	$71.72	$87.45	$30.25	$81.18	$270.60
19	TURKEY POT PIE	2.57	$48.96	$98.12	$18.56	$70.99	$236.63
22	YANKEE POT ROAST	1.16	$23.12	$130.05	$8.38	$69.24	$230.79
20	HAM & NOODLES	1.36	$25.18	$125.67	$9.82	$68.86	$229.53
16	STUFF CHICKEN BREASTS	1.51	$26.20	$110.69	$10.90	$63.34	$211.13
21	CHICKEN W/BROCCOLI	1.28	$23.40	$110.69	$9.24	$61.43	$204.76
3	TURKEY & NOODLES	2.77	$40.78	$80.10	$20.00	$60.38	$201.26
14	CHILI CON CARNE	1.76	$30.94	$96.39	$12.71	$60.02	$200.06
4	CHICKEN A LA KING	2.13	$38.28	$63.84	$15.38	$50.36	$167.86
18	BAKED TUNA & NOODLES	1.40	$24.02	$76.02	$10.11	$47.21	$157.36
17	BLUEBERRY PIE	1.58	$34.94	$59.18	$11.41	$45.23	$150.76
13	LEMON MERINGUE PIE	2.52	$52.00	$32.41	$18.19	$43.97	$146.57
12	APPLE PIE	3.01	$46.36	$24.39	$21.73	$39.63	$132.11
9	MEX TAMALES	1.13	$21.86	$54.82	$8.16	$36.36	$121.20
11	MACARONI & CHEESE	1.34	$22.48	$42.81	$9.67	$32.13	$107.09
23	BANANA CREAM PIE	1.55	$36.58	$19.33	$11.19	$28.76	$95.86
5	BROCCOLI AU GRATIN	0.69	$16.52	$43.34	$4.98	$27.79	$92.63
15	CINNAMON HONEY ROLL	1.48	$26.72	$26.40	$10.69	$27.35	$91.16
7	BUTTERSCOTCH BROWNIE	1.98	$8.52	$35.33	$14.30	$24.92	$83.07
29	STIR FRY VEGETABLES	1.28	$21.78	$18.90	$9.24	$21.39	$71.31
27	HOT DINNER ROLL	1.19	$27.08	$10.28	$8.59	$19.69	$65.64
6	BROWNIES	0.78	$9.56	$30.65	$5.63	$19.65	$65.49
8	APPLE COFFEE CAKE	0.87	$9.94	$18.74	$6.28	$14.98	$49.94

[1] Management cost per labor hour worked was calculated to be $7.22.

[2] Labor Cost + Food Cost + Mgmt Cost +Overhead = Total Cost

TABLE 10. CONVENIENCE FOOD - TOTAL COST BUILDUP (200 PORTIONS) - NABLC

NO.	ITEM	LABOR HRS	LABOR COST	FOOD COST	MGMT COST[1]	OVER-HEAD	TOTAL COST[2]
16	CHICKEN W/WILD RICE STUFFING	0.96	$15.60	$322.08	$6.93	$60.81	$405.42
21	CHICKEN BROCCOLI/CHEESE STUFFING	0.92	$15.00	$266.00	$6.64	$50.76	$338.40
28	BEEF STEW	0.14	$5.36	$279.68	$1.01	$50.48	$336.53
1	CHICKEN CHOW MEIN	0.16	$7.38	$242.80	$1.16	$44.35	$295.69
26	SWEET & SOUR CHICKEN	0.21	$6.76	$227.50	$1.52	$41.61	$277.39
10	CHICKEN ITALIENNE	0.14	$5.66	$213.22	$1.01	$38.80	$258.69
4	CHICKEN & VEGETABLES ORIENTAL	0.11	$4.32	$202.86	$0.79	$36.70	$244.67
14	CHILI CON CARNE	0.11	$4.64	$199.76	$0.79	$36.21	$241.40
19	TURKEY DIJON	0.13	$5.30	$197.54	$0.94	$35.96	$239.74
22	CAJUN SEASONED STEW	0.11	$4.62	$183.28	$0.79	$33.30	$221.99
3	HOMESTYLE CHICKEN & NOODLES	0.11	$4.14	$166.44	$0.79	$30.24	$201.61
20	TURKEY TETRAZZINI	0.13	$5.50	$163.58	$0.94	$30.00	$200.02
9	CHICKEN ENCHANADAS	0.10	$4.18	$148.92	$0.72	$27.14	$180.96
18	TUNA NOODLE CASSEROLE	0.20	$6.34	$144.04	$1.44	$26.79	$178.61
24	VEGETABLE LASAGNA	0.20	$5.52	$144.48	$1.44	$26.72	$178.16
2	BEEF & BEAN ENCHANADAS	0.11	$4.42	$131.74	$0.79	$24.17	$161.12
25	SALISBURY STEAK	0.10	$4.32	$130.22	$0.72	$23.87	$159.13
11	MACARONI & CHEESE	0.11	$5.62	$111.14	$0.79	$20.74	$138.29
17	BLUEBERRY PIE	0.50	$5.88	$102.28	$3.61	$19.72	$131.49
13	LEMON MERINGUE PIE	0.37	$2.72	$94.94	$2.67	$17.71	$118.04
7	BLONDIE BROWNIE BATTER	0.85	$9.26	$79.62	$6.14	$16.77	$117.79
6	BROWNIE	1.15	$9.26	$74.66	$8.31	$16.28	$108.51
12	APPLE PIE	0.96	$7.12	$75.50	$6.93	$15.80	$105.35
23	BANANA CREAM PIE	0.38	$6.28	$80.06	$2.53	$15.68	$104.55
8	GRANNY APPLE & CINNAMON (BATTER)	0.71	$6.56	$72.00	$5.13	$14.77	$98.46
15	CINNAMON ROLL	1.48	$12.16	$59.84	$10.69	$14.59	$97.28
29	VEGETABLE CHOW MEIN	0.06	$2.14	$70.90	$0.43	$12.97	$86.44
5	BROCCOLI AU GRATIN	0.09	$2.48	$62.24	$0.65	$11.54	$76.91
27	SOFT DINNER ROLL	0.67	$11.76	$14.32	$4.84	$5.46	$36.38

[1] Management cost per labor hour worked was calculated to be $7.22.

[2] Labor Cost + Food Cost + Mgmt Cost +Overhead = Total Cost

Tables 11 and 12 show cumulative USS Puget Sound food and labor costs for A-Rations and convenience items based on 150 portions.

TABLE 11. A-RATION FOOD - TOTAL COST BUILDUP (150 PORTIONS) - USS PUGET SOUND

NO.	ITEM	LABOR HRS	LABOR COST	FOOD COST	MGMT COST[1]	OVER-HEAD	TOTAL[2] COST
8	BEEF STROGANOFF	7.07	$86.63	$150.84	$31.74	$115.38	$384.59
6	CHICKEN CHOW MEIN	7.60	$93.18	$105.89	$34.12	$99.94	$333.13
10	VEAL PARMESAN	3.04	$37.18	$180.03	$13.65	$98.94	$329.80
13	CHICKEN POT PIE	6.26	$76.68	$120.83	$28.11	$96.69	$322.31
9	TACOS	5.88	$72.09	$111.05	$26.40	$89.80	$299.34
3	SALISBURY STEAK	3.88	$47.54	$66.39	$17.42	$56.29	$187.64
11	MEX TAMALES	2.13	$26.11	$81.92	$9.56	$50.40	$167.99
4	SWEET POTATO PIE	2.73	$33.50	$24.02	$12.26	$29.91	$99.69
5	CHOCOLATE DROP COOKIE MIX	2.69	$32.93	$13.83	$12.08	$25.22	$84.06
2	CHOCOLATE CHIP COOKIE	2.31	$28.31	$13.83	$10.37	$22.50	$75.01
14	POTATOES AU GRATIN (DEHY SLICES)	1.50	$18.41	$25.01	$6.74	$21.50	$71.66
1	OATMEAL COOKIES	2.31	$28.31	$9.15	$10.37	$20.50	$68.33
12	PEANUT BUTTER COOKIES	1.59	$19.53	$9.23	$7.14	$15.39	$51.29
7	BROWNIES	1.09	$13.36	$17.28	$4.89	$15.23	$50.76

[1] Management cost per labor hour worked was calculated to be $7.22.

[2] Labor Cost + Food Cost + Mgmt Cost +Overhead = Total Cost

TABLE 12. CONVENIENCE FOOD - TOTAL COST BUILDUP (150 PORTIONS) - USS PUGET SOUND

NO.	ITEM	LABOR HRS	LABOR COST	FOOD COST	MGMT COST[1]	OVER-HEAD	TOTAL[2] COST
8	BEEF STROGANOFF	0.47	$5.82	$291.20	$2.11	$52.79	$351.92
11	BEEF & BEAN ENCHANADAS	1.50	$18.35	$243.69	$6.74	$47.43	$316.21
9	CHICKEN ENCHANADAS	1.17	$14.36	$220.38	$5.25	$42.35	$282.34
10	VEAL PARMESAN	0.68	$8.36	$212.58	$3.05	$39.53	$263.52
6	CHICKEN CHOW MEIN	0.97	$11.85	$158.09	$4.36	$30.76	$205.06
13	HOMESTYLE CHICKEN W/NOODLES	0.83	$10.13	$140.84	$3.73	$27.30	$182.00
3	SALISBURY STEAK	0.70	$8.51	$119.49	$3.14	$23.14	$154.28
4	SWEET POTATO PIE	1.43	$17.58	$84.59	$6.42	$19.16	$127.75
14	POTATOES AU GRATIN	0.44	$5.40	$78.20	$1.98	$15.10	$100.68
7	GOURMET BROWNIE	0.64	$7.80	$55.49	$2.87	$11.68	$77.84
5	BROWNIE NUT COOKIE	1.61	$19.82	$17.45	$7.23	$7.85	$52.35
12	PEANUT BUTTER COOKIE	0.67	$8.18	$25.56	$3.01	$6.49	$43.24
1	SUGAR COOKIE	0.86	$10.64	$17.45	$3.86	$5.64	$37.59
2	CHOCOLATE CHIP COOKIE	0.74	$8.94	$17.45	$3.32	$5.24	$34.95

[1] Management cost per labor hour worked was calculated to be $7.22.

[2] Labor Cost + Food Cost + Mgmt Cost +Overhead = Total Cost

In Tables 13 and 14, the total difference between each CF item and its A-Ration counterpart has been calculated and the differences ranked. This was done by subtracting, on an item-by-item basis, the CF cost (column B) from the A-Ration cost (column A). If the CF item costs less than the A-Ration, then the result was a positive (savings) number and if the CF item costs more than the A-Ration item, then the result was a negative (loss) number. As seen in column C, these differences were then ranked from the highest positive (savings) values down to the highest negative (losses) values. Numbers in column D (Cumulative Cost Difference) represent a running total (in descending order) of the positive and negative cost differences from column C.

TABLE 13. TOTAL CUMULATIVE COST DIFFERENCES - NABLC

NO.	A-RATION	CONVENIENCE	(A) (B) 150 PORTION COST		(C) 150 PORTION COST DIFFER-ENCE	(D) CUMUL-ATIVE COST DIFFER-ENCE
			A-RATION	CONV		
2	MEX FAJITAS	BEEF & BEAN ENCHANADAS	$428.87	$161.12	$267.75	$267.75
25	SALISBURY STEAK	SALISBURY STEAK	$287.14	$159.13	$128.01	$395.76
24	SPINACH LASAGNA	VEGETABLE LASAGNA	$270.60	$178.16	$92.44	$488.20
10	CHICKEN CACCIATORE	CHICKEN ITALIENNE	$318.79	$258.69	$60.10	$548.30
26	SWEET & SOUR CHICKEN	SWEET & SOUR CHICKEN	$328.01	$277.39	$50.62	$598.92
20	HAM & NOODLES	TURKEY TETRAZZINI	$229.53	$200.02	$29.51	$628.43
27	HOT DINNER ROLL	SOFT DINNER ROLL	$65.64	$36.38	$29.26	$657.69
13	LEMON MERINGUE PIE	LEMON MERINGUE PIE	$146.57	$118.04	$28.53	$686.22
12	APPLE PIE	APPLE PIE	$132.11	$105.35	$26.76	$712.98
17	BLUEBERRY PIE	BLUEBERRY PIE	$150.76	$131.49	$19.27	$732.25
5	BROCCOLI AU GRATIN	BROCCOLI AU GRATIN	$92.63	$76.91	$15.72	$747.97
22	YANKEE POT ROAST	CAJUN SEASONED STEW	$230.79	$221.99	$8.80	$756.77
1	CHICKEN CHOW MEIN	CHICKEN CHOW MEIN	$304.74	$293.69	$8.55	$765.32
3	TURKEY & NOODLES	HOMESTYLE CHICKEN & NOODLES	$201.26	$201.61	-$0.35	$764.97
19	TURKEY POT PIE	TURKEY DIJON	$236.63	$239.74	-$3.11	$761.86
15	CINNAMON HONEY ROLL	CINNAMON ROLL	$91.16	$97.28	-$6.12	$755.74
23	BANANA CREAM PIE	BANANA CREAM PIE	$95.86	$104.55	-$8.69	$747.05

TABLE 13. TOTAL CUMULATIVE COST DIFFERENCES - NABLC (Continued)

29	STIR FRY VEGETABLES	VEGETABLE CHOW MEIN	$71.31	$86.44	-$15.13	$731.92
18	BAKED TUNA & NOODLES	TUNA & NOODLE CASSEROLE	$157.36	$178.61	-$21.25	$710.67
28	BEEF STEW	BEEF STEW	$310.99	$336.53	-$25.54	$685.13
11	MACARONI & CHEESE	MACARONI & CHEESE	$107.09	$138.29	-$31.20	$653.93
7	BUTTERSCOTCH BROWNIE	BLONDIE BROWNIE (BATTER)	$83.07	$117.79	-$34.72	$619.21
14	CHILI CON CARNE	CHILI CON CARNE	$200.06	$241.40	-$41.34	$577.87
6	BROWNIE	BROWNIE	$64.49	$108.51	-$43.02	$534.85
8	APPLE COFFEE CAKE	GRANNY APPLE & CINNAMON (BATTER)	$49.94	$98.46	-$48.52	$486.33
9	MEX TAMALES	CHICKEN ENCHANADAS	$121.20	$180.96	-$59.76	$426.57
4	CHICKEN A LA KING	CHICKEN & VEGETABLES ORIENTAL	$167.86	$244.67	-$76.81	$349.76
21	CHICKEN W/BROCCOLI	CHICKEN BROCCOLI/CHEESE STUFFING	$204.76	$338.40	-$133.64	$216.12
16	STUFF. CHICKEN BREAST	CHICKEN W/WILD RICE STUFFING	$211.13	$405.42	-$194.29	$21.83

TABLE 14. TOTAL CUMULATIVE COST DIFFERENCES - USS PUGET SOUND

NO.	A-RATION	CONVENIENCE	(A) (B) 150 PORTION COST		(C) 150 PORTION COST DIFFERENCE	(D) CUMULATIVE COST DIFFERENCE
			A-RATION	CONV		
13	CHICKEN POT PIE	HOMESTYLE CHICKEN & NOODLES	$322.31	$182.00	$140.31	$140.31
6	CHICKEN CHOW MEIN	CHICKEN CHOW MEIN	$333.13	$205.06	$128.07	$268.38
10	VEAL PARMESAN	VEAL PARMESAN	$329.80	$263.52	$66.28	$334.66
2	CHOCOLATE CHIP COOKIES	CHOCOLATE CHIP COOKIES	$75.01	$34.95	$40.06	$374.72
3	SALISBURY STEAK	SALISBURY STEAK	$187.64	$154.28	$33.36	$408.08
8	BEEF STROGANOFF	BEEF STROGANOFF	$384.59	$351.92	$32.67	$440.75
5	CHOCOLATE COOKIES	CHOCOLATE COOKIES	$84.06	$52.35	$31.71	$472.46
1	OATMEAL COOKIES	SUGAR COOKIES	$68.33	$37.59	$30.74	$503.20
9	TACOS	CHICKEN ENCHANADAS	$299.34	$282.34	$17.00	$520.20
12	PEANUT BUTTER COOKIES	PEANUT BUTTER COOKIES	$51.29	$43.24	$8.05	$528.25
7	BROWNIES	BROWNIES	$50.76	$77.84	-$27.08	$501.17
4	SWEET POTATO PIE	SWEET POTATO PIE	$99.69	$127.75	-$28.06	$473.11
14	POTATOES AU GRATIN	POTATOES AU GRATIN	$71.66	$100.68	-$29.02	$444.09
11	ENCHILADAS	BEEF & BEAN ENCHANADAS	$167.99	$316.21	-$148.22	$295.87

Upon further examination of the cost difference data in column C from Table 13, it can be seen that down to chicken chow mein (Item #1), it is more cost-effective, on an item-by-item basis, for NABLC to use convenience items vs. A-Ration items. The total savings, in fact, amount to $765.32 (column D). Below chicken chow mein, convenience items become more costly to prepare than their counterpart A-Rations, and negative numbers start to appear in column C. Analogous data for the USS Puget Sound can be seen in Table 14. In this case, convenience items, down to and including peanut butter cookies (Item # 12), would be more cost-effective to use than comparable A-Rations, as seen in column C.

As previously indicated, CFs can be used in many instances to reduce the labor requirements of selected A-Ration menu items. The following methodology outlines one approach to reducing the labor hours required for meal preparation, while not increasing overall system costs. Tables 15

and 16 provide data to assist in demonstrating this on an item-by-item basis. Both tables use existing data found in Tables 7 and 8, i.e., A-Ration and convenience item (1) labor hours and (2) labor hour differences and in Tables 13 and 14, (1) item cost for A-Ration and convenience products, (2) item cost differences and (3) cumulative cost differences.

TABLE 15. LABOR REDUCING CONVENIENCE FOOD SUBSTITUTES - NABLC

NO.	A-RATION	CONVENIENCE	(A) 200 PORTION COST		(B)	(C)	(D) 200 PORTION COST	(E) CUMULATIVE COST
			A-RATION	CONV	LABOR HOUR DIFFERENCE		DIFFERENCE	DIFFERENCE
2	MEX FAJITAS	BEEF & BEAN ENCHANADAS	6.33	0.11	6.22		$267.75	$267.75
25	SALISBURY STEAK	SALISBURY STEAK	4.98	0.10	4.88		$128.01	$395.76
24	SPINACH LASAGNA	VEGETABLE LASAGNA	4.19	0.20	3.99		$92.44	$488.20
1	CHICKEN CHOW MEIN	CHICKEN CHOW MEIN	3.38	0.16	3.22		$8.55	$496.75
12	APPLE PIE	APPLE PIE	3.01	0.96	2.05		$26.76	$523.51
28	BEEF STEW	BEEF STEW	2.87	0.14	2.73		-$25.54	$497.97
3	TURKEY & NOODLES	HOMESTYLE CHICKEN & NOODLES	2.77	0.11	2.66		-$0.35	$497.62
10	CHICKEN CACCIATORE	CHICKEN ITALIENNE	2.69	0.14	2.55		$60.10	$557.72
19	TURKEY POT PIE	TURKEY DIJON	2.57	0.13	2.44		-$3.11	$554.61
13	LEMON MERINGUE PIE	LEMON MERINGUE PIE	2.52	0.37	2.15		$28.53	$583.14
26	SWEET & SOUR CHICKEN	SWEET & SOUR CHICKEN	2.30	0.21	2.09		$50.62	$633.76
4	CHICKEN A LA KING	CHICKEN & VEGETABLES ORIENTAL	2.13	0.11	2.02		-$76.81	$556.95
7	BUTTERSCOTCH BROWNIE	BLONDIE BROWNIE BATTER	1.98	0.85	1.13		-$34.92	$522.03
14	CHILI CON CARNE	CHILI CON CARNE	1.76	0.11	1.65		-$41.34	$480.69
17	BLUEBERRY PIE	BLUEBERRY PIE	1.58	0.50	1.08		$19.27	$499.96
23	BANANA CREAM PIE	BANANA CREAM PIE	1.55	0.38	1.17		-$8.69	$491.27
16	STUFF. CHICKEN BREASTS	CHICKEN W/WILD RICE STUFFING	1.51	0.96	0.55		-$194.29	$296.98
15	CINNAMON HONEY ROLL	CINNAMON ROLL	1.48	1.48	0.00		-$6.12	$290.86
18	BAKED TUNA & NOODLES	TUNA NOODLE CASSEROLE	1.40	0.20	1.20		-$21.25	$269.61
20	HAM & NOODLES	TURKEY TETRAZZINI	1.36	0.13	1.23		$29.51	$299.12
11	MACARONI & CHEESE	MACARONI & CHEESE	1.34	0.11	1.23		-$31.20	$267.92
21	CHICKEN W/BROCCOLI	CHICKEN BROCCOLI/ CHEESE STUFFING	1.28	0.92	0.36		-$133.64	$134.28
29	STIR FRY VEGETABLES	VEGETABLE CHOW MEIN	1.28	0.06	1.22		-$15.13	$119.15
27	HOT DINNER ROLL	SOFT DINNER ROLL	1.19	0.67	0.52		$29.26	$148.41
22	YANKEE POT ROAST	CAJUN SEASONED STEW	1.16	0.11	1.05		$8.80	$157.21
9	MEX TAMALES	CHICKEN ENCHANADAS	1.13	0.10	1.03		-$59.76	$97.45
8	APPLE COFFEE CAKE	GRANNY APPLE & CINNAMON BATTER	0.87	0.71	0.16		-$48.52	$48.93
6	BROWNIES	GOURMET BROWNIE BATTER W/NUTS	0.78	1.15	-0.37		-$43.02	$5.91
5	BROCCOLI AU GRATIN	BROCCOLI AU GRATIN	0.69	0.09	0.60		$15.72	$21.83

TABLE 16. LABOR REDUCING CONVENIENCE FOOD SUBSTITUTES - USS PUGET SOUND

NO.	A-RATION	CONVENIENCE	(A) (B) 150 PORTION COST A-RATION	(B) CONV	(C) LABOR HOUR DIFFERENCE	(D) 150 PORTION COST DIFFERENCE	(E) CUMULATIVE COST DIFFERENCE
6	CHICKEN CHOW MEIN	CHICKEN CHOW MEIN	7.60	0.97	6.63	$128.07	$128.07
8	BEEF STROGANOFF	BEEF STROGANOFF	7.07	0.47	6.60	$32.67	$160.74
13	CHICKEN POT PIE	HOMESTYLE CHICKEN & NOODLES	6.26	0.83	5.43	$140.31	$301.05
9	TACOS	BEEF & BEAN ENCHANADAS	5.88	1.17	4.71	$17.00	$318.05
3	SALISBURY STEAK	SALISBURY STEAK	3.88	0.70	3.18	$33.36	$351.41
10	VEAL PARMESAN	VEAL PARMESAN	3.04	0.68	2.36	$66.28	$417.69
4	SWEET POTATO PIE	SWEET POTATO PIE	2.73	1.43	1.30	-$28.06	$389.63
5	CHOCOLATE COOKIES	CHOCOLATE COOKIES	2.69	1.61	1.08	$31.71	$421.34
1	OATMEAL COOKIES	SUGAR COOKIES	2.31	0.86	1.45	$30.74	$452.08
2	CHOCOLATE CHIP COOKIES	CHOCOLATE CHIP COOKIES	2.31	0.74	1.57	$40.06	$492.14
11	ENCHILADAS	BEEF & BEAN ENCHANADAS	2.18	1.50	0.68	-$148.22	$343.92
14	POTATOES AU GRATIN	POTATOES AU GRATIN	2.00	0.44	1.56	-$29.02	$314.90
12	PEANUT BUTTER COOKIES	PEANUT BUTTER COOKIES	1.59	0.67	0.92	$8.05	$322.95
7	BROWNIES	GOURMET BROWNIES	1.09	0.64	0.45	-$27.08	$295.87

In Tables 15 and 16, A-Ration items have been ranked in descending order from the most labor consuming to the least (column A). Column B represents labor requirements for the counterpart convenience items. Subtracting convenience labor times (column B) from A-Ration labor requirements (column A) yields the additional time required to produce A-Rations over counterpart convenience items (column C). In the majority of cases, it requires more labor to produce an A-Ration item. In some instances, (Table 15), items such as cinnamon honey rolls (Item # 15), no labor savings can be realized by the use of either the A-Ration or its counterpart convenience item. In other cases, such as brownies (Item #6), it actually requires less labor to produce the A-Ration item.

In Tables 15 and 16, columns A, B, and C focus on labor hours; column D (taken from Tables 13 and 14) presents cost data. Column D shows item cost differences; i.e., the total item cost (food, labor, management and overhead) for each CF item subtracted from the total item cost of each comparable A-Ration item. If a convenience item costs less than its A-Ration counterpart item, then the number is positive, and conversely, if the convenience item costs more than the A-Ration item, then the value is negative. Column E represents the cumulative, i.e., a running total of the item cost differences taken from column D. In Table 15, it can be seen that all convenience items are positive, i.e., affordable.

The evaluation methodology focuses on simultaneously reading columns C and E from top to bottom. Proceeding across (1 item at a time), observe if both values (columns C and E) are positive, then substitution of the convenience item will save labor and at the same time, not increase overall costs. This will reduce the high A-Ration labor spike depicted in Figures 2 and 3. When a zero or negative value is first encountered while proceeding down columns C and E, the

point has been reached where there are no further labor savings (total cost will begin to increase). In the case of Table 15, reading down columns C and E, 0.00 labor hour difference is reached in column C (cinnamon honey rolls). At this point, there is no need to continue down the list since no other items listed below cinnamon honey rolls in column C require more than 1.48 hours to produce. While there are other convenience items below this point which can further reduce overall costs, they can have no additional impact on reducing labor spikes. These convenience items which include turkey tetrazzini, cajun seasoned stew, dinner rolls and broccoli au gratin can be substituted at the discretion of the Food Service Manager.

Considering that convenience cinnamon honey rolls would not likely be purchased as they save no labor over the A-Ration version (and cost more) and that 17 A-Ration items listed above the cinnamon honey roll item were substituted with counterpart CFs, then the maximum labor required to prepare any of the 29 items on the list would never exceed 1.48 hours (see Figure 4). Reading down columns C and E from Table 16 (USS Puget Sound), it can be seen that all of the values are positive which indicate that all of the A-Ration items listed can be substituted with convenience items at no additional cost to the Navy and the maximum labor requirement will never exceed 1.61 hours for any of the 14 items being prepared (see Figure 5).

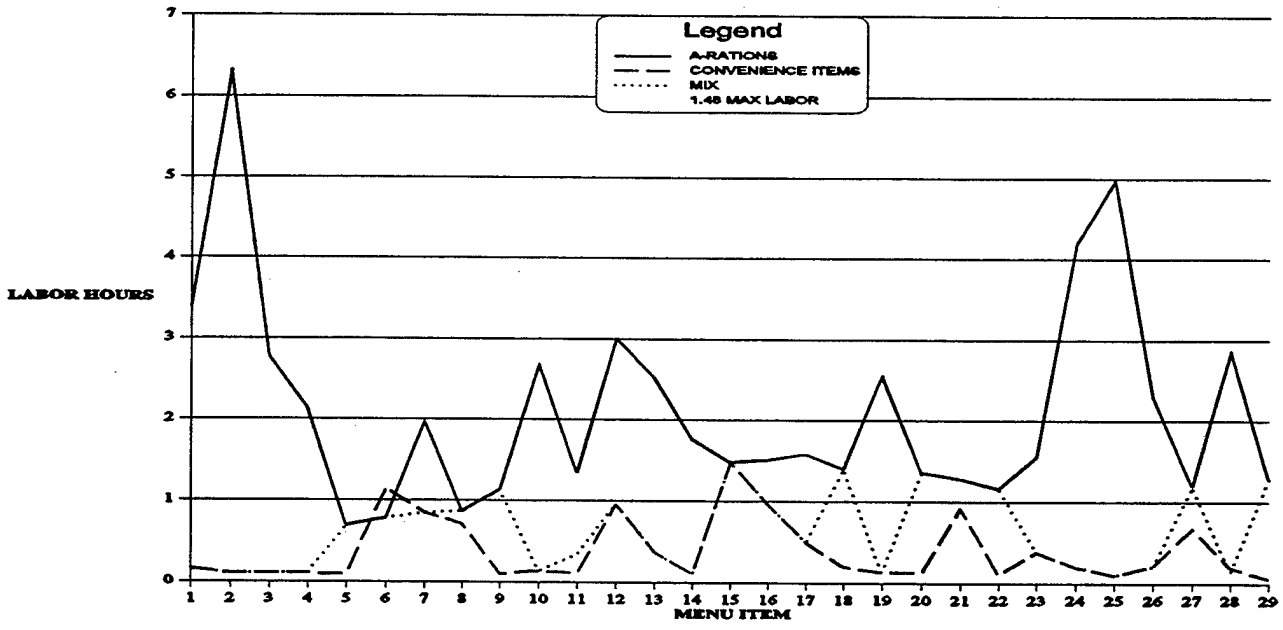

FIGURE 4. NABLC: MAXIMUM ADJUSTED LABOR HOURS PER FOOD ITEM

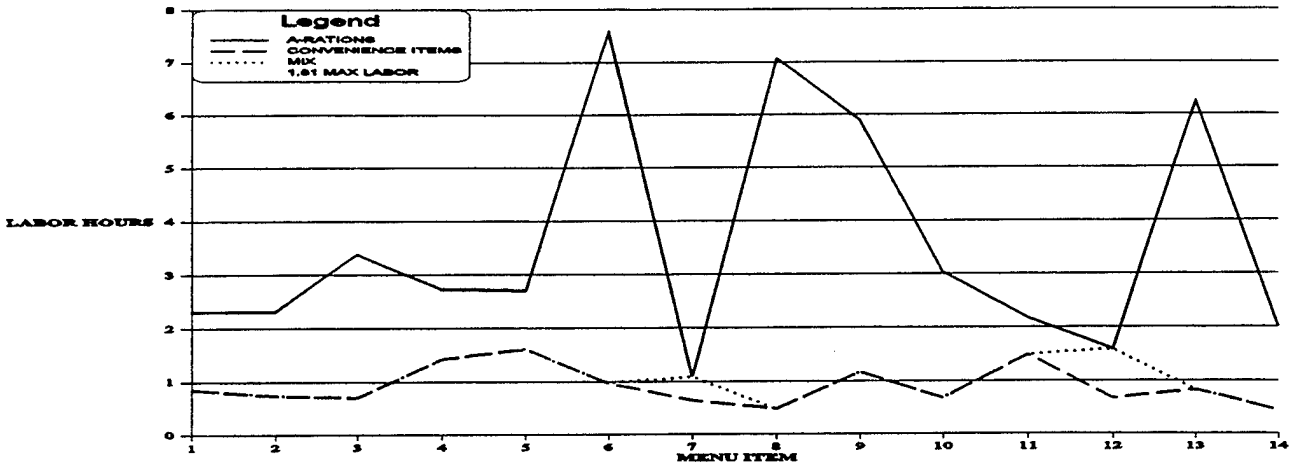

FIGURE 5. USS PUGET SOUND: MAXIMUM ADJUSTED LABOR HOURS PER FOOD ITEM

(5) Summary and Conclusions

The focus of this specific effort was to conduct a comparative analysis between A-Ration and convenience menu items in terms of food and labor costs, labor hour expenditures and overall operation costs. To varying degrees, both labor hour and total cost savings have been demonstrated through the substitution of a number of convenience products for A-Ration items for two different Navy menus, ashore and afloat.

The results further indicate that there are both immediate and long-term benefits derived by the substitution of convenience items for A-Ration items. These analyses were conducted in a manner more consistent with how industry would view these alternatives, i.e., from a total system cost perspective. While the existing approach to funding subsistence and manpower separately in the services makes cost savings transparent at the operational level, the relationship between food service labor expenditures and CF's cost is a given. Future management decisions need to be viewed from the aggregate cost perspective.

Convenience products not only allow for greater ease of preparation, but also affect several other factors in the total food service system as well, including consistency of product, training and storage requirements. One intriguing aspect of the selective use of CFs in present day operations, is the additional presentation/preparation/finish time which would be available to further enhance the overall quality of the food service experience for the consumer. In the future, further substitution of CFs for the more labor-intensive A-Ration products could lead to more optimized food service facility design and operations.

A limiting factor to any broad-based application of these particular results is the fact that they were developed around the NABLC and USS Puget Sound cycle menus and specific AFRS recipes. A need exists for software which will allow individual commands to input their A-Ration menus with an appropriate mix of possible convenience item substitutions which will optimize labor requirements and overall operating costs to the extent best suited to each command's particular circumstances. The CFLM, developed under the overall project by ITS, Inc. (referenced in the Executive Summary) was developed for this purpose.

A second limiting factor concerns the extrapolation of labor hours saved through the use of CFs into actual labor savings. This is not as simple an interpretation as might be expected, and decision makers are cautioned not to make any such determinations based on these data. A separate analysis on the translation of labor hour savings into personnel savings/manning reductions is required since that type of analysis is well beyond the scope of this present effort. This analysis would be required if ship designers required accurate manning data when considering alternative food service designs for ships.

The potential introduction of CFs into current food service systems appears feasible and more easily accommodated in an ashore facility. Use of ashore food service facilities would permit the testing of additional CF items and allow direct observation of their effectiveness on overall food service operations. Food service facilities which currently do not use fully-prepared CFs can start by taking advantage of the limited assortment of items currently available in the Federal Supply Catalog.

D. Comparative Analysis of Food Storage Requirements

The following comparative analysis details storage requirements for basic ingredients needed to prepare A-Ration menu items and comparable commercially available, CF items. The analysis attempts to address Navy concerns that CFs require more storage space than their A-Ration counterparts. This is of particular concern, considering the limited storage space available aboard ships.

(1) Approach

During the ashore phase of the project, 64 AFRS recipes from the cycle menu of NABLC were matched with commercially available CF products. During the afloat phase, 35 AFRS recipes from the USS Puget Sound cycle menu were matched with available commercial products. Tables 1 and 2 illustrate AFRS recipe numbers with the counterpart CF item.

Storage data in terms of dry (ambient room temperature), chill (refrigerated storage) and frozen (freezer storage) cubic foot volume were calculated based on 100 servings of each AFRS recipe. Analogous data were calculated for 100 servings of each convenience item. To insure comparability, portion sizes for convenience items were adjusted to match their A-Ration counterparts. The storage values reflect actual ingredient totals. Number rounding was performed to the nearest full can or bottle, etc. These data can be found in Tables 17, 18, 19 and 20. For ease in referencing, matching A-Ration and CF items were similarly numbered for both NABLC and the USS Puget Sound.

TABLE 17. A-RATION STORAGE DATA - NABLC

NO.	ITEM NAME	(CUBIC FEET)			
		CHILL	DRY	FROZEN	TOTAL
1	ROAST TURKEY	0.15	1.21	1.00	2.36
2	MASHED SWEET POTATOES	0.01	1.05	0.00	1.06
3	BAKED EGG NOODLES & CHEESE	0.18	1.02	0.00	1.20
4	BAKED STUFFED FISH	0.17	0.43	0.73	1.33
5	CHILI MAC	0.07	0.57	0.51	1.15
6	POTATOES AU GRATIN	0.89	0.18	0.00	1.07
7	BAKED CHICKEN	0.00	0.01	2.53	2.54
8	MEX FAJITAS	0.58	0.28	0.75	1.61
9	MEX TAMALES	0.00	0.88	0.00	0.88
10	SWEET & SOUR PORK	0.21	0.81	0.73	1.75
11	CHILI CON CARNE	0.07	0.53	0.51	1.11
12	BAKED MEAT LOAF	0.32	0.53	0.64	1.49
13	TURKEY & NOODLES	0.02	0.64	1.47	2.13
14	ESCALLOPED POTATOES	0.84	0.09	0.00	0.93
15	CHICKEN CACCIATORE	0.33	1.07	2.00	3.40
16	SALISBURY STEAK	0.18	0.24	0.64	1.06
17	CANDIED SWEET POTATOES	0.05	0.94	0.00	0.99
18	BEEF & CORN PIE	0.29	0.60	0.64	1.53
19	OVEN FRIED CHICKEN	0.00	1.42	2.01	3.43
20	VEAL PARMESAN	0.06	0.18	1.00	1.24
21	LASAGNA	1.01	1.32	0.33	2.66
22	BAKED TUNA & NOODLES	0.26	1.18	0.00	1.44
23	HAM & NOODLES	0.17	1.20	0.00	1.37
24	SWEET & SOUR CHICKEN	0.21	0.69	2.00	2.90
25	STIR FRY VEGETABLES	0.98	0.06	0.00	1.04
26	RICE	0.22	0.26	0.03	0.51
27	BEEF STROGANOFF	0.28	0.27	0.73	1.28
28	TURKEY POT PIE	0.53	0.34	1.47	2.34
29	CHICKEN CHOW MEIN	1.26	0.91	1.72	3.89
30	BEEF STEW	0.95	0.30	0.47	1.72
31	BBQ CHICKEN	0.00	0.58	2.00	2.58
32	CHICKEN A LA KING	0.40	0.28	1.72	2.40
33	STUFFED PEPPERS	1.15	0.26	0.51	1.92
34	MOCK FILLET STEAK	0.00	0.00	0.80	0.80
35	SPINACH LASAGNA	0.98	1.57	0.79	3.34
36	CLUB SPINACH	0.08	0.27	0.91	1.26
37	BROCCOLI AU GRATIN	0.05	0.24	0.88	1.17
38	BISCUITS	0.00	0.65	0.00	0.65
39	SAVORY BAKED CHICKEN	0.01	0.23	2.00	2.24
40	LYONNAISE GREEN BEANS	0.12	0.00	0.71	0.83
41	EGG NOODLES	0.02	1.06	0.00	1.08
42	YANKEE POT ROAST	0.21	0.30	0.70	1.21
43	ASST OMELET	1.39	0.06	0.00	1.45
44	ASST OMELET	1.83	0.06	0.00	1.89
45	ASST OMELET	1.79	0.06	0.00	1.85
46	MINCED CHIPPED BEEF	0.04	0.26	0.19	0.49
47	HOT DINNER ROLLS	0.01	0.46	0.00	0.47
48	BUTTERSCOTCH BROWNIE	0.16	0.33	0.00	0.49
49	BROWNIES	0.16	0.33	0.00	0.49
50	OATMEAL COOKIE	0.05	0.34	0.00	0.39
51	OATMEAL RAISIN COOKIES (MIX)	0.00	0.43	0.00	0.43
52	BLUEBERRY PIE	0.01	1.05	0.00	1.06
53	LEMON MERINGUE PIE	0.00	0.97	0.00	0.97
54	APPLE PIE	0.00	0.91	0.00	0.91
55	BANANA CREAM PIE	0.88	0.33	0.00	1.21
56	CHERRY COBBLER	0.00	1.22	0.00	1.22
57	CINNAMON HONEY ROLL	0.03	0.74	0.00	0.77
58	ICED SNAIL	0.18	0.72	0.00	0.90
59	BEAR CLAW	0.05	0.85	0.00	0.90
60	ORANGE/COCOA COFFEE CAKE	0.16	0.48	0.00	0.64
61	QUICK COFFEE CAKE	0.10	0.39	0.00	0.49
62	APPLE COFFEE CAKE	0.08	0.51	0.00	0.59
63	CHOCOLATE CHIP COOKIES	0.07	0.29	0.00	0.36
64	PEANUT BUTTER COOKIES	0.08	0.31	0.00	0.39
	TOTALS	20.38	35.75	33.12	89.25

TABLE 18. CONVENIENCE FOODS STORAGE DATA - NABLC

NO.	ITEM NAME	(CUBIC FEET)			
		CHILL	DRY	FROZEN	TOTAL
1	SLICED TURKEY	0.00	0.00	1.35	1.35
2	WHIPPED SWEET POTATOES	0.00	0.00	0.86	0.86
3	MACARONI & CHEESE	0.00	0.00	2.18	2.18
4	SHRIMP CREOLE	0.00	0.00	1.17	1.17
5	MACARONI & BEEF	0.00	0.00	2.18	2.18
6	AU GRATIN POTATOES	0.00	0.00	1.02	1.02
7	CHICKEN/BROCCOLI CHEESE STUFFING	0.00	0.00	1.67	1.67
8	CHICKEN ENCHANADAS	0.00	0.00	1.16	1.16
9	BEEF/BEAN ENCHANADAS	0.00	0.00	1.19	1.19
10	SWEET & SOUR PORK	0.00	0.00	1.38	1.38
11	CHILI CON CARNE	0.00	0.00	1.50	1.50
12	BAKED MEATLOAF	0.00	0.00	1.81	1.81
13	HOMESTYLE CHICKEN & NOODLES	0.00	0.00	1.52	1.52
14	ESCALLOPED POTATOES	0.00	0.00	0.79	0.79
15	CHICKEN ITALIENNE	0.00	0.00	0.74	0.74
16	SALISBURY STEAK	0.00	0.00	0.88	0.88
17	SWEET POTATO CASSEROLE	0.00	0.00	0.79	0.79
18	BEEF & PEPPERS	0.00	0.00	1.38	1.38
19	CHICKEN PRIMAVERA	0.00	0.00	0.74	0.74
20	VEAL PARMESAN	0.00	0.00	2.72	2.72
21	LASAGNA	0.00	0.00	1.50	1.50
22	TUNA NOODLE CASSEROLE	0.00	0.00	1.39	1.39
23	TURKEY TETRAZZINI	0.00	0.00	1.12	1.12
24	SWEET & SOUR CHICKEN	0.00	0.00	1.38	1.38
25	VEGETABLE CHOW MEIN	0.00	0.00	0.75	0.75
26	CONFETTI RICE	0.00	0.00	0.59	0.59
27	BEEF STROGANOFF	0.00	0.00	0.81	0.81
28	TURKEY DIJON	0.00	0.00	1.38	1.38
29	CHICKEN CHOW MEIN	0.00	0.00	1.97	1.97
30	BEEF STEW	0.00	0.00	1.19	1.19
31	GLAZED CHICKEN	0.00	0.00	0.75	0.75
32	CHICKEN & VEGETABLES ORIENTAL	0.00	0.00	0.75	0.75
33	STUFFED PEPPERS W/SAUCE	0.00	0.00	1.67	1.67
34	BEEF SIRLOIN TIPS	0.00	0.00	1.19	1.19
35	VEGETABLE LASAGNA	0.00	0.00	1.50	1.50
36	SPINACH SOUFFLE	0.00	0.00	0.81	0.81
37	BROCCOLI AU GRATIN	0.00	0.00	0.78	0.78
38	OLD FASHION BISCUITS	0.00	0.00	0.59	0.59
39	CHICKEN W/WILD RICE STUFFING	0.00	0.00	1.67	1.67
40	GREEN BEAN MUSHROOM CASSEROLE	0.00	0.00	0.60	0.60
41	NOODLES ROMANOFF	0.00	0.00	0.56	0.56
42	CAJUN SEASONED STEW	0.00	0.00	0.78	0.78
43	CHEDDAR OMELET	0.00	0.00	1.20	1.20
44	GARDEN OMELET	0.00	0.00	1.20	1.20
45	WESTERN OMELET	0.00	0.00	1.20	1.20
46	CREAMED CHIPPED BEEF	0.00	0.00	0.75	0.75
47	SOFT DINNER ROLL	0.00	0.00	0.69	0.69
48	BLONDIE BROWNIES	0.00	0.00	0.46	0.46
49	GOURMET BROWNIE	0.00	0.00	0.46	0.46
50	COCONUT MACAROON	0.00	0.00	0.28	0.28
51	OATMEAL RAISIN	0.00	0.00	0.55	0.55
52	BLUEBERRY PIE	0.00	0.00	1.10	1.10
53	LEMON MERINGUE PIE	0.00	0.00	1.82	1.82
54	APPLE PIE	0.00	0.00	1.10	1.10
55	BANANA CREAM PIE	0.00	0.00	1.58	1.58
56	CHERRY TURNOVER	0.00	0.00	1.04	1.04
57	CINNAMON ROLL	0.00	0.00	0.54	0.54
58	TWISTED SNAIL	0.00	0.00	0.74	0.74
59	BEAR CLAW	0.00	0.00	0.64	0.64
60	GOOD MORN MUFFIN	0.00	0.00	0.63	0.63
61	BLUEBERRY MUFFIN	0.00	0.00	0.63	0.63
62	APPLE COFFEE CAKE	0.00	0.00	0.63	0.63
63	CHOCOLATE CHIP COOKIE	0.00	0.00	0.55	0.55
64	PEANUT BUTTER COOKIE	0.00	0.00	0.55	0.55
	TOTALS	0.00	0.00	69.10	69.10

TABLE 19. A-RATION STORAGE DATA - USS PUGET SOUND

NO.	ITEM NAME	(CUBIC FEET) CHILL	DRY	FROZEN	TOTAL
1	MACARONI & CHEESE	0.18	0.51	0.00	0.69
2	CHILI MAC	0.07	0.57	0.51	1.15
3	MEATLOAF	0.32	0.53	0.64	1.49
4	VEAL PARMESAN	0.06	0.18	1.00	1.24
5	BEEF STEW	0.95	0.30	0.47	1.72
6	CREAMED GROUND BEEF	0.04	0.18	0.38	0.60
7	SWEET & SOUR CHICKEN	0.21	0.69	2.00	2.90
8	CHICKEN CHOW MEIN	1.26	0.91	1.72	3.89
9	ASST OMELET	1.83	0.06	0.00	1.89
10	ASST OMELET	1.79	0.06	0.00	1.85
11	ASST OMELET	1.39	0.06	0.00	1.45
12	BEEF STROGANOFF	0.28	0.27	0.73	1.28
13	HOT TAMALES W/ CHILI GRAVY	0.00	0.88	0.00	0.88
14	LASAGNA	1.01	1.32	0.33	2.66
15	SALISBURY STEAK	0.18	0.24	0.64	1.06
16	STUFFED PEPPERS	1.15	0.26	0.51	1.92
17	TACOS	0.80	1.28	0.47	2.55
18	CHICKEN POT PIE (CANNED CHICKEN)	0.47	0.69	0.00	1.16
19	POTATOES AU GRATIN (DEHY SLICES)	0.07	0.85	0.00	0.92
20	BAKING POWDER BISCUIT (BISCUIT MIX)	0.00	0.65	0.00	0.65
21	CINNAMON HONEY ROLLS	0.03	0.74	0.00	0.77
22	CHERRY PIE (PIE FILLING, PREPARED)	0.00	0.91	0.00	0.91
23	SAVORY BAKED CHICKEN	0.01	0.23	2.00	2.24
24	PEACH PIE (PREPARED PIE FILLING)	0.00	0.91	0.00	0.91
25	LEMON MERINGUE PIE (FILLING MIX)	0.00	0.49	0.00	0.49
26	CHOCOLATE CHIP COOKIE	0.00	0.40	0.00	0.40
27	SUGAR COOKIES (SUGAR COOKIE MIX)	0.00	0.37	0.00	0.37
28	PEANUT BUTTER COOKIES	0.08	0.31	0.00	0.39
29	CHOCOLATE DROP COOKIES (MIX)	0.00	0.37	0.00	0.37
30	BROWNIES	0.00	0.55	0.00	0.55
31	SWEET POTATO PIE	0.12	0.63	0.00	0.75
32	PECAN PIE	0.41	0.70	0.00	1.11
33	ICED SNAILS	0.18	0.72	0.00	0.90
34	HOT ROLLS	0.01	0.46	0.00	0.47
35	GARLIC BREADSTICKS	0.00	0.19	0.00	0.19
	TOTALS	12.90	18.47	11.40	42.77

TABLE 20. CONVENIENCE FOODS STORAGE DATA - USS PUGET SOUND

NO.	ITEM NAME	(CUBIC FEET)			
		CHILL	DRY	FROZEN	TOTAL
1	MACARONI & CHEESE	0.00	0.00	2.18	2.18
2	MAC & BEEF IN TOM SC	0.00	0.00	2.18	2.18
3	MEATLOAF	0.00	0.00	1.81	1.81
4	VEAL PARMESAN	0.00	0.00	2.72	2.72
5	BEEF STEW/POT	0.00	0.00	1.19	1.19
6	CREAMED CHIPPED BEEF	0.00	0.00	0.80	0.80
7	SWEET & SOUR CHICKEN	0.00	0.00	1.38	1.38
8	CHICKEN CHOW MEIN	0.00	0.00	1.68	1.68
9	GARDEN OMELET	0.00	0.00	1.20	1.20
10	WESTERN OMELET	0.00	0.00	1.20	1.20
11	CHEDDAR OMELET	0.00	0.00	1.20	1.20
12	BEEF STROGANOFF	0.00	0.00	0.81	0.81
13	BEEF & BEAN ENCHANADAS	0.00	0.00	1.19	1.19
14	LASAGNA	0.00	0.00	1.50	1.50
15	SALISBURY STEAK	0.00	0.00	0.88	0.88
16	STUFFED PEPPERS W/SAUCE	0.00	0.00	1.67	1.67
17	CHICKEN ENCHANADAS	0.00	0.00	1.16	1.16
18	HOMESTYLE CHICKEN & NOODLES	0.00	0.00	1.52	1.52
19	POTATOES AU GRATIN	0.00	0.00	1.08	1.08
20	BUTTERMILK BISCUITS	0.00	0.00	0.59	0.59
21	CINNAMON ROLLS	0.00	0.00	0.54	0.54
22	CHICKEN W/BROCCOLI & CHEESE	0.00	0.00	1.67	1.67
23	CHERRY PIE	0.00	0.00	1.38	1.38
24	PEACH PIE	0.00	0.00	1.38	1.38
25	LEMON MERINGUE PIE	0.00	0.00	2.27	2.27
26	CHOCOLATE CHIP COOKIE	0.00	0.00	0.55	0.55
27	SUGAR COOKIE	0.00	0.00	0.55	0.55
28	PEANUT BUTTER COOKIE	0.00	0.00	0.55	0.55
29	BROWNIE NUT COOKIE	0.00	0.00	0.55	0.55
30	GOURMET BROWNIE	0.00	0.00	0.55	0.55
31	SWEET POTATO PIE	0.00	0.00	1.38	1.38
32	PECAN PIE	0.00	0.00	1.38	1.38
33	TWISTED SNAILS	0.00	0.00	0.74	0.74
34	PARKERHOUSE ROLLS	0.00	0.00	1.19	1.19
35	BREADSTICKS	0.00	0.00	0.66	0.66
	TOTALS	0.00	0.00	43.28	43.28

(2) Results and Discussion

This analysis dealt with (a) differences between the mix of storage requirements, (i.e., dry, chill and frozen) needed to support A-Ration and convenience items, (b) overall differences in storage demand factors between the two product lines, and (c) alternative investment strategies based on storage requirements only and storage requirements with food and labor costs factored in.

The question of adequate storage space to support any menu is contingent on three factors; (a) the menu design, (b) the capacity of the existing storage space and (c) the frequency of deliveries. In the case of NABLC, storage was unlikely to be a limiting factor in supporting the menu. The facility was designed to accommodate a much larger consumer population than currently exists and product deliveries could be scheduled on a fairly frequent basis. While inport, the USS Puget

Sound shares a similar storage situation as NABLC; however, while not as severely constrained as many warships (in terms of space, at sea schedules and frequency of resupply), the USS Puget Sound does periodically deploy and must deal with "Topping Off" and supporting her full complement of sailors. Under these circumstances, most of the ship's storage areas, particularly freezer space, are challenged.

Experience would indicate that CFs would take up more storage space than A-Rations; however, data show that over one-half of the 72 different convenience items tested required less storage space than their A-Ration counterparts. When all 72 items were considered, total storage space savings using CFs exceeded total increases. While this is not the purpose of this analysis, it nevertheless would be of interest to identify the sources of the differences, whether they be water for preparation, ingredient trim waste, specific ingredient types and amounts, varying density, etc.

Total cubic foot requirements, including subtotals for chill, dry and frozen storage, are presented in Tables 17 and 18 for the NABLC. Analogous data are presented for the USS Puget Sound in Tables 19 and 20. In both test cases, there is a total migration of all chill and dry space requirements associated with A-Rations to a single frozen storage space requirement for the convenience items. The total space requirements between the test sites varied from a modest 1% increase from the use of CFs on the USS Puget Sound, to a substantial 22.6% decrease using similar items at NABLC.

Storage data were organized in several different ways to evaluate storage requirements from differing perspectives. One approach was to arrange the menu items in respective categories by entrees, starches, vegetables and desserts. Convenience and A-Ration items for both NABLC and the USS Puget Sound are contained in Tables 21, 22, 23 and 24. In viewing the NABLC data, the largest change was a 48.1% reduction in total storage requirements for CF starches over A-Ration items, followed by a reduction of 31.6% for CF entrees, a 27% reduction for vegetables and a 23.4% reduction for breakfast items. The total storage requirement for convenience dessert items was the only category that did not show a reduction in storage requirements increasing by 9.4% over counterpart A-Ration items. The USS Puget Sound data illustrates an 18.3% savings of storage space when using convenience entrees over comparable A-Rations and a similar reduction for breakfast items (24.0%). Convenience starch items required 102 % more space and an increase of 54.5% in space requirements for dessert items. Again, caution is advised in interpreting these percentages. Some percentage changes are the result of the small sample size, e.g., only two starch items for the USS Puget Sound, thus resulting in more variability and less accuracy than if larger sample sizes were used. From an overall perspective, it would appear that the use of convenience entrees would save on total storage space requirement. With regard to breakfast items, prepared convenience omelets would save space over A-Ration omelets made from shell eggs (as shown in the NABLC and USS Puget Sound data), but would be less space-efficient if compared with omelets prepared using frozen whole eggs available in the Federal Supply Catalog. Such decisions are obviously at the discretion of the local command. Starch and vegetable items (canned and frozen) are likely to show no reduction or increase from a space-saving perspective. If no other factors are considered, it would appear prudent to continue with A-Ration starches and vegetables. Again in the aggregate, and considering no other factors, A-Ration breakfast items appear to be the more space-saving alternative.

TABLE 21. A-RATION STORAGE DATA - NABLC

NO.	ITEM NAME	(CUBIC FEET)			
		CHILL	DRY	FROZEN	TOTAL
	ENTREES				
1	ROAST TURKEY	0.00	0.01	1.00	1.01
1	TURKEY GRAVY	0.00	0.12	0.00	0.12
1	SAVORY BREAD DRESSING	0.15	1.08	0.00	1.23
2	SPINACH LASAGNA	0.98	1.57	0.79	3.34
3	BAKED STUFFED FISH	0.17	0.43	0.73	1.33
4	BAKED CHICKEN	0.00	0.01	2.53	2.54
5	CHILI MAC	0.07	0.57	0.51	1.15
6	MEX FAJITAS	0.58	0.28	0.75	1.61
7	MEX TAMALES	0.00	0.88	0.00	0.88
8	SWEET & SOUR PORK	0.21	0.81	0.73	1.75
9	CHILI CON CARNE	0.07	0.53	0.51	1.11
10	BAKED MEAT LOAF	0.32	0.53	0.64	1.49
11	TURKEY & NOODLES	0.02	0.64	1.47	2.13
12	CHICKEN CACCIATORE	0.33	1.07	2.00	3.40
13	SALISBURY STEAK	0.18	0.24	0.64	1.06
14	BEEF AND CORN PIE	0.29	0.60	0.64	1.53
15	OVEN FRIED CHICKEN	0.00	1.42	2.01	3.43
16	VEAL PARMESAN	0.06	0.18	1.00	1.24
17	LASAGNA	1.01	1.32	0.33	2.66
18	BAKED TUNA AND NOODLES	0.26	1.18	0.00	1.44
19	HAM & NOODLES	0.17	1.20	0.00	1.37
20	SWEET & SOUR CHICKEN	0.21	0.69	2.00	2.90
21	BEEF STROGANOFF	0.28	0.27	0.73	1.28
22	TURKEY POT PIE	0.53	0.34	1.47	2.34
23	CHICKEN CHOW MEIN	1.26	0.91	1.72	3.89
24	BEEF STEW	0.95	0.30	0.47	1.72
25	BBQ CHICKEN	0.00	0.58	2.00	2.58
26	CHICKEN A LA KING	0.40	0.28	1.72	2.40
27	STUFFED PEPPERS	1.15	0.26	0.51	1.92
28	MOCK FILLET STEAK	0.00	0.00	0.80	0.80
29	SAVORY BAKED CHICKEN	0.01	0.23	2.00	2.24
30	YANKEE POT ROAST	0.21	0.30	0.70	1.21
	SUBTOTAL	9.87	18.83	30.40	59.10
	BREAKFAST				
31	ASST OMELET	1.39	0.06	0.00	1.45
32	ASST OMELET	1.83	0.06	0.00	1.89
33	ASST OMELET	1.79	0.06	0.00	1.85
34	MINCED CHIPPED BEEF	0.04	0.26	0.19	0.49
	SUBTOTAL	5.05	0.44	0.19	5.68
	STARCHES				
35	MASHED SWEET POTATOES	0.01	1.05	0.00	1.06
36	EGG NOODLES	0.18	1.02	0.00	1.20
37	AU GRATIN POTATOES	0.89	0.18	0.00	1.07
38	ESCALLOPED POTATOES	0.84	0.09	0.00	0.93
39	CANDIED SWEET POTATOES	0.05	0.94	0.00	0.99
40	RICE	0.22	0.26	0.03	0.51
41	BUTTERED NOODLES	0.02	1.06	0.00	1.08
	SUBTOTAL	2.21	4.60	0.03	6.84
	VEGETABLES				
42	VEGETABLE STIR FRY	0.98	0.06	0.00	1.04
43	CLUB SPINACH	0.08	0.27	0.91	1.26
44	BROCCOLI AU GRATIN	0.05	0.24	0.88	1.17
45	LYONNAISE GREEN BEANS	0.12	0.00	0.71	0.83
	SUBTOTAL	1.23	0.57	2.50	4.30
	DESSERTS				
46	DINNER BISCUIT	0.00	0.65	0.00	0.65
47	HOT ROLLS	0.01	0.46	0.00	0.47
48	BUTTERSCOTCH BROWNIE	0.16	0.33	0.00	0.49
49	BROWNIES	0.16	0.33	0.00	0.49

TABLE 21. A-RATION STORAGE DATA - NABLC (Continued)

50	OATMEAL COOKIES	0.05	0.34	0.00	0.39
51	OATMEAL RAISIN COOKIE	0.00	0.43	0.00	0.43
52	BLUEBERRY PIE	0.01	1.05	0.00	1.06
53	LEMON MERINGUE PIE	0.00	0.97	0.00	0.97
54	APPLE PIE	0.00	0.91	0.00	0.91
55	BANANA CREAM PIE	0.88	0.33	0.00	1.21
56	CHERRY COBBLER	0.00	1.22	0.00	1.22
57	CINNAMON HONEY ROLLS	0.03	0.74	0.00	0.77
58	ICED SNAILS	0.18	0.72	0.00	0.90
59	BEAR CLAWS	0.05	0.85	0.00	0.90
60	ORANGE/COCO COFFEE CAKE	0.16	0.48	0.00	0.64
61	QUICK COFFEE CAKE	0.10	0.39	0.00	0.49
62	APPLE COFFEE CAKE	0.08	0.51	0.00	0.59
63	CHOCOLATE CHIP COOKIES	0.07	0.29	0.00	0.36
64	PEANUT BUTTER COOKIES	0.08	0.31	0.00	0.39
	SUBTOTAL	**2.02**	**11.31**	**0.00**	**13.33**
	TOTALS	**20.38**	**35.75**	**33.12**	**89.25**

TABLE 22. CONVENIENCE FOODS STORAGE DATA - NABLC

NO.	ITEM NAME	(CUBIC FEET) CHILL	DRY	FROZEN	TOTAL
	ENTREES				
1	SLICED TURKEY	0.00	0.00	1.35	1.35
2	VEGETABLE LASAGNA	0.00	0.00	1.50	1.50
3	SHRIMP CREOLE	0.00	0.00	1.17	1.17
4	CHICKEN BROC/CHEESE STUFFING	0.00	0.00	1.67	1.67
5	MACARONI & BEEF	0.00	0.00	2.18	2.18
6	CHICKEN ENCHANADAS	0.00	0.00	1.16	1.16
7	BEEF/BEAN ENCHANADAS	0.00	0.00	1.19	1.19
8	SWEET & SOUR PORK	0.00	0.00	1.38	1.38
9	CHILI CON CARNE	0.00	0.00	1.50	1.50
10	BAKED MEATLOAF	0.00	0.00	1.81	1.81
11	HOMESTYLE CHICKEN & NOODLES	0.00	0.00	1.52	1.52
12	CHICKEN ITALIENNE	0.00	0.00	0.74	0.74
13	SALISBURY STEAK	0.00	0.00	0.88	0.88
14	BEEF AND PEPPERS	0.00	0.00	1.38	1.38
15	CHICKEN PRIMAVERA	0.00	0.00	0.74	0.74
16	VEAL PARMESAN	0.00	0.00	2.72	2.72
17	LASAGNA	0.00	0.00	1.50	1.50
18	TUNA NOODLE CASSEROLE	0.00	0.00	1.39	1.39
19	TURKEY TETRAZZINI	0.00	0.00	1.12	1.12
20	SWEET & SOUR CHICKEN	0.00	0.00	1.38	1.38
21	BEEF STROGANOFF	0.00	0.00	0.81	0.81
22	TURKEY DIJON	0.00	0.00	1.38	1.38
23	CHICKEN CHOW MEIN	0.00	0.00	1.97	1.97
24	BEEF STEW	0.00	0.00	1.19	1.19
25	GLAZED CHICKEN	0.00	0.00	0.75	0.75
26	CHICKEN & VEGETABLES ORIENTAL	0.00	0.00	0.75	0.75
27	STUFFED PEPPERS W/SAUCE	0.00	0.00	1.67	1.67
28	BEEF SIRLOIN TIPS	0.00	0.00	1.19	1.19
29	CHICKEN W/WILD RICE STUFFING	0.00	0.00	1.67	1.67
30	CAJUN SEASONED STEW	0.00	0.00	0.78	0.78
	SUBTOTAL	**0.00**	**0.00**	**40.44**	**40.44**
	BREAKFAST				
31	CHEDDAR OMELET	0.00	0.00	1.20	1.20
32	GARDEN OMELET	0.00	0.00	1.20	1.20
33	WESTERN OMELET	0.00	0.00	1.20	1.20
34	CREAMED CHIPPED BEEF	0.00	0.00	0.75	0.75
	SUBTOTAL	**0.00**	**0.00**	**4.35**	**4.35**
	STARCHES				
35	WHIPPED SWEET POTATOES	0.00	0.00	0.86	0.86
36	MACARONI & CHEESE	0.00	0.00	2.18	2.18

TABLE 22. CONVENIENCE FOODS STORAGE DATA - NABLC (Continued)

37	AU GRATIN POTATOES	0.00	0.00	1.02	1.02
38	ESCALLOPED POTATOES	0.00	0.00	0.79	0.79
39	SWEET POTATO CASSEROLE	0.00	0.00	0.79	0.79
40	CONFETTI RICE	0.00	0.00	0.59	0.59
41	NOODLES ROMANOFF	0.00	0.00	0.56	0.56
	SUBTOTAL	**0.00**	**0.00**	**6.79**	**6.79**
	VEGETABLES				
42	VEGETABLE CHOW MEIN	0.00	0.00	0.75	0.75
43	SPINACH SOUFFLE	0.00	0.00	0.81	0.81
44	BROCCOLI AU GRATIN	0.00	0.00	0.78	0.78
45	GREEN BEAN MUSHROOM CASSEROLE	0.00	0.00	0.60	0.60
	SUBTOTAL	**0.00**	**0.00**	**2.94**	**2.94**
	DESSERTS				
46	OLD FASHIONED BISCUITS	0.00	0.00	0.59	0.59
47	SOFT DINNER ROLL	0.00	0.00	0.69	0.69
48	BLONDIE BROWNIE	0.00	0.00	0.46	0.46
49	GOURMET BROWNIE	0.00	0.00	0.46	0.46
50	COCONUT MACAROON	0.00	0.00	0.28	0.28
51	OATMEAL RAISIN COOKIE	0.00	0.00	0.55	0.55
52	BLUEBERRY PIE	0.00	0.00	1.10	1.10
53	LEMON MERINGUE PIE	0.00	0.00	1.82	1.82
54	APPLE PIE	0.00	0.00	1.10	1.10
55	BANANA CREAM PIE	0.00	0.00	1.58	1.58
56	CHERRY TURNOVER	0.00	0.00	1.04	1.04
57	CINNAMON ROLLS	0.00	0.00	0.54	0.54
58	TWISTED SNAIL	0.00	0.00	0.74	0.74
59	BEAR CLAW	0.00	0.00	0.64	0.64
60	GOOD MORNING MUFFIN	0.00	0.00	0.63	0.63
61	BLUEBERRY MUFFIN	0.00	0.00	0.63	0.63
62	APPLE & CINNAMON COFFEE CAKE	0.00	0.00	0.63	0.63
63	CHOCOLATE CHIP COOKIE	0.00	0.00	0.55	0.55
64	PEANUT BUTTER COOKIE	0.00	0.00	0.55	0.55
	SUBTOTAL	**0.00**	**0.00**	**14.58**	**14.58**
	TOTAL	**0.00**	**0.00**	**69.10**	**69.10**

TABLE 23. A-RATION STORAGE DATA -USS PUGET SOUND

NO.	ITEM NAME	(CUBIC FEET) CHILL	DRY	FROZEN	TOTAL
	ENTREES				
1	CHILI MAC	0.07	0.57	0.51	1.15
2	MEATLOAF	0.32	0.53	0.64	1.49
3	VEAL PARMESAN	0.06	0.18	1.00	1.24
4	BEEF STEW	0.95	0.30	0.47	1.72
5	SWEET & SOUR CHICKEN	0.21	0.69	2.00	2.90
6	CHICKEN CHOW MEIN	1.26	0.91	1.72	3.89
7	BEEF STROGANOFF	0.28	0.27	0.73	1.28
8	MEX TAMALES	0.00	0.88	0.00	0.88
9	LASAGNA	1.01	1.32	0.33	2.66
10	SALISBURY STEAK	0.18	0.24	0.64	1.06
11	STUFFED PEPPERS	1.15	0.26	0.51	1.92
12	TACOS	0.80	1.28	0.47	2.55
13	CHICKEN POT PIE (CANNED CHICKEN)	0.47	0.69	0.00	1.16
14	SAVORY BAKED CHICKEN	0.01	0.23	2.00	2.24
	SUBTOTAL	**6.77**	**8.35**	**11.02**	**26.14**
	BREAKFAST				
15	CREAMED GROUND BEEF	0.04	0.18	0.38	0.60
16	ASST OMELET	1.83	0.06	0.00	1.89
17	ASST OMELET	1.79	0.06	0.00	1.85
18	ASST OMELET	1.39	0.06	0.00	1.45
	SUBTOTAL	**5.05**	**0.36**	**0.38**	**5.79**

TABLE 23. A-RATION STORAGE DATA -USS PUGET SOUND (Continued)

	STARCHES				
19	MACARONI AND CHEESE	0.18	0.51	0.00	0.69
20	POTATOES AU GRATIN (DEHY SLICES)	0.07	0.85	0.00	0.92
	SUBTOTAL	**0.25**	**1.36**	**0.00**	**1.61**
	DESSERTS				
21	BAKING POWDER BISCUIT (BISCUIT MIX)	0.00	0.65	0.00	0.65
22	CINNAMON SWEET ROLLS	0.03	0.74	0.00	0.77
23	CHERRY PIE (PIE FILLING, PREPARED)	0.00	0.91	0.00	0.91
24	PEACH PIE (PIE FILLING, PREPARED)	0.00	0.91	0.00	0.91
25	LEMON MERINGUE PIE (FILLING MIX)	0.00	0.49	0.00	0.49
26	CHOCOLATE CHIP COOKIE	0.00	0.40	0.00	0.40
27	SUGAR COOKIES (SUGAR COOKIE MIX)	0.00	0.37	0.00	0.37
28	PEANUT BUTTER COOKIES	0.08	0.31	0.00	0.39
29	CHOCOLATE DROP COOKIES (MIX)	0.00	0.37	0.00	0.37
30	BROWNIES	0.00	0.55	0.00	0.55
31	SWEET POTATO PIE	0.12	0.63	0.00	0.75
32	PECAN PIE	0.41	0.70	0.00	1.11
33	ICED SNAILS	0.18	0.72	0.00	0.90
34	HOT ROLLS	0.01	0.46	0.00	0.47
35	GARLIC BREADSTICKS	0.00	0.19	0.00	0.19
	SUBTOTAL	**0.83**	**8.40**	**0.00**	**9.23**
	TOTALS	**12.90**	**18.47**	**11.40**	**42.77**

TABLE 24. CONVENIENCE FOODS STORAGE DATA -USS PUGET SOUND

NO.	ITEM NAME	(CUBIC FEET) CHILL	DRY	FROZEN	TOTAL
	ENTREES				
1	MAC & BEEF IN TOM SC	0.00	0.00	2.18	2.18
2	MEATLOAF/GRAVY	0.00	0.00	1.81	1.81
3	VEAL PARMESAN	0.00	0.00	2.72	2.72
4	BEEF STEW/POT	0.00	0.00	1.19	1.19
5	SWEET & SOUR CHICKEN	0.00	0.00	1.38	1.38
6	CHICKEN CHOW MEIN	0.00	0.00	1.68	1.68
7	CHICKEN W/WILD RICE STUFFING	0.00	0.00	1.67	1.67
8	BEEF STROGANOFF	0.00	0.00	0.81	0.81
9	BEEF & BEAN ENCHANADAS	0.00	0.00	1.19	1.19
10	LASAGNA	0.00	0.00	1.50	1.50
11	SALISBURY STEAK	0.00	0.00	0.88	0.88
12	STUFFED PEPPERS W/SAUCE	0.00	0.00	1.67	1.67
13	CHICKEN ENCHANADAS	0.00	0.00	1.16	1.16
14	HOMESTYLE CHICKEN & NOODLES	0.00	0.00	1.52	1.52
	SUBTOTAL	**0.00**	**0.00**	**21.36**	**21.36**
	BREAKFAST				
15	CREAMED CHIPPED BEEF	0.00	0.00	0.80	0.80
16	GARDEN OMELET	0.00	0.00	1.20	1.20
17	WESTERN OMELET	0.00	0.00	1.20	1.20
18	CHEDDAR OMELET	0.00	0.00	1.20	1.20
	SUBTOTAL	**0.00**	**0.00**	**4.40**	**4.40**
	STARCHES				
19	MACARONI & CHEESE	0.00	0.00	2.18	2.18
20	POTATOES AU GRATIN	0.00	0.00	1.08	1.08
	SUBTOTAL	**0.00**	**0.00**	**3.26**	**3.26**
	DESSERTS				
21	BUTTERMILK BISCUITS	0.00	0.00	0.59	0.59
22	CINNAMON ROLLS	0.00	0.00	0.54	0.54
23	CHERRY PIE	0.00	0.00	1.38	1.38

TABLE 24. CONVENIENCE FOODS STORAGE DATA -USS PUGET SOUND (Continued)

24	PEACH PIE	0.00	0.00	1.38	1.38
25	LEMON MERINGUE PIE	0.00	0.00	2.27	2.27
26	CHOCOLATE CHIP COOKIE	0.00	0.00	0.55	0.55
27	SUGAR COOKIE	0.00	0.00	0.55	0.55
28	PEANUT BUTTER COOKIE	0.00	0.00	0.55	0.55
29	BROWNIE NUT COOKIE	0.00	0.00	0.55	0.55
30	GOURMET BROWNIE	0.00	0.00	0.55	0.55
31	SWEET POTATO PIE	0.00	0.00	1.38	1.38
32	PECAN PIE	0.00	0.00	1.38	1.38
33	TWISTED SNAILS	0.00	0.00	0.74	0.74
34	PARKERHOUSE ROLLS	0.00	0.00	1.19	1.19
35	BREADSTICKS	0.00	0.00	0.66	0.66
	SUBTOTAL	0.00	0.00	14.26	14.26
	TOTALS	0.00	0.00	43.28	43.28

A second approach called for calculating the storage requirement differences between convenience and A-Ration items and then placing them in rank order (Tables 25 and 26).

TABLE 25. STORAGE DIFFERENCES - NABLC

ITEM NAME	A RATION	CONVENIENCE	DIFFERENCE
OVEN FRIED CHICKEN	3.43	0.74	2.69
CHICKEN CACCIATORE	3.40	0.74	2.66
CHICKEN CHOW MEIN	3.89	1.97	1.92
SPINACH LASAGNA	3.34	1.50	1.84
BBQ CHICKEN	2.58	0.75	1.83
CHICKEN A LA KING	2.40	0.75	1.65
SWEET & SOUR CHICKEN	2.90	1.38	1.52
LASAGNA	2.66	1.50	1.16
ROAST TURKEY	2.36	1.35	1.01
TURKEY POT PIE	2.34	1.38	0.96
BAKED CHICKEN	2.54	1.67	0.87
GREEN PEPPER OMELET	1.89	1.20	0.69
WESTERN OMELET	1.85	1.20	0.65
CHEESE OMELET	1.85	1.20	0.65
TURKEY & NOODLES	2.13	1.52	0.61
SAVORY BAKED CHICKEN	2.24	1.67	0.57
BEEF STEW	1.72	1.19	0.53
EGG NOODLES	1.08	0.56	0.52
BEEF STROGANOFF	1.28	0.81	0.47
MEX FAJITAS	1.61	1.16	0.45
CLUB SPINACH	1.26	0.81	0.45
YANKEE POT ROAST	1.21	0.78	0.43
BROCCOLI AU GRATIN	1.17	0.78	0.39
SWEET & SOUR PORK	1.75	1.38	0.37
STIR FRY VEGETABLES	1.04	0.75	0.29
BEAR CLAWS	0.90	0.64	0.26
STUFFED PEPPERS	1.92	1.67	0.25
HAM & NOODLES	1.37	1.12	0.25
LYONNAISE GREEN BEANS	0.83	0.60	0.23
CINNAMON HONEY ROLLS	0.77	0.54	0.23
CANDIED SWEET POTATOES	0.99	0.79	0.20
MASHED SWEET POTATOES	1.06	0.86	0.20
CHERRY COBBLER	1.22	1.04	0.18
SALISBURY STEAK	1.06	0.88	0.18
BAKED STUFFED FISH	1.33	1.17	0.16
ICED SNAILS	0.90	0.74	0.16
BEEF AND CORN PIE	1.53	1.38	0.15
ESCALLOPED POTATOES	0.93	0.79	0.14
OATMEAL COOKIES	0.39	0.28	0.11
BROWNIES	0.55	0.46	0.09

TABLE 25. STORAGE DIFFERENCES - NABLC (Continued)

BISCUIT	0.65	0.59	0.06
AU GRATIN POTATOES	1.07	1.02	0.05
BAKED TUNA AND NOODLES	1.44	1.39	0.05
BUTTERSCOTCH BROWNIE	0.49	0.46	0.03
ORANGE-COCOA COFFEE CAKE	0.64	0.63	0.01
			+28.17
APPLE COFFEE CAKE	0.59	0.63	-0.04
BLUEBERRY PIE	1.06	1.10	-0.04
RICE	0.51	0.59	-0.08
OATMEAL COOKIES	0.43	0.55	-0.12
QUICK COFFEE CAKE	0.49	0.63	-0.14
PEANUT BUTTER COOKIE	0.39	0.55	-0.16
CHOCOLATE CHIP COOKIE	0.37	0.55	-0.18
APPLE PIE	0.91	1.10	-0.19
HOT DINNER ROLLS	0.47	0.69	-0.22
MINCED CHIPPED BEEF	0.49	0.75	-0.26
MEX TAMALES	0.88	1.19	-0.31
MEATLOAF	1.49	1.81	-0.32
BANANA CREAM PIE	1.21	1.58	-0.37
MOCK FILLET STEAK	0.80	1.19	-0.39
CHILI CON CARNE	1.11	1.50	-0.39
LEMON MERINGUE PIE	0.97	1.82	-0.85
EGG NOODLES	1.20	2.18	-0.98
CHILI MAC	1.15	2.18	-1.03
VEAL PARMESAN	1.24	2.72	-1.48
			-7.55

TABLE 26. STORAGE DIFFERENCES - USS PUGET SOUND

ITEM NAME	A RATION	CONVENIENCE	DIFFERENCE
CHICKEN CHOW MEIN	3.89	0.75	3.14
SWEET & SOUR CHICKEN	2.90	1.38	1.52
TACOS	2.55	1.16	1.39
LASAGNA	2.66	1.50	1.16
SAVORY BAKED CHICKEN	2.24	1.38	0.86
GREEN PEPPER OMELET	1.89	1.20	0.69
WESTERN OMELET	1.85	1.20	0.65
BEEF STEW	1.72	1.19	0.53
BEEF STROGANOFF	1.28	0.81	0.47
STUFFED GREEN PEPPERS	1.92	1.67	0.25
CHEESE OMELET	1.45	1.20	0.25
CINNAMON SWEET ROLLS	0.77	0.54	0.23
SALISBURY STEAK	1.06	0.88	0.18
SNAILS W/STRAWBERRY	0.90	0.74	0.16
BAKING POWDER BISCUIT (MIX)	0.65	0.59	0.06
BROWNIES (CHOC BROWNIE MIX)	0.55	0.55	0.00
			+11.54
CHOCOLATE CHIP COOKIES	0.40	0.55	-0.15
PEANUT BUTTER COOKIES	0.39	0.55	-0.16
POTATOES AU GRATIN (DEHY SLICES)	0.92	1.08	-0.16
CHOCOLATE DROP COOKIES (MIX)	0.37	0.55	-0.18
SUGAR COOKIES (SUGAR COOKIE MIX)	0.37	0.55	-0.18
PECAN PIE	1.11	1.38	-0.27
HOT TAMALES W/CHILI GRAVY	0.88	1.19	-0.31
MEATLOAF	1.49	1.81	-0.32
CHICKEN POT PIE (CANNED CHICKEN)	1.16	1.52	-0.36
GARLIC BREADSTICKS	0.19	0.66	-0.47
PEACH PIE (PIE FILLING, PREPARED)	0.91	1.38	-0.47

TABLE 26. STORAGE DIFFERENCES - USS PUGET SOUND (Continued)

CREAMED GROUND BEEF	0.60	1.19	-0.59
SWEET POTATO PIE	0.75	1.38	-0.63
HOT ROLLS	0.47	1.19	-0.72
CHERRY PIE (PIE FILLING, PREPARED)	0.91	1.67	-0.76
CHILI MACARONI	1.15	2.18	-1.03
VEAL PARMESAN	1.24	2.72	-1.48
BAKED MACARONI AND CHEESE	0.69	2.18	-1.49
LEMON MERINGUE PIE (FILLING MIX)	0.49	2.27	-1.78
			-11.51

Convenience items offering the greatest space savings over comparable A-Rations were ranked from the top down. The negative numbers on the list indicate the convenience items which do not save space and require more storage space than the counterpart A-Ration item. Proceeding down the list, the numbers get larger, as the less space-efficient convenience items require larger and larger amounts of storage space. This listing makes it easy for decision makers to determine exactly which convenience items offer the greatest storage space savings. Additionally, calculating incremental savings reveal more useful data. In examining space saving convenience items, in the case of the USS Puget Sound, the top 3 of 16 items account for over 50% of the total space savings. In the case of NABLC, the top 7 of 45 items account for 50% of the total space savings. From a planning perspective, this makes it easy to maximize storage space savings while minimizing the number of ingredients carried in the inventory.

Tables 27 and 28 illustrate the comparison of storage space requirements (chilled, dry and frozen) for specific categories of food (entrees, breakfast, starches, vegetables and desserts) of CF and A-Ration items at NABLC and aboard the USS Puget Sound.

TABLE 27. COMPARISON OF A-RATION AND CONVENIENCE FOODS STORAGE DATA - NABLC

	(CUBIC FEET)			
	CHILLED	DRY	FROZEN	TOTAL
A-RATION				
ENTREES	9.87	18.83	30.40	59.10
BREAKFAST	5.05	0.44	0.19	5.68
STARCHES	2.21	4.60	0.03	6.84
VEGETABLES	1.23	0.57	2.50	4.30
DESSERTS	2.02	11.31	0.00	13.33
TOTAL	20.38	35.75	33.12	89.25
CONVENIENCE FOODS				
ENTREES	0.00	0.00	40.44	40.44
BREAKFAST	0.00	0.00	4.35	4.35
STARCHES	0.00	0.00	6.79	6.79
VEGETABLES	0.00	0.00	2.94	2.94
DESSERTS	0.00	0.00	14.58	14.58
TOTAL	0.00	0.00	69.10	69.10

TABLE 28. COMPARISON OF A-RATION AND CONVENIENCE FOODS
STORAGE DATA - USS PUGET SOUND

	(CUBIC FEET)			
	CHILLED	DRY	FROZEN	TOTAL
A-RATION				
ENTREES	6.77	8.35	11.02	26.14
BREAKFAST	5.05	0.36	0.38	5.79
STARCHES	0.25	1.36	0.00	1.61
DESSERTS	0.84	8.40	0.00	9.24
TOTAL	12.91	18.47	11.40	42.78
CONVENIENCE FOODS				
ENTREES	0.00	0.00	21.36	21.36
BREAKFAST	0.00	0.00	4.40	4.40
STARCHES	0.00	0.00	3.26	3.26
DESSERTS	0.00	0.00	14.26	14.26
TOTAL	0.00	0.00	43.28	43.28

While storage requirements are an important consideration, it is doubtful that a decision to carry or not carry a specific convenience item would be based solely on this consideration. Consumer acceptance aside, cost would likely play a major role in any decision. Figure 6 conveniently segments all of the CF items into four categories; those that save storage space and cost less (in terms of food and labor cost), those that require less storage space but cost more, those that cost less but require more storage space and finally, those which cost more and require more storage space.

Less Space/Lower Cost	Less Space/Higher Cost
Vegetable Lasagna Salisbury Steak Beef & Bean Enchanadas* Chicken Italienne Chicken Chow Mein Sweet & Sour Chicken Beef Stroganoff Cajun Seasoned Stew Turkey Tetrazzini Broccoli Au Gratin	Chicken & Veges Homestyle Chicken & Noodle Chicken w/Broccoli Turkey Dijon Beef Stew Stuffed Chicken Breasts Tuna Noodle Casserole Potatoes Au Gratin Vegetable Chow Mein Cinnamon Rolls Brownie Blondie Brownie
More Space/Lower Cost	**More Space/Higher Cost**
Chicken Pot Pie Veal Parmesan Dinner Rolls Blueberry Pie Apple Pie Lemon Meringue Pie Chocolate Chip Cookies Peanut Butter Cookies Oatmeal Cookies Chocolate Cookies	Chicken Enchanadas* Chili Con Carne Macaroni & Cheese Sweet Potato Pie Apple & Cinnamon Coffee Cake Banana Cream Pie

* NABLC Data

FIGURE 6. CONVENIENCE FOODS BREAKDOWN BY STORAGE AND COST

Detailed data on the type of outside packaging for the CF items were not collected. It was noted that there was no banding of any type around the outside of the cases. Intermediate packaging consisted, for the most part, of half (12" x 10") and full (12" x 20") size aluminum steam table pans with depths that were either 2 or 4 inches. Some convenience items came packed in less conventional packaging, e.g., cookie dough came in plastic pails and omelets were packaged in molded plastic trays. Usage decisions concerning potential environmentally-unfriendly packaging would have to be made on a product-by-product basis. Packaging upgrades might have to be considered to meet environmental conditions for afloat resupply.

In an effort to present a balanced analysis, it should be noted that any storage space savings attributable to CF use, is diminished to some extent by an increasing need for freezer space and supporting mechanical equipment. Calculating the exact amount of this additional required space, is complicated by the fact that using frozen convenience items reduces the need for chill (refrigerator) space requirements. Although it was beyond the scope of this analysis to calculate the exact impact of CFs on storage capabilities, it is sufficient to say that there will be some change. A reasonable estimate, all factors considered, would be that the selective use of CFs would result in no significant reduction or increase in storage space requirements.

(3) Summary and Conclusions

Figure 6 provides useful information required by decision makers depending on their own set of circumstances and objectives. If cost is not an overriding consideration, then the list of storage space saving CFs is extensive. If cost is a factor, savings from the use of lower cost CFs can be used to offset some of the costs of storage space-saving, higher cost items.

E. Consumer and Food Service Personnel Opinions

An additional objective of this study was to determine the acceptability of CFs by consumers and food service personnel when substituted for the more labor-intensive A-Ration "cook-from-scratch" foods prepared and served in ashore and afloat environments. Ashore and afloat studies will be described separately.

(1) Ashore Study

(a) Approach

The NABLC facility feeds approximately 1,000 consumers each day. After the A-Ration and CF menus were developed, questionnaires and consumer acceptance rating forms (see Appendix B) were developed to gather sociodemographic data, acceptance ratings and other pertinent information. During Phase 1, (January 94), data were collected on A-Ration food items. A month later, during Phase 2, (February 94), similar data were collected on the counterpart CF items.

During the Phase 1 study, test personnel simultaneously administered sociodemographic questionnaires (completed once by each consumer) and rating forms to all consumers who selected study food items in the 3 mess decks, (based on military rank) for 2 meals (lunch and dinner) during the first

week and for 3 meals (breakfast, lunch and dinner) during the second week. Generally, data collectors stood at the end of the serving lines and handed out questionnaires to only those individuals who selected at least 1 of the study items. Consumers were asked to return the questionnaires to the data collectors upon finishing the meal.

The focus group technique was used to obtain information from food service personnel. These focus groups were conducted with MSs during both phases of the study, to determine the attitudes, feelings and concerns about introducing CFs, obtain comments on food quality and preparation procedures.

(b) Demographics

Consumers

TABLE 29. CONSUMER DEMOGRAPHICS - NABLC
(COMBINED PHASE1 AND 2)

MEAN AGE (YEARS): 27 STANDARD DEVIATION: 7		
CATEGORY	NUMBER (N)	PERCENT (%)
GENDER		
Male	621	94.4
Female	37	05.6
No Designation	92	12.2
TOTAL	750	
RANK		
E1-E3	274	36.6
E4-E6	373	49.7
E6 or >	103	13.7
TOTAL	750	
ETHNIC GROUP		
White	518	69.0
African American	142	18.9
Hispanic	46	06.2
Asian	18	02.4
Native American	9	01.2
Other	10	01.3
No Designation	7	0.9
TOTAL	750	
LEVEL OF EDUCATION		
Grade School	4	00.5
Some H.S.	8	01.1
H.S. Grad	331	44.1
Some College	306	40.8
College Grad	101	13.4
TOTAL	750	
LENGTH OF SERVICE		
0-2 Years	285	38.0
3-5 Years	152	20.3
6-10 Years	118	15.8
11-15 Years	110	14.7

TABLE 29. CONSUMER DEMOGRAPHICS - NABLC
(COMBINED PHASE1 AND 2) (Continued)

> 16 Years	83	11.1
No Response	2	0.2
TOTAL	750	
BRANCH OF SERVICE		
Navy	587	78.3
USMC	104	13.8
Other	55	07.8
No Designation	4	00.5
TOTAL	750	
CURRENTLY ON TAD		
Yes	191	25.5
No	523	69.7
No Response	36	4.8
TOTAL	750	

(c) Consumer Acceptance and Satisfaction

TABLE 30. CONSUMER ACCEPTANCE OF MATCHED FOODS

	A RATIONS (Phase 1)			CONVENIENCE FOOD (Phase 2)		
FOOD ITEMS	MEAN*	SD	N	MEAN*	SD	N
Mashed Sweet Potato	5.6	(2.1)	54	7.0	(2.1)	68
Macaroni And Cheese	6.2	(1.8)	184	7.4	(1.5)	153
Escalloped Potatoes	5.5	(2.0)	51	6.6	(1.6)	77
Au Gratin Potatoes	5.9	(1.9)	122	7.0	(1.5)	112
Peanut Butter Cookie	6.0	(2.1)	7	6.9	(1.9)	49
Lasagna	16.2	(2.2)	45	6.9	(1.6)	86
Hot Dinner Rolls	7.7	(1.5)	2.37	7.3	(1.6)	147
Chili Mac	6.6	(1.7)	1.43	6.1	(1.9)	78
Chili Con Carne	7.0	(1.5)	45	6.3	(1.8)	51
Minced/Chipped Beef	6.6	(1.5)	41	5.3	(2.5)	28
Iced Snail	7.7	(0.9)	11	6.3	(1.6)	19
Baked Meat Loaf	7.2	(1.3)	74	5.8	(2.3)	69
Bear Claw	6.8	(2.0)	16	5.3	(2.3)	22
Omelet	7.4	(1.2)	58	5.7	(2.4)	301
Sweet & Sour Pork	6.8	(1.6)	30	5.0	(2.4)	44
French Toast	7.3	(1.5)	84	5.5	(2.1)	50

*Ratings are based on a 9-point scale where 1 = "dislike extremely", 5 = "neither like nor dislike" and 9 = "like extremely".

Items found to be not significant: apple pie, banana cream pie, beef stew, beef stroganoff, biscuit, blueberry pie, breaded pork chops, broccoli au gratin, brownies, butterscotch brownie, chocolate chip cookie, coconut cookie, fried fish, lemon meringue pie, oatmeal cookie, salisbury steak, spinach souffle, stuffed peppers, sweet & sour chicken, roast turkey, and veal parmesan.

TABLE 31. CONSUMER ACCEPTANCE OF SIMILAR FOODS

	A-RATIONS (Phase 1)			CONVENIENCE FOOD (Phase 2)		
FOOD ITEMS	MEAN*	SD	N	MEAN*	SD	N
Mex Fajitas Beef/Bean Enchiladas	4.3	(2.4)	69	6.8	(2.0)	63
Mex Tamales Chicken Enchiladas	5.0	(2.4)	49	6.5	(2.0)	60
Cherry Cobbler Cherry Turnover	5.4	(2.1)	73	6.4	(2.2)	52
Yankee Pot Roast Cajun Seasoned Stew	5.9	(2.1)	67	6.9	(1.9)	53
Baked Chicken Chicken With Broccoli	6.6	(1.6)	50	7.6	(1.5)	56
Savory Bread Dressing Dressing	5.6	(2.1)	122	6.5	(2.1)	54
Candied Sweet Potato Sweet Potato Casserole	6.5	(1.8)	76	7.3	(1.6)	62
Savory Baked Chicken Chicken With Rice Stuffing	6.4	(1.8)	71	6.9	(1.6)	107
Chicken Cacciatore Chicken Italienne	7.3	(1.0)	29	5.8	(2.2)	46
Dinner Rolls Bread Sticks	7.7	(1.5)	237	6.2	(2.0)	78
Turkey Pot Pie Turkey Dijon	7.1	(1.3)	76	5.6	(2.3)	57

*Ratings are based on a 9-point scale where 1 = "dislike extremely", 5 = "neither like or dislike" and 9 = "like extremely".

To determine how consumers felt about A-Ration foods usually served in the dining room, during Phase 1 they were asked to rate their overall satisfaction using a 9-point scale. The results showed that the consumers were "slightly satisfied" (6.3 rating) with A-Ration foods. When convenience foods were served, during Phase 2 testing consumers were asked to compare the appearance and quality of the CFs eaten at lunch and dinner with similar A-Ration foods. Consumers rated the majority of CF breakfast foods between "just the same" to "somewhat better" (3.0-4.0 ratings) for quality and appearance on a 5-point scale where 1="much worse", 3= "just the same" and 5="much better". Only 4 of the 26 CF breakfast items were rated lower, "somewhat worse" (2.49-2.9 rating). These 4 food items; creamed beef, bear claws, cheese omelet and French toast, received acceptability ratings between 5.3-5.7 based upon a 9-point scale ("neither like or dislike") suggesting that they be replaced by more acceptable food products in future studies. This can be accomplished by ordering the same CF items from different suppliers and then determining the most acceptable product for each item. Consumers rated lunch and dinner CFs "just the same" to "somewhat better". These results provide additional evidence that CFs served for lunch and dinner were as good or somewhat better than the A-Ration foods normally served in the dining room. These data also support earlier findings by Darsch et al "An Inport Feeding System for Shipboard Personnel" (Reference 8), where convenience-type foods were well-accepted by consumers participating in an inport study. Cedar-Sinai Medical Center in Los Angeles conducted a study to compare kitchen prepared foods with CFs "Determining the Complexity of Patient Satisfaction with Food Service" (Reference 9). After establishing that patients preferred CFs to foods prepared in the Center's kitchen, they closed their kitchen and are currently serving only convenience foods.

A question arose as to whether all consumers had the same preferences; i.e., did younger consumers (lower rank) rate overall satisfaction differently than those who were older (higher rank). A Tukey, Honestly Significant Difference (HSD) post-hoc test demonstrated that the higher the military rank ($p<.05$) and the older ($p<.05$) the consumers (26 years of age or older), the more satisfied the consumers were with A-Ration foods. This analysis supports the results of Salter et al (Reference 5) and Dube et al (Reference 9), which found that older consumers tended to rate institutional food higher than their younger counterparts. It appears that, as consumers get older, their taste adjusts to the food being eaten.

(d) Food Service Personnel Opinions

Focus group results indicated that initially many of the MSs were concerned about the loss of a job. A few recognized that with force downsizing, the number of MSs will decrease, and the workload of retained individuals will increase. In general, their attitude was favorable to the use of CFs and they anticipated that there would be less cleanup required. They also thought there would be little food waste with CFs, but extra waste might be generated from aluminum pans and packaging. MSs in the study conducted by Darsch et al (Reference 8) also reported a substantial amount of time saved in food preparation and cleanup when CFs were used. After working with CFs, MSs were concerned with inaccurate instructions regarding cooking time contained on the food packages, variability of portion size, adequate freezer storage space, cost and safety. Overall, the MSs approved the use of CFs, particularly, because they felt that fewer personnel were required, less training would be necessary to prepare CFs and standardization would result from more uniform product quality. Based upon both the quantitative data obtained from the consumers and the qualitative information gathered from the MSs, the majority of CFs were found to be as good or better than A-Ration foods and would be acceptable to both the consumers and the MSs.

(2) Afloat Study

(a) Approach

The existing cycle menu was reviewed and food items representing labor-intensive A-Ration entrees, starches, desserts and breakfast items were selected from 1 week of the cycle menu based upon the availability of the same or similar convenience food items which were used for the ashore study. Once the menu items were identified, consumer questionnaires/rating forms, MSs and Food Service Attendants (FSA) questionnaires and focus group scripts were developed to gather sociodemographic data, acceptance ratings, food preparation and food quality data. The afloat tests were conducted in three Phases (Phase 3, 4 & 5). Phase 3 was conducted for 5 days, Phase 4 for 5 days and Phase 5 for 3 days.

During Phase 3, study personnel simultaneously administered sociodemographic questionnaires (once only) and acceptance rating forms to all consumers who selected the study food items. Generally, the data collectors stood at the end of the serving line and handed out questionnaires to only those individuals who selected at least 1 of the study items. The same procedure was followed during Phase 4 when CFs were substituted for selected A-Ration foods. Consumers were asked to return the completed questionnaires to the data collectors or put them in a drop-off box located in front of the scullery.

To obtain information from those responsible for food preparation, questionnaires were distributed and focus groups were convened with MSs and FSAs during all 3 phases of the afloat study. During Phase 3,

study personnel asked questions of the MSs and FSAs, regarding their attitudes, feelings and concerns about the possibility of introducing CFs onboard ships. During phase 4, MSs and FSAs commented on the quality, preparation procedures and impressions of CFs. See Appendix A for responses to open-ended questions. Similar data were collected during Phase 5 when MSs were asked to make comparisons between the differences observed at sea versus inport.

(b) Demographics

Consumers

TABLE 32. CONSUMER DEMOGRAPHICS - USS PUGET SOUND

MEAN AGE (YEARS): 27 STANDARD DEVIATION: 7		
CATEGORY	NUMBER (N)	PERCENT (%)
GENDER		
Male	492	73.3
Female	180	26.7
	672	
TOTAL		
RANK		
E1-E3	227	33.7
E4-E6	287	42.7
E6 or >	3	0.4
No Response	155	23.0
TOTAL	672	
ETHNIC GROUP		
White	456	67.8
African American	141	20.9
Hispanic	29	4.3
Asian	19	2.8
Native American	8	1.2
Other	15	2.2
No Response	4	00.5
TOTAL	672	
LEVEL OF EDUCATION		
Grade School	7	1.0
Some H.S.	8	1.2
H.S. Grad	391	58.1
Some College	230	34.2
College Grad	36	5.3
TOTAL	672	
LENGTH OF SERVICE		
0-2 Years	215	31.9
3-5 Years	207	30.8
6-10 Years	113	16.8
11-15 Years	92	13.6
>16 Years	45	6.69
TOTAL	672	
BRANCH OF SERVICE		
Navy	671	99.9
USMC	1	0.1
TOTAL	672	
CURRENTLY ON TAD		
Yes	4	0.6
No	652	97.0
No Response	16	2.3
TOTAL	672	

(c) Consumer Acceptance and Satisfaction

Consumers rated the acceptance of A-Ration foods during Phase 3, and 1 month later, during Phase 4 they rated the CF counterparts. Out of the 37 items evaluated only, 1 A-Ration item, au gratin potatoes, and 2 convenience foods, French toast and western omelet, were rated as unacceptable. Acceptability ratings for A-Ration items ranged from 4.5 to 7.4 and CFs ranged from 4.6 to 7.7. Ratings were based on a 9-point scale where 1="dislike extremely", 5="neither like or dislike" and 9= "like extremely". A total of 9 CF items rated significantly higher than their A-Ration counterparts, while 3 A-Ration items were rated significantly higher that their CF counterparts.

TABLE 33. CONSUMER ACCEPTANCE OF MATCHED FOODS

	A-RATIONS			CONVENIENCE FOOD		
FOOD ITEMS	MEAN*	SD	N	MEAN*	SD	N
Au Gratin Potatoes	4.5	(2.2)	44	7.2	(1.6)	44
Macaroni & Cheese	5.0	(2.2)	49	7.4	(1.6)	58
Salisbury Steak	5.1	(2.0)	41	7.0	(1.6)	34
Beef Stew	5.3	(2.1)	34	6.7	(1.7)	29
Stuffed Peppers	5.9	(2.1)	34	7.3	(1.4)	51
Minced/Chipped Beef	5.0	(1.9)	19	6.3	(1.8)	24
Macaroni & Beef	5.4	(2.1)	58	6.5	(1.9)	52
Lasagna	6.8	(1.5)	48	7.7	(1.4)	60
Baked Meatloaf	5.6	(1.9)	57	6.5	(1.6)	42
French Toast	6.0	(2.0)	26	4.8	(2.1)	39
Cheddar Omelet	7.4	(1.5)	23	5.4	(2.3)	28
Western Omelet	7.3	(1.5)	18	4.6	(2.7)	16

* Ratings are based on a 9-point scale where 1 = "dislike extremely", 5 = "neither like nor dislike", 9 - "like extremely".

TABLE 34. CONSUMER ACCEPTANCE OF MATCHED FOODS*

	A-RATIONS			CONVENIENCE FOOD		
FOOD ITEMS	MEAN*	SD	N	MEAN*	SD	N
Beef Stroganoff	6.0	(2.2)	20	7.0	(2.0)	28
Pecan Pie	7.0	(2.5)	25	7.7	(1.7)	27
Veal Parmesan	5.9	(1.9)	39	6.5	(2.1)	32
Hot Dinner Roll	7.3	(1.9)	65	7.8	(1.3)	46
Peanut Butter Cookie	7.2	(1.8)	18	7.7	(1.4)	39
Sweet & Sour Chicken	6.7	(1.6)	21	6.9	(2.1)	28
Plain Pancakes	5.9	(2.3)	75	6.1	(1.8)	56
Chocolate Cookies	7.2	(1.4)	25	7.3	(1.2)	24
Cinnamon Roll	7.1	(1.5)	28	7.1	(1.5)	37

The following food items are not included in this table because either the sample population was too small or no match was available: garden omelet, iced snails, biscuits, cherry pie, chocolate chip cookies, chili mac, sweet potato pie, tacos, lemon meringue pie, peach pie, sugar cookies, brownie, chicken pot pie, savory baked chicken, chicken chow mein, beef and bean enchanada.

* Ratings are based on a 9-point scale where 1 = "dislike extremely", 5 = "neither like nor dislike", 9 = "like extremely".

When asked to compare the acceptance of A-Ration foods to convenience foods, 85 % of the consumers rated CFs 6.5 or higher, compared to 49 % for A-Ration items (Table 35).

TABLE 35. CONSUMER ACCEPTANCE DATA OF A-RATIONS AND CONVENIENCE FOOD ITEMS

	A-RATION CUMULATIVE** (N=31)		CONVENIENCE FOOD ITEMS CUMULATIVE** (N=31)	
RATING	NUMBER	PERCENT* (%)	NUMBER	PERCENT* (%)
BELOW 5.0	3	(10)	2	(6)
5.0-5.4	4	(22)	1	(9)
5.5-5.9	6	(41)	0	(9)
6.0-6.4	3	(51)	2	(15)
6.5-6.9	7	(73)	6	(33)
7.0-7.4	8	(99)	11	(66)
7.5-7.9	0		10	(96)
8.0 & ABOVE	0		1	(99)

Ratings are based on a 9-point scale where 1 = "dislike extremely", 5 = "neither like nor dislike", 9 = "like extremely".

* Numbers in parentheses are cumulative percentages.

** The total number of test items (37) were not rated for various reasons: not presented on serving line, too few consumers rated the items, etc.

During the CF study, consumers were asked to rate appearance, variety and quantity of food at each meal (breakfast, lunch and dinner). Food appearance and variety received similar ratings for all 3 meals. However, the food quality during the breakfast meal was rated lower than for the other 2 meals (Table 36).

When consumers were asked to compare the quality and appearance of CF items eaten at all 3 meals with similar A-Ration foods, consumers rated the quality of the CF entrees and omelets served during breakfast as "just the same", whereas all other CFs were rated as "somewhat better" than A-Rations items. (Table 37).

The appearance of all of the CF items was rated as "somewhat better" than similar A-Ration foods except for omelets and entrees served at breakfast and potatoes served at lunch (Table 38).

Table 39 shows A-Ration items compared to CFs when served ashore and afloat. The results indicate that in both environments, more consumers prefered CFs over A-Ration foods. A-Rations were rated 6.0 or greater by 59% of shipboard consumers and 76% of the ashore consumers, while CFs were rated 6.0 or by 91% and 84% respectively.

Quantitative data gathered during these studies indicate that the majority of CFs were as good or better than A-Ration foods and would be highly acceptable to consumers.

TABLE 36. FIVE-DAY AVERAGE RATINGS OF CONVENIENCE FOODS FOR APPEARANCE, VARIETY, AND QUALITY

AVERAGE RATING	$\bar{X}$	SD	N
BREAKFAST			
food appearance	6.4	1.7	203
food variety	4.9	1.8	199
food quality	5.8	1.8	199
LUNCH			
food appearance	6.6	1.6	279
food variety	4.8	1.6	278
food quality	6.6	1.7	278
DINNER			
food appearance	6.4	1.7	228
food variety	4.9	1.6	231
food quality	6.6	1.7	230

Scales: Food Appearance: Ratings are based on a 9-point scale where 1 = "Extremely Attractive", 5 = "Neither Attractive nor Unattractive", 9 = "Extremely Unattractive".

Food Variety & Quality: Ratings are based on a 9-point scale where 1 = "Extremely Poor", 3 = "Poor", 5 = "Average", 7 = "Good", 9 = "Excellent".

TABLE 37. QUALITY OF CONVENIENCE FOODS COMPARED WITH SIMILAR FOODS USUALLY EATEN ABOARD THE USS PUGET SOUND

FOOD QUALITY	$\bar{X}$	SD	N
BREAKFAST			
Omelets	3.4	1.0	79
Entrees	3.4	1.0	128
Bakery products	4.0	0.9	116
LUNCH			
Entrees	4.2	0.9	229
Potatoes	4.0	1.0	114
Bakery products	4.1	1.0	151
Desserts	4.2	0.8	186
DINNER			
Entrees	4.2	0.9	195
Potatoes	4.1	0.9	73
Bakery products	3.9	1.0	153
Desserts	4.4	0.8	170

Scale:
Ratings are based on a 5-point scale where 1 = "Much Worse", 2 = "Somewhat Worse", 3 = "Just the Same", 4 = "Somewhat Better", 5 = Much Better".

TABLE 38. APPEARANCE OF CONVENIENCE FOODS COMPARED WITH SIMILAR FOODS USUALLY EATEN ABOARD THE USS PUGET SOUND

FOOD APPEARANCE	$\bar{X}$	SD	N
BREAKFAST			
Omelets	3.3	1.0	83
Entrees	3.5	1.0	132
Bakery products	4.1	0.9	118
LUNCH			
Entrees	4.2	0.8	239
Potatoes	3.9	0.9	123
Bakery products	4.1	1.0	163
Desserts	4.3	0.8	196
DINNER			
Entrees	4.2	0.8	199
Potatoes	4.1	0.9	75
Bakery products	4.1	1.0	204
Desserts	4.4	0.8	179

Scale:
Ratings are based on a 5-point scale where 1 = "Much Worse", 2 = "Somewhat Worse", 3 = "Just the Same", 4 = "Somewhat Better, 5 = "Much Better".

TABLE 39. COMPARISON OF CONSUMER ACCEPTANCE DATA ABOARD SHIP AND ASHORE

RATING	A-RATION ITEMS		CONVENIENCE ITEMS	
	SHIP (n=31)	ASHORE (n=64)	SHIP (n=33)	ASHORE (n=63)
BELOW 5.0	3(10)*	1(2)	2(6)	0
5.0-5.4	4(22)	3(7)	1(9)	3(5)
5.5-5.9	6(41)	11(24)	0(9)	7(16)
6.0-6.4	3(51)	16(49)	2(15)	15(40)
6.5-6.9	7(74)	20(81)	6(33)	24(78)
7.0-7.4	8(100)	9(95)	11(66)	13(99)
7.5-7.9	0	4(100)	10(96)	1(100)
8.0 & ABOVE	0	0	1(100)	0

Scale:
Ratings are based on a 9-point scale where 1 = "Dislike Extremely", 5 = "Neither Like nor Dislike", 9 = "Like Extremely".
*Numbers in parentheses are cumulative percentages.

(d) Food Service Personnel Demographics

MSs and FSAs

The sample population consisted of 26 MSs and 3 FSAs, 15 men and 14 women, with a mean age of 23.4 years. (Table 40).

TABLE 40. MS/FSA DEMOGRAPHICS*

DESCRIPTION (N=29)	
MEAN AGE (YEARS): 23.4 STD DEV: (4.92)	
CATEGORY	PERCENT (%)
GENDER	
Male	51.7
Female	48.3
ETHNIC GROUP	
White	36.0
African American	60.0
West Indian/Black	4.0
LEVEL OF EDUCATION	
Some high School	3.4
High School Graduate	58.7
Some College	34.5
Graduate College	3.4
JOB CODE	
MS	89.6
FSA	10.4
RANK	
E1 to E3	34.5
E4 to E6	65.5
LENGTH OF SERVICE	
0-2 Years	50.0
3-5 Years	25.0
6-10 Years	21.4
11-15 Years	3.6

DESCRIPTION (N=29)	
MEAN AGE (YEARS): 23.4 STD DEV: (4.92)	
CATEGORY	PERCENT (%)
TIME IN RANK	
0-2 Years	69.0
3-5 Years	24.1
6-10 Years	6.9
PRESENT JOB	
Striker	3.4
Cook	65.5
Baker	3.4
Watch Captain	6.9
Breakouts/Storeroom	6.9
Other	13.9
PLACE OF WORK IN	
Galley	65.5
Vegetable Prep	13.8
Bakery Shop	6.9
Storeroom	6.9
Other	6.9
SHIPS	
No	72.4
Yes	27.6
NAVY FOOD SCHOOLS	
"A" School	81.5
Other	18.5

*Phases 3, 4 and 5 combined.

(e) Food Service Personnel Opinions

Phase 3 A-Rations

Food service personnel responded to several questions on food preparation, job satisfaction and working conditions. They rated entrees, bakery and rolls as "slightly difficult to prepare" and the rest of the products were rated between "neutral" and "moderately easy to prepare" (Table 41). When asked about problems associated with food preparation, 91.3 % of the food service personnel cited equipment problems, 47.8 % indicated problems with the amount of food ordered and 47% indicated problems with utensils (Table 42). Although outside the scope of this effort, these high values warrant further exploration by the Navy to fully define and rectify the problems associated with A-Ration preparation.

TABLE 41. EASE OF PREPARATION OF FOODS USUALLY PREPARED IN THE MESS

FOOD ITEMS	$\bar{X}$	SD
Entree	4.7	1.4
Starch	6.1	1.6
Vegetable	7.2	1.6
Bakery Products and Rolls	4.8	1.9
Dessert	5.4	1.7

Scale:
Ratings based on a 9-point scale where 1 = "Extremely Difficult", 2 = "Very Difficult", 3 = "Moderately Difficult", 4 = "Slightly Difficult", 5 = "Neutral", 6 = "Slightly Easy", 7 = "Moderately Easy", 9 = "Extremely Easy".

TABLE 42. PROBLEMS ENCOUNTERED WHILE PREPARING FOOD ITEMS

	PROBLEM	
	N*	%
Equipment	21	91.3
Amount of Food Ordered	11	47.8
Quality of Purchased Food	6	26.1
Inadequate Preparation Time	6	26.1
Storage	5	21.7
Utensils	11	47.8
Work Space	5	21.7
Sanitation	5	21.7
Waste Disposal	6	26.1
Time Allowed for Food Prep	2	8.7

*Sample size 23.

TABLE 43. EASE OF PREPARATION RATINGS FOR CONVENIENCE FOODS

FOOD CATEGORIES	$\bar{X}$	SD
INPORT		
Entree	7.6	1.6
Starch	7.4	1.7
Bread & Rolls	7.7	1.5
Dessert	7.9	1.6
AT SEA		
Entree	8.0	0.9
Starch	7.8	1.2
Bread & Rolls	8.0	1.3
Dessert	8.0	1.3

Scale: Ratings based on 9-point scale where 1 = "Extremely Hard", 2 = "Very Hard", 3 = "Moderately Hard", 4 = "Slightly Hard", 5 = "Neutral", 6 = "Slightly Easy", 7 = "Moderately Easy", 8 = "Very Easy", 9 = "Extremely Easy".

TABLE 44. TIME REQUIRED TO COOK CONVENIENCE FOODS AS COMPARED WITH SIMILAR A-RATION FOODS

FOOD CATEGORIES	$\bar{X}$	SD
INPORT		
Entree	1.6	1.4
Starch	1.6	1.4
Bread & Rolls	1.6	1.4
Dessert	1.7	1.4
AT SEA		
Entree	2.1	1.1
Starch	2.1	1.1
Bread & Rolls	2.0	1.1
Dessert	2.0	1.1

Scale:
Ratings based on a 9-point scale where 1 = "much less time to prepare convenience foods", 5 = "same amount of time to prepare convenience foods", 9 = "much more time to prepare convenience foods".

TABLE 45. OVERALL SATISFACTION WITH CONVENIENCE FOOD ITEMS

FOOD CATEGORIES	$\bar{X}$	SD
INPORT		
Entree	5.9	1.4
Starch	5.8	1.4
Bread & Rolls	5.9	1.4
Dessert	6.0	1.5
AT SEA		
Entree	6.4	0.8
Starch	6.4	0.8
Bread & Rolls	6.7	0.5
Dessert	6.7	0.5

Scale: Ratings based on a 7-point scale where 1 = "Very Dissatisfied", 2 = "Moderately Dissatisfied", 3 = "Somewhat Dissatisfied", 4 = "Neither Satisfied nor Dissatisfied", 5 = "Somewhat Satisfied", 6 = "Moderately Satisfied", 7 = "Very Satisfied".

TABLE 46. CONVENIENCE FOOD ITEMS WHICH FOOD SERVICE PERSONNEL WOULD SUBSTITUTE FOR A-RATION FOODS (INPORT)

FOOD ITEM	Would Substitute		Would Not Substitute	
	N	%	N	%
Creamed Chipped Beef	8	72.7	3	27.3
Plain Pancakes	9	81.8	2	18.2
Western Omelet	8	72.7	3	27.3
Cheddar Omelet	9	75.0	3	25.0
Garden Omelet	9	81.8	2	18.2
French Toast	9	100.0	1	10.0
Biscuit	10	90.9	1	9.1
Baked Meatloaf	9	81.8	2	18.2
Macaroni & Beef	10	100.0	0	0.0
Au Gratin Potatoes	10	90.9	1	9.1
Beef/Bean Enchanadas	8	88.9	1	11.1
Chicken Enchanadas	8	88.9	1	11.1
Beef Stew	8	88.9	1	11.1
Sweet & Sour Chicken	9	88.9	1	11.1
Chicken Chow Mein	7	87.5	1	12.5
Lasagna	7	87.5	1	12.5
Homestyle Chicken & Noodles	10	90.9	1	9.1
Stuffed Peppers w/Sauce	11	91.7	1	8.3
Macaroni & Cheese	11	91.7	1	8.3
Salisbury Steak	8	88.9	1	11.1
Chicken w/Broccoli/Cheese Stuffing	9	100.0	0	0.0
Veal Parmesan	9	100.0	0	0.0
Beef Stroganoff	8	100.0	0	0.0
Cinnamon Roll	8	88.9	1	11.1
Twisted Snails	6	75.0	2	25.0
Cherry Pie	11	100.0	0	0.0
Chocolate Chip Cookie	8	88.9	1	11.1
Sweet Potato Pie	10	90.9	1	9.1
Peanut Butter Cookie	8	100.0	0	0.0
Soft Dinner Roll	8	88.9	1	11.1
Lemon Meringue Pie	8	100.0	0	0.0
Peach Pie	8	100.0	0	0.0
Pecan Pie	9	100.0	0	0.0
Chocolate Cookies	8	100.0	0	0.0

TABLE 47. CONVENIENCE FOOD ITEMS WHICH FOOD SERVICE PERSONNEL WOULD SUBSTITUTE FOR A-RATION FOODS (AT SEA)

FOOD ITEM	Would Substitute		Would Not Substitute	
	N	%	N	%
Creamed Chipped Beef	4	100.00	-	0.0
Omelets	3	60.00	2	40.0
Biscuits	6	100.00	-	0.0
French Toast	6	100.00	-	0.0
Chicken & Vegetable Oriental	5	100.00	-	0.0
Beef and Pepper	5	100.00	-	0.0
Vegetable Chow Mein	5	100.00	-	0.0
Tuna Noodle Casserole	4	80.00	1	20.0
Fried Chicken	4	100.00	-	0.0
Salisbury Steak	6	100.00	-	0.0
Chili Con Carne	4	100.00	-	0.0
Stuffed Peppers w/Sauce	5	100.00	-	0.0
Sweet Potato Casserole	4	100.00	-	0.0
Coconut Macaroon	4	100.00	-	0.0
Apple Pie	4	100.00	-	0.0
Chocolate Chip Cookies	5	100.00	-	0.0
Soft Dinner Roll	5	100.00	-	0.0

Phase 2 (Inport) and Phase 3, 4 and 5 (At Sea) Convenience Foods

During Phase 2 food service personnel rated CFs as "moderately easy" to "very easy" to prepare while inport and between "moderately easy" and "very easy" while at sea (Table 43). Personnel found that the time required to prepare CFs as compared to similar A-Ration foods prepared from scratch rated between 1.6 to 1.7 when inport and between 2.0 to 2.1 while at sea, where 1="much less time to prepare", 5="same amount of time to prepare" and 9="much more time to prepare" (Table 44). The overall satisfaction with the different categories of CFs rated between "moderately satisfied" and "very satisfied" while at sea (Table 45). Food service personnel were asked which CFs they would substitute for those A-Rations prepared from scratch while inport and at sea. A majority of personnel indicated they would substitute CFs for each of the study food items while inport and at sea (Tables 46 and 47). The personnel recommended substituting entrees, starches, breads and rolls and dessert "often" to "always" when inport and between "often and almost always" while at sea (Table 48). During Phase 2 inport testing, food service personnel when asked, under what conditions they would substitute CFs for A-Rations, under the following conditions: at sea (93.3%), if the mess was understaffed (86.7%), during sea drills (73.3%) and during power outages (60%) (Table 49).

During Phase 4 and 5 tests, food service personnel were asked, under what conditions they would substitute CFs for A-Rations; 57.7% said "all of the time" and 42.9% said "during at sea drills" and "when understaffed" (Table 50).

TABLE 48. FREQUENCY WITH WHICH FOOD SERVICE PERSONNEL WOULD RECOMMEND SUBSTITUTING CONVENIENCE FOOD ITEMS FOR A-RATIONS

FOOD CATEGORIES	$\bar{X}$	SD
INPORT		
Entree	4.6	1.2
Starch	4.4	1.2
Bread & Rolls	4.4	1.6
Dessert	4.6	1.2
AT SEA		
Entree	5.0	1.1
Starch	4.5	1.4
Bread & Rolls	5.2	1.3
Dessert	5.3	1.0

Scale: Ratings based on a 6-point scale where 1 = "never", 2 = "almost never", 3 = "sometimes", 4 = "often", 5="almost always", 6 = "always".

TABLE 49. CONDITIONS UNDER WHICH FOOD SERVICE PERSONNEL WOULD SUBSTITUTE CONVENIENCE FOODS FOR A-RATIONS (Data obtained during Phase 2 Tests)

CONDITIONS	Would substitute convenience foods:	
	N	(%)
Inport	7	46.7
At sea	14	93.3
Standown/Holidays	6	40.0
Inport Drills	5	33.3
Drills at sea	11	73.3
Understaffed	13	86.7
Power Outages	9	60.0

Sample Size = 15

TABLE 50. CONDITIONS UNDER WHICH FOOD SERVICE PERSONNEL WOULD SUBSTITUTE CONVENIENCE FOODS FOR A-RATIONS (Data obtained during Phase 4 & 5 Tests)

CONDITIONS	Would substitute convenience foods:	
	N	(%)
All of the Time	4	57.7
Never	-	0.0
Standown	1	14.3
Holidays	1	14.3
At Sea Drills	3	42.9
Understaffed	3	42.9
Power Outages	2	28.6

Sample Size = 7

Food service personnel were asked their general impression of food service operations inport and at sea (Table 51), and specific problems encountered when preparing and serving CFs both inport and at sea (Table 52). In all cases, inadequate equipment was the number one problem cited.

TABLE 51. FOOD SERVICE PERSONNEL OPINIONS OF FOOD SERVICE OPERATIONS

GENERAL OPINIONS	$\bar{X}$	SD
INPORT		
Inadequate to Adequate Equipment	2.0	1.1
Small to Large Amount of Food Wasted	3.0	1.3
Inadequate to Adequate # of Portions in Container	2.8	0.9
Inadequate to Adequate Storage	2.9	1.5
Inadequate to Adequate Breakout	3.2	1.2
Unacceptable to Acceptable Food Items	3.2	0.7
Inadequate to Adequate Sanitation	3.2	1.2
Limited to Wide Variety of Food Choices	3.3	1.1
Easy to Difficult to Prepare	2.0	1.0
AT SEA		
Inadequate to Adequate Equipment	1.8	0.8
Small to Large Amount of Food Wasted	2.4	1.7
Inadequate to Adequate # of Portions in Container	2.4	0.9
Inadequate to Adequate Storage	2.8	0.8
Inadequate to Adequate Breakout	3.3	0.5
Unacceptable to Acceptable Food Items	2.6	0.1
Inadequate to Adequate Sanitation	3.2	0.5
Limited to Wide Variety of Food Choices	3.0	0.7
Easy to Difficult to Prepare	1.8	0.8
Excessive to Inadequate Packaging	2.5	0.8
Limited to Too Much Food Waste	3.2	1.6

Scale: Ratings based on a 5-point scale where: 1 = "extremely inadequate ", 2 = "moderately inadequate", 3 = "neutral inadequate/adequate", 4 = "moderately adequate", 5= "extremely adequate".

TABLE 52. PROBLEMS ENCOUNTERED WHILE COOKING AND SERVING CONVENIENCE FOOD ITEMS

PROBLEMS	Had Problems	
	N	%
INPORT (Sample Size = 15)		
Equipment	11	73.3
Amount of Food Ordered	4	26.7
Quantity of Purchased Food	1	6.7
Directions on Package	0	0.0
Portion Size	3	20.0
Inadequate Cooking Time	0	0.0
Storage	2	13.3
Utensils	1	6.7
Safety	1	6.7
Container Size and Shape	4	26.7
Work Space	2	13.3
Sanitation	1	6.7
Waste Disposal	5	33.3
AT SEA (Sample Size = 7)		
Equipment	6	85.7
Amount of Food Ordered	2	28.6
Quantity of Purchased Food	0	0.0
Directions on Package	0	0.0
Portion Size	3	42.9
Oversize	2	28.6
Inadequate Cooking Time	0	0.0
Storage	1	14.3
Utensils	0	0.0
Safety	1	14.3
Container Size and Shape	4	57.1
Packaging	1	14.3
Work Space	1	14.3
Sanitation	0	0.0
Waste Disposal	2	28.6
Transferring From Pans	2	28.6
Oven Space	5	71.4

Table 53 indicates responses from MSs and FSAs, when asked about the "Importance of Specific Changes in Improving the Operation of the Mess when using Convenience Foods." As shown, adding ovens, adding larger refrigeration spaces, adding storage space, the use of larger ovens, pan size and portions were considered "very important".

TABLE 53. IMPORTANCE OF SPECIFIC CHANGES IN IMPROVING THE OPERATION OF THE MESS WHEN USING CONVENIENCE FOODS

CHANGES	$\bar{X}$	SD
UNDERWAY		
Larger Pan Size	4.0	1.5
Larger Ovens	4.1	1.2
More Ovens	4.6	0.8
More Counter Space	3.1	1.7
Larger Portions Sizes	4.0	1.5
Greater Storage Space	4.3	1.0
Larger Freezer Space	3.9	1.2
Larger Refrigerator Space	4.4	0.8

Scale: Ratings based on a 5-point scale where: 1 = "not important", 2 = "somewhat important", 3 = "moderately important", 4 = "very important", 5= "extremely important".

F. Nutritional and Drain Weight Analyses

(1) Nutritional Analysis

The objective of the nutritional analysis was to compare the nutrient content of a sample menu from the AFRS with a similar menu utilizing selected CF products. The sample meal plan (Appendix C), modeled after the typical Navy meal plan, consisted of a representative 5-day menu using foods commonly served in Navy dining facilities, both aboard ship and ashore. Commercial products were selected to replace menu items from the AFRS file that were considered the most labor-intensive.

Nutritional information was gathered from several sources. Manufacturers provided nutritional data for their CF items. Values for the AFRS foods were obtained from nutritional analysis profiles provided by the United States Army Research Institute of Environmental Medicine (USARIEM) using a new computer nutrient analysis software program developed cooperatively by the University of Texas and USARIEM and the "Fat, Cholesterol and Calorie Lists for General Messes" published by the NAVFSSO, NAVSUP, Publication 580.

For the purpose of this analysis, the 5-day menu for the AFRS food items and for CFs was analyzed separately (Appendix D) and then compared as an "average day". Any nutrient at or above 90% of the MRDA was considered as meeting the MRDA. Although great care was taken to approximate serving sizes of the AFRS food items, some portions of the CFs were slightly smaller than a typical AFRS portion. Therefore, whenever possible, portion sizes of the CFs were adjusted to that of the AFRS portion size.

Analysis of the data (see Table 54) showed that the nutrient levels of both the AFRS food items and CF's "average day" met or exceeded the MRDA for all nutrients with the following exceptions: zinc (68%) and sodium (84 %) were below the 90% of the MRDA for the AFRS "average day", while zinc (49%), magnesium (77%) and Vitamin B6 (75%) fell below the 90 % for the CFs. The low values for zinc and sodium are not a concern. Zinc values most likely are higher than the analysis indicates because the nutrient analysis data bases for both CFs and AFRS menu items are incomplete for zinc. Sodium values in the analysis do not include salt added at the table. The lower sodium level in the AFRS menu is probably desirable and could even be lowered to reduce the risk of hypertension in sodium-sensitive individuals. Furthermore, the MRDA of 7000 mg far exceeds biological requirements. Low intakes of magnesium and Vitamin B6 may become a concern if CFs are used exclusively without supplementation with fresh vegetables, salads and whole grain food products. Although there is no MRDA for cholesterol, the USDA, DHHS, Dietary Guidelines for Americans and the NIH National Cholesterol Education Program recommend the dietary cholesterol should not exceed 300 mg/day. Both the AFRS (708mg) and CF (527mg) "average day" exceed the allowable amount, with the AFRS being more than twice the allowable amount.

TABLE 54. COMPARISON OF % MRDA OF ARMED FORCES RECIPE SERVICE FOODS AND COMMERCIAL FOODS (AVERAGE DAY)

NUTRIENTS	MRDA	ARMED FORCES RECIPE	CF	DIFFERENCE
Kilocalories	3600 Kcal	103	101	+02
Protein	100 gm	146	129	+17
Carbohydrate	440 gm	96	95	+01
Fat	160 gm	100	106	-06
Cholesterol*	No RD	708 mg	527 mg	+181 mg
Sodium	7000 mg	84	107	-23
Potassium	1875 mg	236	274	-38
Magnesium	400 mg	93	77	+16
Iron	18 mg	99	118	-19
Zinc	15 mg	68	49	+19
Vitamin A	1000 RE	407	450	-43
Vitamin E	10 mg	392	442	-50
Vitamin C	60 mg	415	450	-35
Thiamin	1.8 mg	138	140	-02
Riboflavin	2.2 mg	169	164	+05
Niacin	24 mg	132	115	+17
Vitamin B6	2.2 mg	121	75	+46
Folate	400 ug	113	95	+18
Vitamin B12	3 ug	178	131	+47
Calcium	800 mg	186	211	-25
Phosphorus	800 mg	230	205	+25
Fiber-Dietary*	NO RDA	22.3 gm	22.4	-0.1

COMPOSITION OF DIET: %OF GOAL

	GOAL %	AFRS %	CF %
Carbohydrate	50	45	45
Protein	20	16	14
Fat	30	39	41

* USDA, DHHS, Dietary guidelines for Americans and the National Institutes for Health recommended that the Dietary cholesterol should not exceed 300mg/day.

The composition of the diet is also an important consideration. The MRDA goal consists of 50 % carbohydrates, 20 % protein and 30 % fat. Both the AFRS and CF diets were lower in carbohydrate and protein and higher in fat than the goal (Table 54). The protein level is not problematic since the MRDA is higher than the recommendation for the general population MRDA by 0.2 gm of protein/KG of body weight. The RDA recommends 0.8 gm while the MRDA recommends 1.0 gm protein/KG body weight. Furthermore, it is anticipated that the MRDA recommendation for protein will probably be revised in the near future to more closely parallel that of the general population. The percent of calories from carbohydrates is within the acceptable range for both "average days". Fat content exceeds the MRDA recommendation of total calories in both the AFRS and CF menu items by about 10 % ; AFRS=39 % and CF=41 % of calories from fat. In light of the negative health consequences of a high fat intake, the fat content should be lowered regardless of whether the AFRS or the CF menus are used. A complete listing of nutrients for each product may be found in Appendix D.

(2) Drain Weight Analysis

To determine the protein per portion of the food items selected for the study, a drain weight analysis was conducted on several CFs and AFRS menu items. Drained weight comparison among manufacturers should be used as a selection criteria in future studies or when CFs are substituted for AFRS items. The purpose of conducting a drain weight analysis is to identify products with high ratios of sauces or gravies which are not nutritious and high in cost. Since it was difficult to gather sufficient drain weight data on CFs and AFRS menus, an abbreviated listing of weight of entree may be found in Table 55 which shows the drain weight comparison of selected entrees. When the weight of meat was compared per serving, the AFRS portions contained significantly more protein than their CF counterpart. Most AFRS recipes contain at least 50 % more protein, some as much as 100 % more than the CF counterpart.

TABLE 55. DRAIN WEIGHT COMPARISON OF CF ENTREES TO AFRS

		MEAT (g)
ARMOUR	VEAL PARMESAN W/TOMATO SC	107
CAMPBELL'S	BREADED VEAL PARMESAN	65
AFRS	VEAL STEAK	159
CHUN KING	SWEET & SOUR CHICKEN	51
CHUN KING	SWEET & SOUR PORK	37
AFRS	SWEET & SOUR PORK	118
CAMBELL'S	MEAT LOAF	114
AFRS	MEAT LOAF	184
HEALTHY CHOICE	SHRIMP CREOLE	47
AFRS	SHRIMP CREOLE	91
STOUFFER'S	TUNA NOODLE CASSEROLE	13
AFRS	TUNA NOODLE CASSEROLE	34
ARMOUR	TURKEY	47
AFRS	TURKEY	113
ARMOUR	BEEF STEW	47
AFRS	BEEF STEW	100
HEALTHY CHOICE	SALISBURY STEAK	88
ARMOUR	SALISBURY STEAK	73
AFRS	1 STEAK	128
ARMOUR	CREAMED CHIPPED BEEF	43
AFRS	CREAMED CHIPPED BEEF	64
CHUN KING	CHICKEN CHOW MEIN	26
AFRS	CHICKEN CHOW MEIN	82
ARMOUR	SWEDISH MEATBALLS IN SAUCE	74
AFRS	3 MEATBALLS	118

IV. SUMMARY AND CONCLUSIONS

As part of the study to explore new system concepts in an effort to downsize the scope of food service operations aboard 21st Century Navy warships, different aspects of food service were investigated, for both inport and at sea, to determine the impact of a CF menu on consumers, food service personnel, labor requirements, storage requirements and equipment. The most significant findings are discussed and listed below:

A. Consumer Acceptance

In both aboard and ashore environments, the majority of CFs were found to be as good or better than AFRS A-Ration foods and would be acceptable to both consumers and food service personnel.

B. Food Service Personnel Opinions

Food service personnel opinions gathered during ashore and afloat tests indicate that the majority of the personnel surveyed would use CFs as substitutes for those items usually prepared from AFRS menus. The reasons given to support this opinion includes: ease of preparation, time saved, less personnel required to prepare food, consistency and standardization in appearance and quality, improved sanitation, less food waste and less time needed for cleanup.

C. Labor

To varying degrees, both labor hours and total cost savings were demonstrated through the substitution of a number of CFs for A-Ration items. While the effect may not be fully realized in the near term, the greatest potential remains with future systems yet to be designed.

An intriguing aspect of the selective use of CFs in present-day operations is the additional preparation/finish time that would be made available to further enhance the overall quality of the food service experience for the consumer. In the future, a further substitution of CFs for more labor-intensive A-Ration products could lead to more optimized food service facility designs and operations.

D. Storage

Total storage space savings result from the use of CFs. However, it should be noted that space savings attributable to the use of CFs is diminished by the increased need for freezer space and supporting mechanical equipment.

E. Equipment

Shipboard equipment as it exists today is capable of handling the introduction of CFs into Navy menus. The quantity and availability of ovens, refrigeration and freezer space are important factors to consider in planning a CF menu.

While future shipboard galleys will still require the same basic types of equipment for food preparation, introduction of new food service technologies, new equipment and methods of cooking will likely affect galley design. The increased use of CFs will affect the numbers of different types of equipment required. Expanded CF menus will require more oven and freezer space while potentially reducing the use of kettles, griddles and fryers. Many other factors will drive the ship, galley and equipment designs of the future.

F. Nutrition

The nutritional content of CFs was similar to foods usually prepared in dining halls, using AFRS menus. With few exceptions, the CF items and items usually served in dining halls met the MRDA. Since the goal of reducing fat, cholesterol and sodium is of particular importance today, careful selection of CF menu items will be necessary to meet the nutritional guidelines.

This document reports research undertaken at the U.S. Army Soldier and Biological Chemical Command, Soldier Systems Center, and has been assigned No. NATICK/TR-99/003 in a series of reports approved for publication.

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APPENDIX A
MSs and FSAs FOCUS GROUP RESPONSES

Appendix A

MSs and FSAs FOCUS GROUP RESPONSES

Preface

The following data contain the perceptions expressed by MSs and FSAs on current food service regarding multiple issues and their perceptions of the impact of substituting CFs for "cook-from-scratch" AFRS A-Rations.

Phase 1. "Cook-From-Scratch" - Inport

Sample population: MSs=21, FSAs=2

Food

As a result of the varying number of onboard visitors, liberties and leave, it is impossible to predict with any degree of accuracy, the head count for each meal. Therefore, to insure that sufficient food is prepared, normally too much food is prepared which results in a large quantity of leftovers. If MSs underestimate the quantities of AFRS starch food items, they can substitute CFs to make up the difference.

Menu items vary in degree of preparation difficulty. For example; pepper steak is relatively easy to prepare; beef stew is moderately difficult to prepare and lasagna is difficult to prepare.

Training

MSs believe that "A" school is too brief and does not provide sufficient hands-on training. Conditions on different ships vary greatly; consequently, new food service recruits require more help when they first arrive for duty. Unfortunately, due to the lack of time, there is no ongoing training program onboard ships to orient raw recruits and to increase their skills in the preparation of food.

Personnel

MSs cite that the low morale within the food service personnel ranks is due to the working conditions. There are too few food service personnel to complete the workload and some personnel fail to carry their fair share of the work.
MSs believe that personnel issues contribute to low morale. In addition, they felt that the lack of proper supervision and support are key problems and they find officers are often unappreciative and rude.

Equipment

MSs find that their inability to get equipment repaired (steamer, mixer and warmer) and the lack of basic equipment and utensils (pans, 6 oz.ladles, etc.) are obstacles in performing their job effectively.

Summary of Problem Areas

When asked to rank problem areas, the MSs indicated that morale was the biggest issue followed by equipment and training.

Phase 2. CFs-Inport

Sample population: MSs=14, FSAs=1

Food

CFs were preferred over cook-from-scratch foods except for holidays or special occasions, because during special occasions, different (special menu) items are served in the galley. These cook-from-scratch items tend to be more expensive, better prepared and more acceptable than food normally served in the galley.

Equipment

MSs noted numerous equipment problems: (1) 3 ovens in the galley were not operational. This condition could cause a major problem since all ovens are needed to prepare CFs; (2) larger foil containers are required to replace the smaller ones to reduce cooking time; (3) larger ovens with more racks are needed to accommodate CF items; (4) there is a lack of sufficient counter space and warmers; (5) larger portion sizes would reduce serving times by reducing the number of times food items had to be replenished on the serving line and (6) there is a concern about the adequacy of storage and freezer space on the ship.

Manpower

MSs believe that the use of CFs will reduce the current level of required manning from 6 MSs to approximately 2 MSs. These estimates were based solely upon the opinions of a few MSs.

Packaging

The following changes in packaging were suggested: (1) food items should be packaged in larger cases; (2) perforations in the outer containers would assist in "breaking-down" CF packages; (3) use less tape on the outer boxes and (4) larger portion sizes in larger foil containers to reduce food waste (some food items have to be cut to add to the CF portion to make an acceptable portion size).

Safety

MSs are concerned with a number of specific safety issues, i.e., larger foil containers are needed to minimize the possibility of personnel burns during food transfer.

Time

There is a considerable amount of food service personnel time saved when CFs are used. The savings come from the reduction in preparation time and the reduced amount of time required to purchase food items. For example, the purchase of "convenience" meat loaf requires only one step whereas purchasing the many ingredients required in AFRS for meat loaf preparation, requires several steps. Waste disposal, however, takes more time with CFs and may offset time saved in food preparation.

Morale

CFs were easy to prepare, took less time to clean up, were easy to heat, and required limited instructions for use. The improvement in working conditions led to improved morale.

Waste

The amount and volume of waste generated from CFs in the form of foils, paper, etc., is greater in bulk and harder to store than waste generated from AFRS galley food. Use of CFs generated more packaging waste but less waste in preparation, resulting in easier cleanup and more sanitary conditions in the galley.

Recommendations

(1) package CFs in deeper and wider foil pans; (2) bundle CFs in larger packages and (3) provide more frequent trash pickup for the ship.

Phase 3. CFs - At Sea

Sample population: MSs=7

Food

CFs are thought to be of acceptable quality, well-prepared and taste good.

The portion sizes of most CFs were thought to be adequate, consistent and uniform. There were some exceptions where the portion sizes were small. In these instances, double portions were served.

MSs believed that there were little or no nutritional differences between CFs and cook-from-scratch items. MSs believed the nutritional values would be more consistent in the CFs than in cook-from-scratch items.

Training

No additional or special training is required when using CFs. "Hands-on" experience is all that is required.

Some MSs were concerned that cooks would not learn the skills of their trade, especially in the bakery.

MSs stated that the Chiefs believe that the use of CFs would give the MSs too much free time.

Equipment

Three ovens which needed repair, reduced the effectiveness of MSs in cooking food items and keeping the food hot. Some of the ovens were used to keep the food items hot and consequently, unavailable for the preparation of food items.

Additional proof boxes and warmers for all yeast products are needed in the bakery.

Manpower

MSs believe that the use of CFs will reduce general preparation time by 50% and preparation of bakery products by 80% compared to cook-from-scratch food items.

These estimates were based solely upon the opinions of a few MSs.

Serving time for CFs did not differ from cook-from-scratch items.

The time saved in CF preparation is offset by the increased time needed to clean up and the disposal of trash.

Storage and Packaging

CFs take up a lot of freezer space, especially at sea. Bigger or additional freezers or removal of cook-from-scratch items from storage and freezer space would solve the problem.

Reduce the amount of packaging and use larger containers.

Sanitation and Waste Disposal

MSs differed on the question of sanitation. Some did not consider plastic refuse as a problem, while others believed if plastics were not rinsed properly before storage, particularly during hot weather, the plastic trash/garbage (held in the fantail) would begin to attract flies and the rotting food would stink.

Food waste would be reduced because; (1) the use of CFs would allow MSs to know how many and how much of the items to "break-out" and prepare and (2) the higher level of acceptability of the food items would result in increased consumption.

No raw meat products would be thawing on counter space while other products were being processed.

Waste generated from CFs is estimated to be approximately 10 to 50 % more than for AFRS A-Rations. Breakdown and disposal of waste, with the exception of the excess plastic trash, is not seen as a problem because the majority of the trash (excluding plastics and other nonbiodegradable rubbish) is dumped overboard when at sea.

Concerns with waste disposal, center around the plastics and the amount of time needed to separate the different kinds of waste generated while at sea. MSs recommended replacing plastics with biodegradable substitutes wherever possible.

Work Space

No additional workspace is needed when CFs are used. Some MSs, however, did request more tables and trash cans.

Food Preparation

Less time was needed for thawing and preparing CF items; therefore, certain food items (i.e., pancakes and French toast) were much easier and quicker to replace since they were in their finished prepared form when defrosted. CFs could also be used for the preparation of last-minute items in a microwave oven when available.

Convenience foods would save time and reduce the MSs frustration level, especially between breakfast and lunch.

Serving Convenience Foods

CFs are served in the same manner as the AFRS A-Ration items; however, CFs are easier to handle, consistent in their presentation and do not fall apart.

Some of the CFs were packaged so that they could be placed on the serving line and served directly from their containers, while others had to be transferred to

serving pans. MSs believed the transfer of CFs from cooking pans to serving pans represented the same amount of danger as the transfer of AFRS A-Ration meals. However, the MSs observed that, in some cases, only 2 foil containers could be placed on the serving line per insert instead of the 6-8 foil containers generally used. Consequently, they recommended that CFs be packaged in larger foil containers.

Certain food items could not be transferred from foils, resulting in more frequent rotations (replenishing the serving line more often). This procedure would take more time than usually required. This is another problem which needs to be addressed. MSs observed that some of the packaging appeared to be "flimsy" or not as sturdy as the others.

MSs are concerned that CF leftovers would be served again in violation of the Navy's policy on leftovers.

Consumer Satisfaction

The MSs attribute some of the likability of CFs to their "TV Dinner" appearance.

The MSs believe the CFs are enjoyed more than the AFRS A-Rations because of their consistent taste.

CFs may be considered better than AFRS A-Ration items because they were commercially made and therefore must be good.

Manager Attitude

The MS Chiefs like the CFs because; (1) ordering is easier (can predict the number of portions to order from the number of portions per case) and (2) the reduction in the number of ingredients needed to be ordered for each meal.

MS Chiefs were concerned that cooks would not learn the skills of their trade, especially in the bakery. They suggested an alternating menu of CFs and AFRS A-Rations at each meal.

The MS Chiefs believe that some MSs would try to make the quality of AFRS A-Rations as good as CFs.

Food Service Personnel Attitude and Morale

All MSs agreed that the use of CFs would have a positive effect on the morale of food service personnel by eliminating frustration and saving time. CFs would be easier to prepare while at sea and would allow cooks time to relax. They even cited an increase in the FSA's morale because it would be easier for them to "Break out" the CFs.

Some MSs did express concern that the use of CFs would result in the need for fewer MSs and the degree of skill level required.

Summary

Consumer

Improvement in the quality and variety of CFs currently available for food service establishments offers a reasonable alternative to the traditional military methods for food preparation. This hypothesis was tested both ashore and afloat. Consumers in both segments of the study indicated that CFs were as good or better than AFRS A-Ration prepared foods.

Food Service Personnel

There is agreement between the opinions of food service personnel, recorded in the questionnaires and those opinions gathered during the conduct of focus groups. Most MSs and FSAs would substitute CFs for the ones they usually "prepare-from-scratch". The food service personnel listed the following reasons for their choices: (1) CFs are easy to prepare; (2) require less time to prepare; (3) present consistent appearance; (4) reduce the amount of food waste; (5) improve sanitation and (6) reduce frustration and improve morale. MSs and FSAs did not think the 2 problems identified, (1) disposal of trash and (2) disposal of excessive packaging materials, were significant enough to deter the use of CFs. Instead, the MSs and FSAs offered these solutions to these problems: replace plastics with biodegradable substitutes whenever possible and package food items in larger and deeper cases with less tape used on the outer boxes.

MSs and FSAs SURVEY QUESTIONNAIRE RESPONSES

PREFACE

The following data contain the perceptions expressed by MSs and FSAs on Job Satisfaction and Working Environment. These data provide an indirect measure of morale.

SUMMARY

Satisfaction with Job Aspects

Food service personnel indicated that they were "somewhat dissatisfied" with the number of hours worked each day and "the schedule of weekly hours when at sea" (Table 56).

TABLE 56 RATINGS OF SATISFACTION WITH JOB ASPECTS

JOB SATISFACTION	$\bar{X}$	SD
The work you actually do aboard ship	4.9	2.1
The schedule of rotation among dining facilities	4.2	2.0
The number of hours you work a day while inport	4.3	2.1
The number of hours you work a day while at sea	3.3	2.2
The schedule of weekly hours while inport	4.0	2.1
The schedule of weekly hours while at sea	3.3	2.1

Scale:
Ratings based on a 7-point scale where 1 = "Very Dissatisfied", 2 = "Moderately Dissatisfied", 3 = "Somewhat Dissatisfied", 4 = "Neither Dissatisfied nor Satisfied", 5 = "Somewhat Satisfied", 6 = "Moderately Satisfied", 7 = "Very Satisfied".

Level of Work Effort

Approximately one-third of the food service personnel said they worked "much harder" or a "little harder" than other MSs, one-fourth worked "about the same as others" and 4.3% admitted to working "a little less hard than others" (Table 57).

TABLE 57. RESPONSES TO QUESTION WOULD YOU WORK HARDER, LESS HARD, OR ABOUT THE SAME AS FOOD SERVICE PERSONNEL DOING THE SAME TYPE OF WORK

WORK EFFORT	PERCENT (%)
Much harder than most others	34.8
A little harder than most others	34.8
About the same as most others	26.1
A little less hard than most others	4.3
Much less hard than most others	0.0

Conditions of the Mess

Food service personnel described conditions in the mess while the ship was inport between "neutral" and "somewhat good" and between "somewhat bad" to "neutral" when the ship was at sea. (Table 58).

TABLE 58 CONDITIONS OF THE MESS

CONDITIONS	$\bar{X}$	SD
INPORT		
General Eating Environment	4.9	1.2
Sanitation in the Dining Area	4.7	1.4
Quality of Food	5.0	1.2
Quantity of Food	4.7	1.8
Variety of Food	4.8	1.4
UNDERWAY		
General Eating Environment	3.9	1.7
Sanitation in Dining Area	3.9	1.7
Quality of Food	4.1	1.5
Quantity of Food	4.2	1.7
Variety of Food	4.3	1.7

Scale:
Ratings based on a 7-point scale where 1 = "Very Bad", 2 = "Moderately Bad", 3 = "Somewhat Bad", 4 = "Neutral", 5 = "Somewhat Good", 6 = "Moderately Good", 7 = "Very Good".

Importance of Specific Changes in Improving the Mess Operation

A question was asked "How can the working conditions be improved?" Food service personnel responses were, "more or better equipment", "more recognition for doing a good job", "more MSs and more FSAs" as being "very important" in improving the mess in which they worked (Table 59). Thirteen out of the 22 food service personnel who answered this question, rated, "more or better equipment" as the most important factor in improving the mess.

TABLE 59 IMPORTANCE OF SPECIFIC CHANGES IN IMPROVING THE MESS

CHANGES	$\bar{X}$	SD
More MMSs	4.0	0.9
More Food Service Attendants	4.0	0.8
Better Supervision by Senior Chief	2.8	1.4
Better Supervision by Watch Captains	3.4	1.3
More On-The-Job Training	3.8	1.3
Stricter Supervision of Foodservice attendants	3.4	1.1
More or Better Equipment	4.5	0.9
More Recognition for Doing a Good Job	4.2	1.3
More Foods that are Easier to Prepare	3.5	1.2

Scale:

Ratings based on a 5-point scale where 0 = "Not Important", 2 = "Somewhat Important", 3 = "Moderately Important", 4 = "Very Important", 5 = "Extremely Important".

APPENDIX B
QUESTIONNAIRE AND CONSUMER ACCEPTANCE RATING FORMS

FOOD QUESTIONNAIRE

Please read each question carefully. Mark your answers by filling in the circle(s) beside the correct answer.

1. Your first initial of last name: _____ 2. Last four digits of your SSN: _____

3. What is your branch of service? ◯ Navy ◯ USMC ◯ Other _____ (please specify)

4. Are you currently on TDY? ◯ YES ◯ NO
   IF YES, what is your permanent duty station? _____

5. What is your rank? E- ◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5 ◯ 6 ◯ 7 ◯ 8 ◯ 9

6. What is your gender?
   - ◯ Male
   - ◯ Female

7. What is your age? _____ years

8. How long have you been in the armed services?
   - ◯ 0-2 years
   - ◯ 3-5 years
   - ◯ 6-10 years
   - ◯ 11-15 years
   - ◯ more than 16 years

9. What is the highest level of education you have completed ?
   - ◯ Finished grade school
   - ◯ Some high school
   - ◯ High school graduate or grad equivalent
   - ◯ Some college
   - ◯ College graduate

10. What is your ethnic background?
    - ◯ White
    - ◯ Black
    - ◯ Hispanic
    - ◯ Asian/Pacific Islander
    - ◯ American Indian/ Alaskan Native
    - ◯ Other (please specify) _____

11. In what part of the country have you lived the longest? (fill in the appropriate circle)
    - ◯ New England (ME, NH, VT, MA, CT, RI)
    - ◯ Middle Atlantic (NJ, NY, PA)
    - ◯ South Atlantic (DE, MD, VA, WV, NC, SC, GA, FL, DC)
    - ◯ North Central (OH, IN, IL, MI, WI, MN, IA, MO, ND, SD, NE, KS)
    - ◯ South Central (KY, TN, AL, MS, AR, LA, OK, TX)
    - ◯ Mountain (ID, WY, CO, MT, AZ, NM, UT, NV)
    - ◯ Pacific (WA, OR, CA, AK, HI)
    - ◯ Other (please specify)_____

DO NOT WRITE BELOW THIS LINE

Q2 0 1 2 3 4 5 6 7 8 9

Q4

Q7 0 1 2 3 4 5 6 7 8 9

WEEK

Q10 0 1 2 3 4 5 6 7 8 9

DAY

Q11 0 1 2 3 4 5 6 7 8 9

12. What is your usual ration?

- BAS, Basic Allowance for Subsistance
- RIK, Ration in Kind (meal card)

13. Please fill in the circle(s) for the meal(s) you usually eat in this dining hall.

	M	TU	W	TH	F	SA	SU
BREAKFAST	○	○	○	○	○	○	○
LUNCH/BRUNCH	○	○	○	○	○	○	○
DINNER	○	○	○	○	○	○	○

14. Please rate your overall satisfaction with the food served in this dining hall.

EXTREMELY DISSATISFIED ○ ○ ○ ○ ○ ○ ○ ○ ○ EXTREMELY SATISFIED

NEITHER SATISFIED NOR DISSATISFIED

First initial of last name _____
Last four digits of SSN _____

LUNCHEON FOOD QUESTIONNAIRE
WEEK 1

We would like your honest evaluation of the selected A-Ration LUNCHEON items you ate at noon. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

MONDAY
- Spicy Shrimp Creole
- Macaroni and Beef
- Au Gratin Potatoes
- Spinach Souffle

TUESDAY
- Sliced Turkey
- Turkey Gravy
- Dressing
- Whipped Sweet Potatoes
- Cherry Turnover
- Peanut Butter Cookies

WEDNESDAY
- Chicken Enchanadas
- Beef/Bean Enchanadas
- Blueberry Pie
- Chocolate Chip Cookies

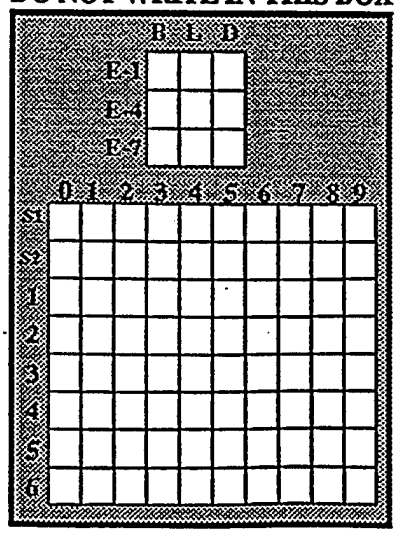
THURSDAY
- Baked Meat Loaf
- Homestyle Chicken and Noodles
- Escalloped Potatoes

FRIDAY
- Salisbury Steak
- Sweet Potato Casserole
- Lemon Meringue Pie
- Oatmeal Cookies

SATURDAY
- Veal Parmesan
- Brownies

SUBSTITUTION ITEMS
_____
_____

DO NOT WRITE IN THIS BOX



First initial of last name _____
Last four digits of SSN _____

DINNER FOOD QUESTIONNAIRE
WEEK 1

We would like your honest evaluation of the selected A-Ration DINNER items you ate at night. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

MONDAY
- Breaded Pork Chops
- Chicken with Rice Stuffing

TUESDAY
- Cajun Seasoned Stew
- Macaroni & Cheese
- Cherry Turnover
- Peanut Butter Cookies

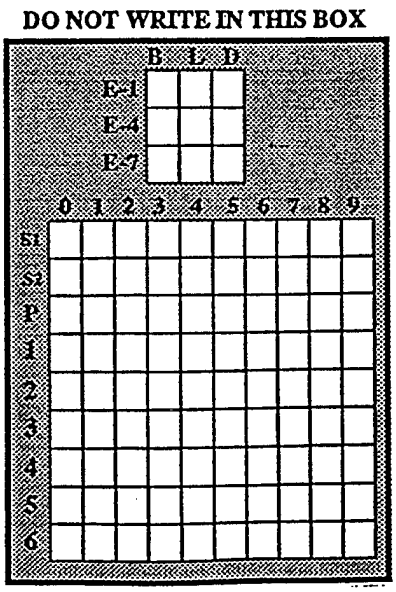
WEDNESDAY
- Chili Con Carne
- Sweet/Sour Pork
- Blueberry Pie
- Chocolate Chip Cookies

THURSDAY
- Fried Fish
- Chicken Italienne
- Macaroni & Cheese

FRIDAY
- Beef & Peppers
- Fried Chicken
- Confetti Rice
- Spinach Souffle
- Lemon Meringue Pie
- Oatmeal Cookies

SATURDAY
- Vegetable Lasagna
- Pizza (type) _____
- Brownies

SUBSTITUTION ITEMS
_____
_____



First initial of last name _____
Last four digits of SSN _____

BREAKFAST FOOD QUESTIONNAIRE
WEEK 2

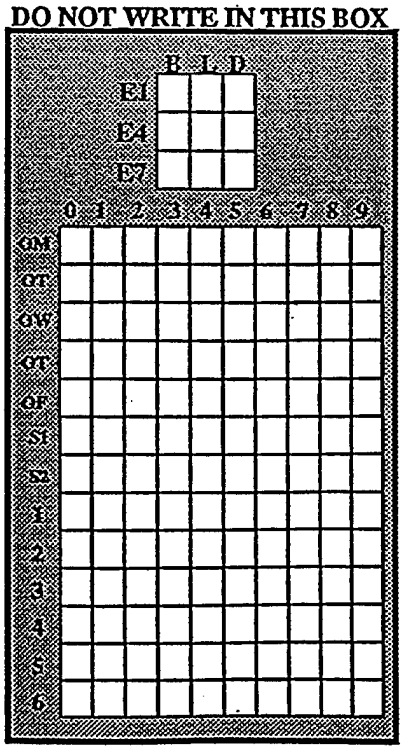
We would like your honest evaluation of the selected A-Ration BREAKFAST items you ate this morning. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

	1	2	3	4	5	6	7	8	9
MONDAY									
Omelet (type) _____	○	○	○	○	○	○	○	○	○
Creamed Beef	○	○	○	○	○	○	○	○	○
Apple Pancakes	○	○	○	○	○	○	○	○	○
Hash Brown Potatoes	○	○	○	○	○	○	○	○	○
Blueberry Coffee Cake	○	○	○	○	○	○	○	○	○
TUESDAY									
Omelet (type) _____	○	○	○	○	○	○	○	○	○
French Toast	○	○	○	○	○	○	○	○	○
Hash Brown Potatoes	○	○	○	○	○	○	○	○	○
Cinnamon Rolls	○	○	○	○	○	○	○	○	○
WEDNESDAY									
Omelet (type) _____	○	○	○	○	○	○	○	○	○
Apple Pancakes	○	○	○	○	○	○	○	○	○
Hash Brown Potatoes	○	○	○	○	○	○	○	○	○
Good Morning Coffee Cake	○	○	○	○	○	○	○	○	○
THURSDAY									
Omelet (type) _____	○	○	○	○	○	○	○	○	○
Creamed Beef	○	○	○	○	○	○	○	○	○
French Toast	○	○	○	○	○	○	○	○	○
Bear Claws	○	○	○	○	○	○	○	○	○
FRIDAY									
Omelet (type) _____	○	○	○	○	○	○	○	○	○
Hash Brown Potatoes	○	○	○	○	○	○	○	○	○
Iced Snails	○	○	○	○	○	○	○	○	○
Apple Coffee Cake	○	○	○	○	○	○	○	○	○
SUBSTITUTION ITEMS									
_____	○	○	○	○	○	○	○	○	○
_____	○	○	○	○	○	○	○	○	○

DO NOT WRITE IN THIS BOX



First initial of last name _____
Last four digits of SSN _____

LUNCHEON FOOD QUESTIONNAIRE
WEEK 2

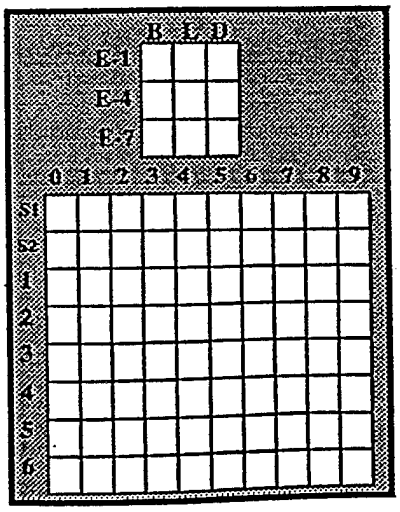
We would like your honest evaluation of the selected A-Ration LUNCHEON items you ate at noon. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

	1	2	3	4	5	6	7	8	9
MONDAY Tuna Noodle Casserole	○	○	○	○	○	○	○	○	○
TUESDAY Turkey Tetrazzini Banana Cream Pie Butterscotch Brownies	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○
WEDNESDAY Sweet/Sour Chicken Vegetable Chow Mein Hot Dinner Rolls	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○
THURSDAY Beef Stroganoff Chicken Primavera Bread Sticks Apple Pie Coconut Cookies	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○
FRIDAY Beef Stew	○	○	○	○	○	○	○	○	○
SATURDAY Stuffed Green Peppers Green Bean and Mushroom Casserole	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○
SUBSTITUTION ITEMS _____ _____	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○

DO NOT WRITE IN THIS BOX



First initial of last name _____
Last four digits of SSN _____

DINNER FOOD QUESTIONNAIRE
WEEK 2

We would like your honest evaluation of the selected A-Ration DINNER items you ate at night. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

MONDAY
- Beef Sirloin Tips
- Chicken with Broccoli and Cheese Stuffing
- Hot Dinner Rolls

TUESDAY
- BBQ Pork
- Noodles Romanoff
- Biscuits
- Banana Cream Pie
- Butterscotch Brownies

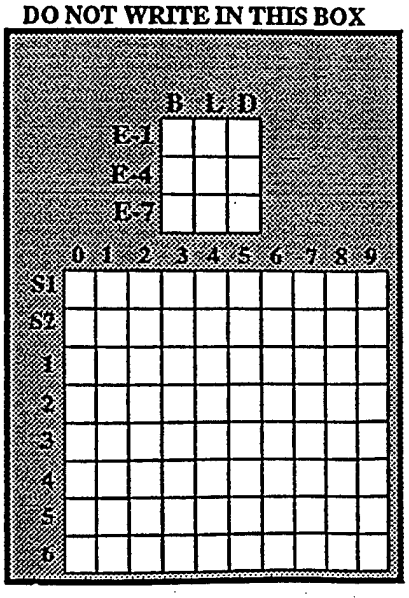
WEDNESDAY
- Lasagna
- Broccoli au Gratin

THURSDAY
- Turkey Dijon
- Sausage, Onion, and Pepper
- Biscuits
- Banana Cream Pie
- Coconut Cookies

FRIDAY
- Glazed Chicken
- Chicken Vegetable Oriental

SATURDAY
- Chicken Chow Mein

SUBSTITUTION ITEMS
_____
_____



1. First initial of last name:_____
2. Last four digits of SSN:_____

3. How would you compare the appearance of the foods eaten during this meal with similar foods you usually eat in this mess deck?

1	2	3	4	5
Much Worse	Somewhat Worse	Just The Same	Somewhat Better	Much Better

	1	2	3	4	5
Omelet (type)_____	○	○	○	○	○
Entrees (Creamed Beef, Pancakes, etc.)	○	○	○	○	○
Bakery Products (Iced Snails, Cinnamon Rolls, etc.)	○	○	○	○	○

4. How would you compare the quality of the foods eaten during this meal with similar foods you usually eat in this mess hall?

1	2	3	4	5
Much Worse	Somewhat Worse	Just The Same	Somewhat Better	Much Better

	1	2	3	4	5
Omelet (type)_____	○	○	○	○	○
Entrees (Creamed Beef, Pancakes. etc.)	○	○	○	○	○
Bakery Products (Iced Snails, Cinnamon Rolls, etc.)	○	○	○	○	○

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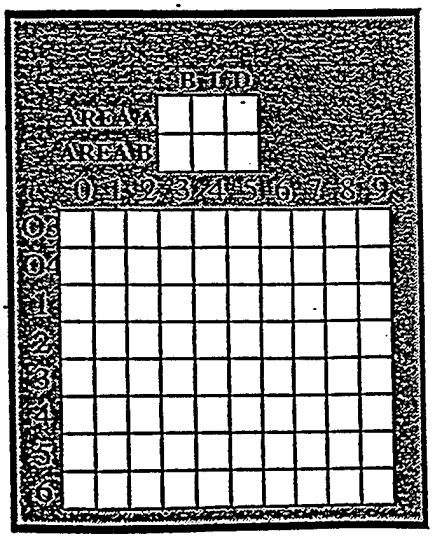

1. First initial of last name:_____
2. Last four digits of SSN:_____

3. How would you compare the appearance of the foods eaten during this meal with similar foods you usually eat in this mess?

1 Much Worse	2 Somewhat Worse	3 Just The Same	4 Somewhat Better	5 Much Better

	1	2	3	4	5
Omelet	○	○	○	○	○
Entrees (Creamed Beef, Pancakes, and French Toast)	○	○	○	○	○
Bakery Products (Iced Snails, Cinnamon Rolls, Biscuits, etc.)	○	○	○	○	○

4. How would you compare the quality of the foods eaten during this meal with similar foods you usually eat in this mess?

1 Much Worse	2 Somewhat Worse	3 Just The Same	4 Somewhat Better	5 Much Better

	1	2	3	4	5
Omelet (type)_____	○	○	○	○	○
Entrees (Creamed Beef, Pancakes, and French Toast)	○	○	○	○	○
Bakery Products (Iced Snails, Cinnamon Rolls, Biscuits, etc.)	○	○	○	○	○

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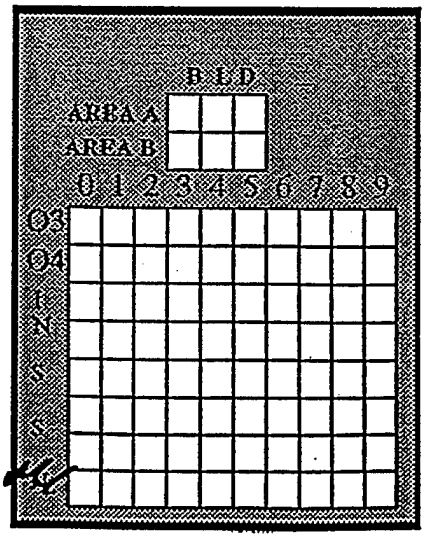

1. First initial of last name:_____
2. Last four digits of SSN:_____

3. How would you compare the appearance of the foods eaten during this meal with similar foods you usually eat in this mess?

1	2	3	4	5
Much Worse	Somewhat Worse	Just The Same	Somewhat Better	Much Better

	1	2	3	4	5
Omelet (type)_____	○	○	○	○	○
Entrees (Creamed Beef, Pancakes, etc.)	○	○	○	○	○
Bakery Products (Iced Snails, Cinnamon Rolls, etc.)	○	○	○	○	○

4. How would you compare the quality of the foods eaten during this meal with similar foods you usually eat in this mess?

1	2	3	4	5
Much Worse	Somewhat Worse	Just The Same	Somewhat Better	Much Better

	1	2	3	4	5
Omelet (type)_____	○	○	○	○	○
Entrees (Creamed Beef, Pancakes, etc.)	○	○	○	○	○
Bakery Products (Iced Snails, Cinnamon Rolls, etc.)	○	○	○	○	○

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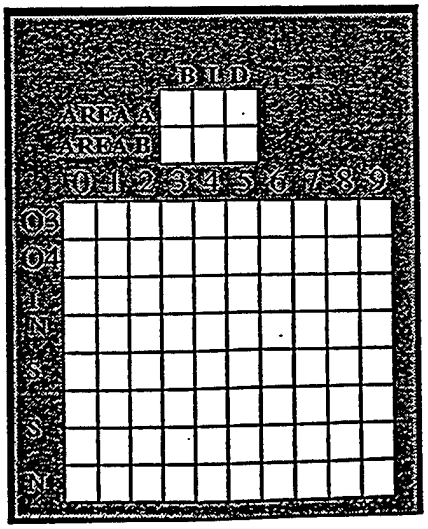

1. First initial of last name:_____
2. Last four digits of SSN:_____

3. How would you compare the appearance of the foods eaten during this meal with similar foods you usually eat in this mess?

1 Much Worse	2 Somewhat Worse	3 Just The Same	4 Somewhat Better	5 Much Better

	1	2	3	4	5
Entrees	○	○	○	○	○
Starches (Noodles, Rolls, Potatoes, etc.)	○	○	○	○	○
Vegetables	○	○	○	○	○
Desserts	○	○	○	○	○

4. How would you compare the quality of the foods eaten during this meal with similar foods you usually eat in this mess?

1 Much Worse	2 Somewhat Worse	3 Just The Same	4 Somewhat Better	5 Much Better

	1	2	3	4	5
Entrees	○	○	○	○	○
Starches (Noodles, Rolls, Potatoes, etc.)	○	○	○	○	○
Vegetables	○	○	○	○	○
Desserts	○	○	○	○	○

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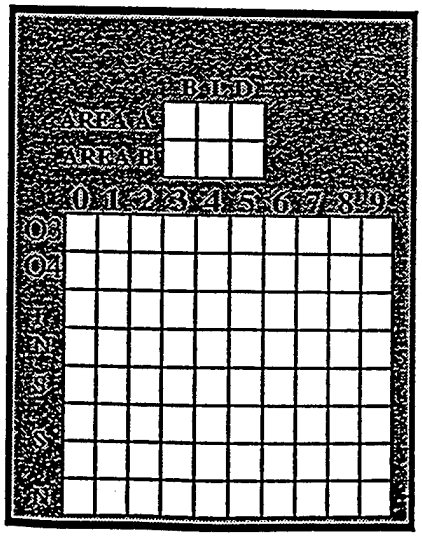


1. First initial of last name:_____
2. Last four digits of SSN:_____

3. How would you compare the appearance of the foods eaten during this meal with similar foods you usually eat in this mess?

1 Much Worse	2 Somewhat Worse	3 Just The Same	4 Somewhat Better	5 Much Better

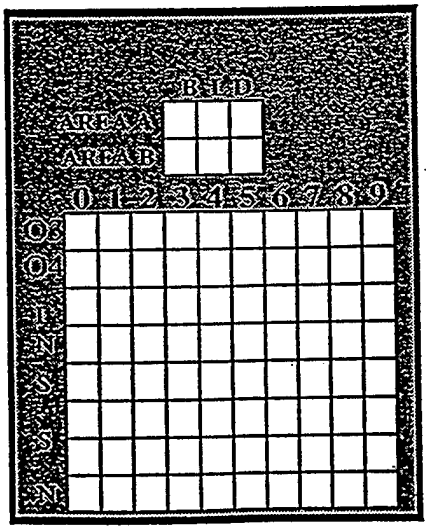
	1	2	3	4	5
Entrees (Meat Loaf, Lasagna, Stuffed Peppers, Veal Parmesan etc.)	○	○	○	○	○
Potatoes	○	○	○	○	○
Rolls	○	○	○	○	○
Breadsticks	○	○	○	○	○
Desserts	○	○	○	○	○

4. How would you compare the quality of the foods eaten during this meal with similar foods you usually eat in this mess?

1 Much Worse	2 Somewhat Worse	3 Just The Same	4 Somewhat Better	5 Much Better

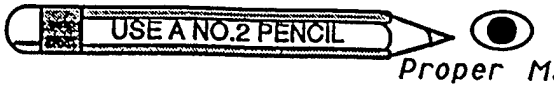
	1	2	3	4	5
Entrees (Meat Loaf, Lasagna, Stuffed Peppers, Veal Parmesan etc.)	○	○	○	○	○
Potatoes	○	○	○	○	○
Rolls	○	○	○	○	○
Breadsticks	○	○	○	○	○
Desserts	○	○	○	○	○

DO NOT WRITE IN THIS BOX



CONSUMER QUESTIONNAIRE

Please read each question carefully. Mark your answers by filling in the circle(s) beside the correct answer.



1. Your first initial of last name: _____ 2. Last four digits of your SSN: _____

3. What is your branch of service? ◯ Navy ◯ USMC ◯ Other _____ (please specify)

4. Are you currently on TDY? ◯ YES ◯ NO
   IF YES, what is your permanent duty station? _____

5. What is your rank? E- 1 2 3 4 5 6 7 8 9

6. What is your gender?
   ◯ Male
   ◯ Female

7. What is your age? _____ years

8. How long have you been in the armed services?
   ◯ 0-2 years
   ◯ 3-5 years
   ◯ 6-10 years
   ◯ 11-15 years
   ◯ more than 16 years

9. What is the highest level of education you have completed ?
   ◯ Finished grade school
   ◯ Some high school
   ◯ High school graduate or grad equivalent
   ◯ Some college
   ◯ College graduate

10. What is your ethnic background?
    ◯ White
    ◯ Black
    ◯ Hispanic
    ◯ Asian/Pacific Islander
    ◯ American Indian/ Alaskan Native
    ◯ Other (please specify) _____

11. Please fill in the circle(s) for the meal(s) you usually eat in this mess hall.

	M	TU	W	TH	F	SA	SU
BREAKFAST	◯	◯	◯	◯	◯	◯	◯
LUNCH	◯	◯	◯	◯	◯	◯	◯
DINNER	◯	◯	◯	◯	◯	◯	◯

DO NOT WRITE BELOW THIS LINE

Q2

Q10 0 1 2 3 4 5 6 7 8 9

Q7 0 1 2 3 4 5 6 7 8 9

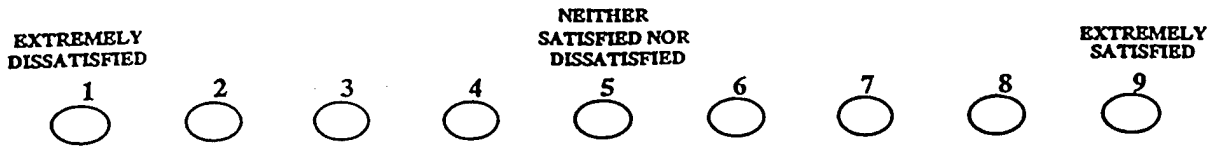
WEEK

Q4 0 1 2 3 4 5 6 7 8 9

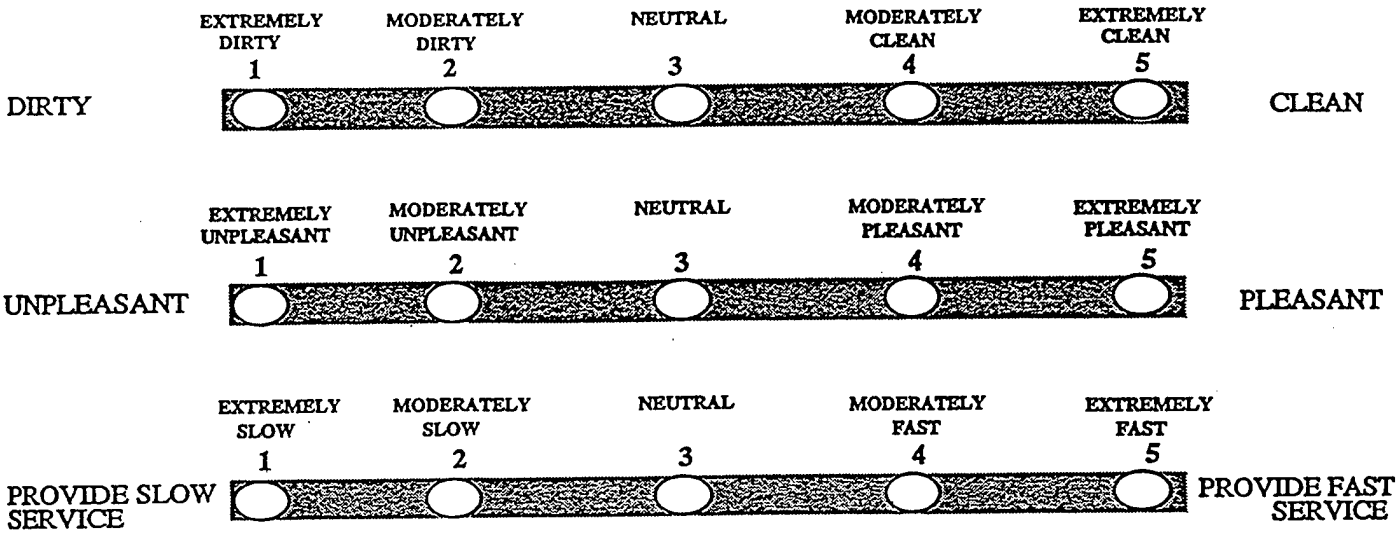
Q3

Q1 0 1 2 3 4 5 6 7 8 9

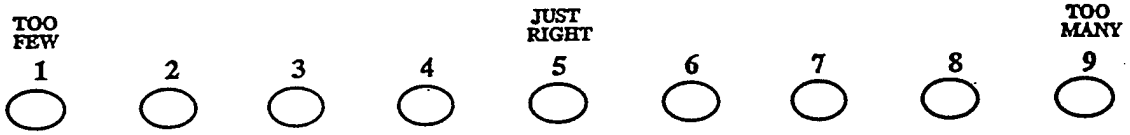
12. Please rate your overall satisfaction with the food served in this mess hall.



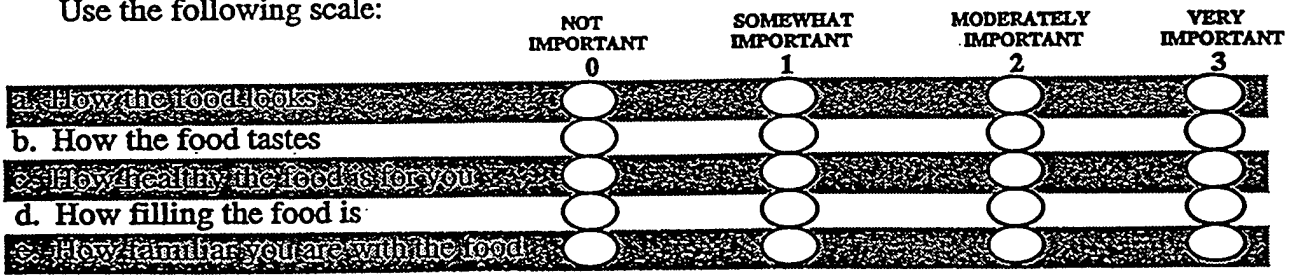
13. Using the scales below, please describe the food service workers on the serving line in this mess hall.



14. During the past month, did you find the number of food choices on the menu satisfactory?



15. How important is each of the following in determining what you choose to eat at a meal? Use the following scale:



16. For each of the following foods, rate the amount given in one serving.

	MUCH TOO SMALL 1	MODERATELY TOO SMALL 2	SOMEWHAT TOO SMALL 3	JUST RIGHT 4	SOMEWHAT TOO LARGE 5	MODERATELY TOO LARGE 6	MUCH TOO LARGE 7
a. Entrees							
b. Starch (Potato, Rice, Bread, etc.)							
c. Vegetables							
d. Dessert							

17. How often is the food in your mess hall: (fill in for each item)

	ALMOST NEVER 1	SOMETIMES 2	OFTEN 3	ALMOST ALWAYS 4
a. Overcooked				
b. Undercooked				
c. Cold				
d. Tasteless or bland				
e. Burned				
f. Dried Out				
g. Greasy				
h. Tough				
i. Too Spicy				
j. Raw				
k. Still Frozen				
l. Too Salty				
m. Spoiled				
n. Stale				

18. How satisfied or dissatisfied are you with the following aspects of military life? (fill in for each item)

	VERY DISSATISFIED 1	MODERATELY DISSATISFIED 2	SOMEWHAT DISSATISFIED 3	NEITHER SATISFIED NOR DISSATISFIED 4	SOMEWHAT SATISFIED 5	MODERATELY SATISFIED 6	VERY SATISFIED 7
a. Travel							
b. Pay							
c. Food							
d. Job							
e. Benefits							
f. Berthing							
g. Friends							
h. Training							
i. Discipline							
j. Work Hours							

First initial of last name _____
Last four digits of SSN _____

LUNCHEON FOOD QUESTIONNAIRE
WEEK 1

We would like your honest evaluation of the selected LUNCHEON items you ate at noon. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

MONDAY
- Meat Loaf
- Cherry Pie
- Chocolate Chip Cookies

TUESDAY
- Chili Mac
- Au Gratin Potatoes
- Sweet Potato Pie
- Peanut Butter Cookies

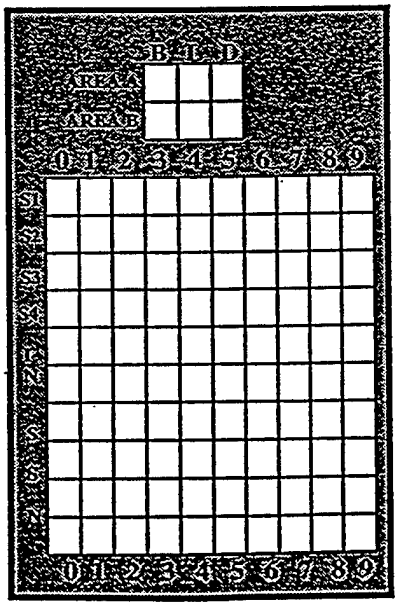
WEDNESDAY
- Enchiladas
- Tacos
- Lemon Meringue Pie
- Peach Pie

THURSDAY
- Beef Stew
- Sweet And Sour Chicken
- Pecan Pie
- Chocolate Cookies

FRIDAY
- Lasagna
- Breadsticks
- Sugar Cookies
- Brownie

SUBSTITUTION ITEMS
_____
_____
_____
_____

DO NOT WRITE IN THIS BOX



GENERAL COMMENTS

Food Appearance _____
_____

Food Variety _____
_____

First initial of last name _____
Last four digits of SSN _____

DINNER FOOD QUESTIONNAIRE
WEEK1

We would like your honest evaluation of the selected Dinner items you ate at night. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

1	2	3	4	5	6	7	8	9
DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY

RATE ONLY THE FOODS YOU TASTED

	1	2	3	4	5	6	7	8	9
MONDAY									
Chicken Pot Pie	○	○	○	○	○	○	○	○	○
Cherry Pie	○	○	○	○	○	○	○	○	○
Chocolate Chip Cookies	○	○	○	○	○	○	○	○	○
TUESDAY									
Stuffed Peppers	○	○	○	○	○	○	○	○	○
Macaroni & Cheese	○	○	○	○	○	○	○	○	○
Sweet Potato Pie	○	○	○	○	○	○	○	○	○
Peanut Butter Cookies	○	○	○	○	○	○	○	○	○
WEDNESDAY									
Salisbury Steak	○	○	○	○	○	○	○	○	○
Savory Baked Chicken	○	○	○	○	○	○	○	○	○
Dinner Rolls	○	○	○	○	○	○	○	○	○
Lemon Meringue Pie	○	○	○	○	○	○	○	○	○
Peach Pie	○	○	○	○	○	○	○	○	○
THURSDAY									
Veal Parmesan	○	○	○	○	○	○	○	○	○
Beef Stroganoff	○	○	○	○	○	○	○	○	○
Pecan Pie	○	○	○	○	○	○	○	○	○
Chocolate Cookies	○	○	○	○	○	○	○	○	○
FRIDAY									
Chicken Chow Mein	○	○	○	○	○	○	○	○	○
Sugar Cookies	○	○	○	○	○	○	○	○	○
Brownie	○	○	○	○	○	○	○	○	○
SUBSTITUTION ITEMS									
_____	○	○	○	○	○	○	○	○	○
_____	○	○	○	○	○	○	○	○	○
_____	○	○	○	○	○	○	○	○	○
_____	○	○	○	○	○	○	○	○	○

GENERAL COMMENTS

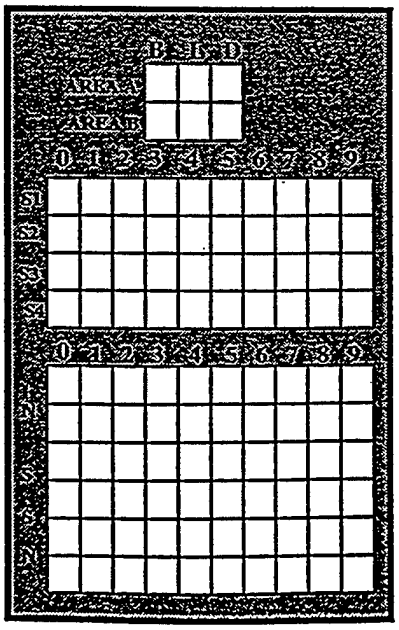
Food Appearance _____

_____

Food Variety _____

_____

DO NOT WRITE IN THIS BOX



First initial of last name _____
Last four digits of SSN _____

BREAKFAST FOOD QUESTIONNAIRE
WEEK 2

We would like your honest evaluation of the selected BREAKFAST items you ate at noon. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

TUESDAY
- Creamed Beef
- Plain Pancakes

WEDNESDAY
- Western Omelet
- Cheese Omelet
- Garden Omelet
- Cinnamon Rolls

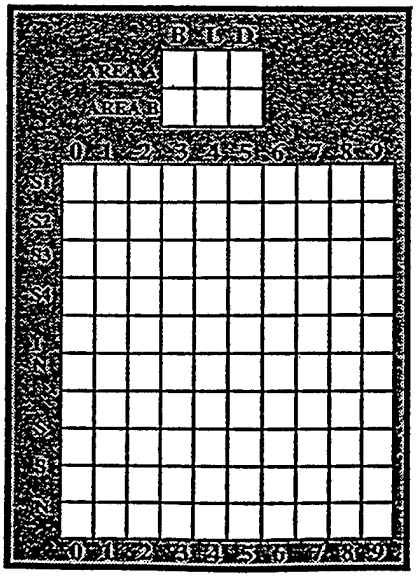
THURSDAY
- French Toast
- Iced Snails

FRIDAY
- Biscuits

SUBSTITUTION ITEMS
- _____
- _____
- _____
- _____

GENERAL COMMENTS
- Food Appearance _____
- Food Variety _____

DO NOT WRITE IN THIS BOX



First initial of last name _____
Last four digits of SSN _____

BREAKFAST FOOD QUESTIONNAIRE
WEEK 2

We would like your honest evaluation of the selected BREAKFAST items you ate at noon. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

TUESDAY
- Creamed Beef
- Plain Pancakes

WEDNESDAY
- Western Omelet
- Cheese Omelet
- Garden Omelet
- Cinnamon Rolls

THURSDAY
- French Toast
- Iced Snails

FRIDAY
- Biscuits

SUBSTITUTION ITEMS
_____
_____
_____
_____

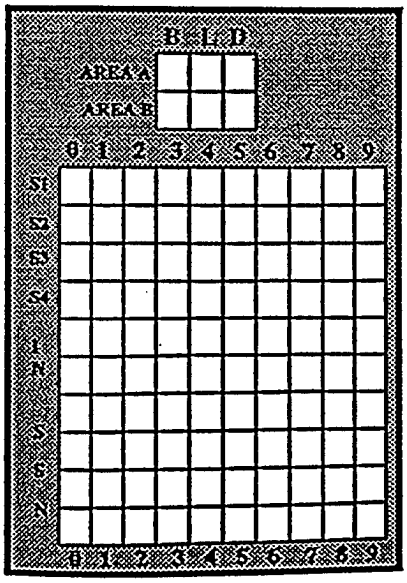
GENERAL COMMENTS _____

Food Appearance: EXTREMELY UNATTRACTIVE 1 2 3 4 5 6 7 8 9 EXTREMELY ATTRACTIVE; NEITHER ATTRACTIVE NOR UNATTRACTIVE

Food Variety: TOO FEW CHOICES 1 2 3 4 5 6 7 8 9 TOO MANY CHOICES; JUST RIGHT

Food Quality: EXTREMELY POOR 1 2 POOR 3 4 FAIR 5 6 GOOD 7 8 EXCELLENT 9

DO NOT WRITE IN THIS BOX



First initial of last name _____
Last four digits of SSN _____

LUNCHEON FOOD QUESTIONNAIRE
WEEK 2

We would like your honest evaluation of the selected LUNCHEON items you ate at noon. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

MONDAY
- Meat Loaf
- Cherry Pie
- Chocolate Chip Cookies

TUESDAY
- Macaroni And Beef In Tomatoe Sauce
- Au Gratin Potatoes
- Sweet Potato Pie
- Peanut Butter Cookies

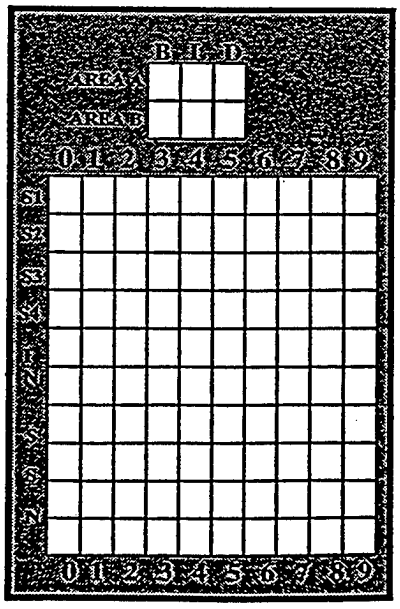
WEDNESDAY
- Beef And Bean Enchanadas
- Chicken Enchanadas
- Lemon Meringue Pie
- Peach Pie

THURSDAY
- Beef Stew
- Sweet And Sour Chicken
- Pecan Pie
- Chocolate Cookies

FRIDAY
- Lasagna
- Breadsticks
- Sugar Cookies
- Brownie

SUBSTITUTION ITEMS
_____
_____
_____
_____

DO NOT WRITE IN THIS BOX



GENERAL COMMENTS

Food Appearance _____
_____

Food Variety _____
_____

First initial of last name _____
Last four digits of SSN _____

LUNCHEON FOOD QUESTIONNAIRE
WEEK 2

We would like your honest evaluation of the selected LUNCHEON items you ate at noon. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

MONDAY
- Meat Loaf
- Cherry Pie
- Chocolate Chip Cookies

TUESDAY
- Macaroni And Beef In Tomato Sauce
- Au Gratin Potatoes
- Sweet Potato Pie
- Peanut Butter Cookies

WEDNESDAY
- Beef And Bean Enchanadas
- Chicken Enchanadas
- Lemon Meringue Pie
- Peach Pie

THURSDAY
- Beef Stew
- Sweet And Sour Chicken
- Pecan Pie
- Chocolate Cookies

FRIDAY
- Chicken Chow Mein
- Lasagna
- Breadsticks
- Sugar Cookies
- Brownie

SUBSTITUTIONS

_____

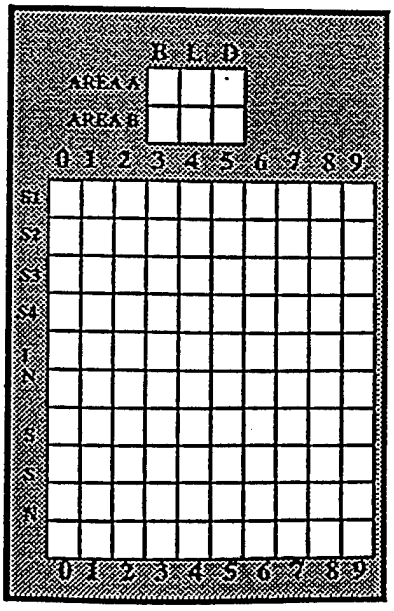
_____

Food Appearance: EXTREMELY UNATTRACTIVE (1) — NEITHER ATTRACTIVE NOR UNATTRACTIVE (5) — EXTREMELY UNATTRACTIVE (9)

Food Variety: TOO FEW CHOICES (1) — JUST RIGHT (5) — TOO MANY CHOICES (9)

Food Quality: EXTREMELY POOR (1) — POOR (3) — FAIR (5) — GOOD (7) — EXCELLENT (9)

DO NOT WRITE IN THIS BOX



First initial of last name _____
Last four digits of SSN _____

DINNER FOOD QUESTIONNAIRE
WEEK 2

We would like your honest evaluation of the selected Dinner items you ate at night. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

MONDAY

	1	2	3	4	5	6	7	8	9
Homestyle Chicken With Noodles	○	○	○	○	○	○	○	○	○
Cherry Pie	○	○	○	○	○	○	○	○	○
Chocolate Chip Cookies	○	○	○	○	○	○	○	○	○

TUESDAY

	1	2	3	4	5	6	7	8	9
Stuffed Peppers	○	○	○	○	○	○	○	○	○
Macaroni & Cheese	○	○	○	○	○	○	○	○	○
Sweet Potato Pie	○	○	○	○	○	○	○	○	○
Peanut Butter Cookies	○	○	○	○	○	○	○	○	○

WEDNESDAY

	1	2	3	4	5	6	7	8	9
Salisbury Steak	○	○	○	○	○	○	○	○	○
Chicken With Broccoli & Cheese	○	○	○	○	○	○	○	○	○
Dinner Rolls	○	○	○	○	○	○	○	○	○
Lemon Meringue Pie	○	○	○	○	○	○	○	○	○
Peach Pie	○	○	○	○	○	○	○	○	○

THURSDAY

	1	2	3	4	5	6	7	8	9
Veal Parmesan	○	○	○	○	○	○	○	○	○
Beef Stroganoff	○	○	○	○	○	○	○	○	○
Pecan Pie	○	○	○	○	○	○	○	○	○
Chocolate Cookies	○	○	○	○	○	○	○	○	○

FRIDAY

	1	2	3	4	5	6	7	8	9
Chicken Chow Mein	○	○	○	○	○	○	○	○	○
Sugar Cookies	○	○	○	○	○	○	○	○	○
Brownie	○	○	○	○	○	○	○	○	○

SUBSTITUTION ITEMS

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

GENERAL COMMENTS

Food Appearance _____

_____

Food Variety _____

_____

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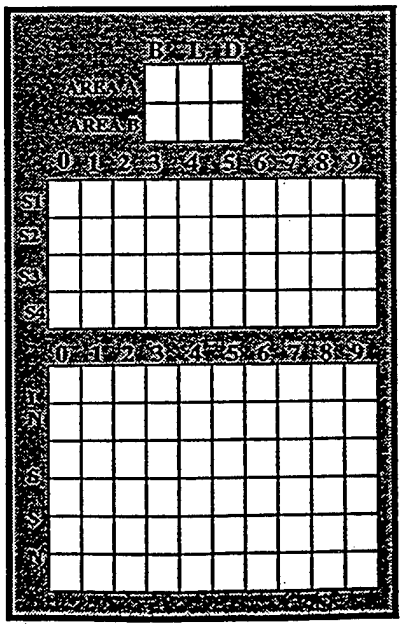


First initial of last name _____
Last four digits of SSN _____

DINNER FOOD QUESTIONNAIRE
WEEK 2

We would like your honest evaluation of the selected Dinner items you ate at night. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

MONDAY

	1	2	3	4	5	6	7	8	9
Homestyle Chicken With Noodles	○	○	○	○	○	○	○	○	○
Cherry Pie	○	○	○	○	○	○	○	○	○
Chocolate Chip Cookies	○	○	○	○	○	○	○	○	○

TUESDAY

	1	2	3	4	5	6	7	8	9
Stuffed Peppers	○	○	○	○	○	○	○	○	○
Macaroni & Cheese	○	○	○	○	○	○	○	○	○
Sweet Potato Pie	○	○	○	○	○	○	○	○	○
Peanut Butter Cookies	○	○	○	○	○	○	○	○	○

WEDNESDAY

	1	2	3	4	5	6	7	8	9
Salisbury Steak	○	○	○	○	○	○	○	○	○
Chicken With Broccoli & Cheese	○	○	○	○	○	○	○	○	○
Dinner Rolls	○	○	○	○	○	○	○	○	○
Lemon Meringue Pie	○	○	○	○	○	○	○	○	○
Peach Pie	○	○	○	○	○	○	○	○	○

THURSDAY

	1	2	3	4	5	6	7	8	9
Veal Parmesan	○	○	○	○	○	○	○	○	○
Beef Stroganoff	○	○	○	○	○	○	○	○	○
Pecan Pie	○	○	○	○	○	○	○	○	○
Chocolate Cookies	○	○	○	○	○	○	○	○	○

SUBSTITUTION ITEMS

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

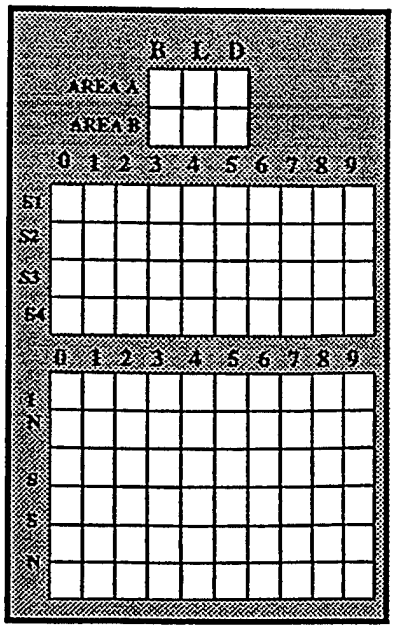
GENERAL COMMENTS _____

	EXTREMELY UNATTRACTIVE			NEITHER ATTRACTIVE NOR UNATTRACTIVE				EXTREMELY UNATTRACTIVE	
Food Appearance	1	2	3	4	5	6	7	8	9
	○	○	○	○	○	○	○	○	○

	TOO FEW CHOICES				JUST RIGHT				TOO MANY CHOICES
Food Variety	1	2	3	4	5	6	7	8	9
	○	○	○	○	○	○	○	○	○

	EXTREMELY POOR		POOR		FAIR		GOOD		EXCELLENT
Food Quality	1	2	3	4	5	6	7	8	9
	○	○	○	○	○	○	○	○	○

DO NOT WRITE IN THIS BOX



First initial of last name _____
Last four digits of SSN _____

DINNER FOOD QUESTIONNAIRE
WEEK2

We would like your honest evaluation of the selected A-Ration DINNER items you ate at night. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

MONDAY

	1	2	3	4	5	6	7	8	9
Homestyle Chicken With Noodles	○	○	○	○	○	○	○	○	○
Cherry Pie	○	○	○	○	○	○	○	○	○
Chocolate Chip Cookies	○	○	○	○	○	○	○	○	○

TUESDAY

	1	2	3	4	5	6	7	8	9
Stuffed Peppers	○	○	○	○	○	○	○	○	○
Macaroni & Cheese	○	○	○	○	○	○	○	○	○
Sweet Potato Pie	○	○	○	○	○	○	○	○	○
Peanut Butter Cookies	○	○	○	○	○	○	○	○	○

WEDNESDAY

	1	2	3	4	5	6	7	8	9
Salisbury Steak	○	○	○	○	○	○	○	○	○
Chicken With Broccoli & Cheese	○	○	○	○	○	○	○	○	○
Dinner Rolls	○	○	○	○	○	○	○	○	○
Lemon Meringue Pie	○	○	○	○	○	○	○	○	○
Peach Pie	○	○	○	○	○	○	○	○	○

THURSDAY

	1	2	3	4	5	6	7	8	9
Veal Parmesan	○	○	○	○	○	○	○	○	○
Beef Stroganoff	○	○	○	○	○	○	○	○	○
Pecan Pie	○	○	○	○	○	○	○	○	○
Chocolate Cookies	○	○	○	○	○	○	○	○	○

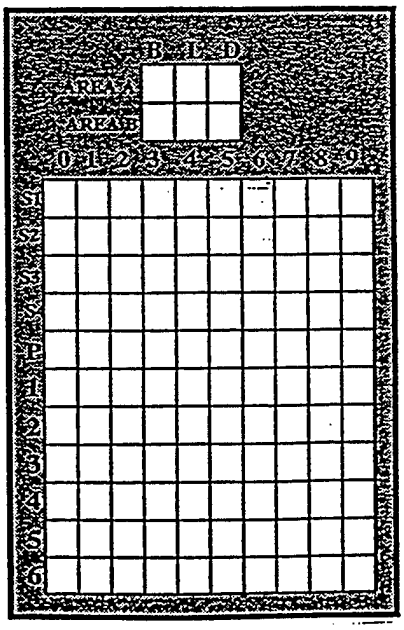
FRIDAY

	1	2	3	4	5	6	7	8	9
Chicken Chow Mien	○	○	○	○	○	○	○	○	○
Sugar Cookies	○	○	○	○	○	○	○	○	○
Brownie	○	○	○	○	○	○	○	○	○

SUBSTITUTION ITEMS

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

DO NOT WRITE IN THIS BOX



First initial of last name _____
Last four digits of SSN _____

BREAKFAST FOOD QUESTIONNAIRE
WEEK 2

We would like your honest evaluation of the selected A-Ration BREAKFAST items you ate this morning. Using the scale below, please fill in the circle below the number that best describes your opinion of each item.

DISLIKE EXTREMELY	DISLIKE VERY MUCH	DISLIKE MODERATELY	DISLIKE SLIGHTLY	NEITHER LIKE NOR DISLIKE	LIKE SLIGHTLY	LIKE MODERATELY	LIKE VERY MUCH	LIKE EXTREMELY
1	2	3	4	5	6	7	8	9

RATE ONLY THE FOODS YOU TASTED

TUESDAY
- Creamed Beef
- Plain Pancakes
- Blueberry Pancakes

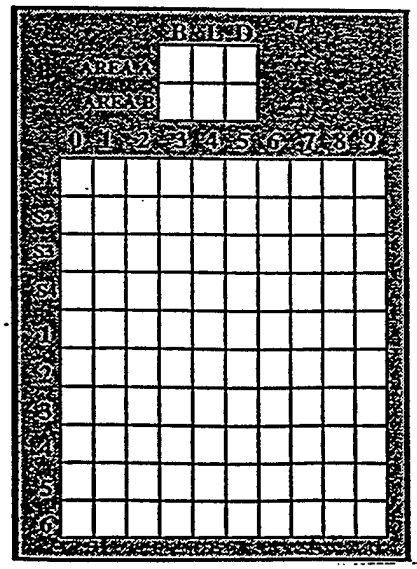
WEDNESDAY
- Western Omelet
- Cheese Omelet
- Garden Omelet
- Cinnamon Rolls

THURSDAY
- French Toast
- Iced Snails

FRIDAY
- Biscuits

SUBSTITUTION ITEMS
_____
_____
_____
_____

DO NOT WRITE IN THIS BOX



BACKGROUND QUESTIONNAIRE (continuation)

Please read each question carefully. Mark your answers by filling in the circle(s) beside the correct answer.

Proper Mark

1. Your first initial of last name: _____ 2. Last four digits of your SSN: _____

3. Would you substitute convenience foods for ones you usually prepare?
   Yes
   If yes, why?_____
   No
   If no, why?_____

4. After working with the convenience food items during your watch, would you substitute the following convenience foods for those you prepared from scratch?
   Answer questions for **only those food items you actually prepared.**

	Would substitute convenience foods for:	Would not substitute convenience foods for:	Reason you would not substitute:
CREAMED BEEF			
OMELETS			
BISCUITS			
FRENCH TOAST			
CHICKEN & VEGETABLE ORIENTAL			
BEEF AND PEPPER			
VEGETABLE CHOW MEIN			
TUNA NOODLE CASSEROLE			
FRIED CHICKEN			
SALISBURY STEAK			
CHILI CON CARNE			
STUFFED PEPPERS			
BEEF STEW			
VEAL PARMESAN			
SWEET AND SOUR CHICKEN			
CHICKEN CHOW MEIN			
LASAGNA			
HOMESTYLE CHICKEN WITH NOODLES			
STUFFED PEPPERS			
MACARONI AND CHEESE			
SALISBURY STEAK			
CHICKEN WITH BROCCOLI & CHEESE			

DO NOT WRITE BELOW THIS LINE

Q1	Q2	Q3a	Q3b
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

	Would substitute convenience foods for:	Would not substitute convenience foods for:	Reason you would not substitute:
BEEF STROGANOFF	○	○	
CINNAMON ROLLS	○	○	
ICED SNAILS	○	○	
CHERRY PIE	○	○	
CHOCOLATE CHIP COOKIES	○	○	
SWEET POTATO PIE	○	○	
PEANUT BUTTER COOKIES	○	○	
DINNER ROLLS	○	○	
LEMON MERINGUE PIE	○	○	
PEACH PIE	○	○	
PECAN PIE	○	○	
CHOCOLATE COOKIES	○	○	

5. How often would you recommend substituting these convenieee food items for the ones you usually prepare?

	NEVER 1	ALMOST NEVER 2	SOMETIMES 3	OFTEN 4	ALMOST ALWAYS 5	ALWAYS 6
a. Entree	○	○	○	○	○	○
b. Starch	○	○	○	○	○	○
c. Bread & Rolls	○	○	○	○	○	○
d. Dessert	○	○	○	○	○	○

6. Under what conditions would you substitute convenience foods for the ones you usually prepare?

- ○ a. Inport
- ○ b. Underway
- ○ c. Standown/Holidays
- ○ d. Inport drills
- ○ e. Underway drills
- ○ f. Understaffed
- ○ g. Power outages
- ○ h. Other _____

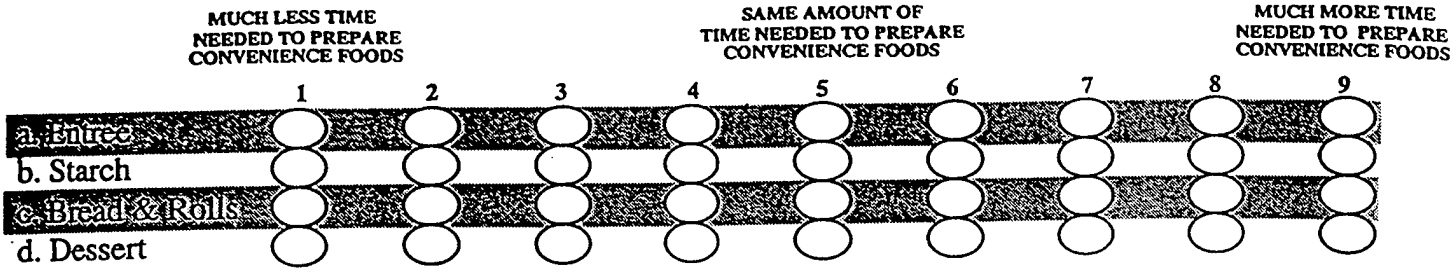
_____

_____

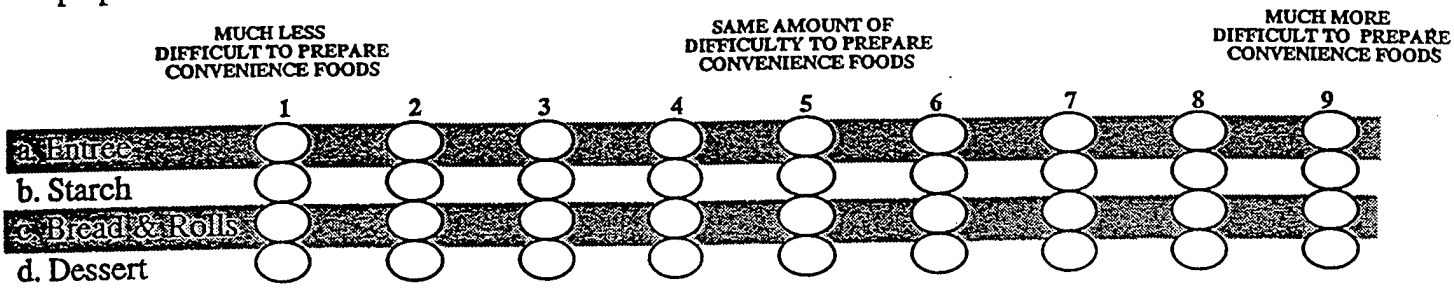
7. Rate the ease of preparation for the convenience food items you served in this mess.

	EXTREMELY DIFFICULT 1	VERY DIFFICULT 2	MODERATELY DIFFICULT 3	SLIGHTLY DIFFICULT 4	NEUTRAL 5	SLIGHTLY EASY 6	MODERATELY EASY 7	VERY EASY 8	EXTREMELY EASY 9
a. Entree	○	○	○	○	○	○	○	○	○
b. Starch	○	○	○	○	○	○	○	○	○
c. Bread & Rolls	○	○	○	○	○	○	○	○	○
d. Dessert	○	○	○	○	○	○	○	○	○

8. How would you compare the amount of time needed to cook convenience foods with similar foods you "prepare from scratch"?



9. How would you compare the difficulty of preparing convenience foods with similar foods you "prepare from scratch"?



10. What are some of the problems you had while cooking and serving the convenience food items? (Fill in one or more circles)

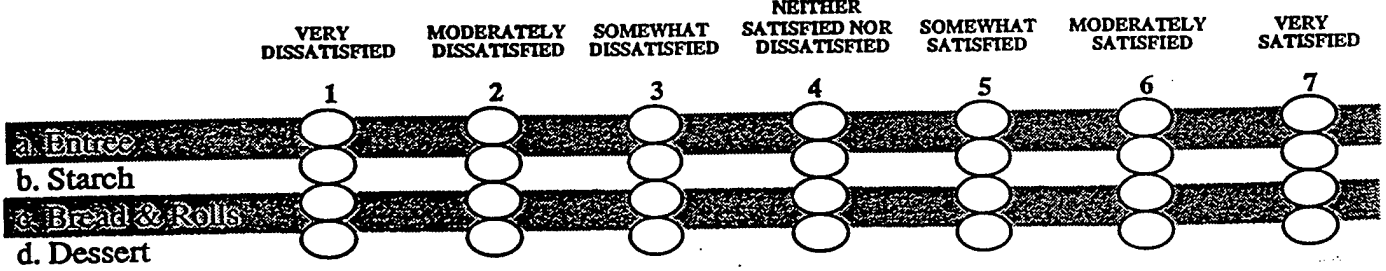
- ◯ Equipment
- ◯ Amount of Food Ordered
- ◯ Quality of Purchased Food
- ◯ Directions on Package
- ◯ Portion Size
- ◯ Inadequate Cooking Time
- ◯ Storage
- ◯ Utensils
- ◯ Safety
- ◯ Containers Size &Shape
- ◯ Work Space
- ◯ Sanitation
- ◯ Waste Disposal
- ◯ Other (write under comments)

Comments:_____

_____

_____

11. What is your overall satisfaction with the convenience food items?



BACKGROUND QUESTIONNAIRE (continuation)

Please read each question carefully. Mark your answers by filling in the circle(s) beside the correct answer.

Proper Mark

1. Your first initial of last name: _____ 2. Last four digits of your SSN: _____

3. Would you substitute convenience foods for ones you usually prepare?
   Yes
   If yes, why?_____
   No
   If no, why?_____

4. After working with the convenience food items during your watch, would you substitute the following convenience foods for those you prepared from scratch?
   Answer questions for **only those food items you actually prepared.**

	Would substitute convenience foods for:	Would not substitute convenience foods for:	Reason you would not substitute:
CREAMED BEEF	○	○	_____
OMELETS	○	○	_____
BISCUITS	○	○	_____
FRENCH TOAST	○	○	_____
CHICKEN & VEGETABLE ORIENTAL	○	○	_____
BEEF AND PEPPER	○	○	_____
VEGETABLE CHOW MEIN	○	○	_____
TUNA NOODLE CASSEROLE	○	○	_____
FRIED CHICKEN	○	○	_____
SALISBURY STEAK	○	○	_____
CHILI CON CARNE	○	○	_____
STUFFED PEPPERS	○	○	_____
SWEET POTATO CASSEROLE	○	○	_____
COCO NUT COOKIES	○	○	_____
APPLE PIE	○	○	_____
CHOCOLATE CHIP COOKIES	○	○	_____
DINNER ROLLS	○	○	_____

DO NOT WRITE BELOW THIS LINE

Q1
J 1 2 3 4 5 6 7 8 9

Q2
0 1 2 3 4 5 6 7 8 9

Q3a
0 1 2 3 4 5 6 7 8 9

Q3b
0 1 2 3 4 5 6 7 8 9

5. While UNDERWAY, how often would you recommend substituting these conveniece food items for the ones you usually prepare?

	NEVER 1	ALMOST NEVER 2	SOMETIMES 3	OFTEN 4	ALMOST ALWAYS 5	ALWAYS 6
a. Entree	○	○	○	○	○	○
b. Starch	○	○	○	○	○	○
c. Bread & Rolls	○	○	○	○	○	○
d. Dessert	○	○	○	○	○	○

6. Under what UNDERWAY conditions would you substitute convenience foods for the ones you usually prepare?

- ○ a. All of the time
- ○ b. Never
- ○ c. Standown
- ○ d. Holidays
- ○ e. Underway drills
- ○ f. Understaffed
- ○ g. Power outages
- h. Other _____

_____

_____

7. Rate the ease of preparation for the convenience food items you served in this mess while UNDERWAY.

	EXTREMELY DIFFICULT 1	VERY DIFFICULT 2	MODERATELY DIFFICULT 3	SLIGHTLY DIFFICULT 4	NEUTRAL 5	SLIGHTLY EASY 6	MODERATELY EASY 7	VERY EASY 8	EXTREMELY EASY 9
a. Entree	○	○	○	○	○	○	○	○	○
b. Starch	○	○	○	○	○	○	○	○	○
c. Bread & Rolls	○	○	○	○	○	○	○	○	○
d. Dessert	○	○	○	○	○	○	○	○	○

8. While UNDERWAY how would you compare the amount of time needed to cook convenience foods with similar foods you "prepare from scratch"?

	MUCH LESS TIME NEEDED TO PREPARE CONVENIENCE FOODS 1	2	3	SAME AMOUNT OF TIME NEEDED TO PREPARE CONVENIENCE FOODS 4	5	6	7	8	MUCH MORE TIME NEEDED TO PREPARE CONVENIENCE FOODS 9
a. Entree	○	○	○	○	○	○	○	○	○
b. Starch	○	○	○	○	○	○	○	○	○
c. Bread & Rolls	○	○	○	○	○	○	○	○	○
d. Dessert	○	○	○	○	○	○	○	○	○

If more time is needed, please comment _____

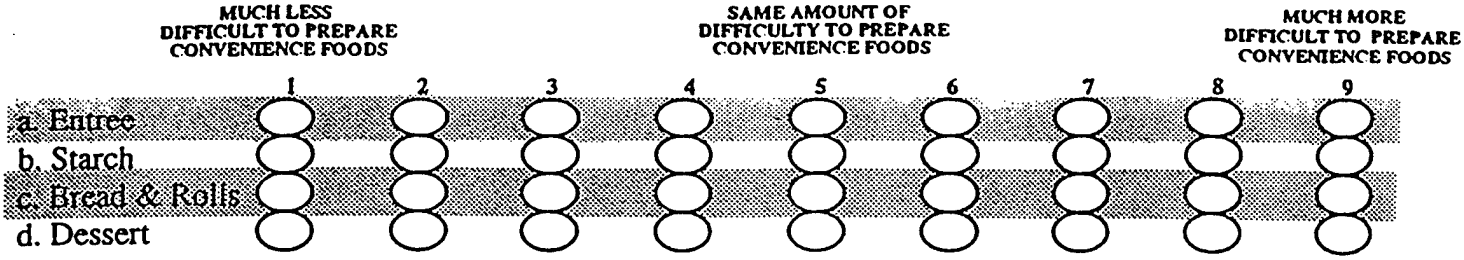
_____

DO NOT WRITE BELOW THIS LINE

6a ☐☐☐☐☐☐☐☐☐☐
0 1 2 3 4 5 6 7 8 9

Q8 ☐☐☐☐☐☐☐☐☐☐
0 1 2 3 4 5 6 7 8 9

9. While UNDERWAY, how would you compare the difficulty of preparing convenience foods with similar foods you "prepare from scratch"?



If more dificult, please comment: _____

_____

10. What are some of the problems you had while cooking and serving the convenience food items when UNDERWAY? (Fill in one or more circles)

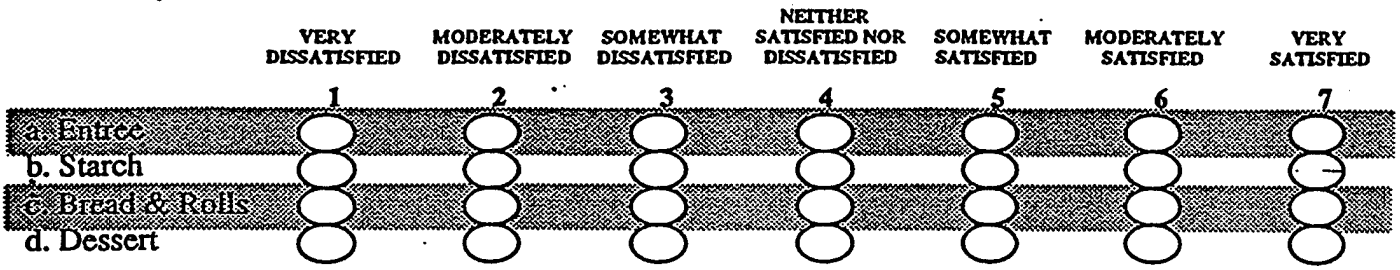
- ◯ Equipment
- ◯ Amount of Food Ordered
- ◯ Quality of Purchased Food
- ◯ Directions on Package
- ◯ Portion Size
- ◯ Oven Size
- ◯ Inadequate Cooking Time
- ◯ Storage
- ◯ Utensils
- ◯ Safety
- ◯ Containers Size &Shape
- ◯ Packaging
- ◯ Work Space
- ◯ Sanitation
- ◯ Waste Disposal
- ◯ Other (write under comments)
- ◯ Transfering from Pans to Insert
- ◯ Oven Space

Comments:_____

_____

_____

11. What is your overall satisfaction with the convenience food items when UNDERWAY?



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Q9 ▢▢▢▢▢▢▢▢▢▢

Q10 ▢▢▢▢▢▢▢▢▢▢

12. For each pair of items below, please indicate your general opinions of the foodservice operation while UNDERWAY. If you have comments about any of the items or items not included, please write them in the space under "other".

	EXTREMELY	MODERATELY	NEUTRAL	MODERATELY	EXTREMELY	
a. Inadequate Equipment	○	○	○	○	○	Adequate Equipment
b. Small Amount of Food Wasted	○	○	○	○	○	Large Amount of Food Wasted
c. Inadequate Number of Portions in Container	○	○	○	○	○	Adequate Number of Portions in Container
d. Inadequate Storage	○	○	○	○	○	Adequate Storage
e. Inadequate Breakout	○	○	○	○	○	Adequate Breakout
f. Unacceptable Food Items	○	○	○	○	○	Acceptable Food Items
g. Inadequate Sanitation	○	○	○	○	○	Adequate Sanitation
h. Limited Variety of Food Choices	○	○	○	○	○	Wide Variety of Food Choices
i. Easy to Prepare	○	○	○	○	○	Difficult to Prepare
j. Excessive Packaging	○	○	○	○	○	Inadequate Packaging
k. Limited Food Waste	○	○	○	○	○	Too Much Food Waste

Other: _____

_____

_____

3. What is your perception of customer satisfaction with the convenience food items when UNDERWAY?

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

14. Rate how important each of the following changes would be in improving the operation of the mess when using "convenience foods" when UNDERWAY. Fill in one circle for each change using the following scale.

	NOT IMPORTANT	SOMEWHAT IMPORTANT	MODERATELY IMPORTANT	VERY IMPORTANT	EXTREMELY IMPORTANT
a. Larger Pan Size	○	○	○	○	○
b. Larger Ovens	○	○	○	○	○
c. More ovens	○	○	○	○	○
d. More Counter Space	○	○	○	○	○
e. Larger Portion Sizes	○	○	○	○	○
f. Greater Storage Space	○	○	○	○	○
g. Larger Freezer Space	○	○	○	○	○
h. Larger Refrigerator Space	○	○	○	○	○
i. Other (please write in) _____	○	○	○	○	○

DO NOT WRITE BELOW THIS LINE

0 1 2 3 4 5 6 7 8 9

Q14 0 1 2 3 4 5 6 7 8 9

Rate the advantages of using "convenience foods" while UNDERWAY. Fill in one circle for each advantage, using the following scale:

	NONE 0	SMALL 1	MEDIUM 2	LARGE 3
Reduced Number of MSs Needed for Preparation	○	○	○	○
Reduced Number of FSAs Needed for Clean up	○	○	○	○
Less time Needed to Purchase Food	○	○	○	○
Decrease in Food Waste During Preparation	○	○	○	○
Decrease in Leftovers	○	○	○	○
Other (please specify)_____	○	○	○	○

. Rate the disadvantages of using "convenience foods" while UNDERWAY. Fill in one circle for each advantage, using the following scale:

	NONE 0	SMALL 1	MEDIUM 2	LARGE 3
Large Amount of Waste Generated	○	○	○	○
Too Many Small Packages	○	○	○	○
Limited Waste Disposal Capacity	○	○	○	○
Other (please specify)_____	○	○	○	○

What do you like most about convenience foods?

_____

_____

_____

What do you like least about convenience foods?

_____

_____

_____

DO NOT WRITE BELOW THIS LINE

Q15 0 1 2 3 4 5 6 7 8 9

Q16 0 1 2 3 4 5 6 7 8 9

Q17 0 1 2 3 4 5 6 7 8 9

Q18 0 1 2 3 4 5 6 7 8 9

BACKGROUND QUESTIONNAIRE

Please read each question carefully. Mark your answers by filling in the circle(s) beside the correct answer.

Proper Mark

1. Your first initial of last name: _____ 2. Last four digits of your SSN: _____

3. Are you a: ◯ MS ◯ FSA Other _____ 4. What is your age?_____years

5. What is your rank? E- 1 2 3 4 5 6 7 8 9

6. What is your gender?
   - ◯ Male
   - ◯ Female

7. What is your time in rate?
   - ◯ 0 - 2 years
   - ◯ 3 - 5 years
   - ◯ 6 - 10 years
   - ◯ 11 - 15 years
   - ◯ More than 16 years

8. How long have you been in the armed services?
   - ◯ 0 - 2 years
   - ◯ 3 - 5 years
   - ◯ 6 - 10 years
   - ◯ 11 - 15 years
   - ◯ More than 16 years

9. What is the highest level of education you have completed ?
   - ◯ Finished grade school
   - ◯ Some high school
   - ◯ High school graduate or grad equivalent
   - ◯ Some college
   - ◯ College graduate

10. What is your ethnic background?
    - ◯ White
    - ◯ Black
    - ◯ Hispanic
    - ◯ Asian/Pacific Islander
    - ◯ American Indian/ Alaskan Native
    - ◯ Other (please specify) _____

11. How would you describe your present job in food service?
    - ◯ Striker
    - ◯ Designated Striker
    - ◯ Cook
    - ◯ Baker
    - ◯ Watch Captain
    - ◯ Senior MS
    - ◯ Breakouts/Storeroom (Jack of the Dust)
    - ◯ Records Keeper
    - ◯ Other (please specify) _____

DO NOT WRITE BELOW THIS LINE

Q2

Q10 0 1 2 3 4 5 6 7 8 9

Q7 0 1 2 3 4 5 6 7 8 9 WEEK

Q4 0 1 2 3 4 5 6 7 8 9

Q1 0 1 2 3 4 5 6 7 8 9

12. Where are you now working in this mess?

- ◯ Galley
- ◯ Vegetable preparation
- ◯ Bakery shop
- ◯ Storeroom
- ◯ Office
- ◯ Other (please specify) _____

13. What navy food service schools have you attended?

- ◯ A School
- ◯ C School - Food Production
- ◯ C School - Food Management
- ◯ Other (please specify) _____

14. Have you worked aboard any other ship? ◯ No ◯ Yes
If yes, how many? _____

15. Rate the ease of preparation for the food items you usually serve in this mess.
Please fill in one oval for each item.

	EXTREMELY DIFFICULT 1	VERY DIFFICULT 2	MODERATELY DIFFICULT 3	SLIGHTLY DIFFICULT 4	NEUTRAL 5	SLIGHTLY EASY 6	MODERATELY EASY 7	VERY EASY 8	EXTREMELY EASY 9
a. Entree	◯	◯	◯	◯	◯	◯	◯	◯	◯
b. Starch	◯	◯	◯	◯	◯	◯	◯	◯	◯
c. Vegetable	◯	◯	◯	◯	◯	◯	◯	◯	◯
d. Bakery Products	◯	◯	◯	◯	◯	◯	◯	◯	◯
e. Rolls	◯	◯	◯	◯	◯	◯	◯	◯	◯
f. Dessert	◯	◯	◯	◯	◯	◯	◯	◯	◯

16. What are some of the problems you have while preparing food items?
If the appropriate choices are not available, please write your additional comments in the space provided.

- ◯ Equipment
- ◯ Amount of Food Ordered
- ◯ Quality of Purchased Food
- ◯ Inadequate Preparation Time
- ◯ Storage
- ◯ Utensils
- ◯ Work Space
- ◯ Sanitation
- ◯ Waste Disposal
- ◯ Time Allowed for Food Prep

Comments: _____

_____

DO NOT WRITE BELOW THIS LINE

Q11 | | | | | | | | | | |
0 1 2 3 4 5 6 7 8 9

Q12 | | | | | | | | | | |
0 1 2 3 4 5 6 7 8 9

Q13 | | | | | | | | | | |
0 1 2 3 4 5 6 7 8 9

Q14 | | | | | | | | | | |
0 1 2 3 4 5 6 7 8 9

17. How would you describe the conditions in the mess when the ship is IN PORT?
Indicate your opinion of the mess by filling in one oval for each category.

	VERY BAD 1	MODERATELY BAD 2	SOMEWHAT BAD 3	NEUTRAL 4	SOMEWHAT GOOD 5	MODERATELY GOOD 6	VERY GOOD 7
a. General eating environment	◯	◯	◯	◯	◯	◯	◯
b. Sanitation in dining area	◯	◯	◯	◯	◯	◯	◯
c. Quality of food	◯	◯	◯	◯	◯	◯	◯
d. Quantity of food	◯	◯	◯	◯	◯	◯	◯
e. Variety of food	◯	◯	◯	◯	◯	◯	◯

18. How would you describe the conditions in the mess when the ship is UNDERWAY.
Indicate your opinion of the mess by filling in one oval for each category.
Do not answer this question if you have NEVER been underway on this ship.

	VERY BAD 1	MODERATELY BAD 2	SOMEWHAT BAD 3	NEUTRAL 4	SOMEWHAT GOOD 5	MODERATELY GOOD 6	VERY GOOD 7
a. General eating environment	◯	◯	◯	◯	◯	◯	◯
b. Sanitation in dining area	◯	◯	◯	◯	◯	◯	◯
c. Quality of food	◯	◯	◯	◯	◯	◯	◯
d. Quantity of food	◯	◯	◯	◯	◯	◯	◯
e. Variety of food	◯	◯	◯	◯	◯	◯	◯

19. Rate the dining facility in which you are presently working (EDF, CPO, mess, or wardroom).

	VERY BAD 1	MODERATELY BAD 2	SOMEWHAT BAD 3	NEUTRAL 4	SOMEWHAT GOOD 5	MODERATELY GOOD 6	VERY GOOD 7
a. The condition (repair) of equipment and utensils	◯	◯	◯	◯	◯	◯	◯
b. The menu	◯	◯	◯	◯	◯	◯	◯
c. Customer satisfaction	◯	◯	◯	◯	◯	◯	◯
d. The dining facility overall	◯	◯	◯	◯	◯	◯	◯

20. Would you say you work harder, less hard, or about the same as other people doing your type of work on this ship?

◯ Much harder than most others
◯ A little harder than most others
◯ About the same as most others
◯ A little less hard than most others
◯ Much less hard than most others

1. Please rate how SATISFIED or DISSATISFIED you are with each of the following aspects of your job. Use the following scale:

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

	1	2	3	4	5	6	7
The work you actually do aboard ship	○	○	○	○	○	○	○
The schedule of rotation among dining facilities aboard ship	○	○	○	○	○	○	○
The number of hours you work a day while INPORT	○	○	○	○	○	○	○
The number of hours you work a day while UNDERWAY	○	○	○	○	○	○	○
The schedule of weekly hours while INPORT	○	○	○	○	○	○	○
The schedule of weekly hours while UNDERWAY	○	○	○	○	○	○	○

2. Please rate HOW IMPORTANT each of the following changes would be in IMPROVING the operation of the mess in which you work. Fill in one circle for each change, using the following scale:

	NOT IMPORTANT 0	SOMEWHAT IMPORTANT 1	MODERATELY IMPORTANT 2	VERY IMPORTANT 3	EXTREMELY IMPORTANT 4
More MS's	○	○	○	○	○
More food service attendants	○	○	○	○	○
Better supervision by the senior chief	○	○	○	○	○
Better supervision by the watch captains	○	○	○	○	○
More On-the-Job training	○	○	○	○	○
Stricter supervision of foodservice attendants	○	○	○	○	○
More or better equipment	○	○	○	○	○
More recognition for doing a good job	○	○	○	○	○
More foods that are easier to prepare (such as pre-breaded chicken; frozen, fully prepared foods; boil-in-bag entrees and vegetables; dehydrated mixes)	○	○	○	○	○

3. Among the improvements listed above, what are the THREE MOST IMPORTANT IMPROVEMENTS? Write in the improvements in the order of their importance, with the MOST important in the space labelled FIRST.

FIRST: _____

SECOND: _____

THIRD: _____

APPENDIX C
Sample Meal Plan

	BREAKFAST	LUNCH	DINNER	DAILY DESSERTS
MONDAY	hot rolled oats eggs to order asst omelets crisp bacon slices waffles hash brown potatoes french toast creamed beef on toast glazed sweet roll quick coffee cakes	chicken noodle soup BAKED STUFFED FISH CHILI MAC AU GRATIN POTATOES rice CLUB SPINACH corn o'brien dinner rolls	vegetable soup BREADED PORK CHOPS SAVORY BAKED CHICKEN brown gravy orange rice brussel sprouts glazed carrots hot dinner rolls	pumpkin pie devil's food cake brown sugar cookies
TUESDAY	hominy grits eggs to order asst omelets crisp bacon slices waffles grilled ham slices grilled bologna pineapple hot cakes home fried potatoes praline roll french coffee cake	beef onion soup ROAST TURKEY grild ham steak TURKEY GRAVY SAVORY BREAD DRESSING MASHED SWEET POTATOES steamed asparagus steamed squash cheese biscuits	chicken gumbo soup YANKEE POT ROAST fish portion steamed rice MACARONI & CHEESE seasoned wax beans steamed broccoli hot dinner rolls	CHERRY COBBLER ginger bread cake PEANUT BUTTER COOKIES
WEDNESDAY	hot oatmeal eggs to order asst omelets crisp bacon slices waffles grilled sausage patties french toast hash brown potatoes snickerdoodle cake cresent roll	beef vegetable soup mex tacos MEX TAMALES MEX FAJITAS spanish rice refried beans calico corn jalopeno cornbread	tomato soup CHILI CON CARNE SWEET & SOUR PORK steamed rice peas and mushrooms steamed carrots hot dinner rolls	BLUEBERRY PIE yellow cake w/icing CHOCOLATE CHIP COOKIES
THURSDAY	hot grits eggs to order asst omelets crisp bacon slices waffles corned beef hash pancakes hash brown potatoes sugar roll apple coffee cake	chicken rice soup BAKED MEATLOAF TURKEY & NOODLES SCALLOPED POTATOES rice green beans harvard beets dinner rolls	clam chowder FRIED FISH CHICKEN CACCIATORE rice MACARONI & CHEESE mixed vegetables hot dinner rolls	peach pie boston cream pie chewy nut bar
FRIDAY	hot farina eggs to order asst omelets crisp bacon slices waffles chipped beef on toast french toast cottage fried potatoes iced kolaches streusel coffee cake	onion soup virginia baked ham SALISBURY STEAK CANDIED SWEET POTATOES rice collard greens blackeyed peas w/porkhocks pineapple raisin sauce yankee corn bread	beef barley BEEF & CORN PIE FRIED CHICKEN chicken gravy RICE mashed potatoes steamed asparagus CLUB SPINACH hot dinner rolls	LEMON MERINGUE PIE chocolate cake OATMEAL COOKIES
SATURDAY	hot oatmeal eggs to order asst omelets crisp bacon slices waffles grilled ham slices blueberry pancakes hash brown potatoes cinnamon honey rolls cherry coffee cake	egg drop soup VEAL PARMESEAN fried fish portions steamed rice macaroni & cheese broccoli polonaisse hot dinner rolls	bean soup SPINACH LASAGNA ASST PIZZA beef ravioli steamed cauliflower toasted garlic bread	pineapple pie jelly roll BROWNIES

NABLC Test Menu - A-Rations CYCLE 2

	BREAKFAST	LUNCH	DINNER	DAILY DESSERTS
MONDAY	hot oatmeal hard/soft cooked eggs eggs to order ASST OMELETS crisp bacon slices waffles MINCED BEEFONTOAST PINEAPPLE PANCAKES HASH BROWN POTATOES SWEDISH TEA RING pecan roll	beef noodle soup BAKED TUNA AND NOODLES liver and onions franconia potatoes rice stewed tomatoes normandie carrots hot dinner rolls	minestrone soup MOCK FILLET STEAK BAKED CHICKEN mushroom gravy mashed potatoes rice augratin cauliflower peas and mushrooms HOT DINNER ROLLS	dutch apple pie angel food cake coconut raisin cookies
TUESDAY	hot grits hard/soft cooked eggs eggs to order ASST OMELETS crisp bacon slices waffles grilled sausage links FRENCH TOAST HASH BROWN POTATOES CINNAMON ROLLS small coffee cake	tomato soup HAM & NOODLES chicken patty mashed potatoes rice club spinach o'brien corn onion rolls oven brown gravy	old fashion bean soup BBQ BEEF fish portions macaroni & cheese rice EGG NOODLES green beans lima beans BISCUITS	BANANA CREAM PIE marble cake BUTTERSCOTCH BROWNI
WEDNESDAY	hot farina hard/soft cooked eggs eggs to order ASST OMELETS crisp bacon slices waffles breakfast steaks PINEAPPLE PANCAKES HASH BROWN POTAOTES cinnamon raisin rolls ORANGE COCONUT COFFEE CAKE	egg drop soup SWEET & SOUR CHICKEN baked lemon fish egg rolls filipino fried rice seasoned green peas STIR FRIED VEGETABLES egg foo young HOT DINNER ROLLS	corn chowder LASAGNA pot roast parsley potatoes rice BROCCOLI AU GRATIN simmered carrots yankee style cornbread	sweet potato pie blueberry cheese cake fruit nut bars
THURSDAY	hot rolled oats hard/soft cooked eggs eggs to order ASST OMELETS crisp bacon slices waffles MINCED BEEF ON BISCUIT FRENCH TOAST home fried potatoes BEAR CLAWS glazed apple coffee cake	split pea soup BEEF STOGANOFF OVEN FRIED CHICKEN mashed potatoes rice southern green beans augratin cauliflower chicken gravy HOT DINNER ROLLS	french onion soup TURKEY POT PIE ITALIAN SAUSAGE SUB rice egg noodles broccoli harvard beets BISCUITS	APPLE PIE strawberry shortcake COCONUT COOKIES
FRIDAY	hot grits hard/soft cooked eggs eggs to order ASST OMELETS crisp bacon slices waffles blueberry pancakes grilled ham slices HASH BROWN POTATOES ICED SNAILS APPLE COFFEE CAKES	mulligatawny soup tempura fried fish BEEF STEW steamed rice fried okra augratin asparagus dinner rolls	chicken noodle soup BBQ CHICKEN CHICKEN A LA KING steamed rice oven browned potatoes steamed broccoli hot dinner rolls	pecan pie banana cake crisp choc cookie
SATURDAY	hot farina hard/soft cooked eggs eggs to order asst omelets crisp bacon slices waffles creamed beef on toast french toast hash brown potatoes glazed sweet rolls quick coffee cake	mushroom soup STUFFED PEPPERS pork adobo egg noodles peas LYONAISSE GREEN BEANS hot dinner rols	creole soup CHICKEN CHOW MEIN sweet & sour meatballs steamed rice chinese noodles fried chinese cabbage lyonnaise carrots hot dinner rolls	blueberry pie cherry cheese cake molasses cookies

	BREAKFAST	LUNCH	DINNER	DAILY DESSERTS
MONDAY	hot rolled oats eggs to order asst omelets crisp bacon slices waffles hash brown potatoes french toast creamed beef on toast glazed sweet roll quick coffee cake	chicken noodle soup SPICY SHRIMP CREOLE MACARONI & BEEF AU GRATIN POTATOES rice SPINACH SOUFFLE corn o'brien dinner rolls	vegetable soup BREADED PORK CHOPS CHICKEN W/RICE STUFFING brown gravy orange rice brussel sprouts glazed carrots hot dinner rolls	pumpkin pie devil's food cake brown sugar cookies
TUESDAY	hominy grits eggs to order asst omelets crisp bacon slices waffles grilled ham slices grilled bologna pancakes home fried potatoes praline rolls french coffee cake	beef onion soup SLICED TURKEY grild ham steak TURKEY GRAVY DRESSING WHIPPED SWEET POTATOE steamed asparagus steamed squash hot dinner rolls	chicken gumbo soup CAJUN SEASONED STEW fish portion steamed rice MACARONI & CHEESE seasoned wax beans steamed broccoli pineapple raisin sauce yankee corn bread	CHERRY TURNOVER ginger bread cake PEANUT BUTTER COOKIES
WEDNESDAY	hot oatmeal fried eggs to order asst omelets crisp bacon slices waffles grilled sausage patties french toast hash brown potatoes snickerdoodle cake crosent roll	beef vegetable soup mex tacos CHICKEN ENCHANADAS BEEF/BEAN ENCHANADAS spanish rice refried beans calico corn jalopeno cornbread	tomato soup CHILI CON CARNE SWEET & SOUR PORK steamed rice peas and mushrooms steamed carrots hot dinner rolls brown gravy	BLUEBERRY PIE yellow cake w/icing CHOCOLATE CHIP COOKIES
THURSDAY	hot grits eggs to order asst omelets crisp bacon slices waffles corned beef hash pancakes hash brown potatoes sugar roll apple coffee cake	chicken rice soup BAKED MEATLOAF HOMESTYLE CHICKEN & NO ESCALLOPED POTATOES rice green beans harvard beets dinner rolls	mulligatawny soup FRIED FISH CHICKEN ITALIENNE rice MACARONI & CHEESE mixed vegetables hot dinner rolls	peach pie boston cream pie chewy nut bar
FRIDAY	hot farina eggs to order asst omelets crisp bacon slices waffles chipped beef on toast french toast cottage fried potatoes iced kolaches streusel coffee cake	onion soup virginia baked ham SALISBURY STEAK SWEET POTATO CASSEROL rice collard greens blackeyed peas w/porkhocks pineapple raisin sauce yankee corn bread	beef barley BEEF & PEPPERS FRIED CHICKEN chicken gravy CONFETTI RICE mashed potatoes steamed asparagus SPINACH SOUFFLE hot dinner rolls	LEMON MERINGUE PIE chocolate cake OATMEAL COOKIES
SATURDAY	hot oatmeal eggs to order asst omelets crisp bacon slices waffles grilled ham slices pancakes hash brown potatoes cinnamon honey rolls cherry coffee cake	egg drop soup VEAL PARMESEAN fried fish portions steamed rice macaroni and cheese broccoli polonaise hot dinner rolls	bean soup VEGETABLE LASAGNA ASST PIZZA beef ravioli steamed cauliflower toasted garlic bread	pineapple pie jelly roll BROWNIES

	BREAKFAST	LUNCH	DINNER	DAILY DESSERTS
MONDAY	hot oatmeal eggs to order ASST OMELETS crisp bacon slices waffles CHIPPED BEEF on toast APPLE PANCAKES HASH BROWN POTATOES BLUEBERRY COFFEE CAKE pecan roll	beef noodle soup TUNA NOODLE CASSEROLE liver and onions franconia potatoes rice stewed tomatoes normandie carrots hot dinner rolls	minestrone soup BEEF SIRLOIN TIPS CHICKEN W/BROC&CHEES STUFFI mushroom gravy mashed potatoes rice augratin cauliflower peas and mushrooms HOT DINNER ROLLS	dutch apple pie angel food cake coconut raisin cookies
TUESDAY	hot grits eggs to order ASST OMELETS crisp bacon slices waffles grilled sausage links FRENCH TOAST HASH BROWN POTATOES CINNAMON ROLLS small coffee cake	tomato soup TURKEY TETRAZZINI chicken patty mashed potatoes rice club spinach o'brien corn onion rolls oven brown gravy	old fashion bean soup BBQ PORK fish portions macaroni & cheese rice NOODLES ROMANOFF green beans lima beans BISCUITS	BANANA CREAM PIE marble cake BUTTERSCOTCH BROWNIES
WEDNESDAY	hot farina eggs to order ASST OMELETS crisp bacon slices waffles breakfast steaks APPLE PANCAKES HASH BROWN POTATOES cinnamon raisin rolls GOOD MORNING COFFEE CAKE	egg drop soup SWEET & SOUR CHICKEN baked lemon fish egg rolls filipino fried rice seasoned green peas VEGETABLE CHOW MEIN egg foo young HOT DINNER ROLLS	corn chowder LASAGNA pot roast parsley potatoes rice BROCCOLI AU GRATIN simmered carrots yankee style cornbread	sweet potato pie blueberry cheese cake fruit nut bar
THURSDAY	hot rolled oats eggs to order ASST OMELETS crisp bacon slices waffles CREAMED BEEF ON BISCUITS FRENCH TOAST home fried potatoes BEAR CLAWS glazed apple coffee cake	split pea soup BEEF STROGANOFF CHICKEN PRIMAVERA mashed potatoes rice southern green beans augratin cauliflower BREADSTICKS	french onion soup TURKEY DIJON SAUSAGE, ONION & PEPPER rice egg noodles broccoli harvard beets BISCUITS	APPLE PIE strawberry shortcake COCONUT COOKIES
FRIDAY	hot grits eggs to order ASST OMELETS crisp bacon slices waffles PANCAKES grilled ham slices HASH BROWNED POTATOES ICED SNAILS APPLE COFFEE CAKE	chicken vegetable soup tempura fried fish BEEF STEW steamed rice fried okra augratin asparagus dinner rolls	chicken noodle soup GLAZED CHICKEN CHIX & VEGES ORIENTAL steamed rice oven browned potatoes steamed broccoli hot dinner rolls	pecan pie banana cake crisp chocolate cookie

APPENDIX D
Nutritional Comparison of AFRS to Commercial

NUTRITIONAL COMPARISON OF AFRS TO COMMERCIAL

PRODUCT	SOURCE OF NUTRITION INFO	SERVING	FAT (g)	Kcal	Cholesterol (mg)	%Kcal from FAT
MONDAY, 1 FEB 1993						
SPICY SHRIMP CREOLE	HEALTHY CHOICE	9 oz	2	94	102	19.15
FISH CREOLE	AFRS		2	127	36	14.17
MAC & BEEF	CAMPBELLS	8.75 oz	17	324	32	47.22
CHILI MACARONI	AFRS		33	574	64	51.74
AU GRATIN POTATOES	STOUFFERS	5.5 oz	10	198	27	45.45
	AFRS		11	236	10	41.95
	ARIEM		12	251	33	43.03
SPINACH SOUFFLE	STOUFFERS	4 oz	9	144	88	56.25
CLUB SPINACH	AFRS		10	159	26	56.60
CHICKEN W/RICE STUFFING	BARBER FOODS	7 oz	24	400	N/A	54.00
	AFRS		17	439	84	34.85
TUESDAY, 2 FEB 1993						
SLICED TURKEY/GRAVY	ARMOUR	6.4 oz	10	225	32	40.00
/STUFFING	AFRS		20	602	134	29.90
WHIPPED SWEET POTATO	STOUFFERS	4.5 oz	8	184	27	39.13
	AFRS		2	127	2	14.17
CAJUN SEASONED STEW	STOUFFERS	8 oz	12	192	48	56.25
BEEF STEW	AFRS		21	447	102	42.28
MACARONI & CHEESE	CAMPBELLS	8 oz	17	324	32	47.22
	AFRS		20	409	56	44.01
	ARIEM		20	119	60	151.26
CHERRY TURNOVER	READI-BAKE	1 each	n/a	n/a	n/a	n/a
	AFRS		n/a	n/a	n/a	n/a
			n/a	n/a	n/a	n/a
PEANUT BUTTER COOKIES	KARPS	2 each	n/a	n/a	n/a	n/a
	AFRS		15	258	31	52.33

PRODUCT	SOURCE OF NUTRITION INFO	SERVING	FAT (g)	Kcal	Cholesterol (mg)	%Kcal from FAT
WEDNESDAY, 3 FEB 1993						
CHICKEN ENCHANADAS	STOUFFERS	5.5 oz	18	280	88	57.86
BEEF FAJITAS	AFRS		15	416	52	32.45
BEEF & BEAN ENCHANADAS	STOUFFERS	5.5 oz	6	154	33	35.06
	AFRS		24	440	98	49.09
CHILI CON CARNE	STOUFFERS	9 oz	11	287	54	34.49
	AFRS		16	291	64	49.48
	ARIEM		17	375	68	40.80
SWEET & SOUR PORK	CHUN-KING	8.5 oz	9	312	64	25.96
	AFRS		29	504	98	51.79
	ARIEM		28	489	110	51.53
BLUEBERRY PIE	CHEF PIERRE	1/8 PIE	12	278	n/a	38.85
	AFRS		17	380	0	40.26
CHOC CHIP COOKIES	KARP	2 each	15	276	23	48.91
	AFRS		13	253	27	46.25
	ARIEM		10	250	33	36.00

NUTRITIONAL COMPARISON OF AFRS TO COMMERCIAL

PRODUCT	SOURCE OF NUTRITION INFO	SERVING	FAT (g)	Kcal	Cholesterol (mg)	%Kcal from FAT
THURSDAY, 4 FEB 1993						
BAKED MEATLOAF W/GRAVY	CAMPBELLS	6.5 oz	11	229	37	43.23
	AFRS		27	448	132	54.24
	ARIEM		22	394	134	50.25
CHICKEN & NOODLES	STOUFFERS	8.5 oz	14	272	68	46.32
	AFRS		16	360	90	40.00
ESCALLOPED POTATOES	ARMOUR	5.5 oz	7	187	22	33.69
	AFRS		6	177	17	30.51
CHICKEN ITALIENNE CHICKEN CACCIATORE	STOUFFERS	8.5 oz	8	187	59	38.50
	AFRS		14	415	129	30.36
MACARONI & CHEESE	CAMPBELLS	8 oz	17	324	32	47.22
	AFRS		20	409	56	44.01

NUTRITIONAL COMPARISON OF AFRS TO COMMERCIAL

PRODUCT	SOURCE OF NUTRITION INFO	SERVING	FAT (g)	Kcal	Cholesterol (mg)	%Kcal from FAT
FRIDAY, 5 FEB 1993						
SALISBURY STEAK	STOUFFERS	5.75 oz	14	235	80	53.62
	AFRS		18	299	94	54.18
	ARIEM		19	318	97	53.77
SWEET POTATO CASSEROLE	ARMOUR	4.5 oz	13	256	30	45.70
	AFRS		3	192	0	14.06
BEEF & PEPPERS	CHUN KING	6.5 oz	7	173	43	36.42
	AFRS		15	299	98	45.15
FRIED CHICKEN	SENSIBLE CHEF	4 oz	8	180	45	40.00
	AFRS		27	519	131	46.82
CONFETTI RICE	STOUFFERS	6 oz	2	144	6	12.50
FILIPINO FRIED RICE	AFRS		5	211	38	21.33
SPINACH SOUFFLE	STOUFFERS	4 oz	9	144	88	56.25
CLUB SPINACH	AFRS		10	159	26	56.60
LEMON MERINGUE PIE	CHEF PIERRE	1/8 pie	13	410		28.54
	AFRS		8	188	0	38.30
OATMEAL RAISIN COOKIE	KARPS	2 each	n/a	n/a	n/a	n/a
	AFRS		10	256	19	35.16

NUTRITIONAL COMPARISON OF AFRS TO COMMERCIAL

PRODUCT	SOURCE OF NUTRITION INFO	SERVING	FAT (g)	Kcal	Cholesterol (mg)	%Kcal from FAT
SATURDAY, 6 FEB 1993						
VEAL PARMESAN	CAMPBELLS	7.5 oz	13	272	110	43.01
	AFRS		27	392	105	61.99
	ARIEM		25	399	119	56.39
VEGETABLE LASAGNA	STOUFFERS	8 oz	17	311	56	49.20
	AFRS		29	363	60	71.90
BROWNIES	KARPS	2.5 oz	18	321	66	50.47
	AFRS		19	361	68	47.37
	ARIEM		9	278	1	29.14
MONDAY, 8 FEB 1993						
CHEDDAR CHEESE OMELET	AWARD	1 each	23	271	378	76.38
	AFRS		21	250	309	75.60
WESTERN OMELET	AWARD	1 each	21	245	339	77.14
	AFRS		17	215	296	71.16
CREAMED CHIPPED BEEF	ARMOUR	6 oz	n/a	n/a	n/a	n/a
	AFRS		13	245	23	47.76
APPLE PANCAKES	ARMOUR	2 each	6	304	14	17.76
	AFRS		11	292	65	33.90
TUNA NOODLE CASSEROLE	STOUFFERS	8.5 oz	15	272	42	49.63
	AFRS		12	322	26	33.54
	ARIEM		13	388	69	30.15
BEEF SIRLOIN TIPS	ARMOUR	7.5 oz	8	226	85	31.86
	AFRS		17	330	92	46.36
CHICKEN W/BROC&CH	BARBER FOODS	7 oz	23	400	N/A	51.75
	AFRS		25	464	154	48.49

PRODUCT	SOURCE OF NUTRITION INFO	SERVING	FAT (g)	Kcal	Cholesterol (mg)	%Kcal from FAT
BLUEBERRY COFFEE CAKE	CHEF PIERRE	1 pc	18	363		44.63
	AFRS		4	193	31	18.65
DINNER ROLLS	READI-BAKE	2 each	4	200	0	18.00
	AFRS		8	302	0	23.84
	ARIEM		14	352	16	35.80
TUESDAY, 9 FEB 1993						
FRENCH TOAST	ARMOUR	2 each	4	200	40	18.00
	AFRS		17	347	313	44.09
TURKEY TETRAZZINI	STOUFFERS	8 oz	18	319	64	50.78
	AFRS		15	344	90	39.24
BBQ PORK	TRAY RATION	7 oz	25	389	68	57.84
	AFRS		32	467	116	61.67
NOODLES ROMANOFF	STOUFFERS	4.5 oz	11	198	18	50.00
	AFRS		10	246	60	36.59
BISCUITS	READI-BAKE	1 each	9	191	2	42.41
	AFRS		8	176	10	40.91
CINNAMON ROLLS	PILLSBURY	1 each	6	216	1	25.00
	AFRS		5	143	17	31.47
BANANA CREAM PIE	CHEF PIERRE	1/8 PIE	18	314		51.59
	AFRS		13	297	72	39.39
BLONDIE BROWNIES	KARPS	2 oz	n/a	n/a	n/a	n/a
	AFRS		12	300	67	36.00
	ARIEM		6	230	0	23.48

NUTRITIONAL COMPARISON OF AFRS TO COMMERCIAL

PRODUCT	SOURCE OF NUTRITION INFO	SERVING	FAT (g)	Kcal	Cholesterol (mg)	%Kcal from FAT
WEDNESDAY, 10 FEB 1993						
GOOD MORNING COFFE CAKE	KARPS	3.0 oz	22	367	59	53.95
CARROT CAKE	AFRS		34	470	159	65.11
SWEET & SOUR CHICKEN	CHUN KING	8.5 oz	5	219	49	20.55
	AFRS		10	400	109	22.50
VEGETABLE CHOW MEIN	STOUFFERS	3 oz	5	42	0	107.14
STIR FRY VEGETABLE	AFRS		n/a	n/a	n/a	n/a
LASAGNA	STOUFFERS	8 oz	17	311	56	49.20
	AFRS		18	408	128	39.71
BROCCOLI AU GRATIN	STOUFFERS	4 oz	6	104	12	51.92
	AFRS		5	103	45	43.69
THURSDAY, 11 FEB 1993						
BEEF STROGANOFF	STOUFFERS	6.5 oz	17	253	71	60.47
	AFRS		19	416	122	41.11
CHICKEN PRIMAVERA	STOUFFERS	8.5 oz	5	144	42	31.25
	AFRS		16	560	142	25.71
TURKEY DIJON	STOUFFERS	8.5 oz	13	272	68	43.01
NO DIRECT SUBSTITUTION	AFRS					
CHICKEN CHOW MEIN	CHUN KING	9.5 oz	n/a	n/a	n/a	n/a
	AFRS		18	361	109	44.88
BEAR CLAWS	PILLSBURY	1 each	15	231	12	58.44
	AFRS		n/a	n/a	n/a	n/a
APPLE PIE	CHEF PIERRE	1/8 PIE	20	440		40.91
	AFRS		11	204	0	48.53
COCONUT COOKIES	KARPS	2 each	n/a	n/a	n/a	n/a
	AFRS		11	228	28	43.42

PRODUCT	SOURCE OF NUTRITION INFO	SERVING	FAT (g)	Kcal	Cholesterol (mg)	%Kcal from FAT
FRIDAY, 12 FEB 1993						
PANCAKES	AUNT JEMIMA	1 serving	8	240	20	30.00
	AFRS		8	224	36	32.14
BEEF STEW	ARMOUR	8.5 oz	10	285	44	31.58
	AFRS		21	447	102	42.28
GLAZED CHICKEN	STOUFFERS	7.5 oz	8	195	67	36.92
TERRIYAKI CHICKEN	AFRS		10	273	109	32.97
CHX & VEG ORIENTAL	STOUFFERS	8.5 oz	10	204	34	44.12
	AFRS		18	273	109	59.34
TWISTED SNAILS	PILLSBURY	1 each	n/a	n/a	n/a	n/a
	AFRS		n/a	n/a	n/a	n/a
APPLE COFFEE CAKE	KARPS	1 each	n/a	n/a	n/a	
	AFRS		4	193	31	18.65
SATURDAY, 13 FEB 1993						
STUFFED PEPPERS	STOUFFERS	7 OZ	10	217	35	41.47
	AFRS		15	390	64	34.62
GRN BN & MUSHROOM CAS	STOUFFERS	4 oz	11	160	8	61.88
	AFRS		3	50	7	54.00

List of Acronyms

Acronyms	Definition
AD	Destroyer Tender
AFRS	Armed Forces Recipe Services
ANOVA	Analysis of Variance
ARIEM	Army Research Institute of Environmental Medicine
ATC	Affordability Through Commonality
BDFA	Basic Daily Food Allowance
CF	Convenience Food
CFLM	Convenience Food Logistics Model
CFs	Convenience Foods
CGN	Nuclear, Guided Missile Cruiser
COMRATS	Commuted Rations
DDG	Guided Missile Destroyer
DHHS	Department of Health and Human Services
EDF	Enlisted Dining Facility
ESN	Ensign
FMT	Food Management Team
FSA	Food Service Attendant(s)
FSC	Federal Supply Catalog
FSO	Food Service Office
FSP	Food Service Personnel
GTS	General Technical Services
HSD	Honestly Significant Difference
ITS	"Information Technology Solutions, Inc."
JTS	Joint Technical Staff
Kcal	Kilocalorie
LHA	Amphibious Assault Helicopter Carrier
LHD/LPD	Amphibious Assault Ship Dock
LLC	Limited Liability Company
MRDA	Military Required Dietary Allowance
ME	Main Entrees
MIDRATS	Midnight Rations
MS	Mess Management Specialist(s)
MS1	Mess Specialist(s) First Class (E6)
MS2	Mess Specialist(s) Second Class (E5)
MS3	Mess Specialist(s) Third Class (E4)
MSC	Mess Specialist(s) Chief
MSCM	Mess Specialist(s) Chief Master
MSSN	Mess Specialist(s) Seaman (E3)
MSSA	Mess Specialist(s) Seaman Apprentice (E2)
NABLC	"Navy Amphibious Base, Little Creek, Norfolk, VA"
Natick	"Natick Research, Development and Engineering Center, Natick, MA"
NAVFSSO	Navy Food Service Systems Office
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply Systems Command

List of Acronyms (Continued)

Acronyms	Definition
NIH	National Institutes of Health
NSN	National Stock Number
RDA	Recommended Daily Allowance
RE	Retinol Equivalents
TAD	Temporary Additional Duty
ug	Microgram
USDA	United States Department of Agriculture
WE	Weekend

Glossary

A School	Basic speciality school after boot camp
A-Rations	Menu items which require fresh ingredients and are cooked-from-scratch using recipe and basic food ingredients
Afloat	Aboard ship
Ashore	Fixed land based facility.
Asian	Ethnic type food.
At Sea/Underway	A ship at sea-underway.
Breakout	Separating and selecting menu ingredients from storage areas.
Convenience	Requiring only heating or very little preparation. Use of conventional oven.
Fantail	Rear outside part of a ship
Frispo	Automatic French fry maker using powdered mix
Inport	A ship tied up at a port location.
Jack-of-the Dust	Issues food items from storage
On-board	Located on a ship.
Pan-up	"Unpacking, separating and placing on a pan"
Plating	"Unpacking, cutting/separation and placing on a plate."
Plating Time	Time required to plate a food product.
Prime Vendor	Order direct from supplier
Proofing	Rising of a yeast containing bakery products.
Striker	Non designated seaman looking for a speciality
Tempering	Partial Thawing of frozen foods.
Topping Off	Resupply to the maximum extent.

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