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A NEW FOODSERVICE SYSTEM CONCEPT FOR AIRCRAFT CARRIERS

by

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The objective of this project has been to improve foodservice on aircraft carriers. As a result of a comprehensive analysis of the existing foodservice systems on the USS John F. Kennedy and USS Saratoga, the areas of greatest potential improvements were determined to be the reduction of times in food waiting lines, increase in customer acceptance, and enhancement of the dining environment. A new systems concept was developed to address these and other problem areas. The new concept involved the creation of a new modern fast food outlet, menu, and decor in the forward galley and mess deck areas. The

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered) projection was that higher user acceptance of the food system would be achieved by giving them a choice of two different types of food outlets, the standard "A" ration aft and fast food fwd. It was also projected that customer participation in the new fast food facility would increase to about fifty percent from the thirty percent participation rates that were generally experienced in carrier forward mess areas. It was expected that this increase in forward dining facility participation would significantly reduce the aft galley waiting lines and that the increased speed of serving modern fast food items at the new forward outlet would prevent line buildup.

The new fast food concept included a new high preference menu which was developed to provide the type of service that individuals have come to expect from the most successful commercial fast food operations. A number of shelf stable, labor-saving, ration-dense food items were selected to support the menu. Some of these products such as shelf stable potato granules for extruded french fries, dehydrated milk shake mix, and shelf stable pizza crusts provided the capability to serve these menu items afloat for the first time on a frequently recurring basis. Certain foods were vitamin fortified to supply consumers with improved nutritional intakes, particularly vitamin A and C. Foodservice equipment selected for the new concept reflected the latest technology and included such items as french fry extruders, conveyorized hamburger broilers and breading machines. Post-test analysis of this system identified relative improvements in all areas, including a 21% reduction in waiting times so that food lines were no longer a serious problem, and customer perceptions of increases of 47% in food quality, 52% in food variety, and 62% in the dining environment. Further, there was a 43% increase in worker productivity and a 100% increase in attendance at dinner and supper meals in the forward facility. About 30 food, foodservice equipment, and serving items that were new to Navy use were introduced and adopted during this test. As a result of the highly successful Saratoga test, the Navy is implementing this fast food concept on all aircraft carriers and selected portions of the system on other classes of ships.

PREFACE

Under US Navy Requirement 7-1 (Title: Foodservice Systems Analysis Afloat) of the Department of Defense Food Research, Development, Test and Engineering Program, the Operations Research and Systems Analysis (ORSA) Office of the US Army Natick Research and Development Command (NARADCOM) has undertaken a project with general objectives of:

- providing a factual definition of current foodservice afloat, and

- developing alternatives to the current system to offer greater user acceptance, increased efficiency, reduced costs, reduced manpower requirements, and improved total foodservice environment.

The sponsor of this effort and the organization solely responsible for conceiving and guiding it has been the Navy Food Service Systems Office (NAVFSSO). The project requirement was originated when Captain R. M. Tomsuden, SC, USN, was Commanding Officer. Captain T. J. Piazza, SC, USN, later Commanding Officer, directed that the first work effort of the project should address *large ship types of older vintage, especially aircraft carriers*. Captain H. E. Hirschy, Jr. SC, USN, has been the Commanding Officer of NAVFSSO during the modification of the selected test ship, USS Saratoga (CV-60), and the subsequent evaluation of the new system at sea.

This report has been prepared to document the portion of the total project that has been concerned with the systems analysis, concept formulation, system design, shipboard modification, and test of the new system for aircraft carriers.

The systems approach used in the project has involved attention to all aspects of shipboard foodservice in order that the Navy could be provided a complete *package* for implementing the system in other aircraft carriers. The broad nature of this approach distinguishes it in scope and resources expended from other narrower foodservice improvement efforts, such as most SHIPALTS or other R&D tasks with more limited objectives. This comprehensiveness has required participation of a diversified, multi-disciplinary technical project team. The effective conduct of the project has, therefore, been dependent on the participation of several organizations and individuals, and on the advice of several others. It would be virtually impossible to acknowledge the help of every person who aided the authors at one time or another during this period. Nonetheless it is desired to recognize the following individuals who assisted on numerous occasions and to whom special credit is due.

- Navy Food Service Systems Office. The sponsor defined broad objectives, reviewed proposed project plans, monitored technical activities, and gave the project team major freedom to develop and test new approaches in carrier foodservice. The speed with which technical results were achieved derived in large measure from this management relationship. Following the early test phase at sea, NAVFSSO assumed responsibility for coordinating logistics support and for activities associated with implementation of the system on other carriers. The interest of, and guidance provided by, Captains Hirschy and Piazza is gratefully acknowledged. Further, helpful advice on a wide range of Navy foodservice matters was given throughout the project by NAVFSSO staff members, including Mr. J. Hastings, Mrs. M. L. Kehoe, Mr. J. W. Martin, Mr. J. Bullock, LCDR C. Ross and LCDR R. Driggers.

- Commander Naval Air Force, US Atlantic Fleet. All matters concerning the plans for and activities on the USS Saratoga have been coordinated through Captain W. J. Hennessey, Force Supply Officer. The help provided by him and his staff (especially CDR S. B. Zumbro, LT J. Johnson, LT B. E. Taylor, and LT R. Brimmer) is appreciated. The Material Department has also supported the project, and substantial incremental funding support essential to the completion of the shipyard work on the Saratoga was provided through arrangements made with LCDR L. J. Ballback of that department. LCDR L. J. Friederickson was the COMNAVAIRLANT Ship Coordinator for the Saratoga's restricted availability in which the EDF modifications were completed.

- USS Saratoga (CV-60). Captain C. B. Hunter, Commanding Officer, actively encouraged the project in its incipient stages, and Captain E. H. Martin, the subsequent Commanding Officer, continued this support. All NARADCOM proposals for the new system, its installation, and test have been carefully reviewed by CDR W. H. Reed, the Supply Officer, and CW04 D. E. Cox, the Food Service Officer. The project team has continued to be impressed with the professionalism of these men and with their desire to improve foodservice for the Saratoga's crew. MSC R. J. Rice has been manager of the new forward EDF foodservice system during its test period, and he has done a commendable job. Other key personnel have been LCDR D. Tarantino and LCDR F. Meyer, Assistant Supply Officers, as well as MSCM Moss, MSCM Haugen, and MSC Laird of the S-2 Division. Throughout the project, the Saratoga has been extremely cooperative, showing an openness to new ideas and then a commitment to making these ideas work at an operational level. In all respects, CDR Reed, CW04 Cox, and the MS assigned to the new system have been partners with NARADCOM in this venture.

- Norfolk Naval Shipyard. Following the development of the system concept and selection of equipment by NARADCOM, Mr. D. Crotts and Mr. C. W. Hammer of NNSY supervised the preparation of engineering drawings by the contractor. In addition, Mr. Hammer was most helpful in providing sound advice on various shipboard engineering matters throughout the planning phase.

- Supervisor of Shipbuilding, Conversion and Repair (SUPSHIPS), Jacksonville, Florida. Through Captain R. Holman, Commanding Officer, this organization made a special effort to assist NARADCOM by including the enlisted dining facility (EDF) modification in the Saratoga's restricted availability (SRA) effort, which it managed. This cooperation was particularly appreciated in view of the fact that the engineering drawings were completed only shortly before the SRA started, and at that time SUPSHIPS JAX already had a full SRA workload. LCDR W. G. Grantham very competently supervised the new EDF installation, and he was capably assisted by his staff (Mr. L. H. Boyd, Mr. H. McDonald). Mrs. May Bolton of SUPSHIPS procured the selected equipment under tight deadlines.

- Naval Sea Systems Command and the Naval Ships Engineering Center. The cooperation of these Commands in reviewing the engineering drawings expeditiously to enable the project to proceed at its accelerated pace is appreciated.

- CDI Marine, Inc, Jacksonville, Florida. Under the above-mentioned time pressures, this contractor carried out the shipchecks and prepared the engineering drawings for all foodservice spaces in an effective and expeditious manner. Mr. J. Hayes was the project coordinator.

- Jacksonville Shipyards, Inc., Jacksonville, Florida. The modification of the Saratoga's forward galley, forward bakery, forward messdecks, and aft bakery were performed by this firm. Performance, cost, and schedule requirements were met even though this system is the first of its kind, and there had, therefore, been no previous experience with the plans or the new equipment installations. Mr. M. Pennel was the project coordinator.

- Foremost Industries, Norfolk, VA. Working as a subcontractor to Jacksonville Shipyards, this firm manufactured the stand-up counters and vision screens for the messdecks, and fabricated and installed the new fast food serving line facing and decor. Each of these endeavors was the first of its kind. Mr. D. Plumblee was in charge of the work.

- Supply Department, Naval Air Station, Jacksonville (LT D. Kouasa, Mrs. Thompson); Naval Supply Center, Norfolk (LT D. Feltes); Commander, Surface Forces, US Atlantic Fleet (CDR H. L. Kerr). These supply organizations effectively supported the test by procuring both standard and non-standard equipment and other supplies for the Saratoga while it was operating out of Mayport and by arranging for the essential overseas supply of the new special subsistence and service items while the ship was deployed.

- Commander Naval Air Force, US Pacific Fleet. The project team appreciated the opportunity to work with Captain J. H. Ruehlin, Force Supply Officer, and staff officers LCDR J. Lenga and LT R. W. Gorrie. While the Saratoga test at sea was in progress, COMNAVAIRPAC aggressively pursued implementation of the forward EDF fast food system in the USS Ranger (CV-61) on an extremely demanding time schedule. Working through the coordination of NAVFSSO, NARADCOM assisted the Ranger effort by providing the proposed galley layout, as well as NARADCOM's selections of the fast food menu, the new food products, galley and bakery foodservice equipment, stand-up counters, disposable and non-disposable serving items, menu board display, recipes, staffing guidelines, and operational procedures. A two week period was spent aboard the Ranger training the ship's new EDF personnel.

-USS John F. Kennedy (CV-67). This ship cooperated fully in the systems analysis phase of the work, providing considerable assistance to the investigative effort. Special thanks are due CDR J. Konapik and his Supply Department personnel.

- The US Army Construction Engineering Research Laboratory (CERL), Champaign, Illinois. CERL operated as an integral part of the NARADCOM team, evaluating the habitability of present messdeck compartments and then producing fast food-oriented architectural designs of the serving line and messing areas, including the innovative stand-up counters, vision screens, and colorful environmental *package*. This work was led by Mr. Robert Porter.

- Letterman Army Institute of Research (LAIR), San Francisco, California. LAIR also functioned as a key part of the NARADCOM team, evaluating the current nutritional adequacy of the diet consumed by carrier enlisted personnel, identifying potential nutritional problems, and recommending changes to insure that the new foodservice system provides a nutritionally adequate diet. The LAIR effort yielded quantitative data needed to address the important issue of what effect the continuing availability of fast food has on the nutritional intake of a ship's crew. Major David D. Schnakenberg of the LAIR Department of Nutrition was the Project Leader.

- US Army Natick Research and Development Command, Natick, Massachusetts. The project team represented the combined efforts of three major NARADCOM organizations, the Operations Research and Systems Analysis Office (ORSA), the Food Engineering Laboratory (FEL), and the Food Sciences Laboratory (FSL). The project has been managed and executed by the ORSA Office, Mr. R. P. Richardson, Program Manager, and Dr. D. P. Leitch, Principal Investigator. The principal participants have been Mr. Paul Short and Mr. Brian M. Hill, ORSA, and Mr. George Turk, FEL. The other major contributors have been Drs. H. L. Meiselman and L. E. Symington, FSL. As in the case of any R&D system project of such broad scope, appreciation is due other NARADCOM personnel. These include Dr. R. J. Byrne, Chief ORSA Office, for his overall technical guidance and his encouragement and support; Mr. J. K. Prifti, FEL Coordinator for the project; Captain E. Chao, USAR, of FSL, for his special

assistance in data collection aboard ship; and the several members of FEL who assisted in food selection, recipe development, and laboratory food testing (Mrs. Mary Klicka, Miss Virginia White, Mrs. Jesse McNutt, Mrs. Lucy Albertini, Dr. Donald E. Westcott, and Mr. John Secrist). Mr. Connie McKeown (AMEL) supervised the construction of the prototype stand-up counters and partitions at Natick. Mrs. Doreen Horne, ORSA, provided secretarial support for the project management, and she was assisted by Mrs. Carol Doering, Mrs. Maryellen Jennings, and Miss Eileen Litchfield. Important contributions were made in the initial concept formulation and galley design and in menu merchandising by the following NARADCOM consultants: Mr. Eric Orkin, Dr. Guy Livingston, Dr. Charlotte Chang, and Mr. Charles Emma. A number of helpful suggestions were made by the Committee on Food Service Systems of the National Research Council, Dr. Lendal Kotschevar, Chairman, and Dr. Frank R. Fisher, Executive Director, during its reviews of project progress. Finally, the project team wishes to express its gratitude to the Navy Representative at NARADCOM, LCDR Robert A. Helmuth, who worked with the team on a continuing basis, providing assistance on many occasions, and who was responsible in large measure for the excellent relationships established with all Navy Commands.

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A NEW FOODSERVICE CONCEPT FOR AIRCRAFT CARRIERS

SECTION I

EXECUTIVE SUMMARY

OBJECTIVE

The broad objective of this project has been to improve foodservice on aircraft carriers (CV's) by providing greater user acceptance, increased efficiency, reduced costs, reduced manpower requirements, and improved foodservice environment.

METHODOLOGY

The major steps have been:

- Systems analysis to quantitatively characterize the present foodservice system and its operations, including assessments of performance and costs.

- Identification of areas of potential improvement, definition of alternative systems concepts to achieve the improvements, and selection of the preferred concept.

- Selection of the test ship; system engineering; detailed design; identification of special equipment, food, and other supplies; and physical modification of the ship.

- Test and evaluation of the new system to develop recommendations for possible implementation on other ships.

The distinguishing characteristic of this approach has been its detailed concern with all facets of the *complete* shipboard foodservice system, including careful attention to the:

- Customer
- Menu
- Food products
- Recipes
- Nutrition
- Foodservice worker
- Management
- Costs
- Food preparation facilities
- Foodservice equipment
- Serving methods and accessories
- Dining environment
- Operational procedures
- Storage
- Sanitation

AIRCRAFT CARRIER FOODSERVICE

The systems analysis established that the following conditions are typical of carriers in general even though each condition may not be present in every ship.

There are two enlisted dining facilities (EDF) for E1-E6. These facilities are located on the second deck, one forward and one aft. Each facility has two serving lines, several adjacent dining compartments, at least one scullery, and a bakery. The ship also has vegetable preparation rooms, thaw rooms, and a butcher shop. Seating capacity in the dining areas is very limited, offering less than 300 seats for about 3800 men in the older carriers. Further, weapons assembly takes place in the dining areas and, when occurring, preempts much of the seating space. For these reasons and because of the ship's round-the-clock activities, food is served from at least one galley up to 18-22 hours a day. At sea, four meals a day (includes *Midrats*) are offered. The aft EDF provides a full cafeteria meal with multiple selections, and the forward EDF typically serves a *speed line* with a simple menu offering hot dogs, chili-mac, canned ravioli, cold sandwiches, and the like. The food storage spaces are limited in size, particularly for frozen and refrigerated foods. Foodservice in aircraft carriers can be characterized as high volume, space-constrained, crowded, prolonged, and active. It is a difficult feeding situation.

Many aspects of CV foodservice are very effectively carried out by hard working, dedicated foodservice personnel. Nonetheless, the objective of this project is to improve foodservice rather than commend it, and for this reason the focus of the system analysis and of the ensuing discussion has been on identifying current operational problems that can be corrected by new systems ideas and innovative products or methods.

The present status of CV foodservice is summarized as follows:

FOODSERVICE ELEMENT	STATUS PRIOR TO NEW SYSTEM
• Waiting Lines	1. The most visible problem in CV foodservice. 2. The *worst foodservice problem* in the opinion of the crew.
• Food Products and Preparation	1. Certain products below desired quality. 2. Run outs of milk and salad at sea are a major customer complaint. 3. Quantities of popular frozen items (e.g., shoestring potatoes) limited by freezer capacity. 4. Tendency to batch cook large quantities vice progressive cookery. 5. Over 70% of crew have negative opinion of food quality.
• Menus	1. Evaluated as generally capable of improvement. 2. Forward EDF speed lines offer easy-to-prepare items which do not have high customer acceptance.

FOODSERVICE ELEMENT	STATUS PRIOR TO NEW SYSTEM
	3. Over 65% of crew have negative opinion of menu variety.
• Food Acceptability	1. Low food acceptance ratings by the crew. 2. 66% of crew rated CV mess worse than other ships' messes; only 17% rated it better. 3. Crew rated food lowest among 9 morale-oriented factors.
• Meal Attendance and Distribution	1. Only 77% of eligible meals actually attended. 2. Caused by long waiting lines, limited time available to eat, unappealing menus, and negative perception of food. 3. Poor distribution of customers: many more eat aft (72%) than forward (28%). 4. Attendance imbalance contributes to waiting line problem.
• Serving Rates and Throughput	1. Serving line speed too slow to expedite large volume feeding and reduce waiting lines. 2. Major contributing factor is large number of food items on serving lines; these decision points have a slowing effect. 3. Line also slowed by some serve-yourself items (e.g., soups and vegetables) and run outs. 4. As a result of low attendance forward, only one serving line used and seating capacity underutilized.
• Dining Environment	1. 61% said EDF was not an enjoyable place to eat. 2. Most serious problems: unattractive appearance, noise, and crowdedness.
• Worker Morale	1. Lower job satisfaction than in sample of other Navy MS. 2. MS considered foodservice to be considerably worse than in their previous ships. 3. Interviews and surveys revealed MS morale problem.
• Foodservice Equipment	1. Condition of equipment cited as *most serious problem* by MS. 2. CV-60 equipment generally old and inefficient.

FOODSERVICE ELEMENT	STATUS PRIOR TO NEW SYSTEM
• Nutrition	1. Potential problems exist; average nutrient intakes satisfactory but fairly large percentages of personnel below standard in one or more nutrients. 2. Significant incidence of low intakes of vitamin A and C. 3. Problems greatest in forward EDF and after milk run outs.

In summary, the major foodservice problems capable of appreciable improvement are:

- reduction of times in waiting lines
- increase in food acceptability (preference, quality, variety)
- increased meal attendance and better forward vs aft customer distribution
- higher food production and serving rates
- enhancement of EDF dining environment
- improvement of foodservice worker morale
- improved nutritional intake, particularly vitamin A and C.

The major general opportunity for improvement, hence the overriding objective of the project, became the achievement of a significant increase in customer satisfaction.

NEW FOODSERVICE CONCEPT

The systems analyses were conducted on the USS Saratoga (CV-60) and USS Kennedy (CV-67). The Saratoga was selected as the ship on which the new concept would be tested. Because of time and funding constraints, and at the request of the type commander, physical modification of the ship was limited to one EDF. The new concept was defined by NARADCOM in September 1977, all shipboard modifications completed in May 1978, and the system was operating at sea in June 1978. Although the system was designed for the Saratoga, a major criterion was that it had to be suitable for implementation on all carriers.

The principal design elements of the new concept are as follows:

a. Location. System changes were confined to the forward EDF which had the least satisfactory menu, was underutilized from an attendance standpoint, and offered the greatest potential for improvement.

b. Distribution of customers. The adopted plan was to generate more customer use of the forward EDF, providing a better forward vs. aft distribution, and achieving a favorable impact on waiting lines in both EDF's.

c. Food acceptability. To increase attendance forward, provide variety from the standard cafeteria meal offered aft, and increase overall food acceptability, the forward EDF was converted to a fast food outlet exclusively, serving only highly popular items similar to those found in successful commercial fast food restaurants. No *low* or *medium* preference foods were to be served; customers were to get only the kind of food that they most preferred.

d. Menu. To provide further variety in the forward EDF alone, the two serving lines became two separate *restaurants* offering five specialty *theme* menus:

MEAL	PORT LINE	STARBOARD LINE
Dinner	Burger House	Submarine Sandwich Shop
Supper	Burger House	Pizza House (1st night) Fried Chicken Stand (2nd night) Fish and Chips Shop (3rd night)

To round out the fast food menu, french fried potatoes and thick milk shakes were offered at dinner and supper every day, in addition to a salad bar and up to ten hot and cold beverage selections. This is the first shipboard EDF designed specifically to provide a modern, complete, and high preference fast food menu equivalent to the best offered in industry.

e. Throughput. To increase customer throughput in the forward system to at least 800 per hour during peak periods and favorably affect waiting lines, the concept called for:

- always operating both serving lines at dinner and supper,
- reducing customer decision time by minimizing the number of items (entree, fries, shakes) on each line in any one meal,
- prewrapping or prepackaging items to facilitate customer self-service, and
- introducing movable stand-up counters to increase the number of eating stations in the mess decks for the increased customer flow.

f. Dining environment. The habitability of the Saratoga dining area was improved both functionally and environmentally by a strong unifying color scheme, stripe and supergraphic motif, and vision screen partitions. In combination, all the modifications were intended to 1) establish a distinct crew dining *place* within the dominant total ship environment, 2) transform the dynamic activity center into a quieter eating setting, and 3) complement the pre-packaged, fast-serve forward dining area menu with an appropriate and integrated environmental *package*.

g. Facilities and equipment. To provide the unusually high food production required to sustain the increased throughput in the new system, specially-selected, modern equipment for the galley and bakery was installed for test. Several items were non-standard, commercial types chosen for specific tasks in the fast food preparation process. This is probably the first case of a shipboard galley and bakery layout, equipment, and work flow being designed for a specific limited menu rather than for a general one. Nonetheless, the galley does have general food preparation capability.

The forward galley is shown in Figure 1. Major galley areas for customer service or specialized food preparation and the most significant related equipment items are indicated below. Detailed information on all equipment is provided in Section VII. New items of equipment which were introduced for test purposes in this project are indicated by the symbol (N).

Ident.	Galley Area	No.	Equipment
A	Starboard Serving Line	6	Cold Food Counter
		23	Hot Food Unit
		5	Milk Shake Display Case (N)
		10/22	Hot Holding Cabinet (Mobile)
B	Port Serving Line	23	Hot Food Unit
		5	Milk Shake Display Case (N)
C	Beefburger Preparation	12	Conveyor Broiler (N)
		8	Hot Holding Cabinet (N)
		-	Microwave Oven (N)
D	Fried Chicken Preparation	-	Existing Kettle
		9	Batter/Breading Unit (N)
		14	Deep-Fat Fryer (N)
		7	Deep-Fat Filter (N)

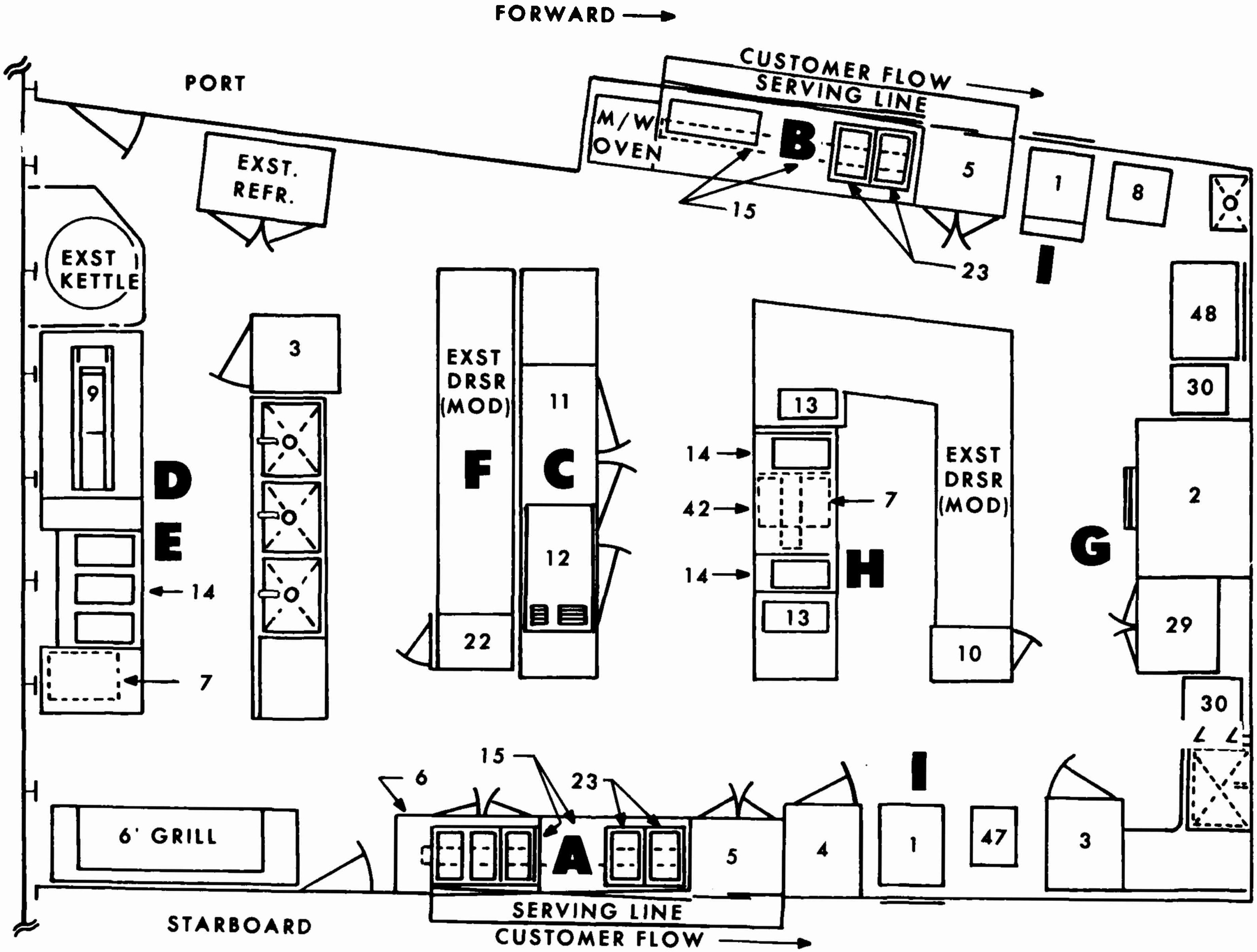

FIGURE 1. Forward Galley, USS Saratoga CV-60, After 1978 Modifications

Ident.	Galley Area	No.	Equipment
E	Fried Fish Preparation	14	Deep-Fat Fryer (N)
		7	Deep-Fat Filter (N)
F	Submarine Sandwich Preparation	-	Existing Dresser
G	Pizza Preparation	2	Pizza Oven (N)
		29	Convection Oven
H	French Fried Potato Preparation	13	Potato Extruder (N)
		14	Deep-Fat Fryer (N)
I	Milk Shake Preparation	47	Powdered Mix Blender (N)
		1	Milk Shake Machine (N)*
		4	Milk Shake Storage (N)
		48	Truck, Mobile (N)

*Soft-serve machine with temperature and overrun settings to produce milk shakes.

Several additional new equipment items were introduced into the forward and aft bakeries (see Section VII).

h. Food product and preparation. The concept stressed selecting and testing new food items that (1) offered quality improvements, (2) were shelf-stable (i.e., dry storage) rather than frozen or refrigerated, and (3) were easy to prepare, hence labor saving. To further stress the quality of the served food, galley operations were designed to be largely dependent on progressive cookery. Almost 40 new food items were selected by NARADCOM for the test, and most were found to offer quality, storage, or preparation benefits. Thirteen of the items have already been approved by the Navy for fast food use, including:

- milk shake flavorings
- new shelf-stable pizza shell
- dehydrated milk shake mix
- pre-cooked roast beef
- canned meatballs and pizza sauce
- frozen diced meat toppings for pizza
- ¼-lb frankfurters
- breaded fish fillets, English style
- dehydrated potato mix

i. Service and accessory items. New disposable and non-disposable items for wrapping, packaging, or serving the food were selected to be as attractive as those in commercial outlets, to reduce scullery work loads, and increase line speed. Colors used on these items were compatible with the serving line and dining area color scheme and provided ready identification of the wrapped products, such as cheeseburgers and submarine sandwiches. New durable plastic (poly-carbonate) tumblers were used instead of glasses or paper cups, and reusable baskets for fish and chicken enabled an *in the basket* mode of serving. Density of packing was actively considered in each instance to minimize storage space requirements.

j. Nutrition. The concept directly addressed nutritional issues through targeting increased meal attendance; making nutritional, balanced meals appealing; and by selectively fortifying a few foods to correct previously noted low intakes of vitamin A and C. Milk shakes were fortified with vitamin A and french fried potatoes and non-carbonated beverages with vitamin C. A salad bar was available at all dinner and supper meals. The milk shake enabled a milk product to be served daily, even when fresh milk had run out; this had a beneficial effect on calcium and riboflavin intake.

k. Worker morale. Improvements were sought by offering (1) a menu that the crew would respond to very favorably, (2) efficient wrapping and serving methods, (3) food preparation simplification permitting most repetitive tasks to be performed by foodservice attendants, and (4) the latest technology in equipment, food products and facilities to help the MS do his work effectively.

FINDINGS

Detailed operational data were collected and analyzed to enable the new forward EDF system to be evaluated based on *before* (1977) and *after* (1978) results from type training periods and Mediterranean deployments. The quantitative results are summarized in Table 1. Except where noted, the information applies for noon and evening meals at sea when the air wing is embarked.

The reduction in waiting times has provided progress against a problem that has plagued carriers for decades. The reduction was achieved by the better balance in forward versus aft attendance and by the success of the various approaches used to increase serving line speed and customer throughput. In the new system there is normally no waiting at all in the burger (port) line after the first 10 minutes of the meal and the starboard line remains short throughout the meal. It must be noted that the extent to which reductions in waiting lines are achieved is a function of two key management decisions: (1) whether certain hot fast food items such as hot submarine sandwiches are assembled on or off the serving line, and (2) whether there is a small or large overlap in the hours that the forward and aft EDF's are open during a given meal. Each of these decisions

TABLE 1

SUMMARY

Results of Test of the New System
(Forward EDF Unless Otherwise Noted)

FOODSERVICE ELEMENT	RESULTS
• Waiting Lines	1. Observed waiting times at forward and aft EDF's reduced a minimum of 21%.
• Food Products and Preparation	1. New products offer ease of preparation, quality, and reasonable cost. 2. Serving frequencies of french fries, pizza, and milk shakes no longer limited by freezer capacity. 3. Greater reliance on progressive cookery. 4. Negative perceptions of food quality reduced 47%.
• Menus	1. Forward EDF ranked highest of the things interviewees liked about shipboard foodservice. 2. New menu items rated highly. 3. Variety ratings in forward EDF improved 52%; 71% wanted no items removed from menu; 50% wanted none added.
• Food Acceptability	1. Food acceptance in forward EDF averaged 22% higher than in pre-test. 2. 48% rated forward EDF better than other ships' messes (vs. only 17% in pre-test). 3. Food in forward EDF rated 6th among 9 morale-oriented factors after rating 9th in pre-test.
• Meal Attendance and Distribution	1. Attendance increase of 20% for dinner and supper (fast food menu not offered for breakfast or midrats). Increase of 10% for all meals. 2. Percentage eating forward for dinner and supper increased from 28% to 46%. The number of customers eating these meals forward increased almost 100%.

TABLE 1 (CONT'D)

FOODSERVICE ELEMENT	RESULTS
• Serving Rates and Throughput	1. Serving line speed increased about 18%. 2. Based on sustained serving line rates, customer throughput in first hour of the meal increased about 110%.
• Dining Environment	1. Previous negative opinion by crew reduced by over 60%. 2. Forward EDF rated much more attractive, less noisy, and more colorful. Also, slightly less crowded.
• Food Costs	1. Averaged 86% of the basic daily food allowance.
• Worker Morale	1. Job satisfaction increased 29% in spite of much heavier workload. Job motivation increased 18%. 2. MS rated satisfaction of their customers 39% higher. 3. MS morale higher in forward EDF than in aft EDF. 4. MS comparative evaluations of their mess with other messes improved 25%.
• Foodservice Equipment	1. MS ratings of foodservice equipment improved 47%. 2. New equipment met the high production rate requirements.
• Nutrition	1. Intake of most nutrients increased; improvements most noticeable in forward EDF. 2. Vitamin A and C fortification of shakes, fries, and beverages reduced incidence of low intakes of these nutrients. 3. Cholesterol, animal fat, percent fat calories, and energy content intake compared favorably with aft EDF meals. 4. The number of meals obtained from gedunk decreased from 5% pre-test to less than 1% during the test.

TABLE 1 (CONT'D)

FOODSERVICE ELEMENT	RESULTS
• Productivity	1. Forward EDF worker productivity about 43% higher than in the conventional aft EDF. Forward galley used foodservice attendants (mess cooks) for many food preparation tasks.
• Water Usage	1. CV-60 Engineering Department attributed appreciable reduction in water usage to the new system.

involves tradeoffs, and therefore ships must decide in the light of their own priorities. Policies applied in the Saratoga did not result in the maximum reduction of waiting times.

Part of the increase in food acceptance resulted from improvements made independently by the ship's new foodservice management. There was also a clearly discernible increase after introduction of the high preference menu, unique items such as milk shakes, higher quality food products, and new equipment and preparation methods. The data established that most of the crew enthusiastically liked the new food choices.

The rewarding increase in the ship's total average daily attendance based on actual headcounts has both nutritional and morale dimensions. The forward EDF was directly responsible for this change.

The burger line had the fastest serving rate at 7 to 11 men per minute because everything offered was pre-wrapped and self-serve. As stated, the speed of the other line varied depending upon whether the hot item (e.g., hot sub sandwich) was assembled on the serving line (slower speed) or off the serving line (faster speed). The speeds of each serving line were much faster than those of commercial fast food restaurants, even when the speed was adjusted to reflect no exchange of money. In addition to the other changes made, the much higher customer throughput (sustainable at over 800 customers per hour) benefited from a 69% increase in number of seats and stand up stations forward and a faster average eating time forward.

Several other findings contributed to the improved foodservice performance. For example, the completed EDF decor package, including the innovative stand-up counters and vision screens, was an integral part of the concept, and the results were very positive. Also, the improved worker morale in the new system was particularly pleasing. Many studies of military foodservice workers have focused on the difficulty of positively changing worker attitude. The effect achieved in this system represents another demonstration that higher customer satisfaction is often correlated with higher worker job satisfaction.

The goal of providing nutritious as well as popular meals in the forward EDF was achieved, and the selective fortification had a favorable impact in reducing the incidence of low intakes of vitamin A and C. The results clearly indicate that the nutritional health of the crew is not adversely affected by the introduction of the new fast foodservice system in carriers.

When the new system is examined in terms of cost and efficiency, it is noted that food costs in the forward galley are less than the food allowance. This permits higher cost, higher preference foods to be used in the aft galley. Further, worker productivity was appreciably higher in the forward galley. Nonetheless, it must be noted that the aft EDF productivity was in itself quite good for EDF's serving full cafeteria meals. In effect, the test established that the high productivity achieved in the fast food industry can also be realized aboard carriers if the concept is right and the design effective. As a corollary, it further demonstrated that most of the galley tasks can be carried out by personnel with little or no foodservice experience, provided that appropriate management and supervision are available.

RECOMMENDATIONS

It is recommended that:

1. the fast food system concept developed and tested in this project be continued and extended to other aircraft carriers. Note: COMNAVAIRPAC has already taken the initiative and implemented a nearly identical system in the USS Ranger (CV-61).

2. the key features of *fast food* as defined in this concept be retained in future applications. These important features are:

- to serve only highly preferred items that are similar to the best commercial fast food menu choices;
- to use a multi-theme menu, but with a limited number of choices (rotational);
- to serve only finger foods;
- to use equipment and foods that enable simple food preparation methods, hence use of personnel with limited training;
- to stress high production and serving rates;
- to utilize progressive cooking to limit the time that foods are held prior to serving, but to schedule production to avoid run outs;
- to provide a colorful decor and movable stand-up counters and vision screens to enhance the dining environment and increase the number of eating stations;
- to offer different and distinctive menus on the separate serving lines to minimize the number of items on any one line (for line speed) and to offer variety in choice of type of food outlet.

3. the present dinner and supper menu be continued. This limited menu has created no variety problems and has many other advantages. As in the case of commercial fast food establishments, consistency is an important key to success, and it is recommended that no additions or deletions be made in the tested menu.

4. the current continental breakfast be augmented with selected hot fast food products similar to McDonald's *Egg McMuffin*.

5. the quality food products identified and introduced successfully in this test continue to be used and, therefore, routinely provided in the supply system. Food purchase specifications need to be rigidly adhered to in order to maintain the high standards of food quality.

6. all of the new galley and bakery foodservice equipment mentioned previously in this section continue to be used with the following exceptions:

- the electric pizza oven, while a satisfactory item, is not required for the pizza product and production methods that were adopted during the test. The pizza oven can be replaced by a double convection oven with a savings of space, weight, deck area, purchase price, and energy usage.
- in spite of reliability problems experienced under heavy production on a prolonged day-by-day basis, the conveyor broiler is recommended for continued use because of ease of operation, high production rate, and the fact that it yields a less fatty, high quality, and consistent cooked product. Improvements to this broiler have been recommended and made. Initial results are favorable. Final recommendations will be made when these tests are completed.

7. the use of the selected new non-disposable (tray, tumbler, basket) and disposable (sandwich wraps, tray and basket paper liners) service items be continued. These items have been cost-effective, well-accepted by the customer, and scullery water usage has been reduced. Further, all chosen items reflect careful attention to high packing density and storage cube minimization.

8. the use of food merchandising methods be continued, and possibly expanded, so the crew is well-informed about the menu through use of attractive menu boards and announcements on the ship's closed circuit TV and radio.

9. continued attention be given to nutrition to include well-stocked salad bars, milk shakes offered daily, and selectively fortified foods to meet needs for specific nutrients.

10. the general design of the new fast food system facilities be utilized for other carriers. Nonetheless, because of the appreciable differences in carrier layouts, it does not follow that the exact Saratoga design is optimal for all CV's, and therefore the system design for each ship should be analyzed and adapted on an individual basis. Major characteristics requiring careful attention and integration are mess deck seating capacity and layout, the number of serving lines and serving stations, serving line layouts, serving rates, production capacity, number of persons to be fed, work flow, scullery capacity, and storage.

11. additional equipment capabilities be provided for CV's having larger forward galleys. To the extent permitted by space it would be desirable to have more capacity for thawing, cooking burgers (2 broilers) and french fries (3 extruders and fryers), 2 complete milk shake operations (blender, shake machine, shake storage freezer, and serving cabinets), 2 microwave ovens, at least 2 steam jacketed kettles, and more refrigeration.

It would also be helpful to have a steamer and more oven capacity in the event it is desired to serve full service cafeteria meals forward. Nonetheless, a standard fare can be, and in fact has been, served from the present galley.

12. the fast food system forward be designed to be independent of aft facilities if feasible. Specifically, it would be most efficient if all associated bakery, vegetable preparation, food storage, supplies storage, office, and thaw spaces were located forward as close as practicable to the forward galley.

13. sufficient attendance, serving line speed, waiting time, and customer opinion information (particularly food acceptance) be collected periodically to enable management to determine trends and take prompt corrective actions where required.

14. formal training be focussed primarily on managers. Once the new equipment is installed and the new food products and recipes are available, management becomes the single most important factor in the success of a fast food galley. Just as in civilian fast food establishments, most of the food preparation is basically simple and does not require skilled cooks. Therefore, the effectiveness of this high volume facility becomes a product of effective supervision rather than culinary talents. The test has clearly shown that customer satisfaction is vitally dependent upon (1) maintaining product quality and availability through correct production techniques and (2) minimizing finished product inventories so that the properly prepared food is served *fresh*. Stated again for emphasis, continuing monitoring and maintaining of preparation standards, and careful attention to production rates so that run outs are avoided and line speed is maintained (but without incurring long holding times for the finished products) -- these are the commitments that management must make, or this system will become a very ordinary one indeed.

Formal schools and similar training emphases should be centered entirely on fast food system managers (Food Service Officer, senior MS, galley manager, watch captain) as is the case in commercial fast food companies. A formal on-the-job-training (OJT) program is adequate for the normal working staff, and OJT materials should be developed so that consistent and appropriate worker training is provided on all ships.

15. design and operating manuals be prepared to assist management in the continuing introduction and use of this type of new system in other ships.

FOOTNOTE

As this technical report goes to the printers, it is several months after the completion and evaluation of the USS Saratoga test, and a number of additional observations may be made that relate to the preceding summary. At the outset, it should be noted that the first of the foregoing recommendations has already been accepted. The Chief of Naval Operations has approved implementation of the new fast foodservice system on all aircraft carriers.

Following implementation of the new system on the USS Saratoga and Ranger, the program has moved forward with fast food installations on three additional aircraft carriers, partial *bootstrap* modifications of several others, and plans for converting all carriers by FY 1983.

At the request of the Navy Food Service Systems Office (NAVFSSO), NARADCOM has also submitted design and operational recommendations for introducing fast food in a more limited way on seven other classes of ships. Many of this project's concepts, menu ideas, service items, food products and special equipment are now in evidence throughout the fleet, and under the direction of NAVFSSO and Type Commanders, this trend is increasing.

Recommendation 6 has also been addressed. The changes in the conveyor broiler that were suggested by NARADCOM have been tested, and the equipment is performing reliably and efficiently. Its continued use is planned.

In the start up of recent new fast food installations, certain operating difficulties have been reported. This report provides information which should clarify the procedures that were found to be effective on the Saratoga. Specific areas of fast food operations that offer opportunity for near term improvement are as follows:

- The basic concept for the fast food system (see Recommendations 2 and 3) is not fully understood by all operators. Specific problem areas and recommended solutions are as follows:

a. Too much production demand is sometimes placed on one menu item (e.g., burgers) by offering only that item on both lines or by offering an extremely popular item (e.g., fried chicken) simultaneously with one having less popularity (e.g., tuna salad sub sandwich). Both of these situations places an unnecessary burden not only on certain pieces of the equipment but also on foodservice personnel. The menu adopted on the Saratoga (Appendix B) has been designed to avoid this problem, and its use is highly recommended.

b. Too many entrees are provided at one meal. Again, this places a heavy strain on galley personnel. The recommended menu is deliberately simple and offers a limited selection of highly preferred food items. This not only simplifies galley operations but also provides faster serving line speed. Variety in the recommended menu is provided by offering different items on each line, by rotation of submarine sandwiches and the supper items, and by customer selection between EDF's.

c. There is excessive experimentation with the menu. The recommended menu was arrived at only after a great deal of test and evaluation. It considers customer preference, food costs, similarity to the civilian fast food industry, compatibility with the Aft EDF menu, and suitability with the production equipment provided. This is one Navy galley where *tinkering* with the menu is unlikely to improve what is already a successful product.

d. Fast food items are often prepared too far in advance of their use. Progressive cooking is an important element in this concept in order to provide a *fresh product*. While an adequate inventory should be on hand for the initial surge of customers when the meal starts, food preparation should continue throughout the meal and inventories kept as small as possible without incurring run outs. The attention of the Galley Supervisor to food production rates is a must.

e. Appropriate food products have not always been available. It is important that the high quality products selected in the Saratoga test continue to be procured and used. These products are identified in this technical report, in Navy Foodservice (NAVSUP Pub 476), dated Apr-June 1979, and in other sources. NAVFSSO is exercising an active role in seeking to ensure the availability and quality of the basic fast food products. In a few cases, such as pizza sauce, the product can be made aboard ship if the supplied item is not of optimal quality.

• Perhaps the most significant *lesson learned* thus far is the critical importance of management. This was stated previously in Recommendation 14 and is reemphasized here. The proper training of the managers of the fast food system prior to their assuming their responsibilities cannot be stressed too much. In this connection, it has become evident that comprehensive on-station *start up* training by special training teams should be provided for entire fast food galley crews prior to the first operations of each new installation, and operating manuals should be available to assist in the continuing use of the system.

SECTION II

INTRODUCTION

ORIGINAL REQUIREMENT FOR THE PROJECT

This project was undertaken as part of the DoD Food, Research, Development, Testing and Engineering Program. The requirement for the proposed research (USN Requirement 7-1) was submitted by the U. S. Navy and given first priority in its FY 1977-78 program. As stated in the initial technical plan, the project was to:

> "Provide factual definition of the overall Navy afloat food service system with its variable components (including food items utilized, storage and handling procedures, preparation and service techniques and related equipment, scullery operations, and environmental influences of dining areas on system). Develop qualitative and quantitative alternatives to the existing system to achieve as many as practicable of the following:
>
> (1) improvements in user acceptance,
> (2) greater efficiency in the various operations conducted within the system,
> (3) reduced costs,
> (4) reduced manpower requirements, and
> (5) architectural and design concepts for improved total foodservice environment."

Of these objectives, the first -- user acceptance -- seems clearly the most important priority. The contribution to crew morale that can be attributed to a good foodservice system which meets customer needs is well recognized.[1] If anything, the restricted environment of a ship at sea probably accentuates the importance of having a system of foodservice which provides a high level of user acceptance.

Though customer acceptance leads the list of priorities, improvements in the efficiency of foodservice operations is almost -- if not equally -- important. To a certain extent, cost and manpower reductions, stated as additional objectives, can be considered measures of the extent to which the foodservice operational efficiency has been enhanced. As the current project developed, interest centered on food costs and on labor productivity as expressed in terms of meals produced per man-hour of labor and meals produced per man-dollar of labor costs as measures of system efficiency.

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1 "EM Panel Passes 12 Ideas to CNO", Navy Times, 23 October 1978.

It should be noted that the project requirement did not specify that any particular type of foodservice system was to be developed. The fact that a new concept was later developed based on fast food was, therefore, a result of the investigation, rather than a given or predetermined solution.

REVISED REQUIREMENT

The original requirement for this project was of necessity fairly general. Two decisions were subsequently made by the sponsor to focus the scope of effort.

First, it was directed that the project should be oriented toward aircraft carriers. Since these are the largest afloat units, any improvements accomplished by a new or improved system would be likely to yield more extensive benefits than if a smaller type of ship were singled out for investigation. It was further decided to focus on older carriers. These ships are smaller than those built in more recent years. Thus, any new system which worked in the smaller carriers with their more compact space, older ventilation systems, and other facilities problems would be expected to more easily transfer to newer and larger ships. If a concept were tested on a newer ship, however, the system might not be easily retrofitted into older and smaller carriers. This problem would be particularly acute to the extent that new or additional pieces of equipment were involved.

Second, the decision was made to focus this effort on improvements to foodservice operations for enlisted personnel up through petty officer first class (E-6), as opposed to chief petty officer, warrant officer, and wardroom outlets. This choice was based upon the fact that more individuals would benefit from system improvements if such changes were made to the enlisted facilities as opposed to any others.

TECHNICAL APPROACH

The approach taken in this analysis of foodservice afloat can be broken into five relatively clear-cut phases of effort. The kinds of activity and time frames in each of these phases are discussed below. Figure 2 summarizes the project schedule.

Problem Definition. The first major step in this project was to learn as much as possible about current problems in carrier foodservice. This objective was pursued through on-site interviews with Navy personnel in the varied organizations that in one way or another influence carrier foodservice operations. This included:

- short visits to eight carriers in both fleets for on-site observations and discussions with supply officers, foodservice officers, engineering department personnel and mess management specialists.

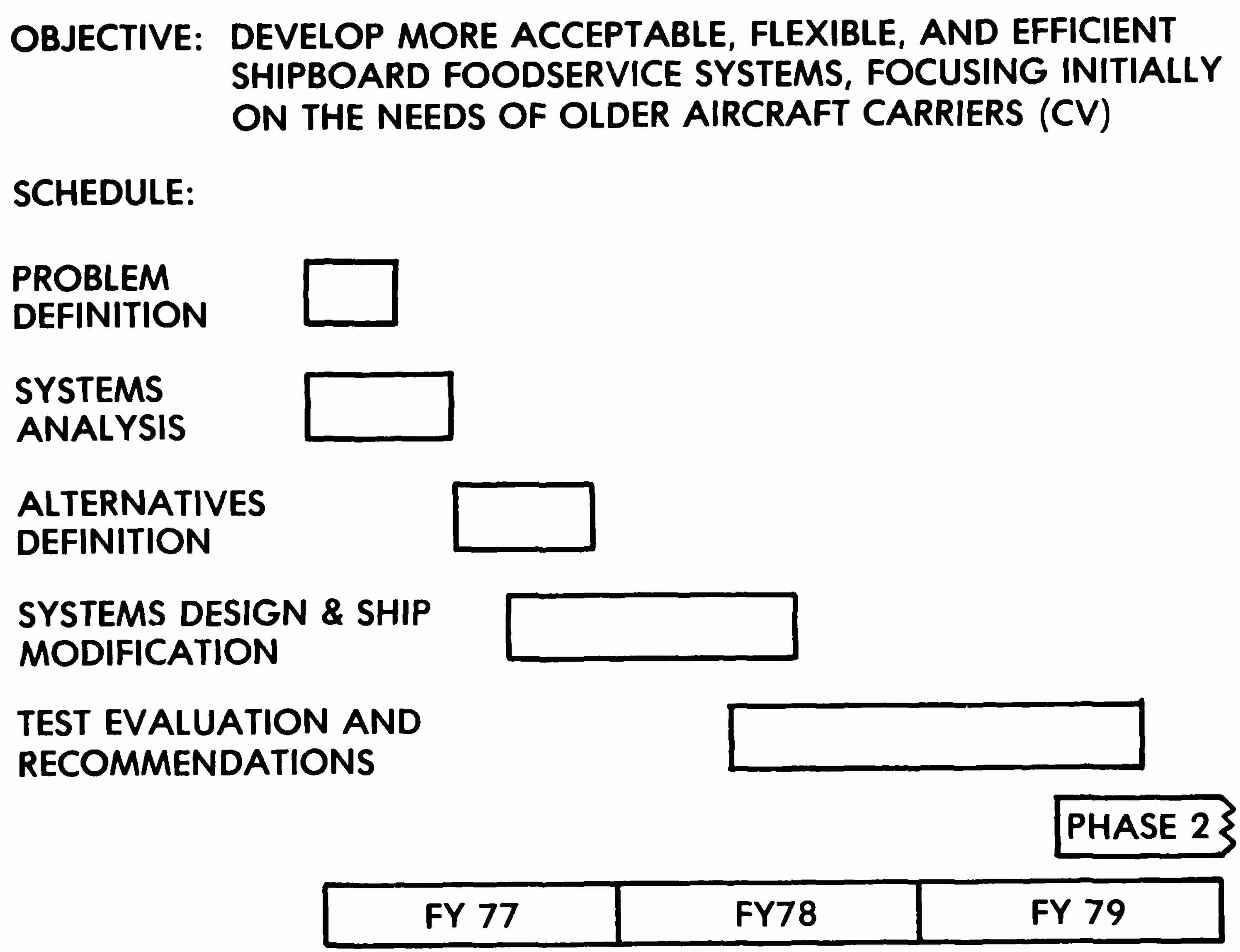

FIGURE 2. Foodservice Systems Analysis Afloat

- interactions with key personnel at NAVFSSO, COMNAVAIRLANT, COMNAVAIRPAC, the Naval Sea Systems Command (NAVSEA), and the Naval Ships Engineering Center (NAVSEC).

- a short period at sea on the USS Saratoga during a carrier qualifications cruise off the Florida coast.

The shipboard visits left the research team with two strong impressions. First, there was a surprising similarity in the observed conditions and in the opinions expressed from one carrier to another. For example, when foodservice personnel were asked what new piece of equipment should be installed, pizza ovens were endorsed on every ship. The fact that so many similarities were observed is important since the intensive systems analysis was performed on only two carriers.

Second, a strong consistency in the *philosophy* of foodservice operations was observed. Forward EDF's were usually found to be converted into *speed lines* with the menu typically consisting of such items as soup, hot dogs, and canned ravioli. Usually only one of the two forward serving lines were operated throughout an entire meal period. Aft galleys invariably provided a full service cafeteria meal.

The problem definition phase was essentially completed in a meeting with the National Research Council's Committee on Food Service Systems held during January 1977. At that time, the Committee members, nationally recognized experts in foodservice, observed operations aboard the USS Coral Sea. From this direct contact, as well as from information supplied by NARADCOM project members, the Committee offered a number of general recommendations relevant to the analysis and improvement of afloat foodservice.[2]

SYSTEMS ANALYSIS

During systems analysis, more detailed data were collected on problems identified in the earlier phase. As carrier operating schedules were analyzed and project milestones were checked with NAVFSSO and type commander personnel, the number of carriers considered as candidates for a test of a prototype system was narrowed to two Atlantic Fleet ships, the USS Saratoga (CV-60) and the USS John F. Kennedy (CV-67). The more than 20 types of information that were collected on one or both ships during the systems analysis effort are listed in Table 2 and briefly discussed below.

It is worth stressing that at the time the data were being collected, there was no clear consensus on what improvements or renovations would accomplish such diverse objectives as faster customer service, improved food quality, fewer equipment breakdowns, and other problems brought up in the fleet interviews.

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[2] L. H. Kotschevar, ed., "Advisory Board on Military Personnel Supplies, Report No. 80", National Academy of Sciences, 1977.

Methods used to gather and summarize the information indicated in Table 2 will be briefly described in the chapters where the results are presented. It seems sufficient at this point to note that the analytical effort was extensive. In addition to the data that is routinely available from foodservice records, information was also obtained through several types of surveys and interviews. Further, direct observation methods were utilized to analyze many important foodservice system parameters, such as serving line rates and waiting times.

ALTERNATIVES DEFINED

As data were being accumulated from the USS Saratoga and USS John F. Kennedy, problem areas were being defined, and ideas for improving food-service operations were beginning to emerge. Trade publications and shows, conversations with food and equipment manufacturers, and discussions with experts in the Navy as well as other governmental organizations proved to be helpful in this search for new approaches.

A few of the alternatives actively considered for improving afloat foodservice are summarized below to give some idea of the scope of the investigation.

1. Emphasis on greater menu acceptability by stressing high preference items plus ethnic meals and newly-developed, non-standard recipes.
2. Maximization of ship endurance for wartime readiness by planning major use of *ration dense* food products to save storage cubic footage.
3. Modification of serving lines and serving procedures to significantly increase customer serving rates.
4. Modification of physical features of forward and aft bakeries and redefinition of types of items to be produced in each bakery for more effective overall production.
5. Development of small satellite food serving spaces in other parts of the ship such as the 03 level and adjacent to the hangar bays.

Since the focus of this report is on the fast food system that was selected for the test aboard the USS Saratoga, the above alternatives will not be discussed further.

SYSTEMS DESIGN AND SHIP MODIFICATION

The starting point for this phase can be identified as the decision to work on the USS Saratoga in a shipboard test of proposed foodservice improvements. The most important factor in selecting the Saratoga was the

TABLE 2

Data Collected in the Systems Analysis of Afloat Foodservice

Operations	Personnel	Food	Facilities	Customers
Meal Headcounts	Satffing Level	Menu	Storage Capacity	Crew Surveys
Waiting Times	Work Measurement	Quantities Issued to Galley	Equipment Usage	Department Head and Leading Chief Interviews
Service Times	Worker Attitudes	Load List	Dining Area Seating Capacities	Crew Interviews
Eating Times		Food Preference	Dining Environment Surveys	Nutrition Surveys
Arrival Rate		Food Acceptance Evaluations		
Service Rate		Food Costs		

fact that this ship's schedule was such that if everything worked according to plan, the required renovations could be worked into the Shipyard Restricted Availability (SRA) period. Other factors favoring the Saratoga as a test site were its age, size, need for foodservice renovation, and the enthusiastic support for the project by the ship's Commanding Officer, Supply Officer, and Food Service Officer.

On advice from COMNAVAIRLANT and other personnel involved in planning the SRA work package, a decision was made to restrict any test of an improved system to one EDF. Since earlier observations had shown that forward EDF's on many carriers were underutilized in terms of equipment usage and number of meals served, it was decided to focus the test on renovations in the Saratoga's forward EDF.

Once the decision was made that a fast foodservice system forward was the best solution to achieve significant improvements in aircraft carrier foodservice, an intensive design effort was initiated. By mid-August 1977, a rough plan view for a new forward EDF was presented by the project team to representatives of the Norfolk Naval Shipyard. The shipyard agreed to assist on a *best efforts* basis and subsequently supervised the conduct of shipchecks and preparation of engineering drawings by a contractor. This work was completed on a tight deadline following definition of all major portions of the new concept by NARADCOM in September 1977. Concurrently, SUPSHIPS JAX also agreed to undertake the hardware portion of the project on a *best efforts* basis. The last of the required shipchecks and engineering drawings were submitted to SUPSHIPS JAX in December 1977. This documentation included not only the forward EDF but also renovations required in the forward dining area, forward bakery and aft bakery as well. Coordination with NAVSEA was also instrumental in obtaining the necessary approval by a 1 November target date.

All renovations were completed by contract effort within the SRA period, which extended from January through May 1978. The accomplishment of this effort is especially noteworthy in view of its *last minute* incorporation into an already intensive SRA workload.

Altogether the project progressed from the definition of a new foodservice system concept in September 1977 through preparation of engineering drawings, approval of five Navy Commands, awarding of design and ship conversion contracts, extensive shipboard modification of four spaces, and approval of procurement for previously unauthorized food, equipment and service items, to a complete, ready-to-operate, Navy acceptable new system in May 1978.

TEST EVALUATION AND RECOMMENDATIONS

Upon completion of the facilities renovations at the end of May 1978, the evaluative phase of the project was started. Through September, the USS Saratoga conducted a series of short underway periods in preparation for deployment in October. Each of the at sea periods lasted roughly two weeks. During the refresher training, NARADCOM personnel were onboard for the purpose of training and assistance in starting the fast food operation. The emphasis switched from training to data collection on the type training (TYT 1 and TYT 2) exercises in the Caribbean area.

The types of data collected to evaluate the results of the fast food prototype system replicated the data collected during the systems analysis phase. The methods used in gathering the information and the individuals participating in the various data collection activities remained essentially the same in the *before* (1977) and the *after* (1978) evaluation periods.

In developing recommendations based on experience in the Saratoga and in considering the proliferation of fast food systems to other carriers, greatest emphasis has been given to the new foodservice concept menu, food items, equipment, procedures, and other factors that account for the favorable improvements observed in comparison of the *old* with the *new* system. However, the recommendations included in this report are based not only on those aspects of the system that worked as expected but also upon the few operations or equipment that did not yield anticipated results. Staffing levels, management policies, and other issues have also been reconsidered in light of the prototype system operation.

PROGRAM CONSTRAINTS

In order to carry out this project, certain constraints were accepted, some self-imposed and others determined by forces external to the research team's control. Brief mention of these factors will assist in understanding some of the choices made in designing and evaluating the USS Saratoga's prototype fast food system.

One of the most significant program constraints was limited funding for ship modifications of the scope determined to be required. DoD Food Program project funding at NARADCOM was sufficient for just over 50% of the funds required for facilities conversion and equipment costs. Therefore, additional financial resources had to be provided if planned renovations were to become a reality. Following discussions with the supply and material departments at COMNAVAIRLANT, type commander funds were made available to supplement those provided by NARADCOM. The USS Saratoga also assisted in various ways, such as by allocating ship's force labor to the accomplishment of certain tasks and by using OPTAR funding to purchase required service products such as the new paper products and non-disposable dinnerware.

The need to accomplish modifications during the Saratoga's SRA period in fiscal year 1978 was another major constraint. To delay beyond the FY 78 date would result in an unacceptable extension of the target date for recommended improvements. As a result, the necessary analysis, concept development, systems engineering, and shipboard modifications had to be completed in an unusually short time span, and this directly or indirectly impacted on a number of issues and decisions.

A rather large number of approvals were needed for shipboard alterations and purchase of non-standard equipment, food and other supplies. The fact that the prototype system was completed in the planned time frame demonstrates that all involved cooperated by carrying out their reviews promptly. The organizations involved were NAVSEA, NAVSEC, SUPSHIPS JAX, Norfolk Naval Shipyard and NAVFSSO, in addition to the USS Saratoga and COMNAVAIRLANT. It should be noted in closing that the reviewers did make comments and that changes were made in accordance with several of their suggestions.

SECTION III

EVALUATION OF AIRCRAFT CARRIER FOODSERVICE

The principal purpose of this section is to describe the salient characteristics of carrier foodservice that were found to exist during the systems analysis. The discussion will draw most heavily on data collected aboard the USS Saratoga during type training exercises and a Mediterranean deployment in 1977. Similar data were collected in 1977 aboard the USS John F. Kennedy, also during a Mediterranean deployment period. Based on observations on other carriers, the assumption has been made that these two ships are fair representations of all carriers in terms of the basic elements of a foodservice system (e.g., numbers of galleys, operating hours, menus, and staffing levels).

OPERATIONAL ENVIRONMENT

In several respects aircraft carriers present very different circumstances from those found on other Navy ships and certainly from those existent in shore installations. One Supply Officer aboard carriers had this to say about his ship's situation:

> "While we're out here on deployment, we are America's first line of defense. We'll be the first to give it -- or get it."

This perception -- and its underlying reality -- perhaps best accounts for the long working hours and what appears to be continual activity aboard carriers. Although it is difficult to show an exact cause-effect relationship the emphasis on front line combat readiness may be one of the important determinants on such foodservice policies as operating hours.

Assuming that readers of this report have some knowledge of afloat foodservice operations, there is no need for a detailed description of such features as resupply at sea or the fact that carriers typically operate as many as seven food outlets for officers, chief petty officers, and crew members. There are, however, four features of foodservice on aircraft carriers that merit more detailed discussion. These elements are galley operating hours, menus, mess deck seating capacities, and food storage capacities.

<u>Crew Galley Operating Hours</u>. Carriers generally operate two galleys for crew feeding (E-6 and below) when at sea with the airwing embarked. The USS Saratoga's operating hours for these two galleys during the 1977 Mediterranean deployment were as follows:

	Forward Galley	Aft Galley
Breakfast	0600-1030	0430-0800
Dinner	1230-1630	1030-1400
Supper	1730-2100	1630-2000
Mid-Rats	Closed	2300-0200

As the above hours indicate, foodservice operations on the USS Saratoga were very nearly continuous. Crew members could obtain a meal at any time except between 0200-0400 and 2100-2300. Thus, one or both galleys were open for service 20 of the 24 possible hours. Since the primary purpose at this point is description rather than evaluation, the wisdom or necessity of a *continuous operations* policy will not be commented upon. It might be noted, however, that counts of customers arriving at various times during meal hours show several periods when few if any customers avail themselves of the opportunity to eat. It was not uncommon to find one or more serving lines being shut down one-half to one hour before the scheduled closing of the meal period.

Menus. On the USS Saratoga, as well as on the USS John F. Kennedy, the aft galley offered an *A-ration* or full-service type of meal. The forward galleys on both ships were devoted to what was called a *speed line menu*. The SARA Sandwich Shop, as the USS Saratoga's forward galley was named, primarily offered soups and sandwiches. The 28-day menu for this facility is provided in Appendix A.

Since a later chapter will present customer evaluations of the menus, it is only necessary at this point to summarize a few observations. First, as shown in Table 3, the SARA Sandwich Shop menu did not provide a great deal of variety, and it featured items that were easy to prepare. The same menu items appeared at both noon and evening meals. The soup offerings in nearly one-half of the menu cycle were restricted to three recipes: chicken noodle, vegetable, and knickerbocker. Sloppy Joe or barbeque sandwiches appeared 6 times on the 28-day cyclical menu. Turkey, chicken, or tuna salad sandwiches appeared 5 times. Of all items, the most frequently offered was pork and beans -- 10 of the 28 menu days.

A second point is that *speed line* was something of a misnomer. The menu items tended to be easy (hence speedy) to prepare in the galley, but serving line speed was found to be only slightly higher than that attained at the aft serving lines.

In addition to the variety and speed issues, the SARA Sandwich Shop menu appeared to pose potential difficulties from a nutritional standpoint. A salad of any kind appeared only 7 times, and in 6 of 7 appearances the salad was a macaroni item. The menu did not call for and the data collectors did not observe salads featuring lettuce, tomatoes, cheese, or similar items.

TABLE 3

A Summary of the 1977 SARA Sandwich Shop Menu

Type of Item	Frequency of Appearance (in 28-Day Cycle)
SOUPS	
Vegetable	6
Chicken Noodle	4
Knickerbocker	3
Chowder	2
Onion	2
SANDWICHES	
Sloppy Joes or Barbeque	6
Turkey, Chicken or Tuna Salad	5
Bacon/Ham or Cheese (cold or grilled)	5
Frankfurts	2
SALADS	
Macaroni	6
Potato	1
OTHER	
Pork and Beans	10
Chili con Carne	3
Ravioli	2

Though the foregoing discussion presents only one menu, it was representative of the *speed line* concept as seen on the USS John F. Kennedy and other carriers. The uniformity in this forward speed service concept can also be inferred from such indications as the distribution of diners being roughly 70% eating aft and 30% eating forward on several carriers.

Mess Deck Seating Capacities. Prior to renovations on the USS Saratoga, the seating capacities on the forward and aft mess decks were as indicated below. For comparison purposes, the USS Eisenhower's planned seating capacities are also indicated.

Number of Seats

	CV-60		CV-69	
	N	%	N	%
Aft Mess Decks	186	66	646*	68
Forward Mess Decks	96	34	300	32
TOTAL	282	100%	946	100%

*Assumes 90 E-6 seats are Aft

When the average number of eligible diners or the actual number of meals served are considered, it is easy to see that seating capacity is severely limited aboard carriers, particularly the older ones. In the specific instance of the USS Saratoga, the number of eligible diners at any given meal was approximately 3,800 individuals. Headcount data in 1977 indicated that roughly 77% of the eligible diners actually attended a given meal. Thus the 282 seats had to accommodate nearly 3,000 men per meal. If diners would spread themselves evenly over a 4-hour meal period, each seat could be occupied for as long as 30 minutes with no problem of congestion. This of course assumes that 66% eat aft and 34% eat forward in consonance with the distribution of available seating.

But the *real world* was quite different. Most diners arrived at certain key intervals during meal periods, between 1030 to 1200 during the dinner meal period, for example. Most of the 3,000 diners thus wished to be accommodated during a 90-minute interval. A back-up occurred because 282 seats could not handle 10 turnovers in 90 minutes. Customers took, on an average, more than 9 minutes to eat their meal. In the trade-off between increased seating or reduced seat occupancy time, the new concept was designed to increase seating capacity.

Generally dining areas were greatly underutilized. On the USS Saratoga, as well as on the USS John F. Kennedy, one entire forward mess deck compartment of the three or four available was usually bare. As will be shown in a later chapter, the new system design was able to effect a significant increase in seating capacity on the USS Saratoga's forward dining area to meet the increased customer demand in that EDF.

Food Storage Capabilities. A final point of emphasis in describing the shipboard foodservice environment is the restricted amount of available storage space. The freezer space in the USS Saratoga permits about a 30 day endurance of frozen foods. Dry storage is sufficient for longer intervals between replenishments, while chill storage space is the most limited: 17 days. Though the cubic footages differ between carriers, it seems generally true that chill space is the most severe constraint, followed closely by frozen storage limitations. It was apparent early in the project that any concept that depended on larger quantities of frozen or chilled food items would not, in fact, represent a feasible solution.

In order to serve the planned menu items in their intended sequence, storerooms must be stocked appropriately. Since this is often not practicable, the food actually offered on the serving line is sometimes there because it was the only product accessible in fully stocked storage spaces. This problem would obviously be eased somewhat by simpler menus which, it will be shown, are possible in the new fast food concept.

CUSTOMER OPINIONS

Customer opinions and evaluations are the subject of a subsequent chapter; thus, the following comments are limited to a brief overview.

Evaluations of the major *quality of life* factors aboard carriers are presented for two carriers in Figure 3. The most significant finding as far as the current project is concerned lies in the fact that foodservice on each was evaluated favorably by only 3 to 5 percent of the crew. The indication that foodservice operations on other types of ships or at shore establishments is more satisfactory can be seen from the finding shown in Figure 3 that Navy food, in general, is evaluated more positively.

It was interesting to see that crew members evaluated job and pay factors rather favorably on both carriers. At least as far as pay is concerned, the positive reaction is to be expected since military pay is generally considered competitive with civilian scales for many of the kinds of jobs performed on carriers by personnel at low to mid-level enlisted rates. Crew members' favorable evaluations of their jobs were also anticipated to some extent. Members of the research team seldom heard crew members complain that their jobs were boring, meaningless, or impossible to accomplish.

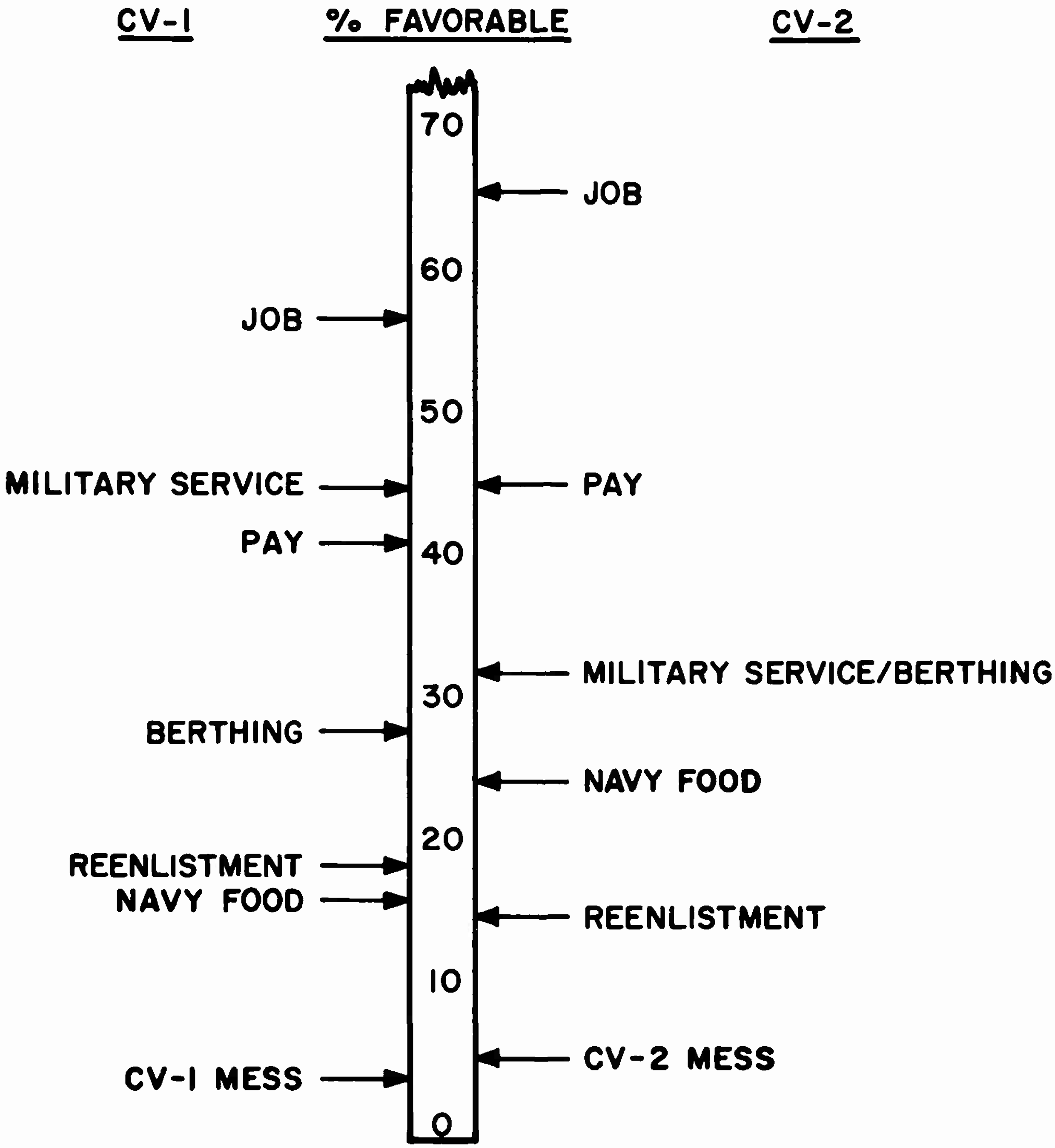

FIGURE 3. Crew Evaluation of Quality of Life Factors

Interviews and survey sessions are sometimes seen as primarily *gripe sessions* with the implication that the expressed complaints are not really as serious as they seem from the crews' comments. The fact that the present results show expected reactions in the case of several factors such as job, pay, and re-enlistment strongly suggests that individuals who responded to the surveys were attempting to be objective.

Figure 4 summarizes results obtained from several questions in which customers were asked to evaluate specific potential problems of the foodservice system on their ship. Ninety-five and 97% of the crew surveyed on each ship reported that waiting in line was a major problem in foodservice. Percentages of customers who criticized food quality and variety are also very consistent from one ship to the other. The finding that *no milk* and *no salads* was an important problem reflects the fact that carriers cannot store sufficient quantities of fresh vegetables and dairy products to last much more than ten days while underway. Exercises that require at least two weeks of constant operations are fairly frequent occurrences in carrier schedules. Customer criticism of the mess deck environment is, on both ships, nearly as pervasive as food-related problems. On both ships, the mess decks were noisy, and traffic flows were not well organized.

The similarity in survey results just presented is particularly interesting since the two ships are rather different. The Saratoga is older and smaller than the Kennedy. The Saratoga results were obtained during a more hectic type training environment than were the Kennedy's evaluations when deployed. Yet the state of foodservice was remarkably similar.

OPERATIONS

While customer opinions are relevant criteria in evaluating foodservice operations, other indices are available and complementary. These include number of meals served (headcount), number of customers moved through the serving line per minute or hour, and the time spent at the table consuming a meal. Two purposes were served by collecting time and rate data: first, to assist in planning a new system; and second, to assess the impact of the new system once installed. Later sections will go into greater detail in both areas. The intent at this point is to present indices of foodservice operations as they pertained to the USS Saratoga before the new system was introduced and as they might currently apply on carriers that have continued the *speed line* concept.

Headcounts. Average headcounts, by meal and galley during at sea operations, are summarized in Table 4. With an average onboard strength of 3,842 E-1 through E-6 personnel, 11,526 meals could be served daily if each man eats 3 alloted meals. On any given day, the number of meals actually served averaged 8,900 from both galleys over all meal hours. Thus, 77% of the meals allowed were actually consumed. On average, twenty-three percent of the meals are being missed, either intentionally or unintentionally, each day.

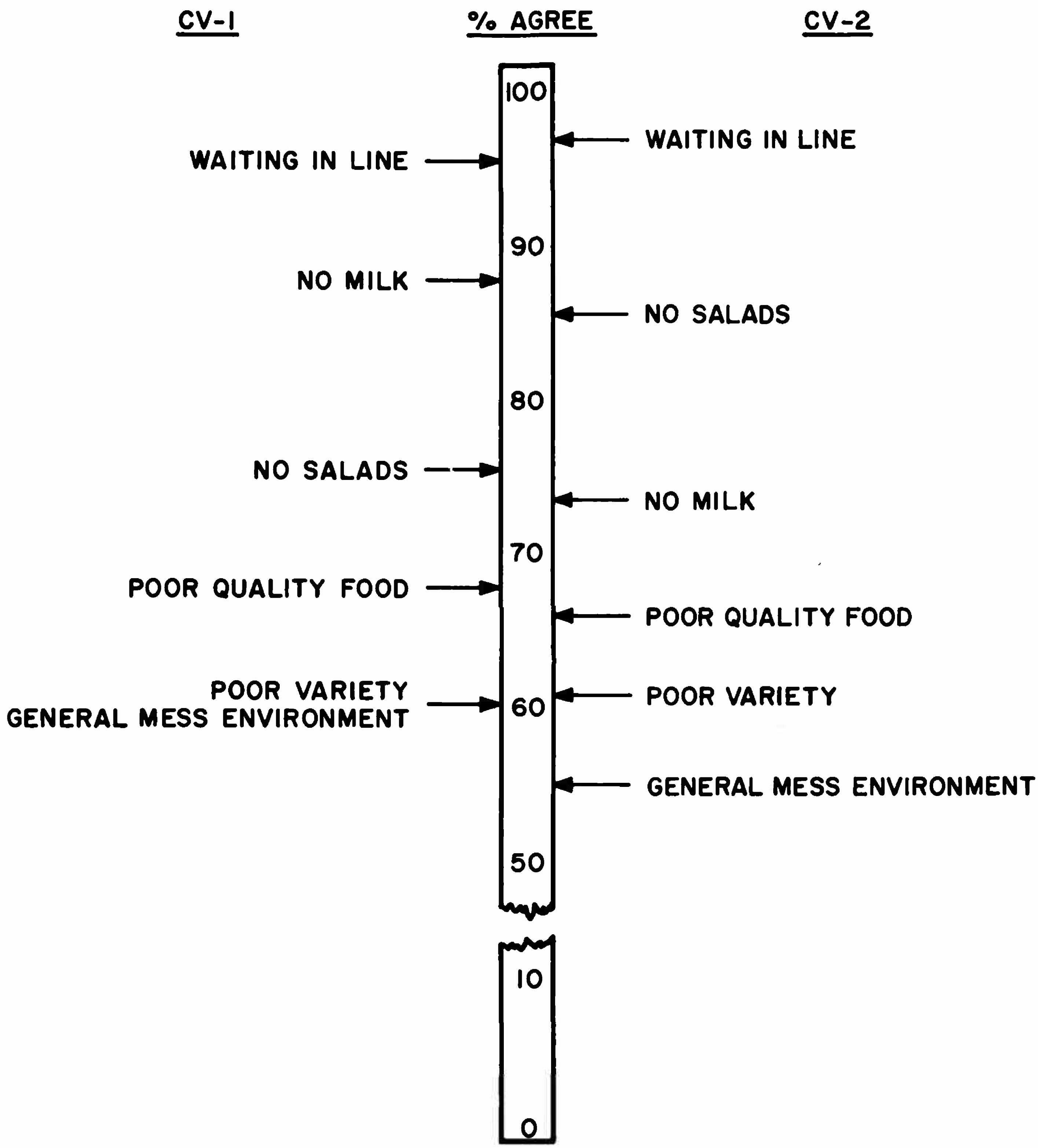

FIGURE 4. Problems in Foodservice from Customer Opinion Survey

TABLE 4

Representative Headcounts On CV-60 During 1977 Deployment

	Average Headcount	Percent of Eligible Population	Percent of Meals Served
FORWARD GALLEY			
Breakfast	600	5	6
Dinner	800	7	9
Supper	775	7	9
MidRats	N/A	N/A	N/A
FORWARD DAILY AVERAGE	2175	19%	24%
AFT GALLEY			
Breakfast	1650	14	19
Dinner	2100	18	24
Supper	2000	17	22
MidRats	975	9	11
AFT DAILY AVERAGE	6725	58%	76%
DAILY AVERAGES (TOTAL)	8900	77%	100%
TOTAL MEALS AUTHORIZED (PER DAY)	11,526		

The headcounts summarized in Table 4 are perhaps of greatest value in understanding why long waiting times on carriers had become so significant a problem. Since only 24% of the meals were served out of the forward facility, the aft galley was taxed to furnish the remaining 76%. Considering just the noon and evening meals, the data presented show that over twice as many meals were served from the aft as compared to the forward facility.

The uneven distribution of meals served from the aft as opposed to the forward galley shows roughly the same proportions on other carriers. The three to one ratio (75% to 25%) was also observed on the USS John F. Kennedy and on the USS America.[3] It seemed clear from this data that proposed foodservice improvements should undertake, as a design objective, to redistribute the customer loads to a more balanced state.

Waiting Time in Meal Lines. Long lines for meals have been a very visible problem on aircraft carriers. Delays reached 30 minutes or more during the first several meals at sea after an extended port period. Scheduled General Quarters or other drills also disrupted some meals and caused long waits to occur. But there is a less dramatic and more persistent waiting time problem that appears during certain hours under normal circumstances.

Results of observed waiting times during peak meal periods (1030-1330 and 1630-1800) are summarized in Figure 5. Customers choosing to eat in the forward facility generally waited less than five minutes in line. But since so few diners made that choice, the finding that their wait was minimal is not an encouraging sign. The majority of customers chose to eat in the aft EDF, even at the risk of a lengthly delay in line. Results show that only 21% found *acceptable* waiting times, if, as in garrison situations, carrier consumers tend to draw the line at approximately five minutes.[4]

Long waiting times have an effect beyond the potential loss of productive man-hours and the obvious customer dissatisfaction created by *excessive* delays. Those problems are associated with customers who elect to wait. But when lines are long, some individuals chose not to wait, either skipping the meal entirely or going instead to the *gedunk* stand.

Serving Line Rates. Another important indicator of foodservice system performance is the rate at which customers can progress through the serving line. In the present inquiry, plans for collecting serving rate data were guided by one objective: to establish the baseline against which performance of a new system could be compared with the old.

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[3]From data furnished by NAVFSSO observers on the USS America when it was deployed during the Vietnam conflict.

[4]H. L. Jacobs and H. L. Meiselman, "Customer Morale and Behavioral Effectiveness", In Technical Report 76-42-OTD, US Army Natick Research and Development Command, Natick, MA, March 1976.

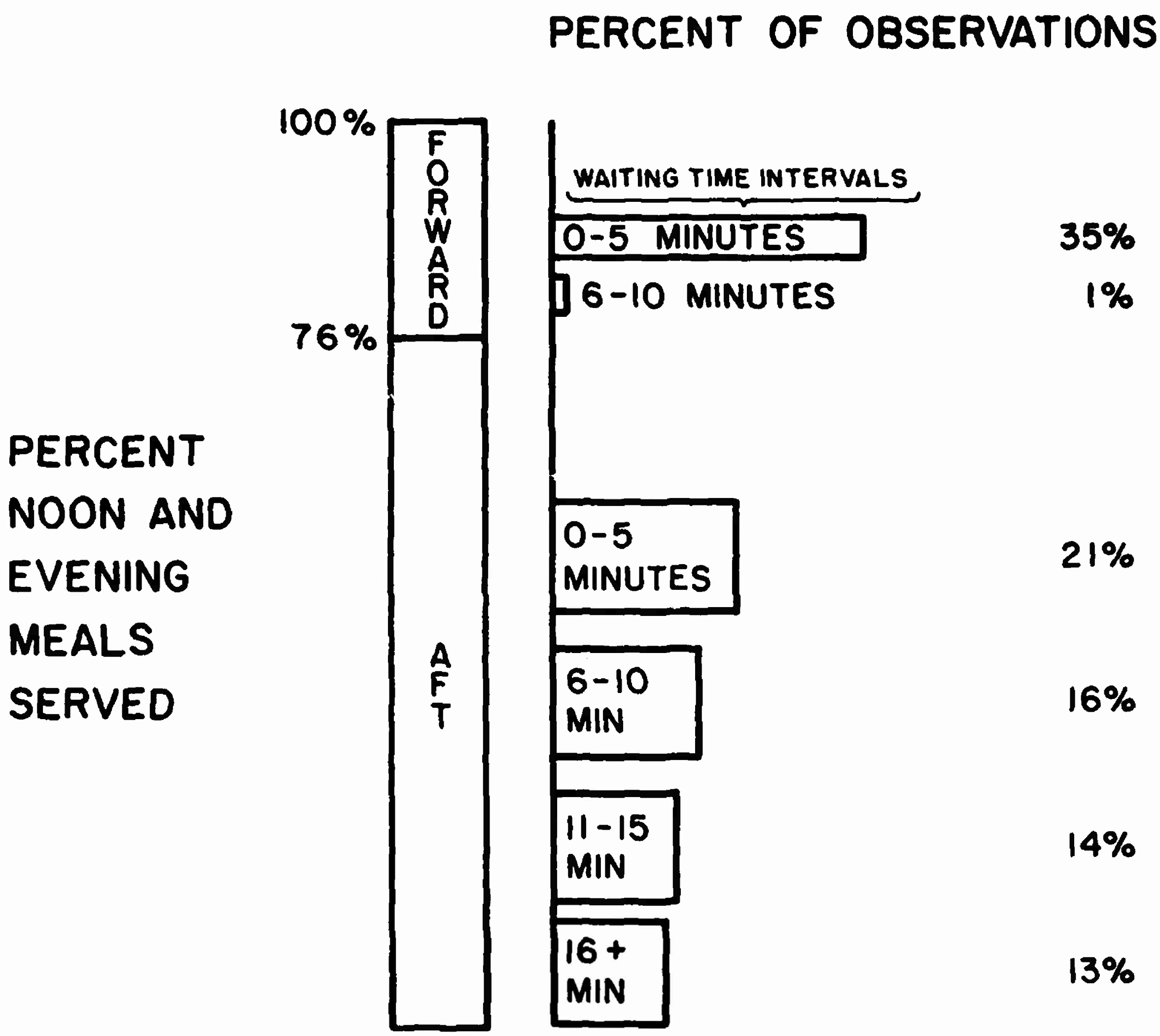

FIGURE 5. Waiting Time in Meal Lines on the USS Saratoga Before Introduction of the New Foodservice System

As the objective of the SARA Sandwich Shop was to provide rapid service, the results presented below suggest that the desired effect was achieved.

Facility	Serving Rate (Customers/min.) Noon	Evening
Forward Galley	5.7	Insufficient Data
Aft Galley	5.1	4.7

The observations were made during a March 1977 type training exercise. At various one-minute intervals when a waiting line existed and when there were no runouts, diners were counted as they left the serving line. Thus the serving line rate in this case is the average number of meals served per minute.

The finding that forward serving line rates were faster than in the old system was expected given the objectives of the SARA Sandwich Shop and the previously noted sparse headcounts. It is worth noting also at this point that the customer had fewer food choices on the serving line in the forward as compared to the aft facility. In general, the SARA Sandwich Shop presented 5 or 6 choices to the diner: soup, one or two types of sandwiches, a starch such as pork and beans, and rarely a salad. The cool beverage dispenser was the diner's last decision point in the SARA Sandwich Shop serving line. In the aft facility, the number of choice points varied from at least one to sometimes two additional stops. As many as 12 decision points were observed on a USS J. F. Kennedy serving line.

Thus, there is some evidence that the flow rate through the line is roughly proportional to the number of choices. The data indicated that the more choices presented, the slower the serving line speed.

The faster rates for the noon as opposed to the evening meal may be a reflection of the fact that approximately 70% of the crew are on daytime work shifts. Thus, there may be more pressure to eat quickly at lunch than there is at the evening meal.

Eating Times. Time taken by customers eating their meals is a critical variable in defining the upper limit of a foodservice system's throughput.* Whether or not seating capacity is sufficient to accommodate flow through the serving lines depends in large part upon how long each seat is occupied. Thus, measured eating time was an important piece of information obtained in data collection visits aboard the USS Saratoga.

*Throughput as used in this report is defined as the number of diners who can obtain and eat their meal with minimum forced delay (e.g., waiting for a place to sit down to eat their meal).

Results are as follows with respect to average eating times.**

	Noon	Evening
Forward Mess Decks	14 min.	11 min.
Aft Mess Decks	16 min.	16 min.

Equipment and Facilities. Results below summarize equipment usage information collected during the pre-test type training exercise in March 1977. The results are expressed as a percentage of the time during a composite 24-hour period that equipment items were in use. A piece of equipment could be considered in use even if it was not being employed in its intended role. Deck ovens, for example, were sometimes observed being used to hold food at serving temperature several hours before the meal period.

The percentage of observations in the *being used* (or cleaned) categories are as follows:

	Forward	Aft
Galley	35%	51%
Bakery	10%	53%
Scullery	38%	73%

Since the menus served in the SARA Sandwich Shop were not the A-Ration fare intended when the galley was originally designed, it is not surprising that the equipment usage rates in the forward galley are much lower than those observed in the aft facility.

Some of the items which were not nearly being used to capacity in the forward galley were:

- 3 deep-fat fryers
- 3 of 12 deck ovens
- 2 three-foot grills on serving line
- 4 other grills
- 1 steam jacketed kettle

**The time spent at beverage and/or salad bars is included in the above average eating times. Forward noon average is based on 18 diners. The three remaining averages are based on 60 or more observations. Results have been rounded to the nearest whole minute.

A special note might be added concerning the use of steam jacketed kettles. Although the observers found them generally in use, this included times when water was being heated to clean the mess decks, as well as times when they were used to prepare menu items, such as pork and beans or non-carbonated beverages.

The finding that forward bakery equipment items were idle in 90% of the observations reflects the use of that facility solely for doughnut production. Of all equipment in the forward bakery, the only pieces utilized were a doughnut machine, vertical mixer, scales, and a 60 gallon steam jacketed kettle. The forward bakery was often secured except for the 4 hours at night when doughnuts were produced.

The extent to which equipment and space were underutilized forward was a somewhat surprising result. During interviews in the early phase of the study, a point of continuing emphasis was that space on carriers was at a premium. Given the underutilization of the forward EDF, more intensive use of this space became a design objective for a new foodservice concept.

PERSONNEL

In this section, attention is directed to one of the most vital components of a foodservice system, those who perform the work. Although the original requirement initiating this project listed reduction in manpower as a desirable outcome, data presented in this section will show why this objective was modified to one involving better utilization of existing personnel resources. Work *sampling observations* were conducted in all food preparation spaces during the *before* and *after* data collection efforts. Only the results of data taken in the forward galley and dining area will be discussed in this section. Over approximately 5 days of at sea operations, work measurement observations were made at 10 minute intervals in two-hour blocks.

Mess Management Specialists in Forward Galley. Results of work sampling data are presented in Table 5 as they pertain to the work accomplished by MS personnel in the forward galley. Activities which are clearly productive in nature such as food preparation, serving, cleaning, and walking loaded accounted for 69% and 54% of the activities observed in the day and night shifts, respectively. When compared with similar data from civilian cafeteria operations,[5] the USS Saratoga's results fall in the higher end of the productivity spectrum. Thus, more intensive use of MS labor did not seem to be a necessary design objective to improve foodservice in the forward EDF. Although there was an imbalance in the workload between day and night shifts, this problem could be and was in fact resolved by a simple rescheduling of working hours.

[5] J. A. Mixon, "Labor Productivity in Selected Civilian Cafeterias", In Technical Report Contract No. DAAG 17-76-C-0036; US Army Natick Research and Development Command, Natick, MA, April 1977.

TABLE 5

Numbers of MS and Types of Activities Observed During Work Sampling on CV-60's 1977 Mediterranean Cruise - Forward Galley

	Food Preparation, Serving, Cleaning, Walking Loaded	Walking Unloaded	Talking	Idle
Day Shift*				
TOTAL	69%	13%	7%	11% (100%)
Night Shift				
TOTAL	54%	15%	13%	18% (100%)

*The shifts changed at 0630 and 1830.

Mess Cooks in the Forward Galley. In this case, the first question of interest was whether the number of workers assigned to the galley corresponded to the number of workers usually present. As shown in Table 6, 4 mess cooks were generally observed on station during meal hours. During *off-meal* hours, there were fewer mess cooks in the galley. Since recordings were not made on each individual by name, there is no way to determine precisely why this decrease occurred. Mess cooks assigned to the galley may have worked somewhere else after the meal hours -- or they may have taken an extended coffee break. Further, S-2M Division records indicate 6 mess cooks were assigned to the forward galley. It did not appear that the six assigned personnel were generally at their assigned work stations.

The work sampling data also indicates that mess cooks in the forward galley were less often engaged in productive activities than were the MS personnel working with them. During the day shift, 56% of the activities observed were clearly productive while the night shift results show 36% in the comparable categories. Activities which are partially, if not entirely, nonproductive in nature accounted for 44% of the day shift observations and 64% of the night shift activities.

Mess Cooks in the Forward Mess Decks. Perhaps the most salient feature of the work sampling results in the mess decks (Table 7) concerns the high proportion of activities in three categories: walking unloaded, talking, and idle. These activities comprised 76% of observations during the day shift and 54% of recordings made during the night shift. While these activities were considered relatively nonproductive in presenting results for galley personnel, a different judgment can be supported in the case of mess deck duties. Since the mess cooks' responsibility during meal hours is primarily to clean tables, a certain amount of idle time cannot be avoided.

The results summarized in Table 7 led the research team to the conclusion that more efficient use could be made of the man-hours available from mess cook personnel. Particularly with 41% of the day shift labor taken up in the *idle* activity category, there appeared to be man-hours available for augmenting the galley workforce in a new foodservice system concept. This conclusion is valid if mess cooks were performing their job properly.

Worker Attitudes. On a widely used measure of job satisfaction, MS personnel were asked to evaluate three factors: work itself, supervision, and co-workers. Results from these surveys showed that Mess Management Specialists were less satisfied with their jobs than is normally the case in military foodservice. Compared with a representative sample from the Air Force[6], USS Saratoga's MS results were 25% lower on the work scale, 39% lower on the supervision scale, and 32% lower on the co-worker scale.

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[6] An unpublished report shows that this was the only normative data of this sort available with respect to military foodservice.

TABLE 6

Numbers of Mess Cooks and Types of Activities Observed During Work

Sampling on CV-60's 1977 Mediterranean Cruise - Forward Galley

		Average Number of Mess Cooks Observed	Food Preparation, Serving, Cleaning, Walking Loaded	Walking Unloaded	Talking	Idle
Day Shift	Meal Hrs	4	44%	7%	5%	22%
	Other	3	12%	5%	2%	3%
	TOTAL		56%	12%	7%	25% (100%)
Night Shift	Meal Hrs	4	16%	6%	3%	23%
	Other	2	20%	9%	7%	16%
	TOTAL		36%	15%	10%	39% (100%)

TABLE 7

Numbers of Mess Cooks and Types of Activities Observed During Work

Sampling on CV-60's 1977 Mediterranean Cruise - Forward Mess Deck

		Food Preparation, Cleaning, Walking Loaded	Walking Unloaded	Talking	Idle
Day Shift	Meal Hrs	19%	12%	15%	28%
	Other	5%	3%	5%	13%
	TOTAL	24%	15%	20%	41%
Night Shift	Meal Hrs	5%	3%	4%	10%
	Other	41%	11%	7%	19%
	TOTAL	46%	14%	11%	29%

It is important to point out that these results were obtained before the new Supply Officer, Food Service Officer, and Senior MS personnel took charge. On a repeat of the worker surveys - and before the new system was introduced - an improvement in worker moral was evident. Evaluation of the work itself was 3% over the norm, though satisfaction with supervision and co-workers was still lower than the norm by 20% and 14%, respectively.

Forward EDF Labor Summary. Considering the data summarized for the activities of Mess Management Specialist and mess cooks assigned to the forward EDF, it appeared that there was some slack in the system. Given the previously presented headcount summaries, it was not surprising that fewer personnel would be found at work stations, than had been assigned on paper. These results provided some assurance that existing staffing levels in the USS Saratoga's forward EDF would probably be sufficient to handle a larger attendance in a new foodservice concept if the new system utilized mess cooks personnel more actively and if supervision were strengthened to assure that assigned personnel were generally at their work stations.

NUTRITIONAL INTAKE

While customer satisfaction is an accepted objective in foodservice system operations, there is another possible goal, nutrition, on which there is less agreement. Whether a foodservice system's objectives extend toward assuring that customers actually obtain a nutritionally balanced diet or whether responsibility should be limited to providing the *opportunity* to obtain nutritionally adequate meals is an argument that will not be addressed in this report. The following comments merely present selected results from nutritional intake surveys to show the basis for a limited nutrient fortification in the new concept.

The major result of the nutritional surveys conducted aboard the USS Saratoga during the pre-test period in 1977 is presented in Table 8. Individuals' nutritional intake ratios were categorized into *low, marginal,* or *adequate*. The cutting points were 70% and 100% of the Daily Dietary Allowance (DDA). Vitamin A intake levels are lower than desirable as reflected by the fact that 20.2% of the population received less than 70% of the DDA. It should be recognized that relatively low Vitamin A intake levels are not unusual occurrences in nutritional studies. However, on aircraft carriers, vitamin A intake levels may be a more pressing concern than in other working environments because severe vitamin A deficiency impairs night vision, and flight operations are often conducted at night.

Another incident of low intake involves vitamin C. About eight percent of the individuals sampled had average intake levels lower than 70% of the recommended daily level for vitamin C. The primary sources of vitamin C are fresh fruits and vegetables. The potential deficiency noted in vitamin C intake can be partially traced to the difficulty carriers sometimes encounter in obtaining fresh fruits and vegetables during extended periods at sea and also to the limited storage capacity for, and shelf life of, these products.

TABLE 8

Evaluation Of All USS Saratoga Meals

July-August 1977

	Percentage of Population[a]		
Nutrient	Low[b]	Marginal[c]	Adequate[d]
Protein	0	3.9	96.1
Calcium	1.5	21.2	77.3
Iron	3.0	52.7	44.3
Vitamin A	20.2	31.0	48.8
Thiamin	3.0	52.7	44.3
Riboflavin	0.5	24.1	75.4
Niacin	0.5	23.2	76.4
Vitamin C	8.4	18.2	73.4

[a] 203 subjects

[b] Nutrient ratio < 0.7 of DDA

[c] Nutrient ratio 0.7 to < 1.0

[d] Nutrient ratio $\geq$ 1.0

NOTE: See Section XII for computational procedures used to derive nutrient ratios.

When data from individuals eating one or more meals in the forward EDF are analyzed, the results show a more serious vitamin A and C problem. Sixty-one percent were low in vitamin A and 50% were low in vitamin C intake levels.

The nutritional profile suggests the desirability of monitoring nutrition afloat whether or not new types of foodservice systems and new foods are introduced. As for this particular test, the empirical evidence indicated the need to address specific instances of low intake, vitamin A and C, rather than pursue broad fortification in all nutrient areas.

SUMMARY OF PROBLEM AREAS

Results presented thus far have summarized the status of foodservice aboard the USS Saratoga during type training and Mediterranean operations before implementation of an improved foodservice system. In approximate decreasing order of their importance to the design effort, the following list summarizes the significant problems:

- Significant Waiting Lines
- Menus Need Improvement, Particularly Forward
- Limited Seating Capacity
- Forward Galley and Mess Deck Underutilized
- Uneven Distribution of Diners
- Slow Serving Line Movement
- Food Acceptability Relatively Low
- Dining Variety Needs Improvement
- Idle Foodservice Equipment
- Poor Dining Environment
- Low Intakes of Certain Nutrients
- Limited Freezer and Reefer Capacity
- Worker Morale Below Desired Level

As is true in any complex system, each problem is somewhat unique but is also interwoven with others observed in the operations. Thus, the presentation of these issues as separate problems is somewhat arbitrary.

Indications that menus needed improvement, particularly in the forward facility, came from several results noted earlier. Customers were critical of menus in their surveys; attendance, particularly in the forward facility, was relatively low; and in addition, outside observers felt there was considerable room for improvements in menus.

Limitations in mess deck seating capacities were noted earlier in this section, and this problem derives directly from the fact that there are a relatively small number of seats to serve a large dining population. Since most customers apparently want to be accommodated during specific peak periods, normally in the first 60-90 minutes of each meal, such notions as enforced meal periods for the various organizational units do not appear to solve the problems of mess deck seating availability without antagonizing many of the crew.

One of the rather surprising patterns in headcount data collected aboard the USS Saratoga, the USS John F. Kennedy, and other carriers was the very uneven distribution of meals served from the aft and forward galleys. Forward galley meals constituted roughly 30% of the total served during breakfast, dinner and supper. This pattern, working in concert with rather slow serving line rates, roughly 5 men per minute, limited seating capacities aft, and low acceptance menus in the forward facility probably accounts for one of the most important problems from the customer's and manager's viewpoints -- long waiting lines.

With respect to long waiting lines, results showed that in the aft EDF during peak meal periods, 89% of the customers waited longer than seemed reasonable to them. Waits in excess of 10 minutes were encountered by 27% of the diners who chose to remain in line. The observed waits in the forward galley were, again on average, less than one minute. But due to the fact that relatively little demand was placed on the forward facility, the lack of any significant waiting time cannot be interpreted as a measure of successful foodservice operations. From the crew surveys, it is apparent that the customers perceive waiting time as a significant problem.

A final point of emphasis concerns the results of nutritional surveys. A fairly high incidence of low intake levels of vitamin A and C was noted and the results were identifiably worse in the forward EDF. On the basis of these results, an effort to correct these shortfalls was deemed advisable.

In the past, military menu planners have tended to provide increased variety not by creating different specialty outlets, but by adding more items to an existing A-Ration menu or *speed line* menu. A different strategy has been pursued in the present project.

Although identified as a separate type of objective, the provision of faster service and reduced waiting times represents a goal, which, if attained, should also increase customer satisfaction. But the increased efficiency of foodservice operations that may result from greater customer throughput is a worthwhile objective in and of itself. Given the observed disproportionate share of meals served from the aft facility, an attempt to balance the customer load would at least make better use of forward facilities.

An important objective of the new system was to show improvement in MS job satisfaction. To the extent that customer responses could be made more favorable in a new system, foodservice personnel could be expected to be more positive in their attitudes toward their jobs. The introduction of modern equipment would also have a favorable impact on worker attitudes, especially as the new items made the job easier, and fewer equipment breakdowns occurred. The third element in this objective was to simplify work so that less skilled labor would be required. This appeared to be fruitful from work sampling results showing that foodservice attendants were not fully utilized. It also seemed a desirable design objective in face of the fact that recruiting quotas for the MS rate have been difficult to achieve in recent years. Overall, success in the above areas should lead to more productive output from available personnel resources.

The final objective formulated for the design effort was to apply, where possible, new technology in the foodservice industry. Constraints on carrier foodservice made it obvious at an early stage that new technology in food or equipment would have to be found to cope with certain problem areas, such as limited chill and freeze storage and the need for high production in small spaces.

While other objectives grew directly from the observed problem areas, the mandate to apply new technology has an additional base. It is the direct responsibility of an R&D effort to develop and test new items. New food, equipment, production procedures, and serving methods were searched for and evaluated in terms of potential applicability for carrier foodservice. Those that survived this evaluation were included for test aboard the USS Saratoga. For example, the dry mix blender, which satisfied a serious need in the milk shake production cycle, had never before been utilized on a ship of any type. The same was true of several food products. The application of new technology in these and other cases proved to be a useful and important objective in designing an improved foodservice system for prototype testing on board the USS Saratoga.

PROGRAM OBJECTIVES

Having documented various problem areas, the effort turned to developing alternative solutions to as many of these issues as could be reasonably addressed within available time and monetary resources. In order to develop the alternatives and select the most reasonable approaches for field testing, certain technical objectives were formulated.

The program objectives so defined are summarized in Table 9. These goals were focused around four somewhat distinct areas: customer satisfaction, operational efficiency, foodservice personnel, and new technology.

TABLE 9

PROGRAM OBJECTIVES

INCREASED CUSTOMER SATISFACTION

- Higher Preference Menus
- Improved Variety:
  - Food Choices
  - Food Outlet Choices
- Improved Food Quality
- Better Dining Environment

FASTER SERVICE AND REDUCED WAITING

- Better Forward and Aft Attendance Balance
- Greater Serving Rate
- Increased Seating Capacity

MS JOB SATISFACTION AND EFFICIENCY

- Improved Customer Response
- Modern and Efficient Equipment
- Simplicity of Skill Demands
- Improved Productivity

FOODSERVICE TECHNOLOGY BENEFITS

Most of the objectives listed in Table 9 impact on the customer. The specific problems addressed by these objectives undoubtedly accounted for the low opinions of foodservice noted earlier. Therefore, the improvement of customer satisfaction gave every evidence of proving the greatest payoff in this effort and has become, in fact, the primary objective of the project. Customer satisfaction as a main objective is, of course, dependent upon actions taken to accomplish more specific goals, such as those shown in Table 9.

While the above objectives are rather obvious, the issue of menu variety deserves emphasis at this point. Increased variety in menu offerings can be accomplished in at least two ways: increase the different items within a given menu or increase the number of types of food outlets offering different or specialized menus. For example, in most cities, individuals desiring to eat out can choose restaurants with broad menus or they can select among various types of specialty restaurants.

SECTION IV

THE NEW FOODSERVICE SYSTEM

CONCEPT DEVELOPMENT

BACKGROUND

When members of the NARADCOM research team visited the USS Saratoga after the new foodservice system had been installed in the forward EDF, some of the *old hands* remarked about how quickly the new system had been implemented (that is, between Mediterranean deployments). Of course they were not aware of the large number of analytical steps and technical decisions that had been required to translate their earlier suggestions and criticisms and other data and observations into the new system. This section will describe that process by which the new concept evolved, as well as the results of its application in the Saratoga.

The description of the system evolution serves not only to provide background on how the program objectives (Section III) were achieved in the Saratoga's prototype operation but also to summarize the general systems analysis methodology that can be followed in other foodservice systems design. Variations of the new system may be necessary to accommodate the physical differences of other carriers, but a repeat effort of the magnitude of this project will not be required.

APPROACH

Concept development activities normally begin with problem identification and with the formulation of specific objectives to be achieved by the developmental activities. Since these important elements were reviewed in the preceding section, the discussion will begin at the point where the research determined how the objectives could be met in an optimal and practical design solution that would provide tangible benefits for the Navy.

There are two major decision areas in the concept development activity: 1) the scope of the system, and 2) the types of analyses required to produce the desired results. For numerous reasons, including the orientation of the person(s) doing the investigation and the limitations on time and resources, many projects to improve foodservice are narrow in scope and focus on only one or two system elements, such as equipment and menus. The NARADCOM ORSA Office normally follows a total-systems approach in its foodservice design projects, and the project team concluded that such a comprehensive scope would be required in this project. Subsequent events proved the value of this judgment. The impact of a total-systems approach was that each of the following foodservice system elements would be examined in detail:

- The customer
- Menu
- Food preparation facilities
- Foodservice equipment
- Food products
- Recipes
- Nutrition
- Serving methods and accessories
- Dining area environment
- Foodservice worker
- Management
- Operating procedures
- Storage
- Sanitation
- Costs

As a result of this deliberate attempt to be comprehensive, the project demanded adequate time for data collection, analysis, and evaluation. This methodology left no unresolved issues when the effort was completed.

The major aspects of the second decision area, the kinds of analyses undertaken, are depicted in Figure 6. This figure attempts to indicate the simultaneous interactions between analytical areas, while also giving a sense of the sequential nature of certain of the steps. Overlaying this entire pattern is the fact that concept development usually incorporates the seed of a basic idea and, after many iterations, the idea germinates into a fully developed design.

In this case the basic foodservice system concept that appeared to best address each of the several project objectives was to introduce some highly attractive form of fast foodservice operation in the forward EDF.

MENU CONCEPT

Noting the top of Figure 6, the development of the forward EDF menu and the mess deck throughput analyses proceeded more or less simultaneously. Under the umbrella of fast foodservice there was a wide latitude in defining the specific menu which would help increase the flow of customers through the system, reduce waiting times, and improve customer satisfaction with food variety and quality.

In order to favorably affect customer flow and waiting, the following features influencing the menu selection were adopted for the test.

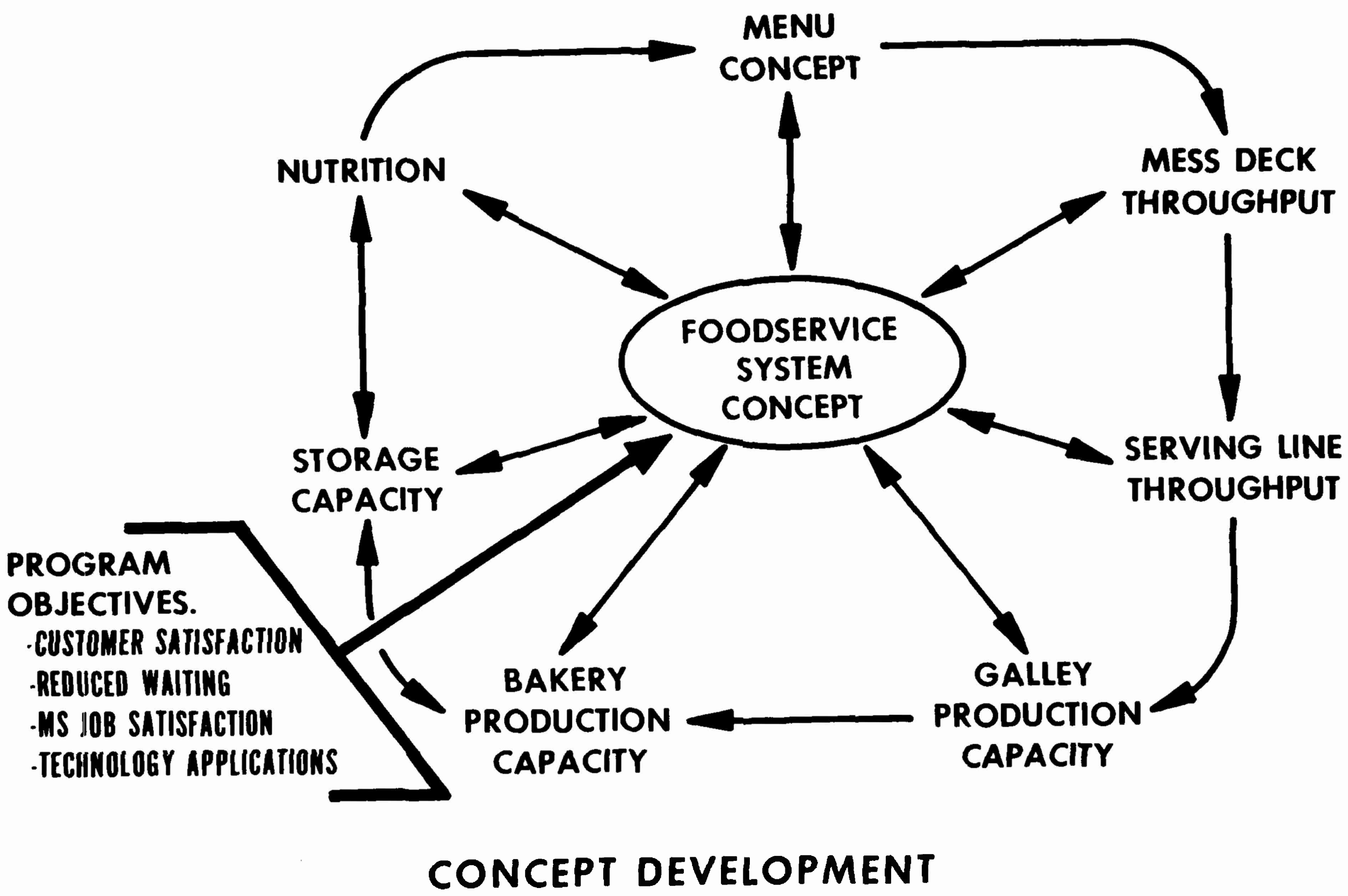

FIGURE 6. Concept Development

Feature	Effect
- Serve only finger foods	Possible reduction in the time chairs are occupied in the mess decks
- Limited food choice on each serving line	Reduce *decision* time the customer spends in selecting food items
- Pre-packaging of food items and customer self-service	Higher serving rates

Customer acceptability was to be improved by offering only highly preferred fast food items based upon preference surveys taken on the ship, NARADCOM experience in other test projects, and commercial practice. In fact, successful civilian fast food establishments and their most acceptable food selections became a general model for the menu and for other features of the system.

The goal of menu variety was to be achieved through a menu stressing multiple themes by utilizing two serving lines, each with distinctive menu features. The serving lines not only offered different menus but also a given line could change themes on a rotational basis, such as by serving one type of theme menu for dinner and another at supper and by changing the type of menu at supper each day over a several-day cycle. Thus, variety was realized even though the choice of items offered per line per meal was limited. Further, the range of food selections in the forward EDF offered an entirely different menu variety from the standard full cafeteria meal aft. Finally, additional variety was achieved within a single menu theme by different *flavors* -- for example, several types of pizzas were served on a rotational basis and the same was true of submarine sandwiches.

Food quality was addressed by observing the foods in use prior to the test and, in selected cases, introducing higher quality items during the test. This was done to provide a basis for recommendations on whether new food items should be introduced into the supply system to support future fast food operations. Another concept for enhancing quality was to stress progressive cookery during the meal.

MESS DECK THROUGHPUT

The analysis of customer throughput in the mess deck (Figure 6) was an early key effort because it directly impacted on the objective of reducing waiting times in foodservice lines. Without adequate flow in the dining area, there was little advantage in accelerating the serving line and food production rates.

The major parts of this analysis were to determine:

- total seating capacity
- average eating times
- scullery throughput

The architect on the project team carefully designed the layout of tables and other mess deck equipment such as salad and beverage bars to maximize the number of dining stations within other constraints such as passageway width. Further, through an innovative decor concept (Section XIII), stand-up counters were provided yielding additional dining stations. Average eating times were measured in the existing system, and new times were projected for the fast food concept with finger foods offered. The estimated eating times enabled seat turnovers per hour to be determined and, when combined with total eating stations, the hourly throughput of the dining areas was estimated. Concomitantly, the scullery capacity was examined to ensure that it was adequate. Interestingly, the simplicity of the serving concept was such that there was usually only the need to wash one flat tray and one hard plastic tumbler per customer and, as a result, scullery capacity in terms of customers serviced per hour actually increased.

Before leaving this area, it should be noted that probably more than any other factor, mess deck configurations and seating capacities present design constraints that vary notably from one carrier to another. For example, the USS Saratoga accommodates about 16% more eating stations in the forward dining area than the USS Ranger, and the USS John F. Kennedy has much more capacity than the Saratoga. It is recommended that any new fast foodservice system design effort -- in another carrier, for example -- consider in its early stages the two mutally related factors, seating capacity and mess deck throughput.

SERVING LINE THROUGHPUT

The estimated flow of customers through the dining area (about 800 per hour) became the target goal for the serving line throughput. Factors requiring consideration here were:

- arrival rate of customers
- average time to serve a customer, which is a function of:
  - number of items offered (i.e., number of selection decisions)
  - pre-packaging of items
  - customer self-serve or serving by MS or foodservice attendant
- number of serving lines

The combined effect of these factors enables the impact on waiting times to be determined.

The serving line operation was complicated by the fact that arrival rate data indicated that 84% of the diners arrived during the first 90 minutes of a dinner or supper meal period. Nonetheless, the throughput analysis established that the customer load could be handled within serving line capabilities without creating significant waiting lines, except briefly at the start of the meal or during some unusual surge subsequent to that time. However, this was true only if two serving lines were operated simultaneously at the forward galley and if serving rates appreciably greater than those previously experienced could be attained. A requirement of a total throughput from the serving lines of 12 to 14 men per minute was judged to be feasible to accomplish.

GALLEY PRODUCTION CAPACITY

With the planned menu in mind and with the desired serving rate established, the next step was to select appropriate food production equipment and an efficient galley layout. This required analysis of:

- numbers of customers selecting each menu item on a meal-by-meal basis
- types of *raw* foods to be used in preparing the item
- production capacities and physical characteristics of alternative available equipment
- space available in the galley

Each menu item was examined separately in terms of its particular equipment needs, and by this procedure the multiple uses of certain equipment such as the deep-fat fryers were also identified. Many new non-standard types of equipment were selected. In some cases the equipment was used for the first time because the menu itself was new to ships -- for example, the milk shake holding freezer. In other instances the equipment was chosen because its high production capacity was needed to meet the quantity requirements imposed by the previously determined serving rates. Finally, some equipment was selected because of the unique food product used such as the dry potato granules used in making french fries. All new equipment was commercially available, and therefore no special development of equipment was required.

The result of the galley food production analysis was that it was deemed possible to select equipment that could efficiently meet the serving requirements. The only problem was in the early part of the meal period when the largest customer demand occurred; this problem was to be solved by having a modest quantity of finished product in inventory when the meal started.

BAKERY PRODUCTION CAPACITY

The adoption of a menu which offered (1) only sandwich type meals at dinner and (2) sandwiches on one of the two serving lines at supper created an appreciably increased demand for rolls. An analysis of demand was conducted to determine total requirements for bread and rolls, and then existing equipment capacity was evaluated against those requirements. Shortfalls in bakery production capacity were thus highlighted.

Subsequently a modification plan providing for all bread production in the aft bakery was proposed and adopted. This plan included five new high production pieces of equipment and a rearrangement of the work and storage area. An analysis of commercially available containers was also conducted to determine the best method for holding rolls and for transporting them to the forward galley. Plans were developed for modifying the smaller forward bakery for efficient production of pastry and dessert items.

On completion of the bakery evaluation, production capacity was compatible with the needs of the fast food concept and the existing A-ration facility.

STORAGE CAPACITY

The ship's capability to store frozen, chill, and dry food products was analyzed early in the project. As reported, this effort revealed that it would not be feasible to introduce a new foodservice system that created a greater need for frozen or chill storage because of existing space and volume constraints. When the fast food concept came under consideration, storage loomed as a potential problem because many of the desired menu items are customarily prepared from frozen foods. Food technology provided a work table solution to this dilemma because the project team was able to identify and substitute new food products which could be stored in the amply available dry storage in the ship. These new products were pre-tested in the Experimental Kitchen at NARADCOM and found to be very acceptable. This approach enabled the concept to be adopted within storage constraints and probably even made a slight improvement in resupply and endurance factors.

NUTRITION

The introduction of a high-quality, fast-food system offered significant customer satisfaction and serving rate gains but raised the specter in some minds of possible nutritional inadequacies. For this reason the systems analysis effort included a pre-test study of consumer nutrition in the Saratoga EDF's. This research indicated that there were a number of personnel with low intakes of Vitamin A and C, and the problem was most pronounced in the case of forward EDF meals. In addition, when the supply of fresh milk was exhausted after several days at sea, the percentage of personnel with low or marginal intakes of calcium increased markedly.

The new system addressed the latter issue by providing a highly acceptable milk shake that could be made throughout an entire at sea period by using a dehydrated mix. The adopted concept for improving the vitamin intakes was to seek increased attendance, to offer a fully stocked salad bar, and to selectively fortify certain high-preference menu items.

CONCEPT COMPARISON: SPEED LINE VS. FAST FOOD

Since carriers had evolved a *speed line* service before development of the fast food concept, some observers of the Saratoga operation have expressed the opinion that it is what we've been doing all along. An examination of the features of the fast food concept indicates that in fact there is very little similarity between speed line service and the prototype Saratoga operation.

Several of the differences in these types of systems are as follows:

	Fast Foods	Speed Line
MENU	Limited choice of high preference foods	Primarily lower preference foods
VARIETY	Different menus on 2 lines at dinner and supper	Same menu on one line at dinner and supper
QUALITY	New high quality commercial foods	Standard supply system products with variable quality
NUTRITION	Increased salad bar utilization, measured improvements in nutrient intakes	Low intakes of several important nutrients
SERVING METHOD	Primarily pre-packaged self service menu items	Conventional institutional service
ATTENDANCE	Approached 50% of total	Less than 30% of total
DECOR	Colorful civilianized image	Noisy, stark work-oriented atmosphere
EQUIPMENT	High production state-of-the-art equipment	Standard equipment

The fast food concept introduced a totally new approach to providing the customer with a highly acceptable, nutritious meal presented in an efficient manner and in a pleasant dining atmosphere. State-of-the-art technology in food and equipment as well as improved operational techniques were included in a design effort oriented towards achieving major decreases in the time spent in line by the customer. This system concept differs significantly from the characteristics of the existing speed line systems, and the successful implementation and support of the new concept on other ships will entail careful attention to, and adoption of, the details that have been outlined in this report.

SYSTEMS DESCRIPTION

BACKGROUND

Section III has summarized the systems analysis portion of the project and described the formulation of the technical objectives of the system design effort. The objective of this sub-section is to provide a brief description of the new foodservice system actually tested on the USS Saratoga (CV-60).

Limited Menus. Initial menu planning discussions were concerned not only with the types of foods to be selected but also with the frequency of serving. While the theme of the forward EDF was to be similar to a commercial fast food establishment, which menu theme should be predominant? Agreement that beefburgers should be an integral part of the concept was unanimous. However, should the EDF be strictly a *burger house* concept? The rationale behind such a limited, albeit extremely popular, menu would be that limited choice provides the customer with fewer decisions and results in faster service times.

While there is merit in this rather narrow approach, as is evidenced in the market segmentation strategies of the commercial fast food industry, conditions are sufficiently different aboard ship that the approach was rejected. The large number of outlets in the commercial marketplace provide the variety required by allowing the customer the option of going to any one of a number of establishments often in the same general location and purchasing what he wants. However, while the captive nature of the audience aboard ship does not lend itself to the single specialty facility, it does permit a limited choice menu at any one meal. Therefore, instead of providing a single entree facility, plans were developed to establish several high-preference single entree outlets operating within one facility. In this manner, variety was achieved by offering on a rotational basis several types of meals rather than by offering wide variety at any single meal. Altogether five theme menus were designed with two of these specialty menus (one per serving line) being featured at each dinner and supper.

Customer Service. Noted earlier was the fact that waiting time was a function of the slow service rates caused by run outs and by customer indecision when faced with miltiple choices. Run outs occur because of inattention by galley personnel and because of inaccurate estimates of the demand for food at a particular meal. Run outs often take place near the end of a meal period because foodservice personnel seem to operate on the basis of it being better to run out than be left with extra portions. Typically, the customer has an adverse reaction to run outs of preferred items. In the designed system, food items such as pizza, chicken, and beefburgers can be made in small batch sizes almost to order; and it is easier to avoid the run out problem.

Customer indecision in selecting food on the serving line was to be minimized by reducing the number of choices available at any meal. By presenting only highly acceptable food items, it was projected that the customer would not be dissatisfied by the limited menu. As mentioned above, variety is taken care of by offering a choice of outlet. The first choice would be between forward and aft EDF's; then, if the forward EDF were selected, the customer would find that the starboard and port lines offer different fast food menus at each dinner and supper. Possible indecision between lines was addressed by establishing the forward port line as the beefburger line at both meals. Further, by establishing the starboard line as the line to enter when other than beefburgers were wanted, the customer would soon learn that submarine sandwiches were offered at dinner and either pizza, fried chicken, or fish and chips during the evening meal. Merchandising displays were designed into the system to increase awareness of the new forward EDF. An athwartships passageway aft of the forward EDF provided a point where the waiting lines break to go either to the port or starboard serving areas. At this junction, colorful, lighted menu boards that were changed each meal were installed to make customers aware of the menu.

Another component of customer indecision involves the interaction of customer and server. Everytime a customer asks "What is this" or "Give me only this much", a slowdown is created. To avoid this type of discussion, considerable thought was given to the serving methods that would be most appropriate. As with the commercial fast food industry, major reliance on disposables was determined to be the method that would be best suited to the operation being designed. By packaging food items in distinctive, readily recognizable packages which permitted self-service, customer service would be facilitated. A wide assortment of disposable products was evaluated for cost, storage, and concept compatibility standpoints. Section VIII presents the analysis and rationale for selection of specific items.

Manpower. Estimates of increased attendance at the forward EDF in the new system indicated that the manpower that was formerly assigned to the facility might not be sufficient for the redesigned operation. Some reductions in staffing in the aft EDF would be possible as the forward EDF assumed more of the customer load, but with the ship feeding only 77% of the crew and with an expected increase in total number of diners, overall assigned manpower under the new system might be stretched to its limit.

However, it was possible to meet the increased demand with the existing MS staff because fast food service did not need to utilize the same amounts of skilled labor as the full service operations did. Foodservice attendants were trained to perform numerous functions within the new galley under the direction of a limted number of skilled MS. This approach has been well validated in commercial operations. Further, MS personnel were trained to supervise a specific repetitive operation (Section IX). In this manner, productivity was increased for both foodservice attendants and the MS personnel involved.

Equipment Selection. With many of the menu items suggested, the means for producing large quantities of high quality food products would have been extremely difficult without specific high capacity equipment. For example, beefburgers presented a difficult situation. Could the production of beefburgers to meet the estimated demand be satisfied with conventional equipment and techniques? Certainly, with enough grills or ovens and a large labor supply, adequate production could be accomplished. However, the forward EDF could not spare the extra space or manpower that would be required, and limitations in funds precluded adding more ventilation capacity. To overcome these difficulties, state-of-the-art equipment was surveyed and a conveyor broiler suitable for shipboard use was identified. This machine would provide necessary quantities of cooked product in a limited space with minimum manpower. Other operations had similar problems which will be described later (Section VII).

Reduction of Waiting Times. Minimization of waiting time was one of the basic objectives of the test. By creation of a popular dining facility forward to establish a better forward versus aft customer distribution and by greater customer throughput in the forward EDF, it was projected that waiting times would decrease even if more people attended meals than previously. Throughput was to be increased at the serving lines by keeping open two lines during the entire meal period and by achieving faster serving rates. However, faster rates would deliver a larger volume of people into the dining area, creating a potential seating shortage problem. Additional seating capacity was obtained by careful planning of the available dining area space and by the introduction of stand-up counters providing 20 new eating stations. It was also found that exclusive use of finger foods in the forward EDF resulted in appreciably less eating time (seat occupancy time), hence greater seat turnover and customer throughput in the dining area.

Dining Area. Positive customer perception of the dining areas was very important in the renovation of the forward EDF. Satisfaction with foodservice does not rest alone with the quality or quantity of food served. Price-value relationships in commercial foodservice often outweigh the aesthetics of a foodservice operation; however, aboard ship the diner was not presented with a price-value consideration. Negative attitudes towards foodservice, no matter how well done, would likely persist when the dining environment was unenjoyable. Therefore, the decor and layout improvements in the serving and dining areas were significant elements in the total concept. These architectural improvements included new partitions and stand-up counters to separate the dining space from the general passageway circulation, and a bright color coordinated scheme which unified the several compartments comprising the fast food facility.

Nutrition. In addition to providing a fully nutritious and balanced forward menu, the popularity of food items selected for service offered a unique opportunity to increase the present low intakes of certain nutrients through fortification of key food products. Efforts were directed towards addressing the potential problems identified in the pre-test nutritional survey. One measure was to fortify each milk shake with one-third of the Daily Dietary Allowance (DDA) of Vitamin A. Vitamin C intakes were supplemented by fortifying the french fries and the non-carbonated beverages. Salads were routinely provided to enhance nutritional intake.

Bakery Operations. Bakery operations were of critical importance to the success of the fast food concept. The quantity of beefburger and submarine rolls necessary to meet daily demand would have severely taxed the existing bakery from both equipment and labor standpoints. In addition to producing breads and rolls, the bakery was responsible for furnishing pastry and dessert items for all shipboard foodservice facilities.

The existing system on the Saratoga utilized the aft bakery for all production. One shift would be devoted to bread products, while the other shift would prepare desserts. In the new system, the volume of rolls and breads that were needed was so large that serious difficulties in meeting production requirements were identified.

The much smaller forward bakery was not in use except for doughnut preparation. Provisions were made to re-open this facility. Because of the limited work space and oven capacity available, roll production for the adjacent forward EDF would not be practicable. Bread and roll production was the most labor-and space-intensive operation for the ship's bakery; therefore, production of these products was planned for the aft bakery. Desserts and pastry items were more easily accommodated in the forward bakery.

Ideally, to facilitate efficient transfer operations, bakery production should be located as close as possible to the facility that would be using the products. In the present case, this option was not a viable alternative due to the space constraints. Realizing the potential problems that could develop, the system design included an improved method for transferring bakery products. Large clear plastic food containers that were filled with sliced rolls in the aft bakery were to be transferred to the forward galley where storage racks were provided. These containers were furnished with covers to facilitate handling, prevent contamination, and help preserve product freshness.

High production equipment was installed in the aft bakery to insure that bread and roll production could be met in an efficient manner. A detailed discussion of this equipment is included in Section VII.

Head-of-the-Line Privilege. Pre-test observations highlighted potential problem for the forward EDF. First class head-of-line privilege at the aft starboard line contributed to the excessive aft waiting times. Length of time in line was increased in the starboard line as 200-300 firstclass petty officers ate dinner and supper. Because of the head-of-line privileges, other customers tended to enter the aft port line, and this increased the wait in this line.

In the forward EDF, no special privileges have been granted to the first class petty officers. Response to a question dealing with head-of-line privilege placed 85% of the sample against this practice. If the first class were able to *cut* into the front of the line, this feature would be detrimental to the forward EDF by:

a. creating a negative impact on the image desired, and

b. contributing to increased waiting times.

To date, the lack of a first class head-of-line privilege forward has not been an issue. With a fast food system having only limited lines at a few peak demand points, head-of-line privileges were not necessary.

Concept of Galley and Serving Line Design. Certain key fundamental concepts governed the design of the modified galley. Perhaps the most important was the fact that the limited menu made it possible to arrange in an integrated manner all of the equipment that is used in preparing a specific menu item. While this equipment can be used to produce other items, it is normally dedicated to one item. In a few cases one piece of equipment is used to prepare two menu items, but never more than one in any single meal. Therefore, individual equipment used for storage, pre-preparation, cooking, holding, and serving can be laid out in sequential, production line fashion. This is illustrated in the Saratoga by the equipment for fried chicken and pizza preparation.

A second factor affecting galley design was to arrange the layout so that product flow during food preparation is toward the serving line. The milk shake and beefburger layout and flow demonstrate this approach.

Another layout concept was to shorten the serving line appreciably. This was possible because of the limited number of items offered. One benefit was that the customer's view into the galley is limited, offering a neater appearance. Further, this approach provides more bulkhead area permitting greater use of color on the outside facade of the serving line and more space for mounting equipment along the galley side of the bulkhead. The serving line was also planned so that the same type of menu item (entree, french fries, milk shake) would always be in the same location. This was done to minimize possible customer confusion and delays.

The concept for beverage preparation called for making milk shakes in the galley and offering them as pre-poured, self-serve items in display cabinets on the serving lines. In addition, a beverage bar offering up to 10 additional types of drinks was installed in the dining area, where the self-serve lines would not slow the serving line flow. The salad bar was placed in the dining area for the same reason.

Taken as a whole the galley layout, equipment selection, and work flow are designed to provide an *idealized*, high production rate, high labor productivity, food preparation space for a *limited* menu. This may well be the first case of a full-sized shipboard galley planned for a limited menu rather than for a general one.

Special Situations. Production capabilities in the fast food EDF are not strictly limited to the menu that was developed. Two situations might require the operation of the EDF in some mode other than the present. The first situation is when the ship must close the aft EDF for a sustained period of time such as during an extended ship restricted availability. The second case would be under the more arduous conditions of a battle feeding situation. In either event, the forward facility could be expected to perform quite well. The equipment installed in the forward EDF has generally the same functions as that in the aft facility although there are a few minor variations and there are smaller numbers of certain types of equipment. The ovens, broiler, steam-jacketed kettle, deep-fat fryers and grills can all be used to feed the crew a limited A-ration menu. With the addition of a portable steamer, the forward EDF would be capable of providing a broader range of meals. During periods such as an SRA period, the planning lead time involved would be adequate to provide for temporary installation of any additional equipment that would be required.

The more critical situation of battle feeding when the aft facility was inoperable would not comprise the fast food EDF at all. To be sure, the conditions that exist at the time might place constraints upon the type of menu offered. However, the fast food menu is well suited to this type of situation. The quick-to-prepare finger foods featured forward can be delivered to and consumed at manned battle stations more easily than most A-or B-ration items. Further, the high production rate possible in the forward EDF would be of great value if it were necessary to feed the entire ship's company from this single, moderately sized galley.

FORWARD GALLEY OPERATIONS BY MENU ITEM

Beefburgers. The beefburger operation is perhaps the most important production area within the fast food EDF. This entree has been selected as the port serving line menu item that will remain a constant daily feature at both dinner and supper. Analysis of post-test attendance patterns has confirmed early attendance and demand estimates for this entree. Between 40 and 50% of all those attending a forward EDF meal select the beefburger line. On the average, the burger line attendance was about 700 for dinner and 1,000 for supper, with each customer normally taking 2 sandwiches.

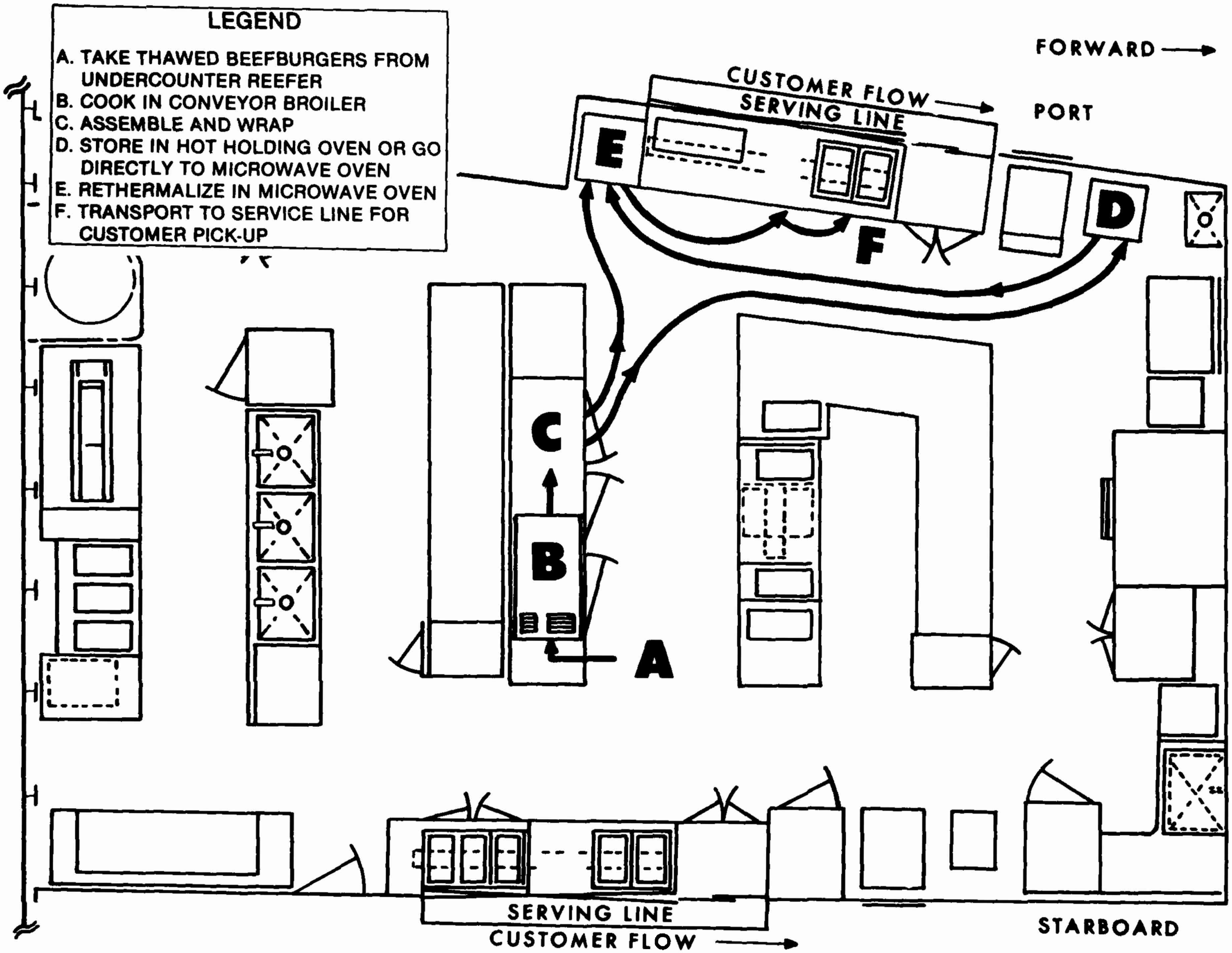

FIGURE 7. Forward Galley, Beefburger Operation

An MS was given the responsibility of supervising this operation. The function of the supervisor was to guarantee that procedures for high quality food preparation were being followed. In his role as a working supervisor, the MS would assure that the foodservice attendants assigned had been instructed or he would instruct them in the operational procedures that have been developed by NARADCOM. Section IX describes in detail the roles of all the individuals involved and the necessary training required to achieve operation efficiencies. Section VII provides an in-depth discussion of equipment used in this operation.

The direction of the work and product flow within the beefburger operation is from starboard to port as presented in Figure 7. Thawed beefburgers are brought from the meat preparation area and stored in the undercounter refrigerator in the quantities necessary to service the meal. With the start-up of a meal's production, the MS-supervisor begins a first-in/first-out (FIFO) rotation of thawed patties from the undercounter refrigerator to the foodservice attendant loading the broiler. Cooked beefburger patties are then assembled into sandwiches and wrapped. After assembly and wrapping, the sandwiches are placed in a service pan which when filled is taken to a hot holding cabinet where a small inventory of sandwiches is stored to meet demand. From this hot holding cabinet the sandwiches are normally placed in a microwave oven for re-thermalization prior to being placed on the serving line. In some circumstances the sandwiches may go directly to the microwave oven after assembly. The microwave is used only to ensure that the customer gets a hot product since the beefburger is cooked in the broiler.

Submarine Sandwiches. One hot and one cold submarine sandwich was available at each dinner meal on the starboard serving line. Customers were limited to one sandwich at a time but could return for another sandwich if they chose. Because of the size of the sandwiches, few customers actually returned. Attendance at this meal averaged 700 with a 65/35% split between hot and cold sandwiches, respectively.

As in all operations, a working MS-Supervisor was in-charge of this production area. In accordance with the recipe cards for the sandwiches that were being prepared, the quantities of food products required were brought to and stored in the forward EDF during the night before serving. Preparation of cold submarine sandwiches took place during off-peak hours of the early morning. After asembly, these sandwiches were wrapped in the appropriate paper and stored in an undercounter reefer below the starboard serving line (Figure 8). In this manner both labor efficiency and customer service were positively affected because the serving line attendant could maintain the products on-line without having to leave the line.

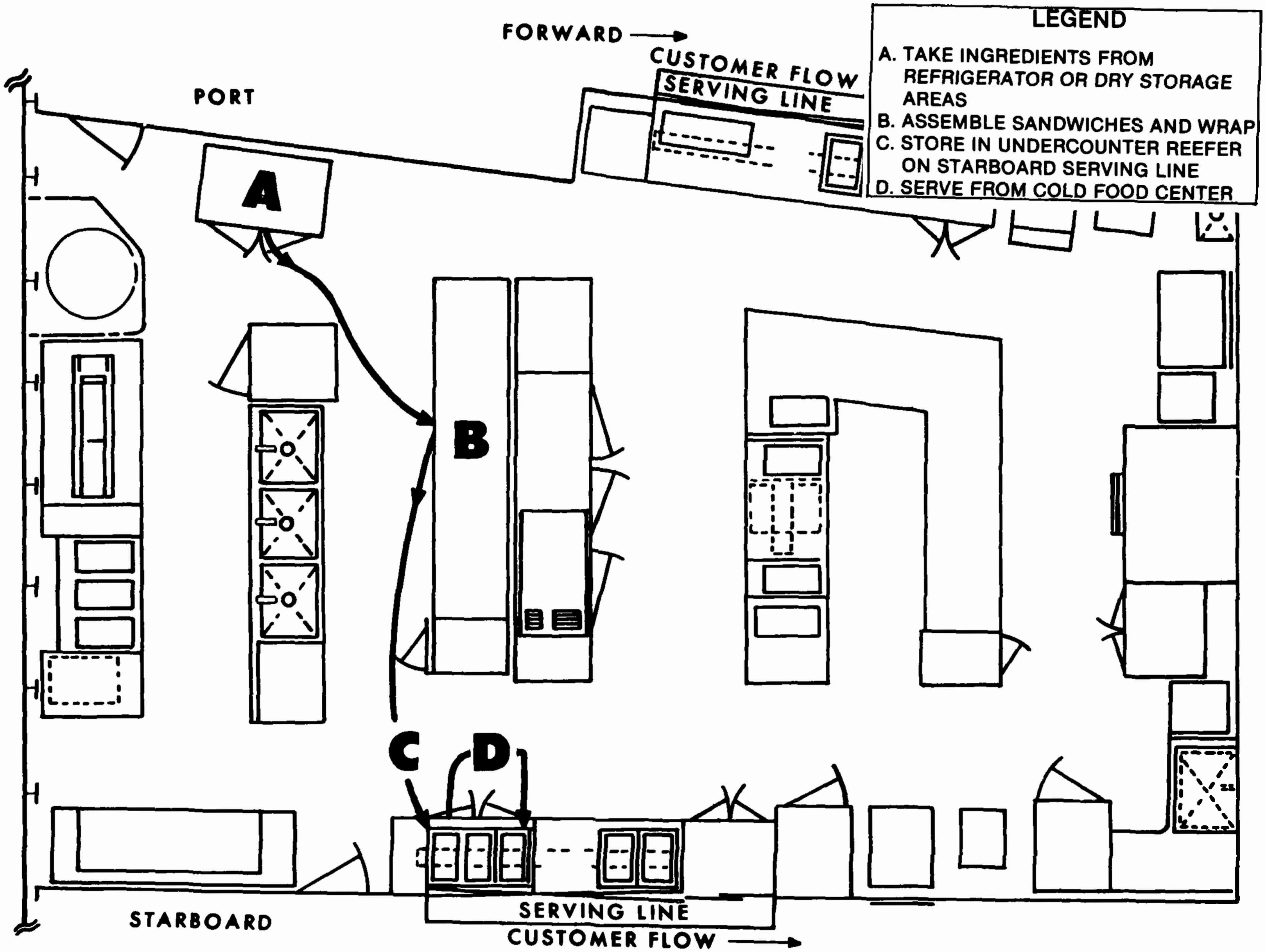

FIGURE 8. Forward Galley, Cold Submarine Sandwich Operation

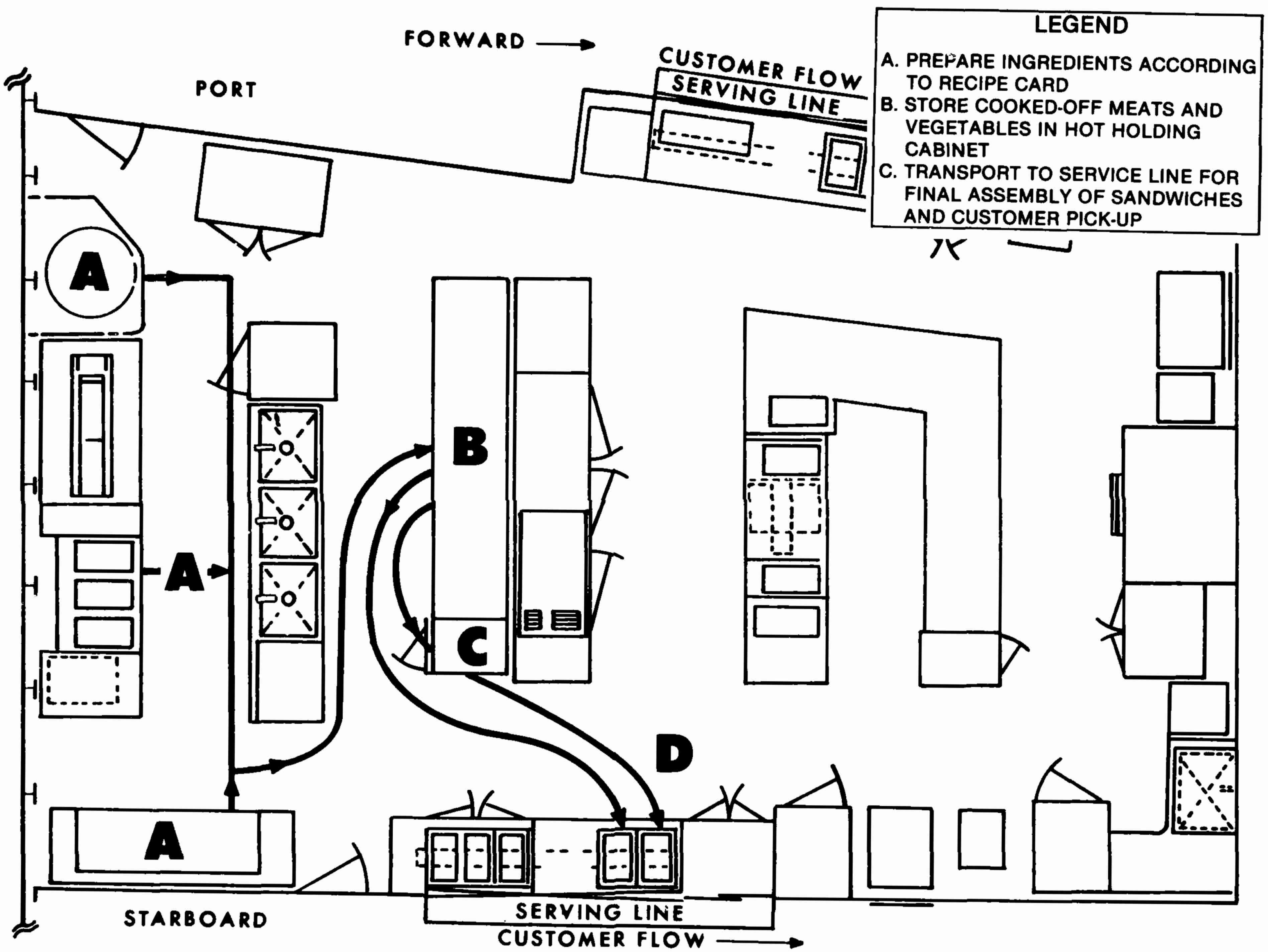

FIGURE 9. Forward Galley, Off-Line Preparation of Hot Submarine Sandwiches

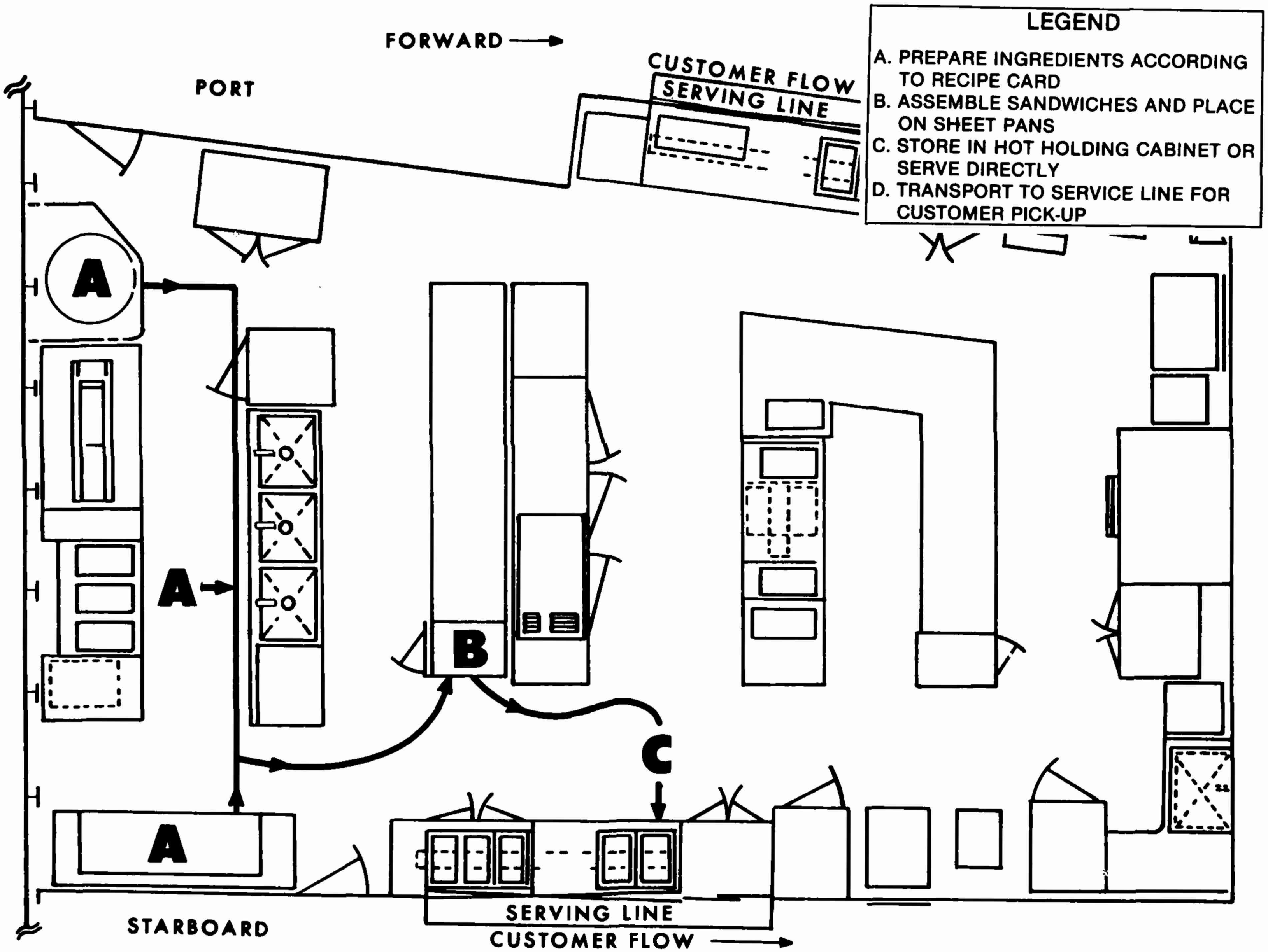

FIGURE 10. Forward Galley, On-Line Preparation of Hot Submarine Sandwiches

Also during the off peak meal hours of the early morning, the food products for hot submarine sandwiches were readied for the day's operation. Generally, preparation entailed cutting meats that were to be cooked-off just prior to the opening of the line in order to maintain high product quality.

Two service procedures have been used to present the customer with a hot sandwich. The first method developed used an off-line preparation technique (Figure 9). Sandwiches would be assembled and held in a warming cabinet adjacent to the serving line. The line attendant would take the tray of pre-assembled sandwiches from the cabinet as required. In the second alternative, sandwiches would be assembled on-line (Figure 10) as requested by the customer. While this procedure is appealing from a product quality standpoint, certain potential difficulties were apparent. Based on planned line speeds, when only one server was tasked with making hot sandwiches, he could not keep up with demand, thus having a negative impact on serving rates and customer waiting times. The use of two servers working cooperatively would be required to even approach the line speed achieved with off-line preparation. Therefore, if on-line preparation is utilized, the effect of inadequate staffing on serving line movement must be given serious consideration.

Fried Chicken. Food preference surveys as well as historical data collected onboard the Saratoga indicated that this menu item would be extremely popular. Attendance forecasts for fried chicken estimated that on the average 1000 customers would enter the starboard serving line. In reality, the resulting average headcount was approximately 1100. Headcounts of this magnitude had the potential for creating serious difficulties with regard to the labor and the number of fryalators required to prepare and serve fried chicken under the existing system. With a portion size consisting of three pieces of chicken (12 oz), over 750 lb of product were necessary for the meal (Figure 11).

An industry search for equipment that would provide increased preparation and cooking times with a reduction in labor led to the selection of several new pieces of equipment. Specifically, fast recovery deep-fat fryers and an automatic batter/breader unit were procured (Section VII). In addition to new equipment, a totally new method of preparing the chicken was developed that would enable the MS's to fry chicken in much less time than was previously required (Section VI).

At the beginning of the meal, a small inventory of fried chicken is built up and maintained to meet the large initial demand surge. After this point, progressive cookery is used to meet demand. At the serving line, foodservice attendants place the chicken in a paper lined plastic basket with french fries for customer pick-up.

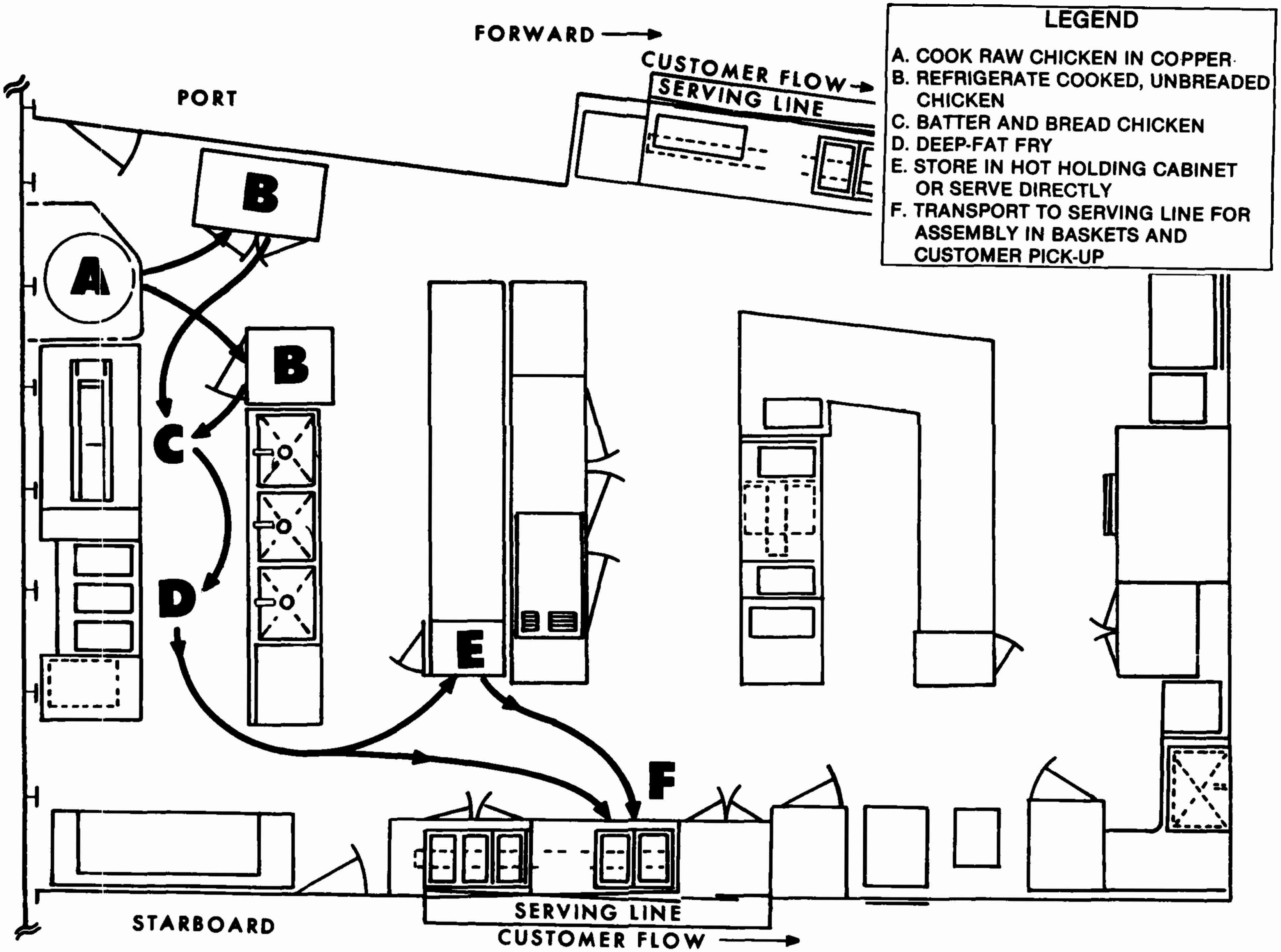

FIGURE 11. Forward Galley, Fried Chicken Operation

Fish and Chips. Since the fish portions in the supply system were of variable quality and did not have the same appearance as fish served in commercial fish and chip restaurants, commercially-available fish fillets were selected and tested. To accent the entirely new image desired, an English-style pre-breaded fish fillet which was different from the customary rectangular fish portion was chosen. This product would create a favorable quality and appearance impression contributing to the fish and chip theme, where the rectangular portion would not.

Production of fish and chips was extremely simple. The pre-portioned frozen fish fillets were placed in fryalators and cooked in about 5 minutes by one MS (Figure 12). In preparation for the high demand experienced when the line opened, a small inventory of product was held in a hot holding cabinet near the fryalators to prevent run outs. Subsequently, progressive cooking in small batches was followed throughout the meal. Fish portions with chips were placed in a paper lined plastic basket by serving line attendants for customer pick-up.

Pizza. Initially, two methods were considered for providing pizza. One was to use frozen prepared pizza or frozen pizza shells. However, both the projected attendance and frequency of service made this alternative impractical because significant amounts of freezer space would have been necessary to store this product. The second method was to make pizzas in the conventional way by preparing a dough crust and then dressing it with toppings. This method had been used in the past and found to be extremely labor intensive and time consuming. For these reasons, an alternative preparation technique was needed.

An industry state-of-the-art search led to a product that would allow pizza to be served with relative ease. This product was a shelf-stable pizza shell. Since dry storage was not as limited as chill or frozen, this item was also desirable from a storage viewpoint. Further, food testing using taste panels was performed, and the product was determined to have high customer acceptance (Section VI).

To further add to the ease of preparation, thereby reducing the need for a large number of skilled MS, recipes were developed that utilized other high quality pre-prepared food products (i.e., pizza sauce, shredded cheese, diced meat toppings). All food products accepted for use underwent product quality and food acceptability review.

Two choices of either a plain cheese or a topped pizza were offered on-line at supper every third day. A menu rotation was developed providing a different pizza variety from the previous time served. Assembly and inventory of ready to cook pizza began during the off-peak meal hours prior to the supper meal. Twenty-four rectangular (4" x 6") pizza shells are placed on a sheet pan and topped appropriately. About 20 minutes before

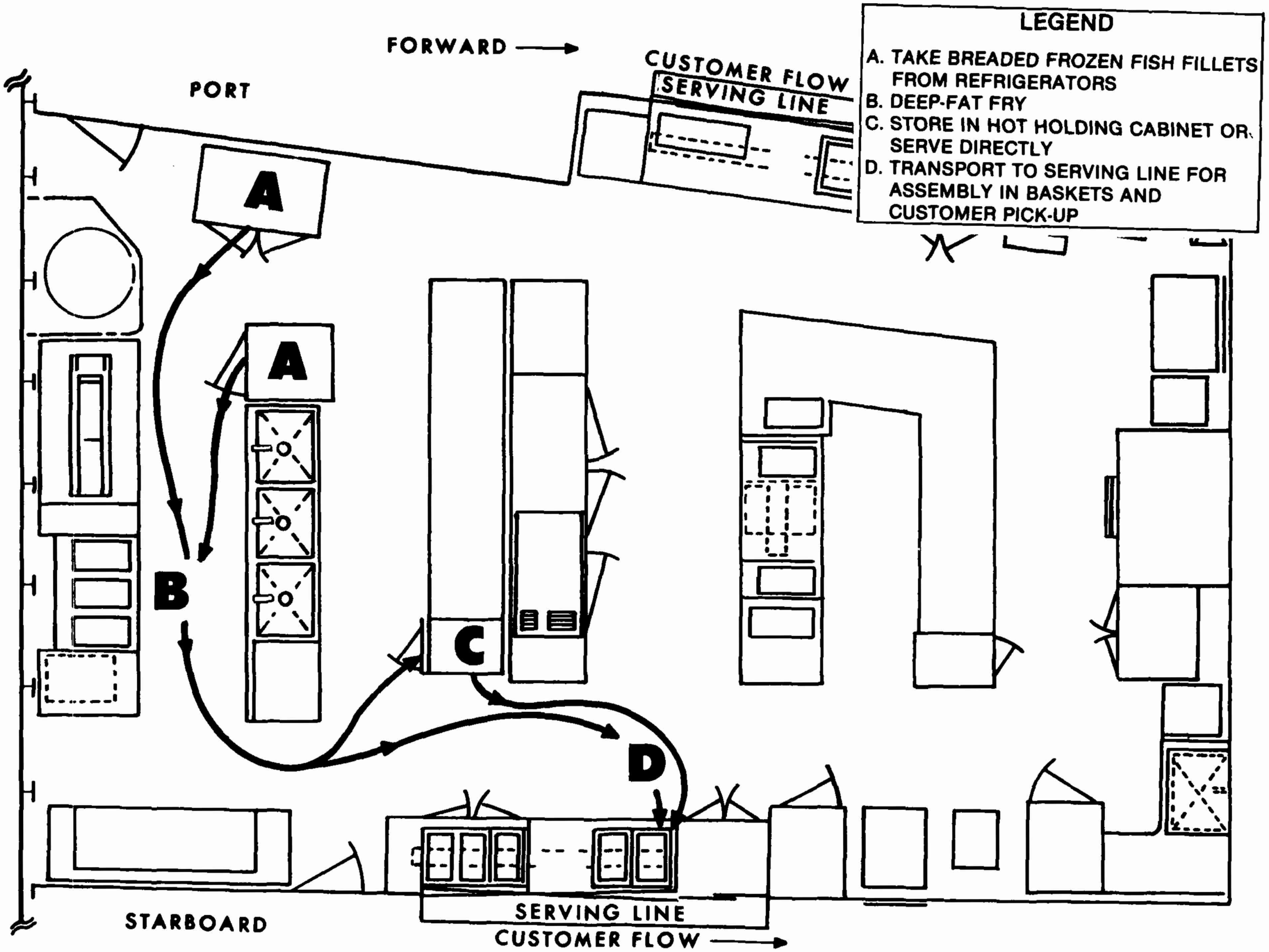

FIGURE 12. Forward Galley, Fish and Chip Operation

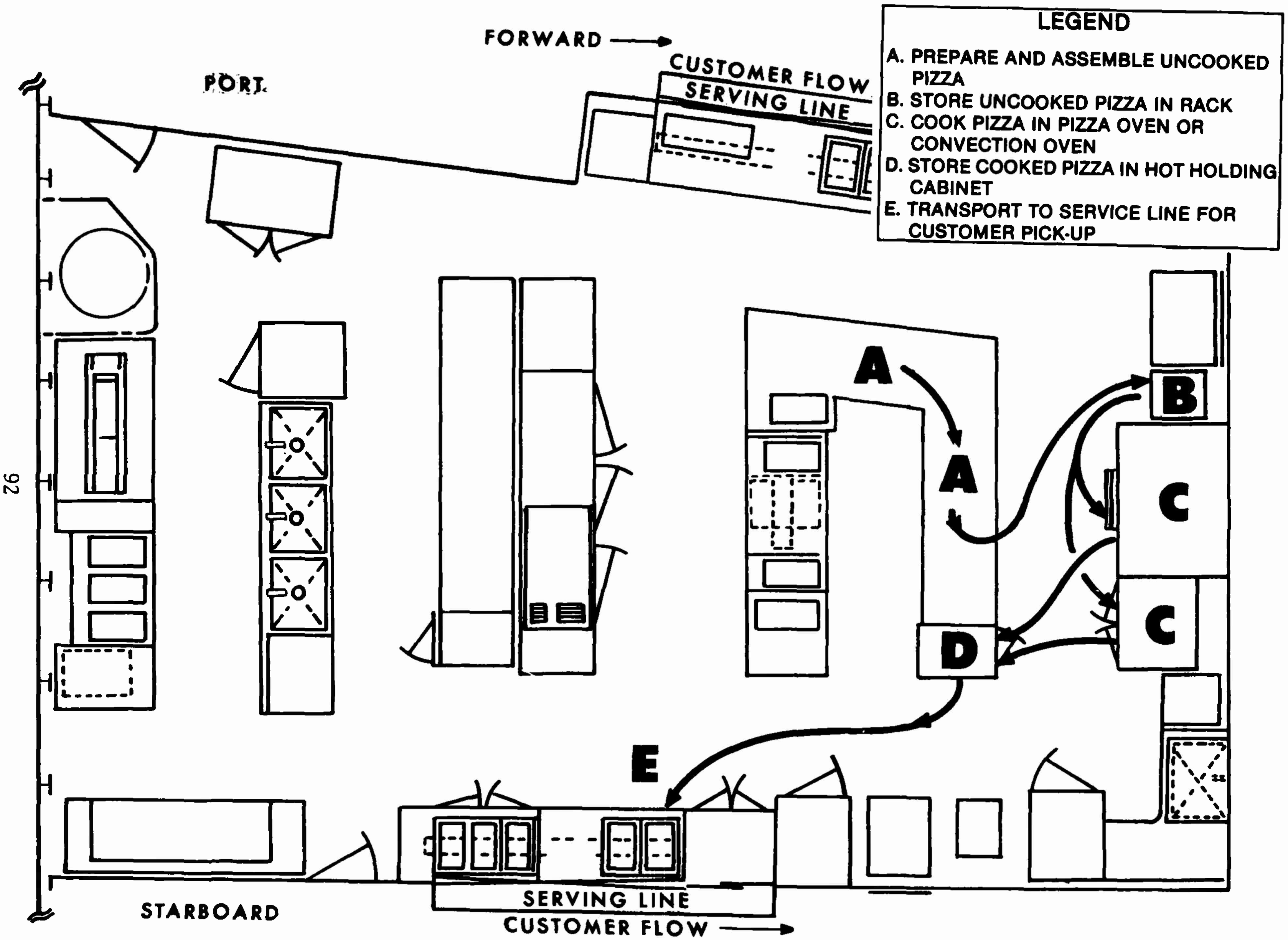

FIGURE 13. Forward Galley, Pizza Operation

the meal opens, a full oven (10 pans) of pizza are cooked-off (10 min) in the convection oven or pizza oven and stored behind the serving line in a hot holding cabinet (Figure 13). Cooking continued with the MS in charge balancing the cooking with the customer demand. As the meal progressed, additional pans of pizza were assembled and cooked, contingent upon the demand. The mean attendance for pizza was 900.

Service of the pizza to the customer was accomplished by using a spatula to lift the portion requested from the sheet pan and place it onto a flat tray lined with a non-porous wax paper. The customer then continued through the serving line.

Milk Shakes. One of the most important elements of the entire system was the service of milk shakes. Not only did this product contribute to the overall image change of the forward EDF but it also provided a new medium that was capable of improving nutrition of the enlisted personnel (Section XII).

Contribution to the positive image of the forward EDF was in part due to the availability of milk shakes on both serving lines at all dinner and supper meals. With 80 to 90% of all those entering the system during the early test phase selecting a shake, selection of durable high capacity equipment was essential. Space and manpower constraints were such that only one shake machine could be put on each line. However, the customer demand and equipment capacity indicated that one machine per line could not keep up. To overcome this situation, a shake storage freezer was installed that could inventory to 280 shakes. With this inventory and with both machines working during the high demand period at the meal's outset, production of sufficient quantities was possible. A (FIFO) policy was used in storing shakes in the freezer.

One of the more serious problems involved with volume shake production (Figure 14) concerned the blending of the powdered milk shake mix. To attain maximum production capacity, a fully blended and chilled product must be placed in the machine. Potential difficulties, including manpower, production time, and chill storage space required for blended product, were solved by installing an automatic blender which had just recently been developed for powdered mix operations. The Saratoga was the first foodservice outlet to use this machine. Sufficient quantities of blended mix could be prepared by one person during both the off-peak hours and meal period to meet the demand.

Customers served themselves by picking up pre-poured milk shakes at a dispensing cabinet located at the end of both the starboard and port serving lines. Choice of two flavors was offered at each meal.

French Fries. French fries were served with all entrees except pizza. Customers either picked-up a pre-bagged 2½-to-3oz portion on the serving line or received them as part of the entree as with chicken in a basket. With a projected attendance of at least 1300 in the forward EDF

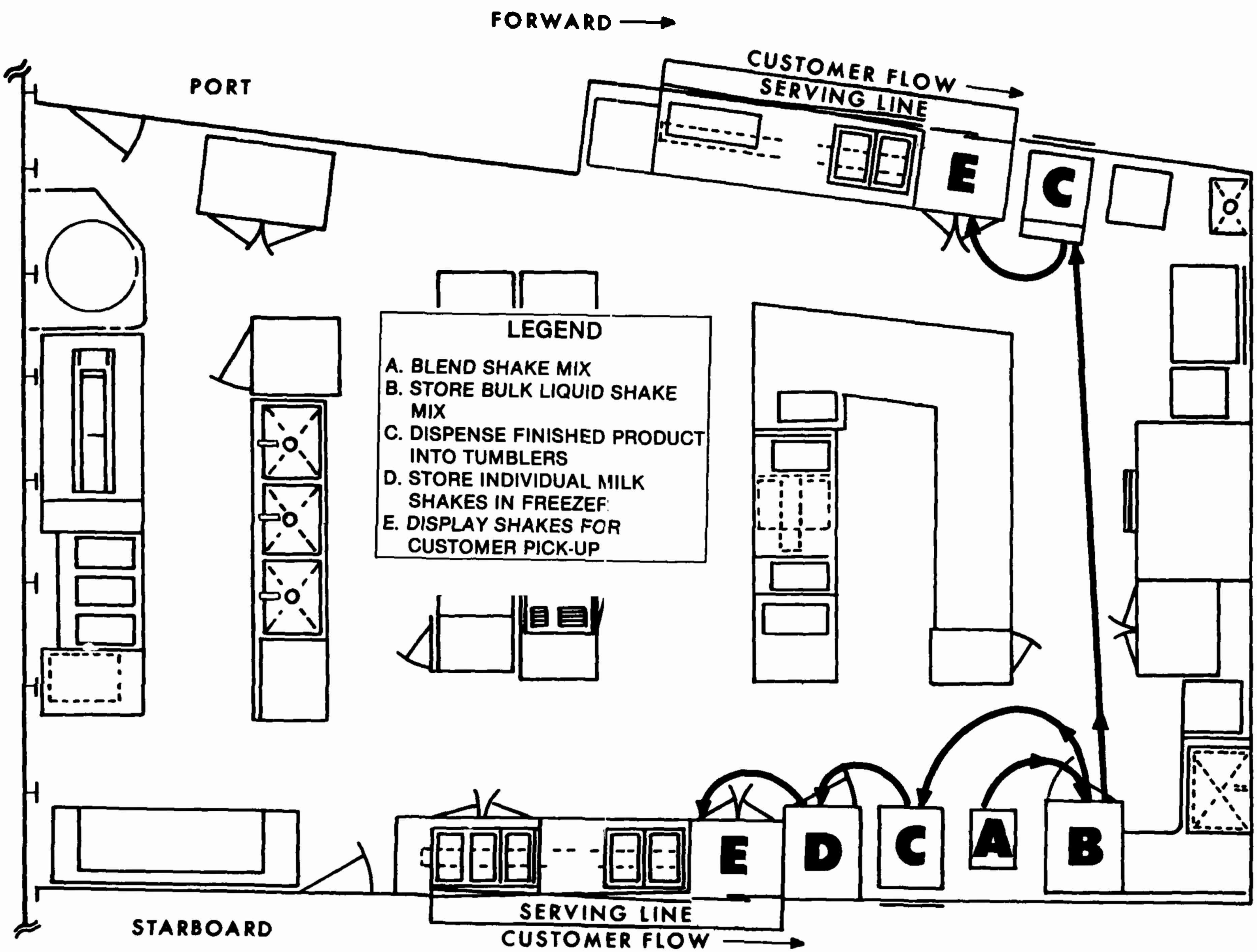

FIGURE 14. Forward Galley, Milk Shake Operation

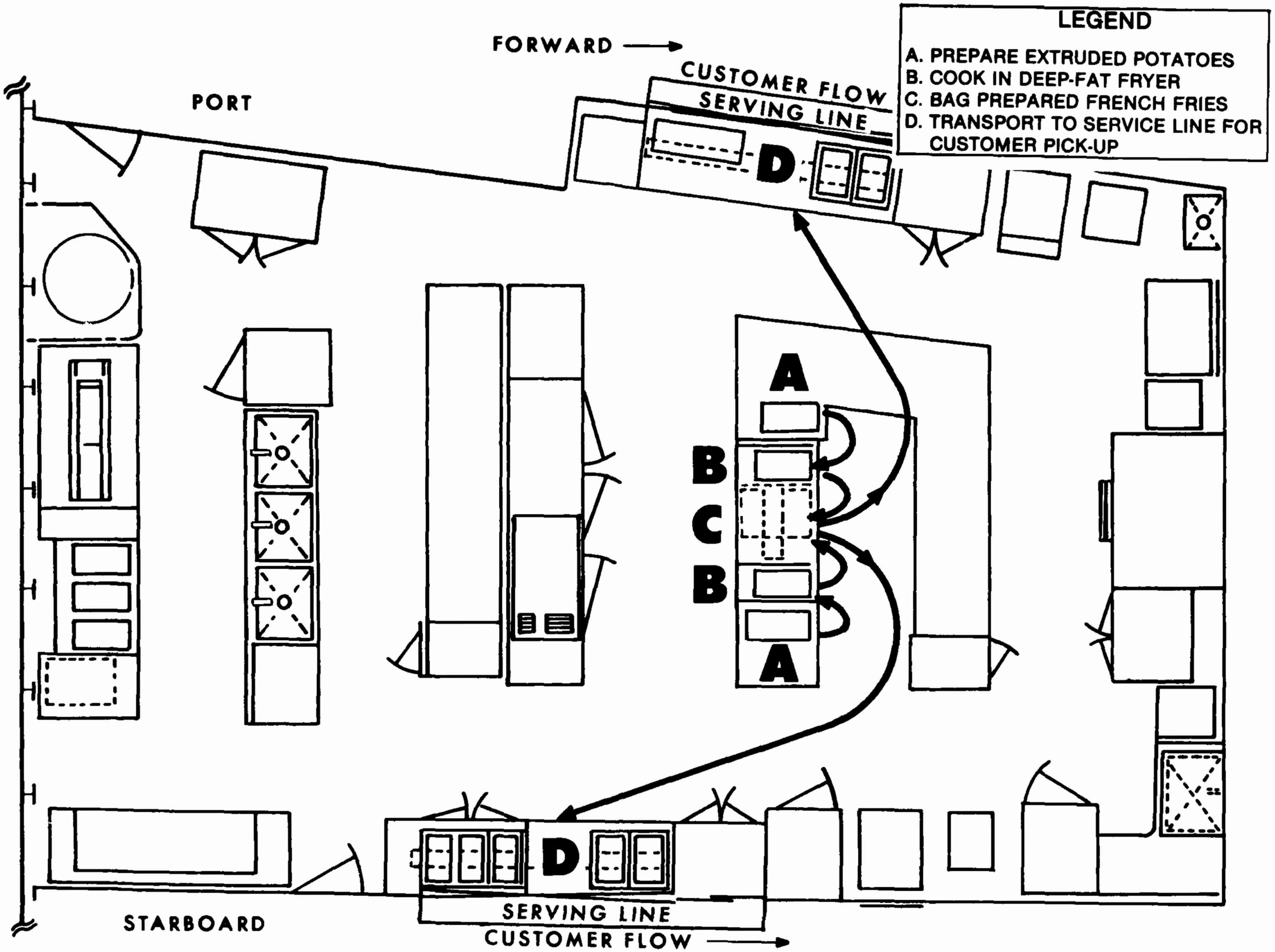

FIGURE 15. Forward Galley, French Fry Operation

twice daily and an estimated selection of french fries close to 100%, early in the test's planning stages, it became apparent that a high dependence on use of frozen french fries would be difficult from a storage point of view.

Therefore, extruded potatoes formed from dehydrated mixes presented a means of producing the quantity of product necessary. Several production methods were considered. The machine that was selected mixes the dehydrated potatoes, extrudes, and cuts them by having the operator merely push a button. All that was required for this operation was water and electricity for the machine, the dehydrated potato mix, and an operator. This machine is also capable of providing a number of different shapes for the french fries through a change in the cutter head. In the fast food concept, the shapes that have been used are straight-cut, crinkle-cut, and a chip or wedge shaped potato. Acceptability of the french fries has been extremely favorable when produced according to instructions.

An MS in charge of the fry operations operated the extruders and fried the product (Figure 15). After frying, the french fries were placed in a bagging well. One of two foodservice attendants bagged french fries and brought them to the serving line in steam table pans. In the case where french fries were included as part of the entree as with fish and chips, the unbagged fries were placed in steam table inserts and brought to the line, where they were placed in baskets with the entree.

ANALYSIS OF RESULTS

MEAL ATTENDANCE

Overall meal attendance was an important measure of the new system's success. Table 10 summarizes the mean daily attendance patterns by EDF and meal for both pre- and post-test phases of the Saratoga test. The mean daily attendance has been increased from 77% in the old system to 85% since the incorporation of the fast food concept. Thus, a relative increase in overall attendance of 10.4% has been demonstrated.

It is interesting to note that at breakfast and midrats, the percent of those eating remained about the same. The fast food concept to date has not actively undertaken to change these meals; therefore, the change in the percent eating might be expected to remain relatively the same.

At both the dinner and supper meals, where fast food modifications were focused, significant change was evident. Table 11 provides the mean daily attendance for dinner and supper meals in both EDF's. An

TABLE 10

Mean Daily Attendance for Enlisted Personnel

	Pre-Test		Post-Test	
	Attendance	Percent*	Attendance	Percent*
FORWARD EDF				
Breakfast	600	5	600	5
Dinner	800	7	1300	12
Supper	775	7	1800	16
MidRats				
TOTAL	2175	19	3700	33
AFT EDF				
Breakfast	1650	14	1225	11
Dinner	2100	18	1850	16
Supper	2000	17	1800	16
MidRats	975	9	1000	9
TOTAL	6725	58	5875	52
DAILY TOTAL	8900	77	9575	85
AVERAGE AUTHORIZED TO EAT	3845		3780	

*Percentage = Mean attendance at the meal ÷ daily authorized meals (i.e., 3 x avg. authorized to eat)

TABLE 11

Mean Daily Attendance for Dinner and Supper Meals

		Pre-Test Attendance	Post-Test Attendance	Change Attendance
FORWARD EDF	Dinner	800	1300	500
	Supper	775	1800	1025
	TOTAL	1575	3100	1525
AFT EDF	Dinner	2100	1850	(250)
	Supper	2000	1800	(200)
	TOTAL	4100	3650	(450)
	TOTAL	5675	6750	1075
	AUTHORIZED MEALS	7690[a]	7560[b]	
	PERCENT OF AUTHORIZED MEALS ACTUALLY ATTENDED[c]	74%	89%	
	RELATIVE CHANGE IN PERCENT ATTENDING FORWARD EDF			20%

NOTES:

[a] 2 x 3845 = 7690
[b] 2 x 3780 = 7560
[c] Meals Attended ÷ Meals Authorized

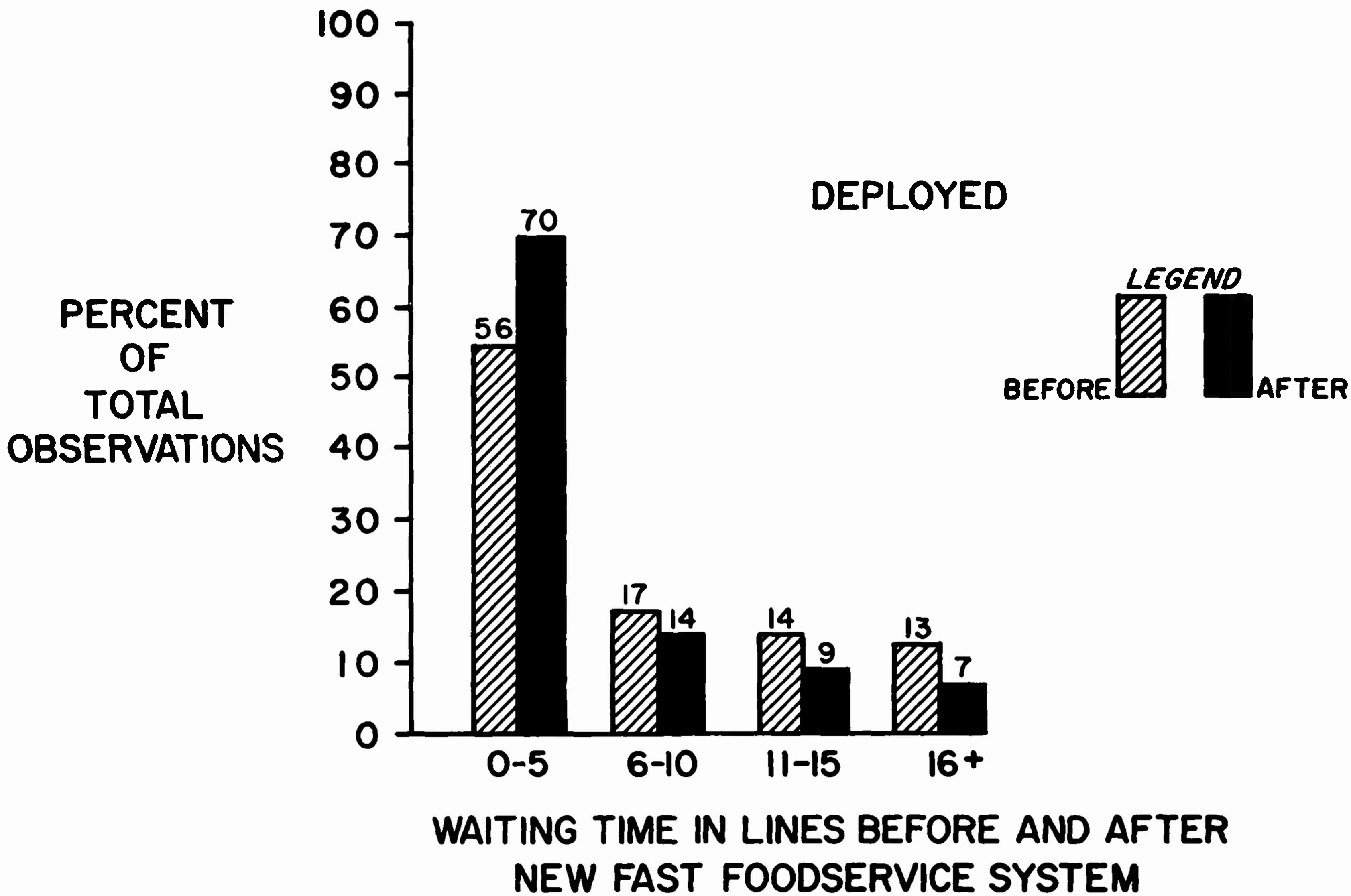

FIGURE 16. Waiting Time in Lines Before and After New Fast Foodservice System

average daily increase in attendance of 1525* diners equaling a relative increase** of 20% can be attributed to the popularity of the fast food EDF. EDF selection by enlisted personnel overwhelmingly favored the aft EDF at both dinner and supper meals in 1977. Post-test results cited in Table 12 indicated that the disproportionate utilization of the aft EDF no longer exists. At both dinner and supper, the EDF selection percentages were more evenly balanced.

WAITING TIMES

Results summarized in Figure 16 show that waiting time was reduced after implementation of the fast food concept. In the categories of six to ten minutes, eleven to 15 minutes, and over 16 minutes results place the relative percentage reductions at 21%, 67% and 88% respectively. The waiting time reduction in the five minutes or less category derives from the fact that more customers appeared in this category after fast foods were introduced than before the modifications were made.*** Thus the objective to reduce waiting times was achieved by increasing the number of customers who waited less than five minutes for a meal.[7] The results displayed in the figure represent combined data for all noon and evening meals served during peak periods generally the first 90 minutes of the meal from the forward and aft facilities.

Two management policies, if adopted in future applications of the fast food concept, might produce an even more significant reduction in customer waiting times. The first policy decision would be to operate both forward and aft EDF's at the same hours for noon as well as evening meals. One of the heaviest demands on the USS Saratoga's foodservice facilities occurred between 1030 and 1230. During this interval, the new fast food facility was opened only during the last 30 minutes, (i.e., 1200-1230) and therefore, it could not significantly affect the aft lines.

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*Forward EDF dinner and supper headcounts = 3100 *after* vice 1575 *before*.

**Authorized noon and evening before = 2 x 3845; after = 2 x 3780. 1525 divided by 7560 = 20%.

***The division of observed waiting times into 5-minute intervals is somewhat arbitrary. There is, however, evidence from garrison foodservice studies which shows that five minutes is about the point at which customers report that lines are too long.

[7]Jacobs and Meiselman, p. 279.

TABLE 12

USS Saratoga EDF Selection Patterns

Meal Distribution Percentages*(%)

	Percentage		Percentage	
	Pre-Test		Post-Test	
	AFT	FWD	AFT	FWD
DINNER	72	28	59	41
SUPPER	72	28	50	50

$$^{*}\frac{\text{Mean Attendance at Indicated EDF}}{\text{Mean Attendance at that Meal}}$$

The second management decision which has an effect on waiting times is the extent to which items were prepared on-line or drawn from an inventory. In the present case, speed of service was observed to slow down when hot submarine sandwiches were prepared and served on line. This also applied when fried chicken and fish were placed in the basket on the serving line. On-line serving rates were further slowed when only one foodservice worker was behind the line to assemble and serve the hot items.

The factors which influence waiting time at a given meal are both numerous and complex. Flight operations, scheduled General Quarters, and man-overboard drills have a significant effect. In the results summarized above, all meals for which data were taken have been included and thus the results were influenced by the fact that all of these special situations occurred during the data collection period.

THROUGHPUT RATE

A primary component of throughput involved the serving line capacity of the system. Saratoga's pre-test forward EDF was capable of serving 5.7 men per minute on the average from the one serving line that was in use. Only rarely was this serving line observed maintaining a sustained rate. Post-test Saratoga was able to improve the old rate by 18% by raising the service rate to an average of 6.7 for the meals observed. Apart from increasing the serving rate on the one line, an additional serving line was opened. The serving rate on the average for that line was also 6.7 men per minute. The men per minute that now can be served represented a 235% relative increase.

A final comment concerning serving rates must be made. In the new system, serving rates at the beginning of a meal were extremely high. A line build-up prior to opening the EDF quickly disappeared as serving rates of the pre-packaged entrees often reached as high as 14 to 18 men per minute on both serving lines for a short-period of time when the EDF started meal service.

The fast food EDF required the very high throughput that was achieved. With the serving rates obtained, a potential 804 diners can be delivered into the dining areas. This represents 110% increase over the old system and has been achieved on several occasions. Under the old system, the dining area seating provided 96 spaces for diners. With a measured average eating-time of roughly 12 minutes, seating would have been insufficient to accept the diners entering the dining areas. Average actual eating-time is now 10 minutes which represents a 9% decrease over pre-test eating times and 5.2 potential turnovers of the dining area. Preliminary analysis of the pre-test system had accented this potential problem; therefore, seating had been increased by 69% to a total of 162 eating spaces and was therefore capable of meeting the throughput that had been achieved since 5.2 turnovers multiplied by 162 spaces to eat approximates 840 seatings per hour.

Analysis of attendance and eating times in the fast food system indicated that while not every meal required this high throughput, many did. Between 40 and 45% of those who attended the meal arrived in the first hour of operation; therefore, with attendance ranging as high as 2000 to 2400, as many as 1100 men had entered the system during the first 60 minutes, requiring maximum galley throughput.

CUSTOMER OPINION

Foodservice aboard the Saratoga during the 1977 pre-test was rated the least satisfying out of 9 morale-related aspects of Navy life, when a question dealing with the quality of life aboard ships was asked. Data collection during the 1978 Mediterranean deployment was directed towards determining whether the pre-test ranking of foodservice had changed. A change from 9th to 6th place in the forward EDF had taken place. Rankings in the aft facility had remained about the same 7 to 8. This was a marked improvement for the forward EDF when one considers that to change the basic attitudes towards these aspects of Navy life in such a short time span was very difficult.

Sailors were asked to compare their ship's EDF to those aboard other ships on which they had served. In pre-test surveys, only 23% indicated that the Saratoga's EDF's were better in some degree than other ships. After the fast food system was introduced, 47% of the sample responded that the forward EDF was better in some degree than other ship's EDF's. This represents a relative increase of over 100%.

Food acceptance evaluations by Saratoga enlisted personnel have also increased. The average overall rating for the post-test was 6.69 which falls between *like slightly, like moderately,* while the pre-test average rating was 5.50, *neither like or dislike.* Comparison of the average food acceptance ratings for pre-and post-test periods reveals that the satisfaction with the food served in the forward EDF was improved by approximately 22%.

The major conclusion drawn from the questionnaires and interviews was that the fast food concept gave sailors the high quality and preferred food products that they said they wanted. By giving the enlisted man what he desired, positive attitudes towards the foodservice operations and the overall quality of life were generated.

MS EVALUATIONS

Mess Management Specialists (MS) were surveyed and interviewed in both the Caribbean and Mediterranean cruise during pre-and post-test phases to determine job satisfaction as measured by a Job Description Index. It had been postulated that because of an anticipated increase in the workload, MS job satisfaction in the forward facility could be adversely affected. Comparisons of responses made by forward and aft EDF MS's indicated that job satisfaction between pre-and post-test had changed. Mediterranean results, because they came after long-term usage of the facility, were perhaps more representative of the system than some of the early data. Test results for the 1978 Mediterranean deployment placed MS satisfaction within the forward EDF 29% higher than during the 1977 Mediterranean cruise.

MS ratings of selected factors for both aft and forward facilities also highlighted the positive aspects of the fast food concept. Mean MS responses for job motivation were higher in the forward EDF than for the aft. MS opinions of eight specific aspects in their foodservice operations once again provided an interesting contrast. Forward MS mean responses placed each of the 8 factors at least *good* while every factor in the aft galley was rated *slightly bad*. The conclusion that can be drawn from these types of responses was that the forward EDF was providing an environment that positively related to the needs of the MS, thus contributing to overall satisfaction.

PRODUCTIVITY

Analysis of the staffing levels required to service the fast food EDF indicate that the productivity level for each man in comparison with the conventional aft facility had increased. Productivity as measured by meals served per labor man-hour for the forward EDF during dinner and supper meal periods averaged 20 meals per man-hour, while the aft facility provided 14 meals per man-hour. On the average for this period, the forward EDF had a productivity level which was 43% over the aft galley. Presently, the forward EDF was not serving a midrats meal which it was easily capable of doing without increasing labor requirements. The effect of adding this meal would be to increase the overall daily productivity of the forward EDF.

As was evident from the food acceptance and the sustained high serving rates that had resulted, utilization of foodservice attendants, *mess cooks*, in many food preparation tasks in the new galley had not compromised the concept at all. Thus, the new system was not dependent on a high level of cooking skill. One of the significant aspects of using the foodservice attendants was that a better return for the labor dollar was effected. *Meals per man-dollar* represents the number of meals served for each dollar of labor expended in the galley. Productivity for the forward galley was 4.8 meals per man-dollar, while for the aft galley the measure was 3.3 meals per man-dollar. A variance of 1.5 meals per man-dollar in favor of the foward EDF represented a 45% increase in productivity for the fast food EDF over the aft EDF when measured in this manner.

FOOD COSTS

Following implementation of the new system in the Saratoga, an analysis was made of food costs for the dinner and supper meals in the forward EDF. Over an 8-day data collection period for both meals, the cost of food per meal served was found to average 86% of the pertinent portion of the basic daily food allowance. These costs were probably conservative. In most start-up operations, inefficiency and waste often occur, and the present case was no exception. As the effect of the learning curve takes place, it is expected that the increase in efficiency will result in further reductions in food costs as a percentage of the basic daily food allowance.

NUTRITION EVALUATION

Measurements taken during the 1977 pre-test detailed a high incidence of low intakes of vitamins A and C as well as calciums in the diet of enlisted personnel.

TABLE 13

Evaluation of Forward EDF Meals

	Percent of Population*			
	Before Fast Food Adequate Intake %	After Fast Food Adequate Intake %	Percent Improvement %	Relative Percent Improvement %
Protein	86	96	10	12
Calcium	75	91	16	21
Iron	48	35	(13)	(27)
Vitamin A	13	51	38	292
Thiamin	59	53	(6)	(10)
Riboflavin	66	86	20	30
Niacin	60	89	29	48
Vitamin C	36	57	21	58

*184 subjects in pre-test, 203 subjects in post-test who reported eating at least one meal in the forward EDF.

Fortification of a few specific highly popular food items with the nutrients targeted for improvement contributed to the progress that was measured in this area.

Soft-serve milk shakes furnished a medium that enabled calcium and vitamin A inadequacies to be addressed. Availability of milk shakes at all meals allowed customers to have access to a significant alternate source of calcium which was especially important when milk supplies ran out. Milk shakes also offered a method for vitamin A fortification, as it was an excellent carrier for this nutrient.

As shown in Table 13, the incidence of adequate calcium intake has increased in the post-test forward EDF to 91% representing a 16% improvement over the pre-test. Milk shakes providing 1/3 the USRDA of vitamin A have significantly contributed to raising the adequacy of intake of this nutrient in the population sampled. Before introduction of fast foods, only 13% of the sample reached adequate levels for this vitamin as compared to 51% in the post-test results. This 38% increase over 1977 actually represents a relative improvement of 292% which is significant.

Extruded french fries were identified as one of the better sources capable of being fortified with vitamin C. To each 2-½-to 3-oz serving of french fries, fortification sufficient to provide 1/3 the USRDA of vitamin C after frying was added. Results indicated that the incidences of adequate intake for the population sampled was increased 21%. Also recommended as a method for increasing the availability of vitamin C was the use of fortified non-carbonated beverage bases. These beverage bases were used for a short time in the Caribbean. Surveys indicated that they were well liked; however, the Saratoga did not have this item in stock during the Mediterranean survey. Undoubtedly vitamin C intakes would have been higher if these beverage bases had been in use.

DINING DECOR

In the pre-test period 61% of those surveyed indicated that the forward EDF was not an enjoyable place in which to eat. Following the physical changes in the serving lines and dining areas, the negative evaluations had been reduced to 23%, a relative improvement of 62%.

Modifications to the dining area environment influenced several important habitability factors. The effect of these renovations is tabulated in the following summary.

Habitability Requirements	Specific Factors of the Dining Envrionment	Positive Opinion Before	(%) After	Relative Improvement (%)
Privacy	Crowdedness	8	17	113
	Separation of Activities	20	60	200
	Visual Distraction of other people	21	33	57
	Waiting time in Chowline	20	32	60
Comfort	Chair comfort	19	40	111
	Noise level	31	49	58
	Table Size	76	66	(13)
Efficiency	Finding a place to eat	17	16	(6)
	Ease of obtaining a meal	27	62	130
Image	Furniture condition	25	52	108
	Visual distraction from physical items	36	63	75
	Furniture color	42	66	57
	Color throughout space	22	52	136

Improvements were achieved in all areas except in the ease of finding a place to eat. This is understandable because of the low usage of the forward EDF in the pre-test period and the greatly increased attendance after the new system was introduced. Considering this fact, it is surprising that the perception of crowdedness actually improved.

In sum, the forward dining area environment was significantly improved. The conclusion that the physical modifications developed for this project were an integral component in the success of the fast food concept seems warranted.

SUMMARY

Major results of this study are summarized in Table 14 and justify the following points.

The goal of increasing the overall satisfaction with foodservice aboard aircraft carriers has been accomplished. Design of a completely new foodservice system featuring a new food outlet that serves a high preference, limited choice, fast food menu has positively contributed to raising the quality of life for the enlisted man aboard CV's.

TABLE 14

Summary of Results for USS Saratoga Fast Food Test

Forward EDF Test Results	Relative Improvement
FOOD ACCEPTANCE	22%
Food Quality	47%
Food Variety	52%
DINING ENVIRONMENT	62%
PERCENTAGE EATING FORWARD	
All Meals	77%
Dinner and Supper	100%
OVERALL ATTENDANCE (FORWARD AND AFT)	
All Meals	10%
Dinner and Supper	20%
WAITING LINE TIMES	21%
THROUGHPUT/FIRST HOUR	110%
Serving Rate	18%
MESS DECK SEATING INCREASED	69%
MS JOB SATISFACTION	29%
WORKER PRODUCTIVITY	43%
FOOD COST UNDER BDFA	14%

Application of state-of-the-art equipment and food technology enabled major improvements in existing foodservice problem areas of storage, productivity, and nutrition to be made.

Reductions of the time spent in line resulted from utilizing improved display and service techniques that allowed the customer to process his selections in a more efficient manner. Apart from expediting meal service, renovations to the dining areas provided maximum seating in a more pleasant dining environment.

In summarizing the results of fast food's first test afloat, perhaps a USS Saratoga sailor said it best:

> "I made the last cruise and the improvements since last year are truly amazing. Things that need improvement in the Navy usually take years, not between cruises. Thanks".[8]

[8] "Fast Food Operations", USS Saratoga MSG 061442Z, 1978 December.

SECTION V

FAST FOOD MENU

BACKGROUND

Surveys of the crew and observations by the project team have led to the conclusion that menus on aircraft carriers were capable of improvement. The initial concept development considered numerous versions of menus for both the forward and aft enlisted dining facilities (EDF) of the USS Saratoga and USS Kennedy. The scope of the project was subsequently narrowed with the selection of the Saratoga as the test ship and a decision that only the forward EDF would be modified.

PRE-TEST ANALYSIS

Pre-test data clearly indicated that the aft EDF was serving the majority of meals aboard the ship. In fact, the forward *speed line* was serving only about 28% of the breakfast, dinner, and supper meals. This low attendance at the forward line contributed significantly to the Saratoga's aft waiting line problems.

Daily, the aft EDF offered multiple entree dinner and supper meals. Different selections were provided for each meal. The forward EDF offered the same speed line menu for dinner and supper. There appeared to be no menu coordination between the forward and aft galleys to avoid product repetition. On one occasion, for example, the menus indicated that both the forward and aft galley were featuring some form of seafood at the noon meal. The *speed line* menu typically consisted of a soup and sandwich combination, while occasionally offering raviolis, B-B-Q beef on a bun, chili, and frankfurters. It was observed that beverage and salad bar selections forward were very limited.

Data from consumer opinion questionnaires* taken in the Mediterranean cited waiting lines as a major problem, in addition to indicating dissatisfaction with food quality, quantity, variety, and speed of service. Customer dissatisfaction was further evidenced by the fact that on the average only 77% of Saratoga's crew attended meals at sea.

As a result, the two major objectives in the menu concept development became: (1) improve customer satisfaction, and (2) reduce waiting lines by attaining higher service rates.

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*See Section XI for further information.

MENU DEVELOPMENT

As part of the menu design effort, customers were asked to rate a variety of foods and indicate their likes or dislikes for each item (Food Preference Survey). Interviewees were also asked to select three specific types of new foodservice outlets that they would like to see on the ship (Customer Opinion Survey). The following table illustrates the combined results of the first, second, and third choices of the customers surveyed. Items appear in descending order from most popular to least popular:

	Items Evaluated*	Scale Value
1.	Submarine Sandwiches	7.0
2.	Fish and Chips	6.7
3.	Hamburgers	6.2
4.	Barbecue	5.8
5.	Mexican Food	5.4
6.	Vending Machine Items	5.2
7.	Pizza	5.1
8.	Spaghetti	5.0
9.	Health Foods	4.7
10.	Sandwiches	4.1
11.	Hot Dog, Polish Sausage	3.8
12.	Vegetarian	2.7
13.	Others	1.9

High preference items identified in the Customer Opinion Survey and the Food Preference Survey began to take on characteristics of a commercial fast food menu. This supported results from surveys and from actual foodservice experiments conducted by NARADCOM in other military services.

A literature search of trends in the fast food industry proved interesting. In 1978, burger operations accounted for 55% of the industry's $17 billion in sales. Full course fast food steak houses, fried chicken, pizza, and fish and chips restaurants followed respectively. Further, pizza chains are considered to be one of the most rapidly growing types of operations in the industry. Overall, industry sales figures demonstrate that fast food organizations on a whole have been quite successful in merchandising limited menus. The question was then how would a limited selection fast food menu affect Saratoga's crew? Numerous analyses were conducted on projected attendance, customer arrival rates, service rates, and seat turnovers. The results presented a favorable case for adopting fast food in the forward EDF as a distinctive and highly acceptable alternative to the established full service menu in the aft EDF.

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*Fried Chicken was not included in this survey.

Supported by the customer opinion data, consumer preference data, and previous NARADCOM experience, the decision was made to design a menu that incorporated a number of commercially popular fast food themes. A major objective in this decision was to offer the customers onboard Saratoga products that were similar to and as acceptable as menu items in the best fast food companies. Overall, system continuity would be maintained by offering only high preference, finger type foods. Serving methods compatible with these foods would permit accelerated serving line speeds, hence real *fast foodservice*.

The menu design was built around a variety of submarine sandwiches, fish and chips, fried chicken, pizza, and burgers. Other items were identified and tested but subsequently dropped for various reasons. To enhance the desired fast food image and offer additional high preference items, french fries and milk shakes were added to the menu. Actual construction of the new menu presented some challenges. Various new fast food products and recipes, similar to those used in industry but adaptable to shipboard equipment and circumstances, had to be selected and tested. Other variables also had to be taken into consideration -- for example, what items should be served at lunch, what items should be offered at supper, which foods from an equipment standpoint could be produced simultaneously, and what combination of foods could be offered on the two forward serving lines that would maintain the desired variety and service rate. To illustrate this latter point, suppose cheeseburgers, meatball subs, ham salad subs, french fries, onion rings, and two varieties of milk shakes were to be offered on each serving line at dinner; the number of decision points a customer would have to contend with would certainly have a detrimental effect on serving line rates. In the area of operations, a menu offering fried chicken, English style fish and chips with hush puppies, and burgers with french fries and/or onion rings would require an excessive deep-fat fryer capability compared with other menu combinations that would not place such emphasis on fryers.

The basic menu concept developed by the NARADCOM project team is presented in Table 15. Over a three-day cycle this concept enables the forward EDF to become a Burger House, Submarine Sandwich Shop, Pizza House, Fried Chicken Stand, and an English Fish and Chips Inn. By this means, a variety of themes and food products are offered. No redesign effort was focused on the breakfast meal. The Saratoga wished to continue the customary continental style breakfast that had previously been offered.

Because of their popularity, burgers, french fries, and milk shakes are available on the port serving line for both noon and evening meals. This design also maintains a measure of continuity on one serving line, thus simplifying the customer's decision of lines. The starboard line offers a choice of one hot and one cold submarine sandwich at the noon meal. The cycle menu lists thirteen submarine sandwich selections, seven of which were new recipes developed specifically for the Saratoga. The sub sandwich menu is periodically supplemented with quarter-pound all beef frankfurters, fishwich sandwiches, chili dogs, B-B-Q beef on a bun, and Sloppy Joe's on a bun.

Evening meals on the starboard serving line on successive nights offered English style fish and chips, a variety of pizza (cheese, combination, pepperoni, sausage, hamburger, mushroom), and fried chicken. All these commercially popular products were offered on an unlimited seconds basis. Normally two types of pizza were offered at any one meal.

It will be noted that pizza was included in the menu even though it had not been rated particularly highly in the previously mentioned customer opinion data. The decision was based on the observation that the typical pizza served aboard ship was mediocre at best and that by offering customers a high quality product, an excellent level of acceptance would be realized. This decision was further based on the popularity of pizza with young service members in ashore locations and on National Restaurant Association data which shows that pizza is the fastest growing item in US restaurants.

TABLE 15

Fast Food Menu Concept*

	Port Line	Starboard Line
Dinner	Beefburgers French Fries Milk Shakes	Submarine Sandwiches French Fries Milk Shakes
Supper	Beefburgers French Fries Milk Shakes	Pizza - (Day 1) Fried Chicken - (Day 2) Fish and Chips - (Day 3) French Fries Milk Shakes

*Salads and assorted carbonated and noncarbonated beverages were routinely offered at each meal. Their location was in the mess decks rather than on the serving line.

As part of the new system, milk shakes, french fries, nine assorted beverages and a good salad bar selection were available at all dinner and supper meals. This permitted offering a *complete* fast food meal comparable in quality and variety with the better commercial fast food companies. Normally two flavors of milk shakes were provided at each meal.

Based on operating experience, a complete twenty-one day cycle menu was drafted for the new fast food facility, and this menu is presently in use onboard the ship. This menu is provided in Appendix B. New or revised recipes supporting the menu are shown in Appendix C.

POST-TEST RESULTS

As a result of the new operation, a significant increase in customer attendance forward was achieved with a concomitant increase in serving rates and customer throughput (Section IV). The popularity of the fast food menu was the major contributing factor in this increase.

RECOMMENDATIONS

1. To the extent possible, the forward and aft menus should be different and distinctive. That is, foods appearing on the fast food menu forward should not be incorporated into the aft menu, and vice versa. Further, the serving of similar items forward and aft during the same meal or even the same day should be avoided. For example, on the day that fried chicken is served in the forward EDF, it is undesirable to offer a chicken item aft.

2. The present fast food menu designed for Saratoga should not be increased or modified. Similarity to commercial fast food menus is a key element. Items appearing on the menu have been selected, tested and proven under actual operations. Consistency is as important onboard ships as it is at McDonald's and Kentucky Fried Chicken. Further, variety has not been found to be a problem in the new system.

3. The distinct serving line identities at the dinner and supper meals should be maintained. Variety in types of foodservice outlets is a key element in the concept.

4. Limit product selections on serving lines. The concept is to offer highly preferred items but to strictly limit the number of selections at any one meal in order to decrease customer decision time and maintain line movement.

5. Utilize the food products which have been specially selected for quality, ease of preparation, and storage characteristics.

6. Implement a short order breakfast line around assorted omelets, a product similar to McDonald's *Egg McMuffin*, fresh breakfast pastries, and a high quality orange juice.

SECTION VI

FOOD PRODUCTS AND RECIPES

BACKGROUND

Initial menu proposals focused on possible menu redesign efforts in both the forward and aft dining facilities. General customer dissatisfaction with foodservice presented a convincing case for upgrading the menus in both galleys. Since the menu concepts being considered dictated the choice and evaluation of new food products, a brief description of initial menu development will show why various food products were selected for testing.

EARLY MENU CONCEPTS

Early in the concept formulation, a 42-day menu was proposed for the aft dining facility reflecting increased emphasis on the more popular food items customers said they preferred. In addition, a menu made up of various ethnic/specialty meals (such as French, German, Italian, and Southern) was drafted to periodically supplement the A-ration meal on the aft port serving line. A new short order breakfast line was developed around fresh orange juice, assorted omelets, a McDonald's *Egg McMuffin* like product, quality breakfast pastries, coffee, and cocoa. A dieter's menu was also considered for the aft facility.

The forward galley menu, however, soon became the main thrust of the concept development effort. As mentioned previously, the theme of the new system forward centered around the fast service of popular, high quality menu items.

In conjunction with the above menu planning effort, over 100 food items were tested and evaluated by the project team for possible inclusion in one or more of the proposed menus. Over 70 new food items from commercial industry sources were tested during the initial product evaluation phase. Foodservice trade shows throughout the country provided a good deal of the information on these new products. Forty-three additional food items were chosen from the Federal Supply Catalog Stock List, FSC Group 89. These stock items were evaluated to determine their suitability for the new menu concepts under development. Where possible, food items were selected from the stock list in an effort to lessen the impact of introducing new products into the resupply system.

PRODUCT EVALUATION CRITERIA

Each new product considered for the fast food menu was subjected to evaluation either in NARADCOM's Experimental Kitchen or onboard the USS

Saratoga. The following criteria were established to aid in determining each product's suitability for inclusion in the system.

1. Product Quality

Quality food items represent a key success factor in any commercial fast food operation. This is evidenced by the tight centralized control that industry corporations exercise over the menus and purchasing requirements of their company outlets and franchises. The objective aboard the Saratoga centered around providing the ship's customers with equally high quality food items.

Two categories of product quality standards were applied:

(a) Ingredient Quantity. Where they applied, USDA Product Standards of Identity were used in the selection of food items for the new menu. A case in point was Beef with Barbeque Sauce, a local purchase item in the stock catalog. A product was selected which met the necessary criteria to be labeled *Beef with Barbeque Sauce*. The requirement for this catalog item specifies that the product contain a minimum of 50% cooked beef. On the other hand, *Barbequed Sauce with Beef* can contain as little as 35% cooked beef. In the latter case, a lesser quality product is substituted. Based on providing the same quantity of beef per serving, this product offers fewer portions per can, and in most instances at a proportionately higher cost per serving.

(b) Ingredient Quality. Of equal or greater importance in the evaluation is ingredient quality. A particular English-style breaded fish fillet was selected not only for its high percentage of fish flesh, but also for the species and quality of fish used in the product.

It was observed on several occasions aboard the Saratoga that the standard stock fish fillets were somewhat boney while the cod fillets selected for the test were virtually boneless. NARADCOM feels the breaded fish portions in the system should not be substituted for the English-style fillets in the new fish and chips recipe. The English-style fish fillets have been specifically designed by way or product texture, shape and batter coating for use as a finger food entree.

2. Product Adaptability

Food items selected for the new menu would have to perform within the physical constraints of the forward galley. Food operations requiring large preparation areas, highly sophisticated pieces of equipment, large amounts of refrigeration space, or intensive use of labor could not be considered. An example would be a conventional pizza operation where dough has to be made and rolled out, sauce prepared, cheeses grated, and then everything assembled and baked. An operation on this scale would not be feasible for mass feeding aboard Saratoga. However, with the use of shelf-stable pizza crusts and commercially prepared sauce, grated cheese, and diced sausage and pepperoni, NARADCOM has reduced labor, minimized preparation time and space, and greatly simplified equipment requirements.

3. Product Packaging and Handling

In many instances manufacturers will be required to upgrade their packaging to conform to Level A overseas specifications. Moisture barrier packaging will have to provide sufficient protection for products when ships are operating in very warm, humid climates. Products that are very sensitive to high storage temperatures cannot be used. For example, plastic gallon containers of liquid milk shake flavorings did not hold up well in transit. Therefore, alternate dry flavorings are currently being considered to alleviate this problem. An early consideration to use preformed taco shells was later rejected because of the high breakage factor involved in transporting this particular product.

4. Storage Requirements

By design, shipboard bulk storage spaces represent the most restrictive criterion of all. At no time was there any consideration given to modifying or enlarging bulk storage spaces aboard Saratoga; rather the new foodservice system had to be compatible with this existing constraint. As mentioned previously, storage space for frozen and chilled products was particularly limited.

Products that would be used in large quantities were not considered if they had disproportionately high cubic storage requirements. For example, items such as liquid milk shake mix, frozen pizza crusts, fully prepared ready-to-cook fried chicken, and frozen french fries would have posed impossible demands on existing storage spaces. To alleviate this situation, maximum use was made of semi-perishable products whenever possible. Shelf-stable pizza crusts, dehydrated milk-shake mix, and french fries from a dry mix are examples of forms of popular menu items that would not otherwise have appeared on the new fast food menu with such frequency.

The preceding discussions have focused on factors that were of immediate concern in analyzing each new product's potential for success in the fast food menu. Discussion will now be directed to product testing and results.

PRODUCT/INGREDIENTS TEST RESULTS

As previously mentioned, numerous food tests were conducted at NARADCOM, in addition to field testing aboard the Saratoga. Items tested in the NARADCOM Experimental Kitchens were prepared by in-house home economists or representatives from the respective companies. Informal groups sampled and rated products on a nine-point hedonic* scale. As a rule of thumb, entree

*Reference Section XI

items tested at Natick are required to score a 7.0 or better for further consideration. The tests aboard Saratoga were conducted in much the same manner. Twenty customers were randomly selected to rate products prepared by MS's in the forward galley. Saratoga crewmen were in all cases the final judges of each product's success or failure.

Tables 16 and 17 list each product tested on the ship. Successive columns lists the manufacturer, menu location, and evaluation results.* Table 16 presents products that were tested and selected for use in the forward and aft galley menus during the system experiment. The majority of these items now appear as part of a twenty-one-day, fast-food, cyclic menu** in the forward galley.

Products on the approved list such as breaded pork cutlets were discontinued when it was learned the product would routinely be made available for fleetwide use in the near future. Items such as the individual fruit turnovers and meat turnovers have been recommended by this project for CONUS*** use only. These items received excellent ratings by the Saratoga's crew, but the products are fairly easily damaged in shipment and impact on scarce freezer storage space.

Table 17 lists food items that were tested and rejected at NARADCOM and/or aboard Saratoga. Failure to meet one or more of the four criteria described earlier was cause for rejection. During the shipboard test phase, additional criteria emerged that resulted in the further rejection of items.

Examples of rejections and the relevant reasons were as follows:

(a) Mortadella. Deleted after Saratoga customers did not perceive any difference between Italian submarine sandwiches made using standard stock canned ham or the mortadella.

(b) Coffee Milk Shake Flavoring. This item produced an excellent quality product, but one that was not highly rated by the Saratoga crewmen.

(c) Natural Strawberry Milk Shake Flavoring. This product was too weak to adequately flavor the dehydrated shake base.

(d) Strawberry Coloring. Deleted by the Navy in lieu of red food coloring presently carried in the system. (However, the red food coloring is not available in the Atlantic Fleet Cargo Requisitioning Guide.)

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*Reference Section XI

**See Appendix B

***That is, for use when ships are operating out of, and supplied in, CONUS ports.

TABLE 16

Food Items Selected for Test of the New System

Food Item	Manufacturer	Menu Concept	CV-60 Test Results Finished Product
Pizza Shell, Thin Shelf Stable 4" x 6"**	Fairmont Foods	Fast Food	7.0
Beef with BBQ Sauce	Smithfield Co.	Fast Food	6.8
Veal Cutlets, Breaded	DPSC Contract	Fast Food	7.2
Milk Shake Flavoring** Orange	American Food Labs	Fast Food	7.8
Beverage Base, Lemonade, Vit. C. Fortified	Wyler Foods (Borden Co.)	Fast Food	*
Beverage Base, Grape, Vit. C. Fortified	Wyler Foods	Fast Food	*
Beverage Base, Orange Vit. C. Fortified	Wyler Foods	Fast Food	*
Beverage Base, Punch Vit. C. Fortified	Wyler Foods	Fast Food	*
Frispo Potato Mix Vit. C. Fortified**	Basic American Food Co.	Fast Food	7.4
Shake Mix Dehy Vanilla w/butterfat, Vit. A Fortified**	Maple Island	Fast Food	7.1
Shake Mix Dehy Chocolate w/butterfat, Vit. A Fortified**	Maple Island	Fast Food	7.1

TABLE 16 (CONT'D)

Food Item	Manufacturer	Menu Concept	CV-60 Test Results Finished Product
Bread Crumbs	Local Purchase Item	Fast Food	See fried chicken rating
Roast Beef, Cooked**	DPSC Contract	Fast Food	7.7
Meatballs #10 CN**	Sexton Co.	Fast Food	*
Tartar Sauce	McCormick Co.	Fast Food	*
Pizza Sauce #10 CN**	Fairmont Foods	Fast Food	7.0
Sausage Diced, FZN**	Fairmont Foods	Fast Food	6.7
Pepperoni Diced, FZN**	Fairmont Foods	Fast Food	6.9
Frankfurters, Beef 4 oz**	Oscar Mayer	Fast Food	7.0
Pork Cutlets	NARADCOM	Aft Galley	*
Wine, Burgundy Dehy	Beatrice Foods	International	*
Wine, Sauterne, Dehy	Beatrice Foods	International	*
Fish Fillets, Breaded English Style**	Commodore Co.	Fast Food	7.5
Whipped Topping, Dehy	Carnation Co.	Aft Galley	6.7
Au Gratin Potatoes, Dehy	Carnation Co.	Aft Galley	7.6
Hash Brown Potatoes, Dehy	Carnation Co.	Aft Galley	7.1
Fruit Turnovers, FZN	Del Monte Co.	Aft Galley	
Apple			7.8
Cherry			6.0
Lemon			7.1

TABLE 16 (CONT'D)

Food Item	Manufacturer	Menu Concept	CV-60 Test Results Finished Product
Coffee, Freeze Dried	DPSC Contract	Fast Food	*
Cocoa Mix, Hot	DPSC Contract	Fast Food	*
Iced Tea Mix	DPSC Contract		*
Meat Turnovers, FZN	Del Monte	Aft Galley	
Chicken			7.6
Chili			6.6
Sloppy Joe			6.2
Milk Shake Flavoring, Dehy, Pkg.	Maple Island	Fast Food	*
Chocolate Mint			
Raspberry			
Banana			
Strawberry			
Malt Vinegar	Heinz Co.	Fast Food	*
Strawberry Flavoring** WONF	American Food Labs	Fast Food	7.1

*Qualitative Assessment.
**Approved by NAVFSSO for Carrier Fast Food Use. All items indicated as DPSC Contract or Local Purchase are already approved except Cooked Roast Beef, which is currently under test.

TABLE 17

Food Items Rejected for Test of the New System

Food Item	Manufacturer	Menu Concept	CV-60 Test Results Finished Product
Pizza Shell, FZN Commercial	Local Purchase Item	Fast Food	7.5
Pizza Shell, Shelf Stable, Round 9"	Fairmont Foods	Fast Food	6.7
Pizza Shell, Shelf Stable, 4" x 6", Thick	Fairmont Foods	Fast Food	6.7
Pizza Sauce, Commercial	Local Purchase	Fast Food	6.4
Pizza Crust	Armed Forces Recipe	Fast Food	6.7
Pizza Sauce	Armed Forces Recipe	Fast Food	7.0
Pizza Sauce, Tomato Sauce, Basic	Armed Forces Recipe	Fast Food	6.1
BBQ, Pork #10 CN	Smithfield Co.	Fast Food	6.9
BBQ, Pork, Deep South #10 CN	Smithfield Co.	Fast Food	5.6
Beef Cutlets	NARADCOM	Fast Food	6.8
Beef Cutlets	Armour Co.	Fast Food	6.6
Mortadella	Local Purchase	Fast Food	7.0
Kellogg's RTE Salads	Kelloggs Co.	Fast Food	
Chicken			5.8
Tuna			5.3
Ham			4.8
Egg			5.4

TABLE 17 (CONT'D)

Food Item	Manufacturer	Menu Concept	CV-60 Test Results Finished Product
Meat Turnovers	Del Monte	Fast Food	
Tamale			5.4
Beef			5.8
Omelet Turnover	Del Monte	Fast Food	5.4
Fruit Turnovers (raw) Peach	Del Monte		6.8
Fruit Turnovers RTE	Del Monte	Fast Food	
Apple			5.9
Lemon			5.8
Berry			6.4
Chocolate			5.5
Turkey Roll, Cooked	DPSC Contract	Fast Food	*
Mexican Foods, FZN	Butcher Boy	Fast Food	
Filled Tacos			6.5
Pochitos			6.1
Enchiladas			5.6
Buritos			6.8
Pizza Snak			6.5
Empanadas			6.6
BBQ Beef			7.0
Tamale			5.8
Sour Cream, Dehy	Beatrice Foods	International	*
Extruded Potatoes**	Scionics Co.	Fast Food	*
Meatballs, FZN	Sexton Co.	Fast Food	7.1
Meatballs, #10 CN	Fairmont Foods	Fast Food	6.9

TABLE 17 (CONT'D)

Food Item	Manufacturer	Menu Concept	CV-60 Test Results Finished Product
Milk Shake Mix, Dehy Artificial Straw	Beatrice Foods	Fast Food	6.7
Milk Shake Mix, Dehy Veg. Oil, Vanilla	Maple Island	Fast Food	5.9
Milk Shake Mix, Dehy Veg. Oil, Chocolate	Maple Island	Fast Food	6.7
Coffee Flavoring	American Food Labs	Fast Food	5.9
Strawberry Flavoring Natural	American Food Labs	Fast Food	*
Strawberry Coloring	American Food Labs	Fast Food	*
Scalloped Potatoes, Dehy	Carnation Co.	Aft Galley	7.2
Beef Stew #10 CN	Smithfield Co.	Aft Galley	5.6
Brunswick Stew #10 CN	Smithfield Co.	Aft Galley	6.7
Beef Cubes, Comitrol	NARADCOM	Aft Galley	7.0
Pork Cubes, Comitrol	NARADCOM	Aft Galley	6.7

*Qualitative Assessment.
**Selected by NAVFSSO for future use but not used aboard Saratoga.

(e) Frozen Meatballs. These were dropped in favor of the more convenient canned meatballs in tomato sauce.

It is clear from preceding discussions that many factors were involved in the final evaluation of new products for use in the fast food menu.

In October 1978, a conference was held at NAVFSSO for the purpose of determining what new products currently being tested aboard the Saratoga would be Navy-approved and made available for use in future carrier fast food operations.* The majority of items considered by NARADCOM to be essential to the operation were approved. Items such as prepared tartar sauce and vitamin C fortified, pre-sweetened beverage bases were not accepted by the Navy. While these particular items cannot be considered crucial to the overall fast food operation, they remain attractive from the standpoint of quality and convenience, and, in the case of the beverages, needed vitamin fortification.

RECIPE DEVELOPMENT

In some cases recipes** had to be developed to support new food items or to solve local production problems. Table 18 displays the name of these recipes and their preliminary hedonic ratings. Recipes for three varieties of hot steak submarine sandwiches were developed using a commercially available precooked roast beef. These sandwiches have proven to be very successful in repeated tests.

The development of a new fried chicken recipe was a significant achievement in the study. Simulated customer arrival rates derived from pre-test operational data indicated that even with the new, quick recovery deep-fat fryers being installed, adequate production levels could not be maintained while cooking chicken from the raw state.[9] A new recipe that called for completely cooking the product during off-peak hours was designed for this test by the Experimental Kitchen at NARADCOM. The new method, which was chosen over the conventional Newport oven style recipe,[10] called for simmering large quantities of product at one time in a steam-jacketed kettle. Production time, labor requirements and oven capacity made the Newport recipe impractical in this application. Using the new recipe, the product can be cooked off and refrigerated for up to 24 hours.

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*Reference Table 16.

**Reference Appendix C.

[9] Armed Forces Recipe Service (AFRS), L-137-1, 1 January 1976.

[10] Armed Forces Recipe Service (AFRS), L-44, 1 January 1976.

TABLE 18

New Recipes for Saratoga Test

Recipe	Menu Concept	Preliminary Test Ratings
Veal Cutlet Submarine Sandwich	Fast Food	7.2
Fried Chicken	Fast Food	8.1
Pepper Steak Submarine Sandwich	Fast Food	7.7
Steak and Cheese Submarine Sandwich	Fast Food	7.1
Hamburger Pizza	Fast Food	7.8
Sausage Pizza	Fast Food	6.7
Combination Pizza	Fast Food	6.9
Cheese Pizza	Fast Food	6.7
Pepperoni Pizza	Fast Food	6.9
Steak and Egg Submarine Sandwich	Fast Food	6.8
Mushroom Pizza	Fast Food	6.9
Hot Sausage Submarine Sandwich	Fast Food	6.6
Combination Submarine Sandwich	Fast Food	7.0
Hot Meatball Submarine Sandwich	Fast Food	7.1

During production periods, the chicken is automatically breaded in a batter/breading machine and then deep-fat fried for only 90 seconds. The new production rate of over 480 servings per hour (vs. 133 servings per hour of AFRS L-137) is sufficient to maintain the desired service rates. Due to this increased production rate, lengthy holding times, with resulting product deterioration can now be eliminated. The new recipe represents the most effective means for maintaining required production rates when fried chicken is served in carrier fast food operations, and it is recommended that it be included in the Armed Forces Recipe Service.

There remains existing recipe requirements for an improved submarine roll, hamburger roll and hot dog roll. The recipes should be designed giving consideration to the new bakery equipment on Saratoga, the need for a better textured roll, and improving the product's keeping qualities.

The new food products and recipes selected for the Saratoga Project have developed into a highly successful fast foodservice system. This system would not have been possible using only conventional FSC Group 89 food items and the Armed Forces Recipe Service. By making maximum use of semi-perishable foods in the forward galley, the resulting increases in the total number of meals served daily in the forward galley have posed no unmanageable burdens on existing storage spaces aboard the ship.

Supply functions were carefully managed throughout the project. In the absence of specifications for the test products, a great deal of coordinative effort was required between NARADCOM and local purchasing agents at Naval Air Station, Jacksonville, in supplying Saratoga with the correct food items on a timely basis. The agents occasionally had difficulty ordering new food items they were unfamiliar with, and at times they were not able to locate a local supplier for a particular item. In support of Saratoga's deployment, assistance was provided the Norfolk Naval Supply Center in procuring the types and quantities of food items required for the six-month period. Monthly resupply levels and cubic space requirements for each item were provided the Mobile Logistics/Load Management Office of COMNAVSURFLANT to load-out the various supply ships that would replenish the Saratoga in the Mediterranean.

Questions concerning the positioning of new fast food items overseas for resupply have arisen on several occasions. With Naval Supply Depots in Subic Bay, R. P., and Yokosuka, Japan, overseas positioning of new food items for 7th fleet carriers would appear to pose no insurmountable problems. Sixth Fleet replenishments, on the other hand, probably require greater planning as all major resupply is done by the Mobile Logistics Support Force ships. However, including fast food items in fleet requisitioning guides does not necessarily impose additional cargo requirements on the supply ships because readjustment of inventory levels of presently carried cargo items may be possible. It is recommended that feedback in the form of current *quarterly stores consumed* data be compared with equivalent consumption rates prior to fast food installations to arrive at adjustment percentages for cargo revisions.

In order for demand factors for fast food items to be accurately established, it is important that adequate supplies be available. This will mean that initially the Mobile Logistics Support Force Ships will have to be sufficiently stocked to avoid run outs. This further means that any permitted use of the products by other than aircraft carriers must be taken into consideration. It will, of course, be important for fleet supply commands to have advance notice when each new carrier fast food system comes on-line.

To summarize, the supply task for fast food will require a good deal of coordinative effort between the numerous commands involved. Tight purchase descriptions and product specifications are needed to assist the Defense Personnel Supply Center and local purchasing agents in obtaining products of equal quality as those evaluated. Adjustments to supply ships' inventories will unquestionably be required, and inclusion of the fast food items in fleet requisitioning guides is essential if ships are to be properly supported overseas. Finally, each ship has the important responsibility to order and load-out properly prior to deployment.

RECOMMENDATIONS

The following recommendations are presented relative to the new food products and recipes proposed for the Saratoga and future carrier fast food installations.

(1) Provide high quality fast food items of comparable quality to those selected, tested, and approved including:

Pizza Shells		Meatballs #10 CN
Orange Milk Shake Flavoring		Pizza Sauce #10 CN
Strawberry Milk Shake Flavoring		Sausage Dice, FZN
Vanilla Shake Mix		Pepperoni Diced, FZN
Chocolate Shake Mix		¼-lb Frankfurters, Beef
Precooked Roast Beef	Frispo Potato Mix	English Style Fish Fillets

(2) Establish product specifications and purchasing descriptions for the new fast food items. Purchasing agents should be encouraged to contact a designated NAVFSSO representative with any problems concerning product specifications, identification, or vendor lists.

(3) Introduce into the FSC Group 89 all new food items necessary for the support of the fast food concept.*

(4) Provide logistical support for ships operating overseas by positioning adequate quantities of new products at appropriate Naval Supply Depots and aboard fleet supply ships.

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*See Table 16.

(5) Provide continuing fleet support through Navy Food Management Teams knowledgeable in fast food operations for training and assistance in new product uses.

(6) Introduce fast food recipes into the Armed Forces Recipe Service.*

(7) Develop new and better submarine, hamburger and hot dog roll recipes. Design the recipes around the type of bakery equipment installed in the Saratoga.

(8) Provide Fast Food Operations Manuals to aid in future implementation of the new system aboard other aircraft carriers.

(9) Stress the importance of galley management in fast food preparation operations.

The careful analysis and selection of new fast foods and the development of special recipes has paid off in the Saratoga project. NARADCOM recommends these products and recipes be made available for all future fast food operations in the Navy.

*See Table 16 and Appendix C.

SECTION VII

FOODSERVICE EQUIPMENT

BACKGROUND

Equipment selection was an important element of this project. The process involved is summarized as follows:

- a list of potential equipment that was compatible with the planned menu was generated.
- expected total demand by menu item was estimated from historical data in conjunction with more recent consumer surveys.
- the estimated rate of demand based upon historical arrival data was calculated.
- a specific unit was then selected that would meet space, reliability, maintainability, and production constraints.

The methodology used in the equipment selection is necessary whenever another carrier intends to implement or modify its foodservice system because each carrier presents a new set of design requirements and constraints. Differences in mess deck seating capacities, the number of eligible diners, the number of serving lines, potential serving stations, food preferences, current production capacity, and scullery capacity are just some of the factors that can affect a change in arrival rates, serving line rates, eating times, and throughput. Since these factors are variable, they can require production rate requirements for new equipment to be different from those determined for the USS Saratoga operation. Thus, although the analytical process need not be as detailed on other carriers as was the effort expended on the USS Saratoga design, it is a process that should be repeated to some degree on each and every carrier for which fast foodservice is planned.

One indication of the extent to which fast food equipment differs from the items needed to prepare a full A-ration menu is provided by the number and types of items removed from the USS Saratoga's forward galley in preparation for the new fast food system. This information may be of use in gauging the extent to which future carrier modifications will require replacement of existing equipment in a forward facility.* Focusing only on food preparation equipment, the list is as follows:

*It should be noted, however, that some of the items removed such as steam tables, deep-fat fryers, deck ovens, grills were replaced by similar but newer and more appropriate equipment.

Galley Equipment Removed	Galley Equipment Retained
2 5-well steam tables	1 refrigerator
3 deep-fat fryers, low capacity	
9 deck ovens	
4 80-gal steam jacketed kettles	
1 vertical mixer	
6 3-foot grills	

Figure 17 shows the forward galley layout as modified for fast foodservice. This galley is 40' long and approximately 29' wide. Since each numbered item is a new piece of equipment, it is apparent from this drawing that modification was extensive. Even so, only one hood was changed, ventilation was not modified to any significant extent, drains were retained, five sinks were kept, and several existing dressers continue to be used. All equipment is listed in Table 19.

The installation of fast foodservice required that modifications be made to both the forward and aft bakeries. Equipment was removed, replaced, or relocated in each bakery to provide the capacity to furnish the desired bakery products. The forward bakery (Figure 18) was set up for the production of pastry products. The aft bakery, which makes all the Saratoga's bread, was outfitted to also make the large quantities of rolls and buns required for the forward galley. Equipment location in the aft bakery is shown in Figure 19. New bakery equipment included the molder/sheeter, divider rounder, proof box, and bun slicers.

The individual pieces of equipment will be discussed next. Tables 19, 20, and 21 provide a summary of salient data. Following the descriptive comments, the remaining sections will present operational discrepancies, suggested modifications to improve the equipment, general conclusions, and specific recommendations.

ITEM DESCRIPTIONS

CONVEYOR BROILER (ITEM #12)

The conveyor broiler (Figure 20) is designed for electrical operation. Its rated production capacity is 720 beefburger patties per hour using thawed products. Actual production rates observed during USS Saratoga operations varied from 540 to 600 patties per hour after the broiler was modified for use with an 18-inch conveyor belt. The thawed beefburger (3 oz) patty temperature was 34° to 37°F.

TABLE 19

Equipment List, Forward EDF

NO	ITEM	MANUFACTURER	MODEL NO.	QUANTITY INSTALLED	UNIT* PRICE	NSN	SPECIFICATION
1	Shake & Soft Serve	Taylor	777	2	4490.00	9G4110-01-043-1599	MIL-I-43705, Type I, size 3, style II, class 2 (modified for Milk Shakes)
2	Oven Pizza	Blodgett	1203R	1	5175.00	-	-
3	Refrigerator Upright	Hobart	HS-1	2	1502.00	-	MIL-R-21098, Type I, style 1, model A, size 20, s/s interior & exterior (w/intermediate shelf)
4	Shake Storage	Traulsen & Co.,Inc.	RLT-1-32WUT S/F	1	420.00	-	-
6	Cold Food Counter	Low Temp	SD-6030	1	2450.00	-	MIL-O-19645 Four Pan Capacity (modified for 3 pan opening)
7	Filter, Deep Fat	Dean Industries	MF-90AU/80	2	483.00	-	MIL-F-2296, Type II, size 1 (modified for power suction, minimum fat capacity 75 lbs)
8	Cabinet, Holding	Alto-Sham, Inc.	750-S	1	810.00	-	-
9	Breading/Batter Unit	Sam Stein Assoc.	MB-2C wo/table	1	3420.00	-	-
22	Cabinet Holding	Crescent Metal	130-1836-CDD	2	512.00	7320-736 6763	MIL-C-40617, Type II, 40-Pan capacity single door
11	Ref. Undercounter	Low Temp	RB 12034	1	2450.00	-	-
12	Broiler, Conveyor	Fostoria, Ind.,Inc.	EMB-4-6-12-R	1	3050.00	9G-7310-00-671-2863	MIL-B-43928, style 2 (modified to single 18 inch conveyor)
13	Potato Extruder	American Potato	Frispo-Matic	2	2130.00	-	-
14	Fryer, Deep-Fat	G.E. Co.	AK50 (AM 50)	5	2087.00	-	-
15	Infra-Red Food Warmer	Crescent Metal	IFW-4825-U-2-Q (Aluminum)	4	174.00	-	-
16	French Fry Holder	Prince Castle	333-4	2	38.00	-	-
17	Can Opener	Edlund Co.	700 Crown Punch	1	280.00	-	-
23	Hot Food Unit	G.E. Co.	MF 711 wo/drain	4	123.00	9G-7310-00-529-7379	MIL-W-43896 (wo/drain)
29	Oven, B&R Con. Elec.	G.E. Co.	MN. 902	2	3321.00	9G-7310-00-548-3797	MIL-O-43633, Type II, model B, size 1
30	Rack	Crescent Metal	200-1841	1			
42	Infra-Red Food Warmer	Crescent Metal	IFW-3625U-2-Q	2	156.00	-	-
47	Powdered Mix Blender	Taylor Freezer	230	1	2400.00	-	-
48	Truck, Mobile	Caddy Corp.	T-203-B	2	219.00	-	-
	Microwave Oven	Litton Industries	70/80	1	1895.00	-	

*Most items were procured during Oct-Dec 1977.

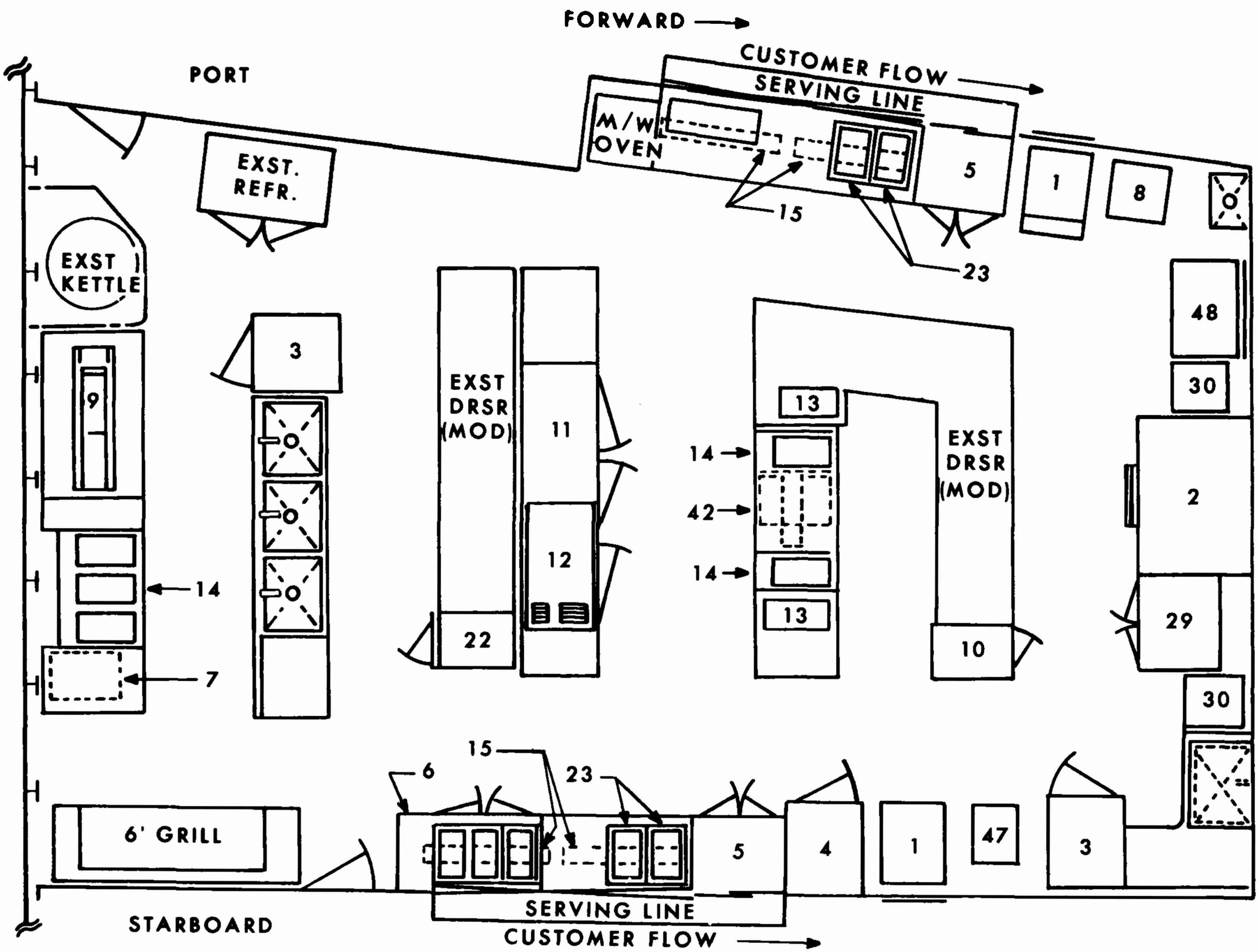

FIGURE 17. Forward Galley, USS Saratoga CV-60

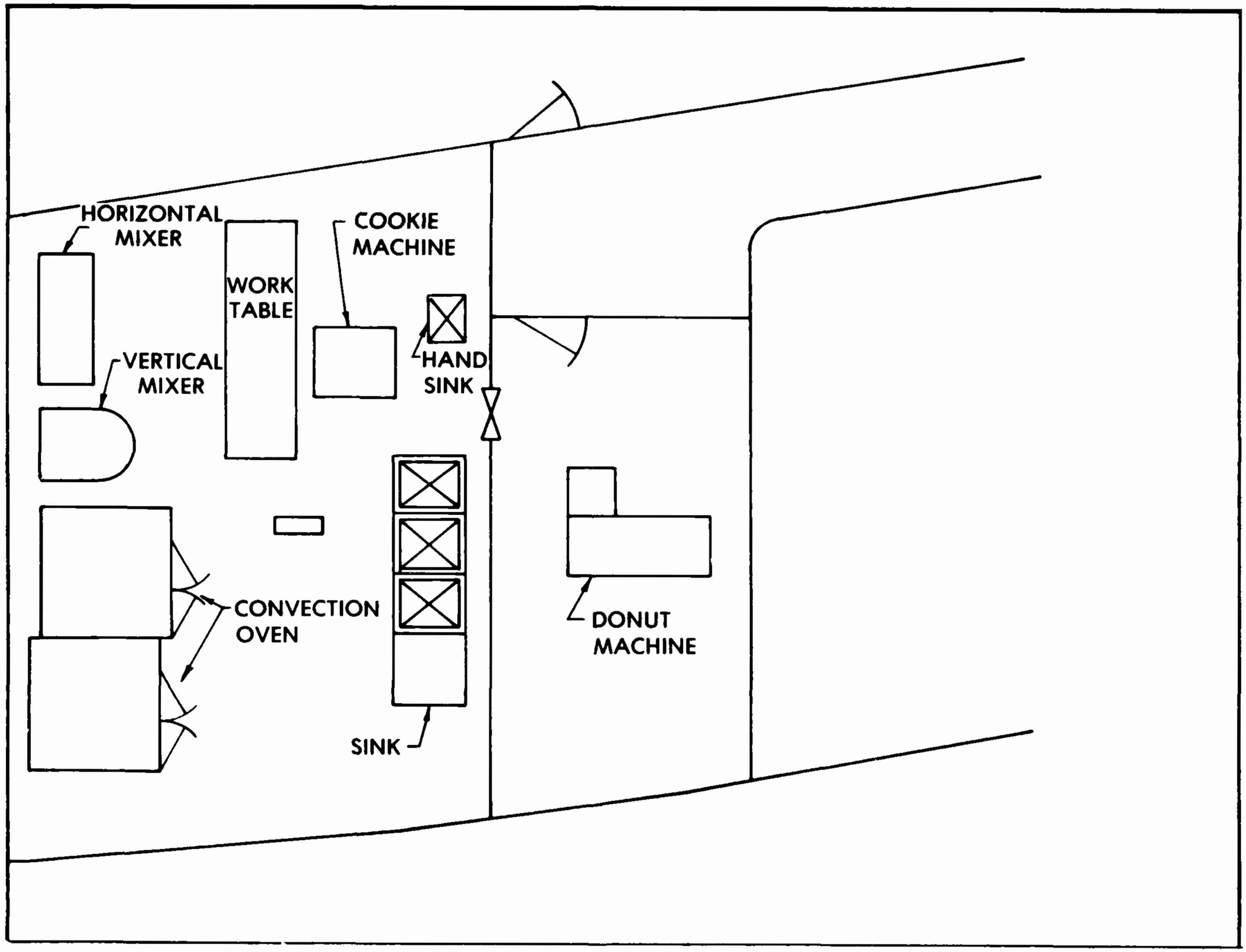

FIGURE 18. USS Saratoga CV-60 Forward Bakery After Modification

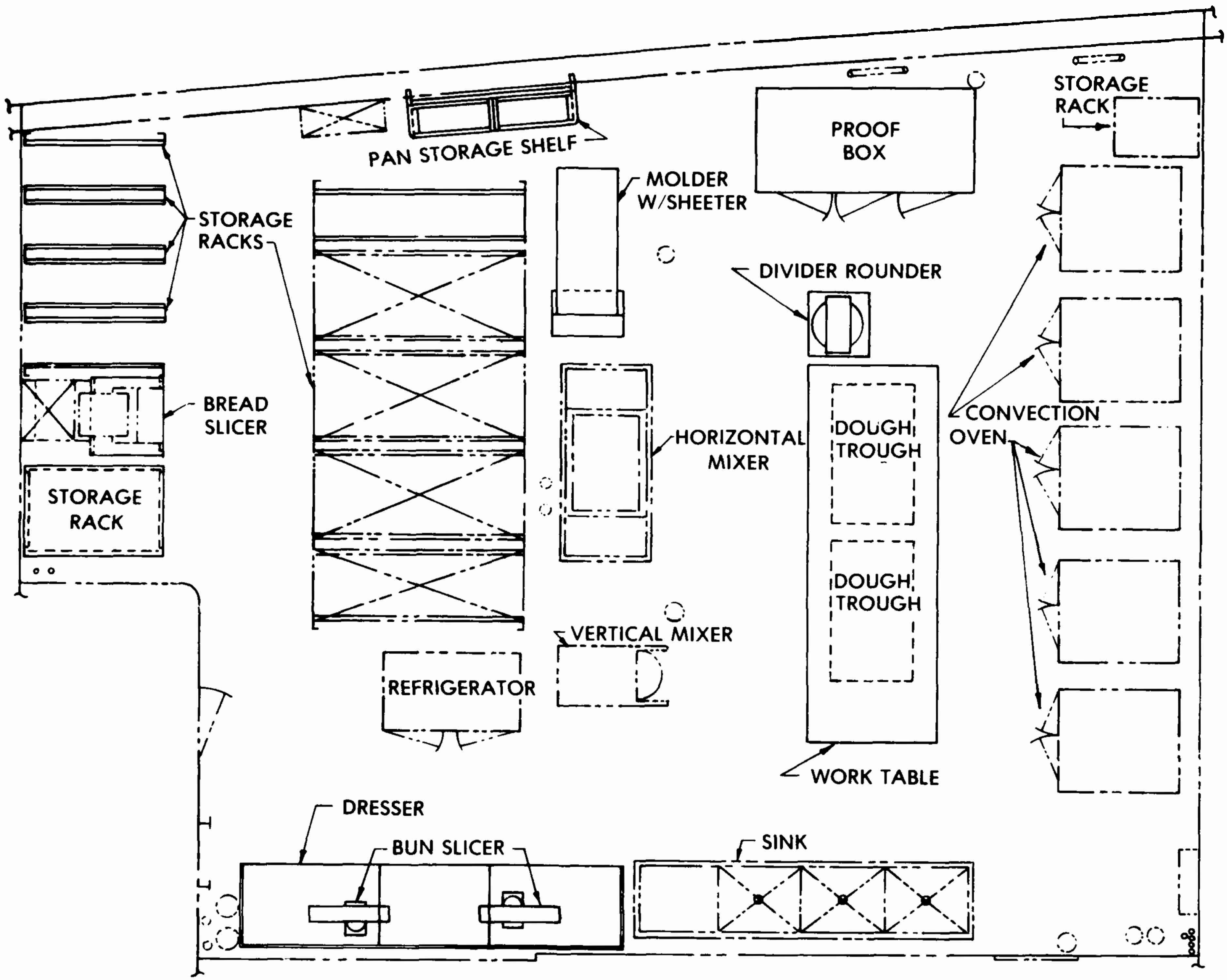

FIGURE 19. USS Saratoga CV-60 - Aft Bakery After Modification

TABLE 20

Forward Mess Deck Beverage Counter and Salad Bar Equipment

Item	Spec	Description	Cost
Cup/Glass Dispenser	MIL-D-40631	Type II, Design B, Size 2, Mod A NSN 9G7320-00-611-8030	$ 173.68
Flake Ice Water Dispenser	MIL-I-43682	Type II, Grade A, Size 1, Style 1 NSN 9G4110-00-548-3780	2,529.28
Carb. Bev. Dispenser	MIL-D-43738	Type II, Class 4, Style A NSN 9G7310-00-151-6525	665.60
Non-Carb. Bev. Dispenser	MIL-D-82035	Type II, Style B, Size 11 NSN 9G7310-00-364-1438	336.96
Iced Tea Dispenser	MIL-D-43845	NSN 9G7320-871-9680	88.40
Hot Chocolate Dispenser	MIL-D-43715	NSN 9G7310-00-302-7962	209.40
Freeze Dried Coffee Dispenser	MIL-D-43807 (GL)	NSN 7310-00-302-7970	185.12
Milk Dispenser	00-D-450	Type I, Style A, Size 3-5 NSN 7310-00-345-9903	464.88
Beverage Stand	Commercial	FUDS - 15.5 MR Progressive Mfg. Co., Phila, PA	4,094.00
Cold Food Counter (salad bar)	MIL-C-43300	Size 5, Style a (modified)	5,175.00
TOTAL			$13,922.32

NOTE: Quantity is one of each item. Electrical requirements are 115 Volts, 1 phase, 60 Hz.

TABLE 21

Accessory Equipment List for Forward and AFT Bakeries

AFT Bakery

No.	Item	Manufacturer	Model No.	Quantity Installed	Unit Price	Remarks
1.	Proof Box	Norlake Inc.	72" X 84" X 38"	1	$3506.00	
2.	Bread Molder	D. R. McClain	#8 w/plates	1	$1570.00	
3.	Roll Divider & Rounder	Dutchess	36-Part	1	$3500.00	NSN 7330-00-815-1442
4.	Bread Slicer	The Moline Co.	250 Bun & Coney Slicer	1	$ 395.00	

Forward Bakery

No.	Item	Manufacturer	Model No.	Quantity Installed	Unit Price
1.	Cookie Dropper	H. C. Rhodes Bakery Equip. Co.	KOOK-E-KING fully automatic	1	$1980.00
2.	Cabinet	Crescent Metal Co.	102-1841 LH	2	$ 222.00
3.	Rack	Bucks Co.	RD-13	3	$ 159.00

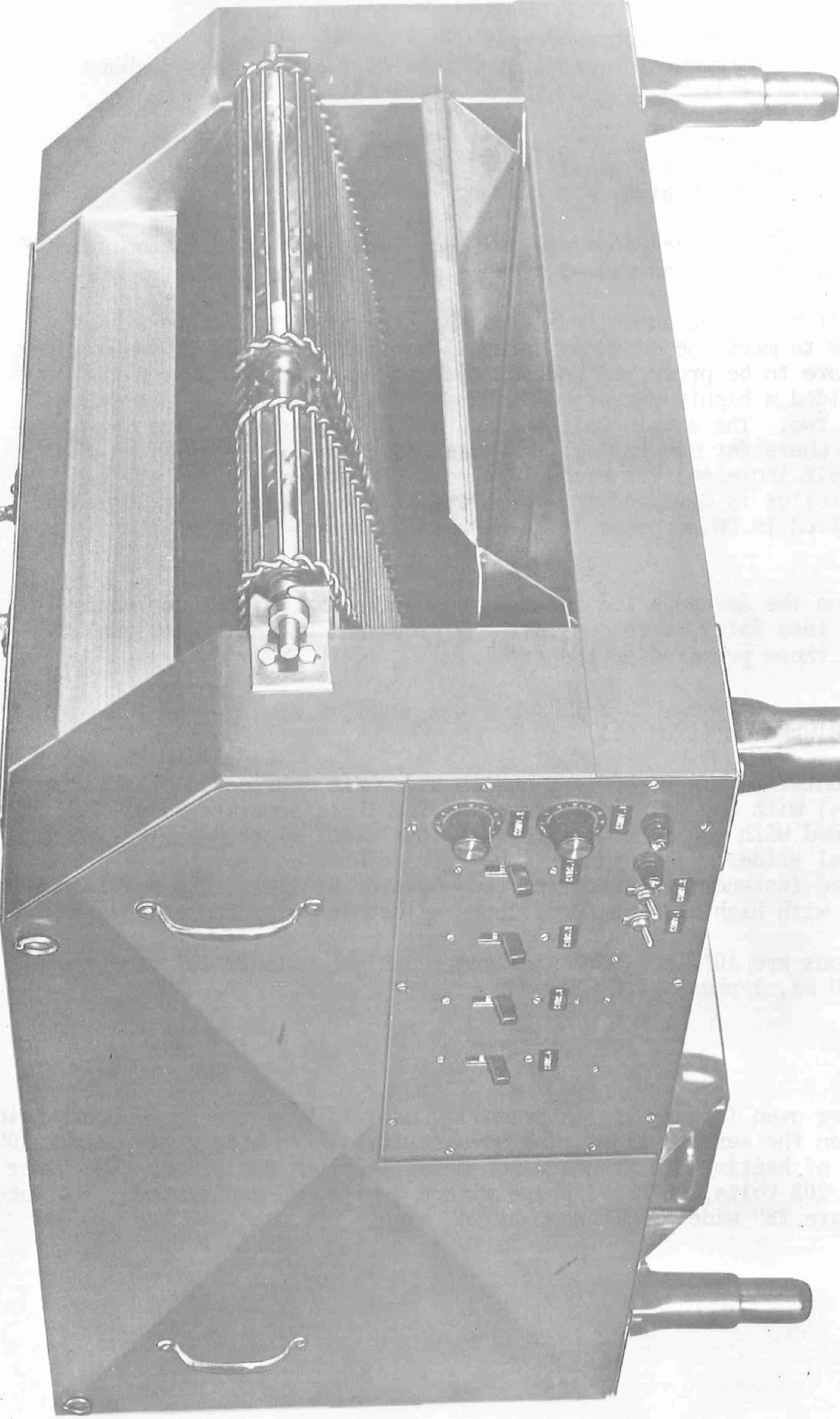

FIGURE 20. Conveyor Broiler

As originally purchased, the conveyor broiler was equipped with:

- one 12" and one 6" conveyor belt
- 16 quartz heating elements in two sets of 8 each, located above and below the conveyor belt
- a drip pan 4" deep
- a receiving pan
- a right hand control panel
- mounting legs 4" high.

The control panel provided separate switches for the top and bottom sets of heating elements as well as individual speed controls for each conveyor belt.

Actual operational experience indicated that the production rate with two belts was too low to meet the customer demand. Two belts are advantageous only if toasted buns are to be produced, however customer evaluations showed that untoasted buns yielded a highly acceptable product. An 18" belt was substituted for the original two. The single belt configuration also reduced cleaning time, reduced the area where fat can collect to cause flare-ups, and simplified the unit. The 18" belt increased the production rate to between 540 and 600 patties per hour. The broiler is designed for operation on a 440 Volt, 60 Hz, 3-phase system, and required 16 kW of power. Its dimensions are 48" long x 30" wide x 24" high.

Operations on the Saratoga led to the conclusion that burgers cooked in the broiler were less fatty, more consistently prepared, and of higher quality, in general, than those prepared on the grill.

UNDERCOUNTER REFRIGERATOR (ITEM #11)

The undercounter refrigerator is a custom made unit fabricated of stainless steel (300 series) with one main compartment having three separate doors. Each section is provided with two intermediate stainless steel slotted shelves mounted on stainless steel slides with latches. The refrigerator counter top is provided with four threaded fasteners for securing the conveyor broiler. The refrigeration unit is provided with high and low temperature adjustments for temperature control.

Its dimensions are 10' long, 30" wide and 36" high. Electrical requirements are 115 Volts, 60 Hz, 1-phase with ½ Hp Motor.

MICROWAVE OVEN

The microwave oven (Figure 21) is primarily used to warm the beefburgers prior to placing them on the serving line. The oven cavity is 24" wide x 14" deep x 10" high and capable of heating one standard non-metallic steam table pan. The power requirements are 208 Volts, 60 Hz, 1-phase with a 3-wire, 30-amp system. Its outside dimensions are 28" wide by 25" deep by 24" high.

FIGURE 21. Microwave Oven

BATTER/BREADING MACHINE (ITEM #9)

The batter/breader machine (Figure 22), is designed to completely cover chicken pieces with liquid dip and bread crumbs. The unit was mounted on a specially designed dresser for ease of operation. All components are fabricated of stainless steel (300 series). The machine is rated to produce 600 lbs per hour. The batter/breader machine is designed for electrical operation on a 120 Volt, 60 Hz, 1-phase system. Dimensions are length 43", width 16½", and height 24".

STEAM JACKETED KETTLE

An 80-gallon capacity steam jacketed kettle (copper) is used to simmer the chicken to reduce the amount of frying time required. This copper is of the 2/3 jacketed type, stainless steel (300 series), with solid one-piece welded construction, and designed to operate on steam pressure between 5 and 25 psig.

DEEP-FAT FRYERS (ITEM #14)

The deep-fat fryer (Figure 23) is designed for electrical operation and is rated to produce up to 30 lb of chicken or up to 125 lb of french fries per hour at 350°F temperature setting. A bank of three fryers is used in the chicken and fried fish operation, and two fryers are used in the french fries operation. Each fryer is individually operated with an automatic computerized solid state control for quick recovery and is pyrolytically cleaned. The fryer is designed for electrical operation on a 440-Volt, 60 Hz, 3-phase system with connected load of 22kW per fryer. Dimensions are width 15", depth 32", and height 35".

SHAKE AND SOFT SERVICE MACHINE (ITEM #1)

The shake and soft service ice cream machine (Figure 24) is rated to produce 240 milk shakes (12.5 oz) per hour. Two units are installed in the forward galley. One is adjacent to the port serving line and the other to the starboard serving line. The unit is designed for electrical operation on a 440-Volt, 3-phase, 60-Hz system. Dimensions are width 26", depth 33", and height 58½". This equipment is procured with factory settings of temperature and overrun so that it produced a milk shake rather than soft service ice cream.

POWDERED MIX BLENDER (ITEM #47)

The powdered mix blender (Figure 25) is designed to automatically blend powdered shake mix and water and to chill the mix to 38°F to 40°F at the rate of 35 GPM in 4-gallon batches. This unit is a manufacturer's prototype and can also be used to blend powdered milk. The blender is designed for operation on a

FIGURE 22. Batter/Breading Machine

FIGURE 23. Electric Deep-Fat Fryer

FIGURE 24. Shake and Soft Serve Machine

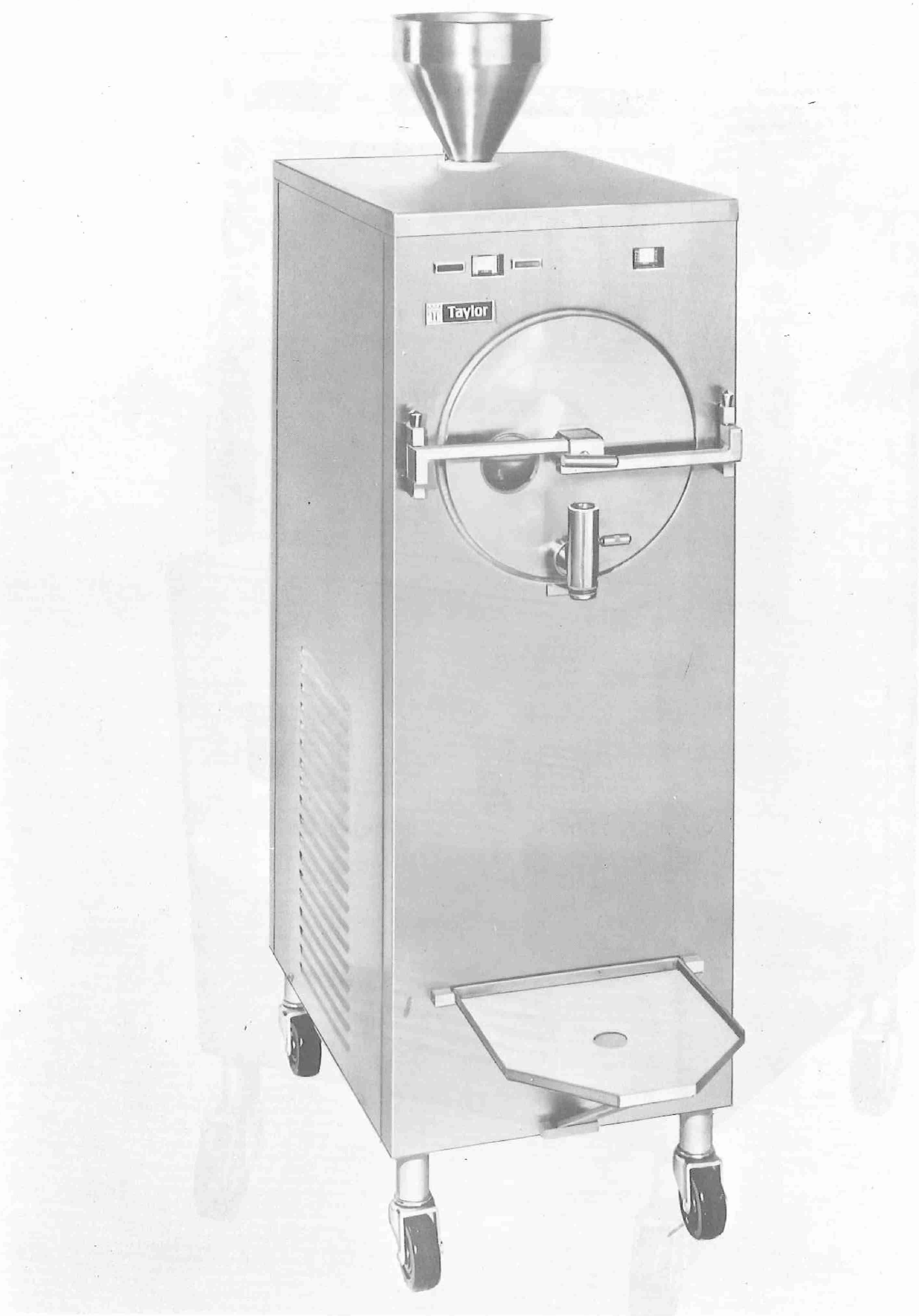

FIGURE 25. Powdered Mix Blender

440-Volt, 60 Hz, 3-phase system with a compressor that is sea water cooled. The dimensions are depth 24", width 16", and height 49".

SHAKE STORAGE FREEZER (ITEM #4)

The shake storage freezer is designed to refrigerate milk shakes stored in baskets which are manufactured of stainless steel (300 series). The shake storage freezer holds eight full-size baskets. Each basket in turn stores 35 milk shake containers (tumblers), thus providing total freezer storage of 280 shakes. The unit temperature is preset at the factory for 23°F. The freezer is designed for operation on a 115-Volt, 60 Hz, 1-phase system. The dimensions are width 26", depth 33", and height 58½".

MILK SHAKE DISPLAY CASE (ITEM #5)

The milk shake display case is non-refrigerated and fabricated of stainless steel (300 series). Two units are installed in the forward galley, one each in the port and starboard serving lines. These units are custom fabricated because no suitable commercially available unit was located. Each unit has two shelves. Doors are located on the galley side. A refrigerated milk shake display case was not considered a requirement because the demand frequency was sufficiently high to avoid product degradation on the serving line. The dimensions are width 36", depth 36", and the total height of the two open shelves 27".

POTATO EXTRUDER (ITEM #13)

The potato extruding machine (Figure 26) is designed for electrical operation and is rated to produce 600 oz (171, 3½ oz portions) of formed potato pieces per hour. The potato extruder consists essentially of a case with a removable front hopper, hopper extension, hopper cover, loader cylinder, motor driven pressure piston, extruder plate, single cutter wire, switches, indication lights, water connections, and electrical components. The hopper capacity is approximately 15 pounds of dry product which produces about 200 servings of raw product. With the addition of a hopper extension, the hopper capacity is doubled. A complete set of extruder dies consists of ¼" and 5/16" straight cut slicer, 5/16" crinkle cut slicer, cottage fries slicer, and steak cut slicer (Figure 24). Two slicer units are furnished with the basic unit. The unit is designed for operation on a 115-Volt, 60 Hz, 1-phase system. The dimensions are width 26", depth 26", and height 26".

BAGGING DRESSER (ITEM #42)

The bagging unit is fabricated of stainless steel (300 series) and is located between the deep-fat fryers used in the french fried potato operations. The bagging unit has a recessed receiving tray with a screen to drain the oil from the french fries.

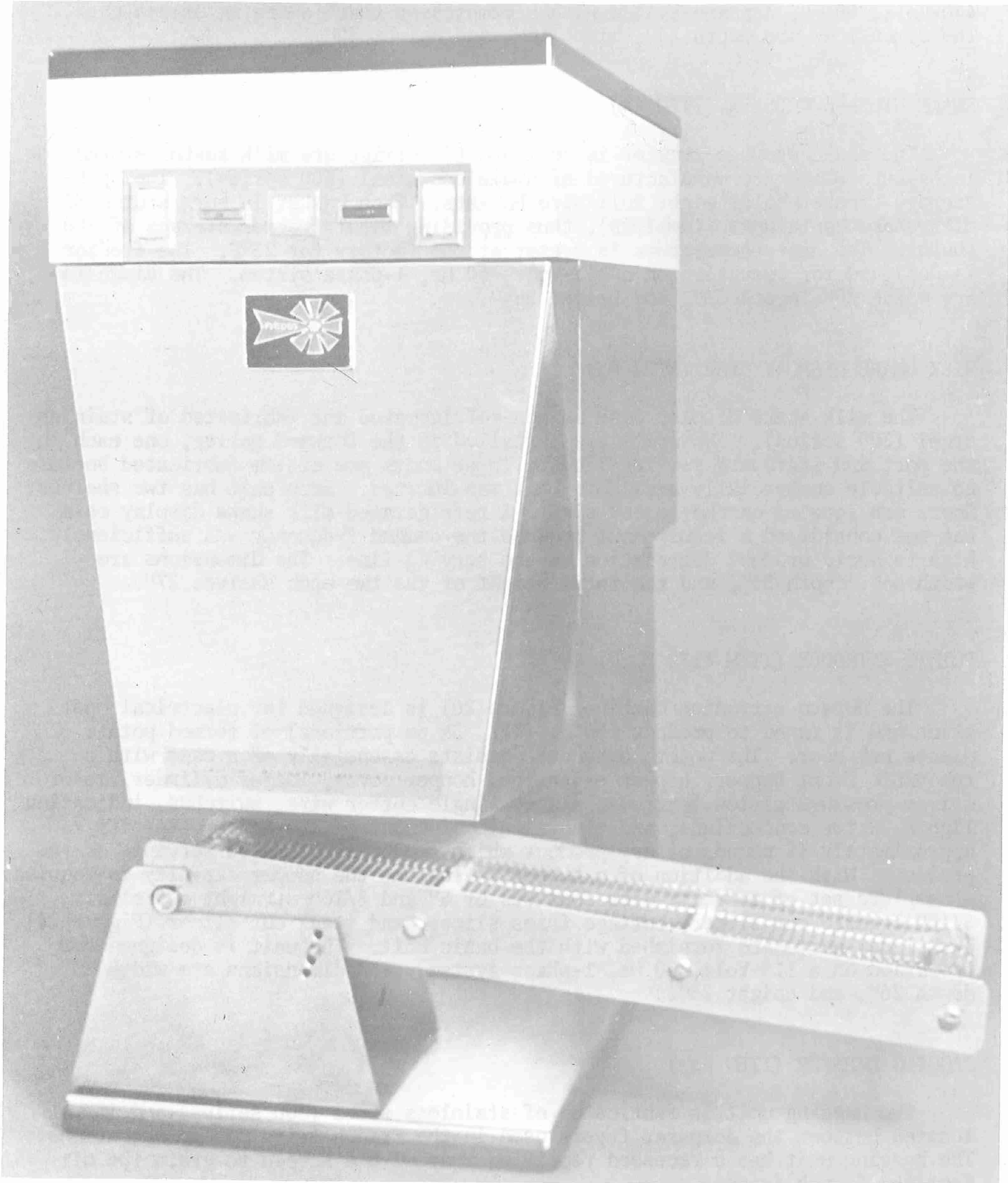

FIGURE 26. Potato Extruder

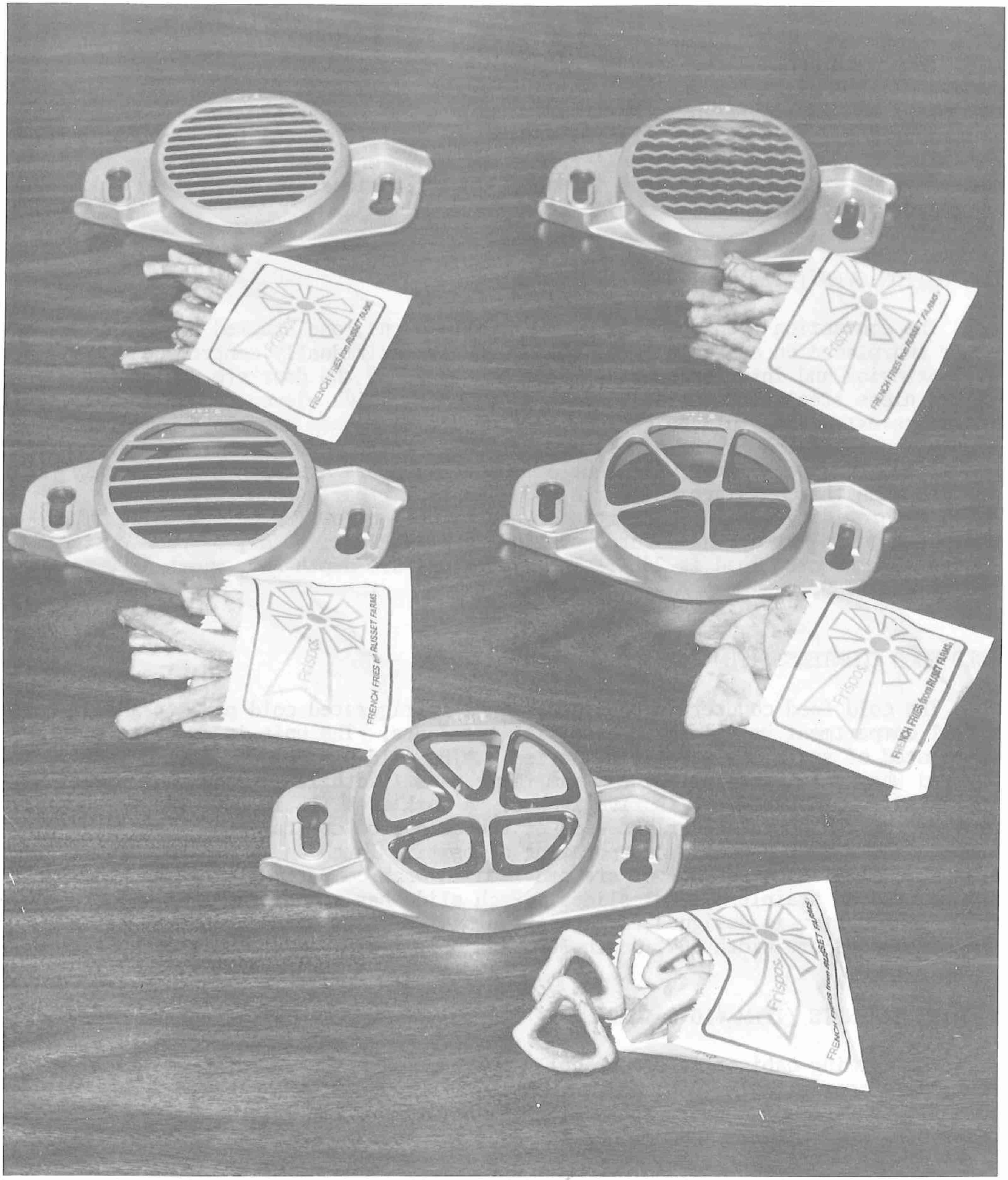

FIGURE 27. Potato Extruder Dies

PIZZA OVEN (ITEM #2)

The pizza oven is designed for electrical operation and contains three individual ovens stacked one unit above the other forming a triple deck oven. The ovens are fabricated of sheet steel with a shelf constructed of rokite supported by angle iron frames. This shelf can be easily rotated for cleaning. The pizza oven is designed for electrical operation on a 440-Volt, 60 Hz, 3-phase system; the connected load is 36kW. The dimensions are depth 47", width 60", and height 80".

CONVECTION OVEN (ITEM #29)

The convection oven consists of two single ovens, one stacked above the other and placed on a single base. Each oven is individually controlled. The unit exterior and interior surfaces and both faces of the door are fabricated of stainless steel (300 series). Each oven cavity holds eleven removable racks. The doors extend the full height of the oven and both open and close simultaneously when operated by the single handle. When the electrical circuit is energized, the oven blower will shut off when the doors are open and will only operate when the doors are fully closed. The repair parts inventory was reduced by providing similar convection ovens as used elsewhere on the ship. The convection oven was designed for operation on a 440-Volt, 60 Hz, 3-phase system. The total connected load is 22kW. The dimensions are depth 36", width 38", and height 65½".

COLD FOOD COUNTERS (ITEM #6)

The cold food counter is provided with a refrigerated cold pan top and a full compartment refrigerated base with two doors. The unit is completely fabricated of stainless steel (300 series). The cold pan opening is completely covered whenever three full-size steam table pans (width 12", length 20") are installed. Cold pan depth is five inches. A work area (15 inches wide) is provided on the operator's right side of the cold food counter top. The unit is provided with two doors incorporating a positive latch on each door. Two stainless steel slotted shelves are provided in each compartment section and are mounted on stainless steel slides. Each slide has a positive lock. The cold food counter is designed for operation on 120-Volt, 60 Hz, 1-phase system. The dimensions are width 60", depth 30", and height 32".

WARMING CABINETS (ITEM #10 and 22)

The warming cabinet is electrically operated with the temperature thermostatically controlled. Temperature is uniform throughout the cabinet. The hot unit consists of a thermostat, pilot light, timer, air intake, humidity reservoir, and switch. The cabinet was used for holding chicken, fish, pizza, and hot submarine sandwiches. There are two of these units located in the forward galley. Each unit is capable of holding 36 sheet pans (18" x 26" x 1"). The cabinet is designed for operation on a 120-Volt, 60 Hz, 1-phase system. The connected load is 1.5kW. The dimensions are length 21", width 31", and height 69 3/4".

HOT WELLS (ITEM #23)

Hot wells are the drop-in rectangular type, each capable of holding one full-size steam table pan (12" x 20" x 6"). Two hot wells are installed on each serving line. Each hot well is individually controlled by a manually operated thermostat. The hot wells can be operated wet or dry, but to minimize plumbing costs, the hot wells are provided without drains. Therefore, when used wet, the water has to be scooped out on completion of use. The hot wells are designed for operation on a 120-Volt, 60 Hz, 1-phase system. The connected load is 1660 watts. The dimensions are length 22 5/8", width 14 5/8", depth 7 7/8".

UPRIGHT REFRIGERATOR (ITEM #3)

There are two standard upright single-door refrigerators located in the forward galley. One is used specifically for the milk shake operation and the other is used for multiple purposes. Both units are identical except for the interior shelving. The unit used for the milk shake operation stores containers filled with pre-mixed product from the powdered mix blender. This is a standard refrigeration unit with one important modification: heavy duty intermediate shelves capable of withstanding a load of 75 pounds per square foot were substituted for the standard shelving. The multi-use refrigerator was provided with an 18" x 26" baker's food file with 1½" spacing between centers. Each refrigerator is provided with a dial type temperature indicator and power *on* light located on the front of the unit above the door. Each unit is designed for operation on a 120-Volt, 60 Hz, 1-phase system.

WARMING OVEN (ITEM #8)

The warming oven is a single compartment unit fabricated of stainless steel (300 series). The unit is provided with a manually operated temperature control and an indicator light. The unit is capable of holding five baking pans (18" x 26" x 1") or five standard size steam table pans (12" x 20" x 2½"). The indicator light glows whenever the selected temperature is not attained. One unit is located in the forward galley and was primarily used to maintain burgers at a warm temperature. The warming oven is designed for electrical operation on a 120-Volt, 60 Hz, 1-phase system. The connected load is 1kW. The dimensions are depth 29", width 25½", and height 27".

RACK (ITEM #30)

Both the frame and corrugated sides of the rack are fabricated of Hi-Tensile aluminum. It is mounted on four, heavy duty, 5-inch-diameter swivel casters and is capable of holding 39 sheet pans (12" x 20" x 1"). Dimensions are width 21 9/16", depth 26 3/4", and height 69 9/16".

INFRA-RED FOOD WARMER (ITEM #15, 42)

The food warmer consists of dual quartz infra-red glass tubes and is designed to provide high concentration heat without illumination. The food warmer can be adjusted in the vertical dimension. Infra-red food warmers are located above the port and starboard serving lines and french fry potato bagging station. The lengths of the units above the serving line are 48" each, and the unit above the bagging station is 36" long. The infra-red food warmer is designed for operation on a 120-Volt, 60 Hz, 1-phase system.

GRILL

A 6' electric grill with a surface area of 1710 sq. in. was mounted in the forward galley as a back-up unit to the conveyor broiler. The unit is designed for operation on a 440-Volt, 60 Hz, 3-phase system, and the connected load is 7kW. The dimensions are width 72", depth 27 5/8", and height 12 5/16".

FILTER, DEEP-FAT (ITEM #7)

The deep-fat filter (Figure 28) is designed to filter and return the hot liquid deep-fat fryer shortening compound. The deep-fat filter incorporates a reservoir with a capacity of 80 pounds, reversing pump for suction and pumping of the shortening compound, nozzle and hose assembly, and switch assembly. The deep-fat filter is designed for operation on a 120-Volt, 60 Hz, 1-phase system. The dimensions are width 18", depth 24", and height 27".

PROOF BOX (AFT BAKERY)

A one compartment unit designed for electric operation. Its interior and exterior are fabricated of stainless steel (300 series) with ten shelves. The proof box is designed for operation on a 240-Volt, 60 Hz, 1-phase system. The dimensions are width 82", depth 38", and height 72".

ROLL DIVIDER AND ROUNDING MACHINE (AFT BAKERY)

This machine will divide and round dough into 36 equal pieces. The divider/rounder unit is designed for operation on a 120-Volt, 60 Hz, 1-phase system.

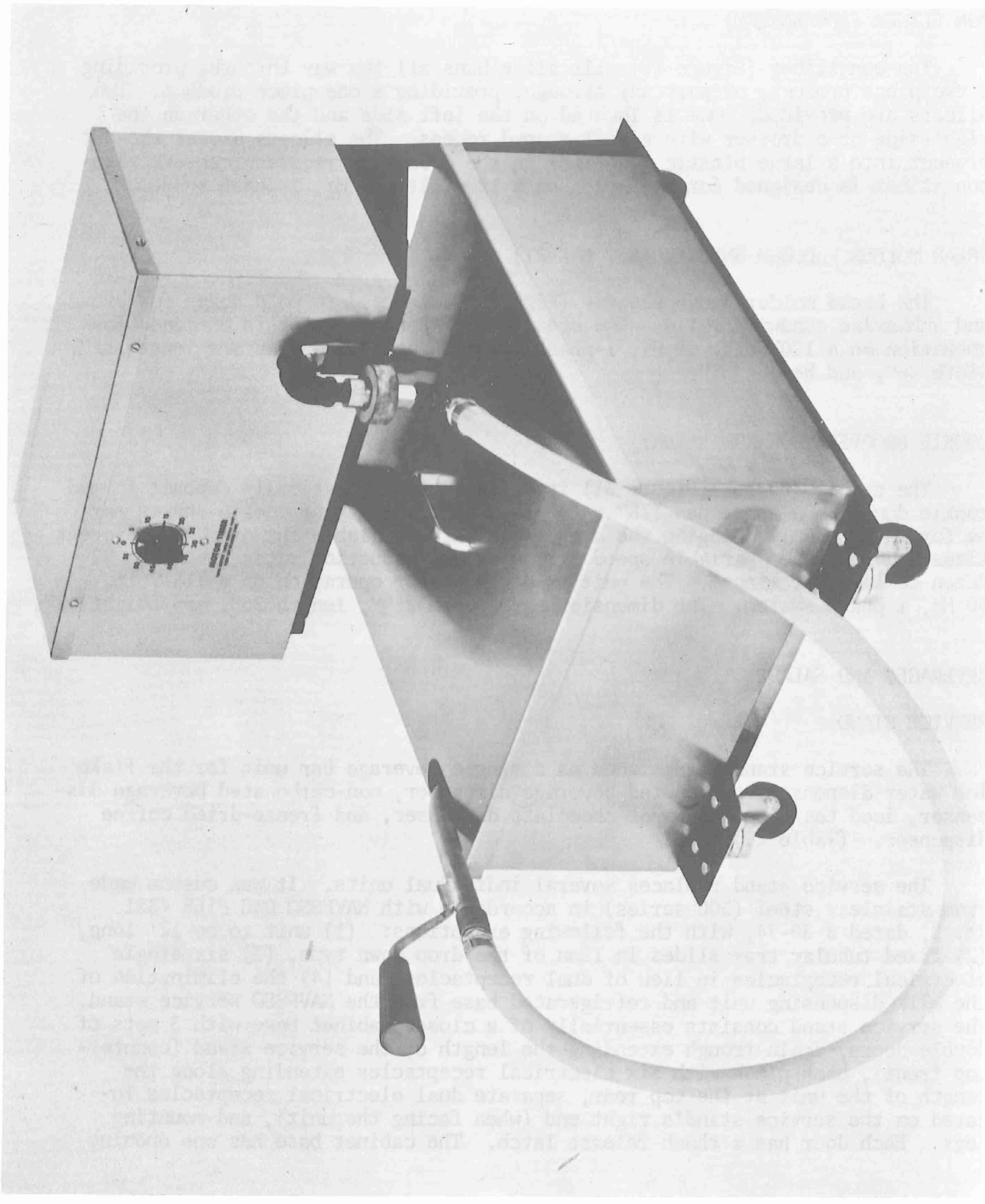

FIGURE 28. Deep-Fat Filter

BUN SLICER (AFT BAKERY)

The bun slicer (Figure 29) will slice buns all the way through, providing a two-piece product, or part way through, providing a one-piece product. Two slicers are provided. One is located on the left side and the other on the right side of a dresser with a well-shaped recess. The slicers direct the cut product into a large plastic container in the dresser's recessed center. The bun slicer is designed for operation on a 120-Volt, 60 Hz, 1-phase system.

BREAD MOLDER - DOUGH SHEETER (AFT BAKERY)

The bread molder-dough sheeter (Figure 30) is used to mold dough for bread and submarine sandwich rolls. The bread molder-dough sheeter is designed for operation on a 120-Volt, 60 Hz, 1-phase system. The dimensions are length 62", width 26", and height 57".

COOKIE DROPPER (FORWARD BAKERY)

The cookie dropper (Figure 31) is designed to automatically deposit formed cookie dough on a sheet pan (18" x 26"). A wide variety of cookie shapes may be formed by simply changing the dies. Dies are available for over 40 different sizes and designs. Variable speed drives allow production rates from 8 to 27 dozen cookies per minute. The unit is designed for operation on a 115-Volt, 60 Hz, 1-phase system. The dimensions are width 28½", length 36", and height 48".

BEVERAGES AND SALADS

SERVICE STAND

The service stand is designed as a single beverage bar unit for the flake ice water dispenser, carbonated beverage dispenser, non-carbonated beverage dispenser, iced tea dispenser, hot chocolate dispenser, and freeze-dried coffee dispenser. (Table 20)

The service stand replaces several individual units. It was custom made from stainless steel (300 series) in accordance with NAVFSSO DWG FILE #851 Rev B, dated 8-30-74, with the following exceptions: (1) unit to be 12' long, (2) fixed tubular tray slides in lieu of the drop down type, (3) six single electrical receptacles in lieu of dual receptacles, and (4) the elimination of the milk dispensing unit and refrigerated base from the NAVFSSO service stand. The service stand consists essentially of a closed cabinet base with 3 sets of double doors, drain trough extending the length of the service stand (countertop front), backsplash with six electrical receptacles extending along the length of the unit at the top rear, separate dual electrical receptacles located on the service stand's right end (when facing the unit), and mounting legs. Each door has a thumb release latch. The cabinet base has one opening

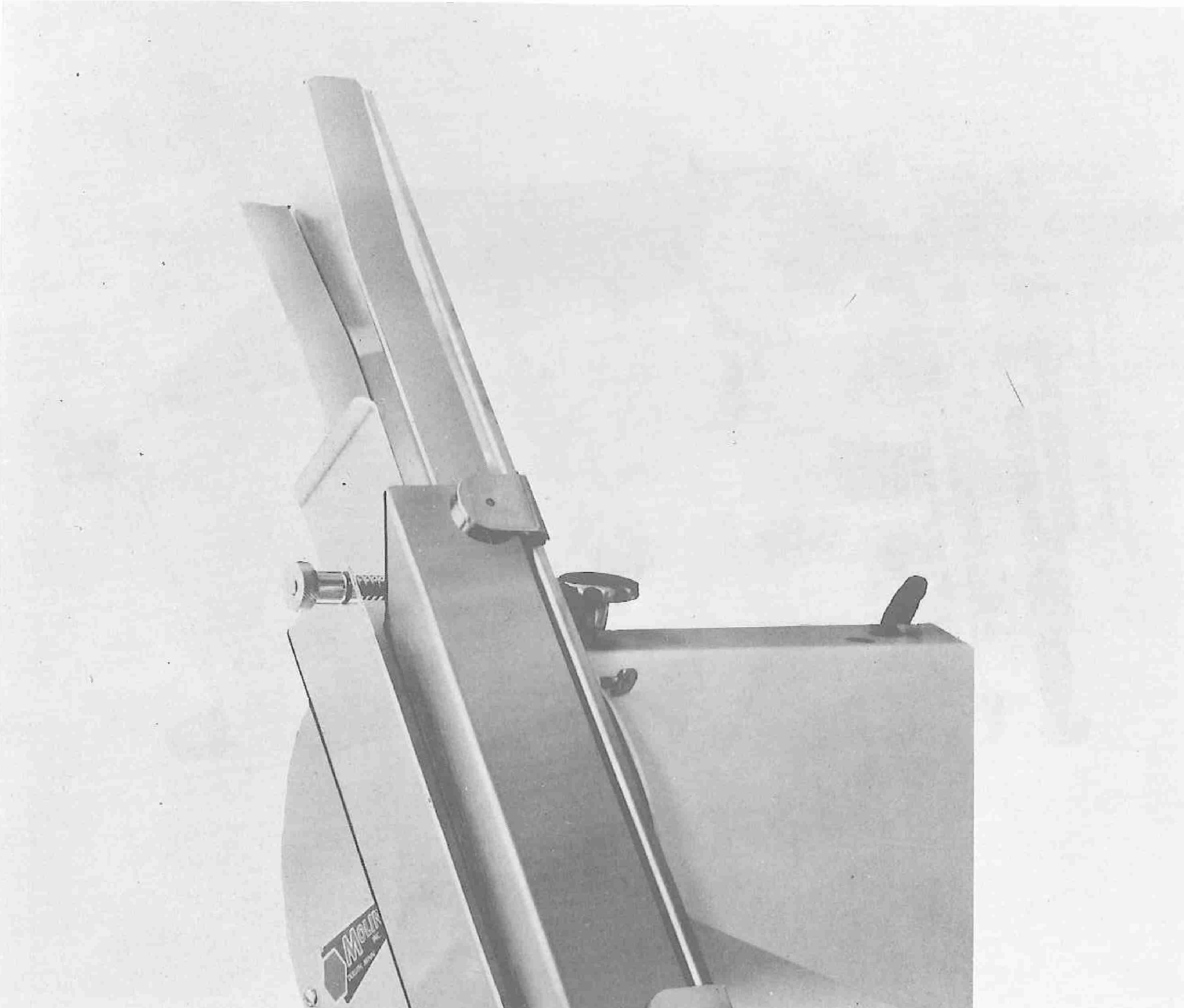

FIGURE 29. Bun Slicer

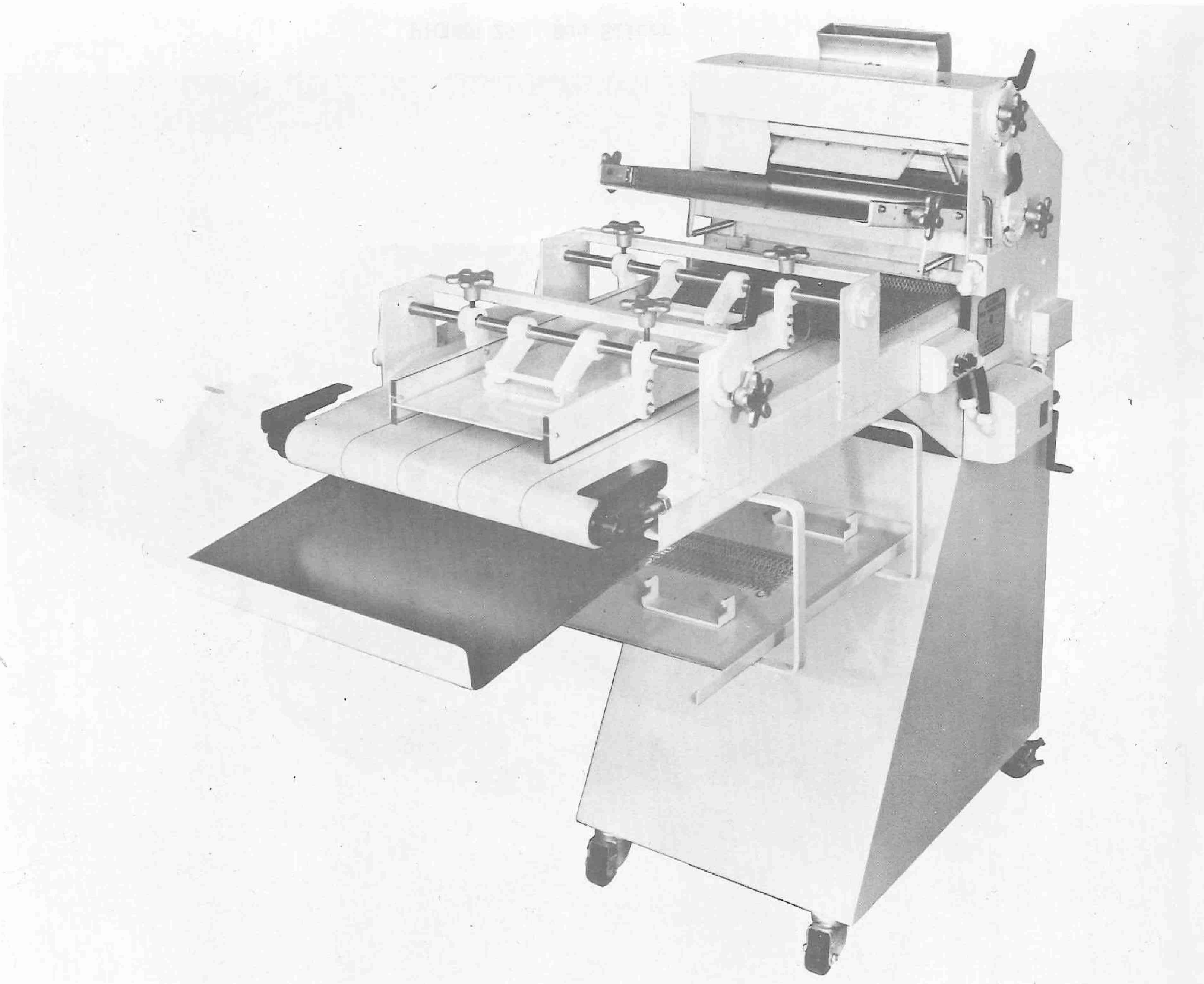

FIGURE 30. Bread Molder - Dough Sheeter

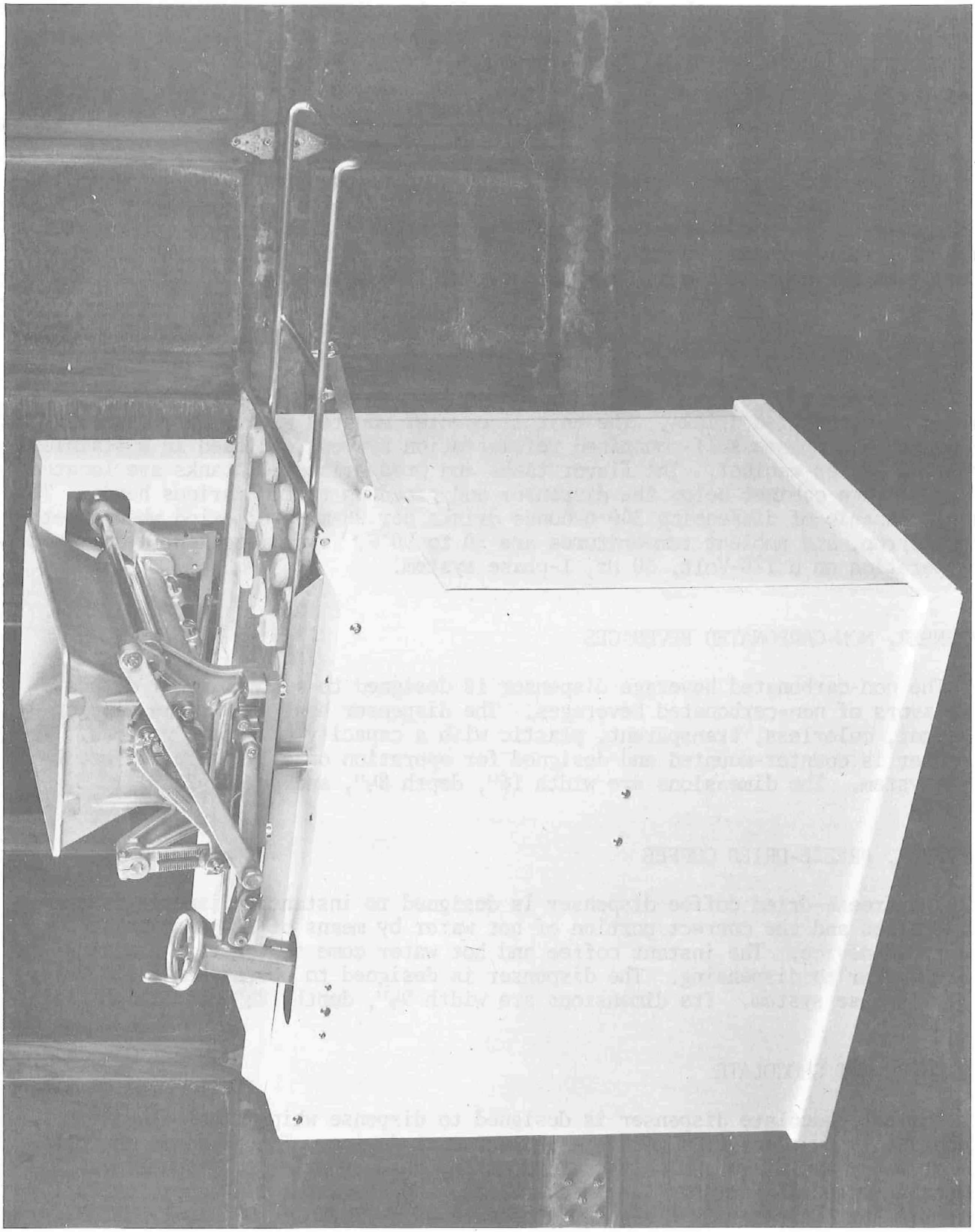

FIGURE 31. Cookie Dropper

extending the entire length of the unit. A multi-section intermediate shelf also extends the entire length of the unit. The six receptacles are designed for units that operate on a 120-Volt, 60 Hz, 1-phase system.

ICE MAKER AND WATER DISPENSER

The ice maker and water dispenser is designed to produce 650 lb per 24-hour period with a storage capacity of 100 lb. The unit is all stainless steel (300 series) and is counter-mounted. The unit is completely automatic and utilizes a heavy duty refrigeration system with a sea water cooled condenser. The dispenser is designed for operation on a 120-Volt, 60 Hz, 1-phase system.

DISPENSER, CARBONATED BEVERAGE

The carbonated beverage dispenser is designed to automatically dispense four flavors of carbonated drinks. The unit is counter mounted with a base assembly containing a complete self-contained refrigeration system, enclosed in a stainless steel 300 series cabinet. The flavor tanks and pressurized CO_2 tanks are located in the storage cabinet below the dispenser and piped up to the various heads. The unit is capable of dispensing 360 6-ounce drinks per 90-minute period when inlet water, syrup, and ambient temperatures are 50 to 90°F. The dispenser is designed for operation on a 120-Volt, 60 Hz, 1-phase system.

DISPENSER, NON-CARBONATED BEVERAGES

The non-carbonated beverage dispenser is designed to automatically dispense two flavors of non-carbonated beverages. The dispenser bowl is a rigid, impact-resistant, colorless, transparent, plastic with a capacity of 5 to 6 gallons. The dispenser is counter-mounted and designed for operation on a 120-Volt, 60 Hz, 1-phase system. The dimensions are width 16", depth 8½", and height 23¼".

DISPENSER, FREEZE-DRIED COFFEE

The freeze-dried coffee dispenser is designed to instantly dispense freeze-dried coffee and the correct portion of hot water by means of a mechanical-electrical device. The instant coffee and hot water come together in a mixing chamber prior to dispensing. The dispenser is designed to operate on a 120-Volt, 60 Hz, 1-phase system. Its dimensions are width 9½", depth 18½", and height 18".

DISPENSER, HOT CHOCOLATE

The hot chocolate dispenser is designed to dispense whipped hot chocolate automatically by means of a mechanical-electrical device. The powdered chocolate and hot water are mixed and whipped in a mixing chamber prior to dispensing. Product storage capacity is 4 lb of chocolate, and the water tank capacity is 1.2 gallons. The dispenser is designed to operate on a 120-Volt, 60 Hz, 1-phase system.

The dimensions are width 8 1/16", depth 18 5/8", and height 20¼".

DISPENSER, ICED TEA

The iced tea dispenser is designed to dispense instant tea automatically by means of a mechanical-electrical device. The instant tea and cold water is mixed in a mixing chamber prior to dispensing. The iced tea is dispensed as long as the switch is depressed. The dispenser is designed to operate on a 120-Volt, 60 Hz, 1-phase system.

SALAD BAR

The salad bar is provided with a refrigerated cold pan top and two-door, full-compartment refrigerated base. The unit is fabricated of stainless steel (300 series). The cold pan opening is completely covered whenever five full-size steam table pans (width 12" by length 20") are in place. Cold pan depth is five inches. The unit is provided with two doors incorporating a positive latch on each door. Two stainless steel slotted shelves are provided in each compartment section and mounted on stainless steel slides. Each slide has its own positive lock. Two full-length solid fold-down type tray rails are provided and located on each side of the unit. A sneeze guard completely protects both sides and ends of the salad bar. Casters for the salad bar are provided with brakes. The salad bar is designed for operation on a 120-Volt, 60 Hz, 1-phase system. The dimensions are length 70", width 28", and height 36".

STANDARD AND NON-STANDARD ITEMS

Many of the items cited in Table 19 are standard items, and the National Stock Numbers (NSN) for these items are indicated. There are some items in the table that are not identified with an NSN, but that are provided with military specification designations with modifications. These items basically conform to the requirements of the specifications documents except that they have additional features which are not described in the specifications. The additional features can be included in the specification by revising or amending the procurement document.

ACCESSORY EQUIPMENT LIST

The accessory equipment list shown in Table 22 specifies items which were recommended for supporting the numerous operations in the forward galley, the aft bakery, and the forward bakery.

TABLE 22

Accessory Items for Individual Operations

OPERATIONS & ITEMS	TOTAL QUANTITY	MANUFACTURER	PART NUMBER	UNIT PRICE	NSN	SPEC
Shake						
Glass Racks	48	Metropolitan Wireware	G2 x 8	$33.38	-	
Dolly (Glasses)	4	"	D112020	75.00	-	
Can Milk						
s/s w/lid & wo/spigot	22	Penn Michigan Corp	SS-20	42.00	-	
Traulsen Racks	5	Traulsen & Co.	340-28205	75.00	-	
Aluminum Measure						
Gallon	6	Wearever - Lincoln	5264	-	7330-00-264-5368	RR-L260, Type IV, Size 4
1 Quart	6	"	5621	-		
Egg Whip	6	-	-	-		
Shake Brushes						
Cleaning	12	Taylor Manufacturing Co.	8666	2.42	-	
Spout	12	"	13073	.70	-	
Rear Bearing	12	"	13071	.94	-	
Pizza						
Aluminum						
Sheetpans (18 x 26)	160	-	-	-	7330-00-633-8905	RR-P-54, Type II, Size 2
Pan Handle	case	-	-	-	-	
Peel Pizza	2	DON	K4506	5.65	-	
Ladle						
72 oz.	2	-	-	-	7330-00-153-9759	RR-L-30, Size 72 oz.
8 oz.	8	-	-	-	7330-00-248-1153	RR-L-30, Size 8 oz.
Cutting Wheel	6	Russell Harrington Cutter	P177A	6.95	-	
Blade Only	4		P17	3.45	-	
Spatula	6	Prince Castle	356	18.00	-	
12 x 20 x 8 s/s pans	6	Vollrath Co.	2008-5	71.30	-	RR-B-500, Style C, 60 qt
s/s Stockpot	4	-	-	-	7330-00-234-8831	
3" Pastry Brush	12	-	-	-	7330-00-290-7152	
1½" Pastry Brush	12	-	-	-	7330-00-223-8006	
Pan Hook	2				Local Fabricate	

TABLE 22

Accessory Items for Individual Operations (Continued)

OPERATIONS & ITEMS	TOTAL QUANTITY	MANUFACTURER	PART NUMBER	UNIT PRICE	NSN	SPEC
Cold Food Center						
12 x 20 x 4 s/s Pan	24	Vollrath, Co.	200-5	27.40	-	
Solid Cover	8	" "	70005	19.20	-	
Fat Filter						
S/S Rod ¼" diameter	2	Local Fabrication	-	19.00/case	-	
Keating Klenzer	3 cases		-	19.00/case	-	
3-M Scouring Pads	Bx of 60	-		-	7920-00-753-5242	L-P,Type 2, Class 1, Size 1
Fish Net	12	-	-	1.00		
Chicken						
Ladle 72 oz. Perforated	3	Casson Corp.	72 oz. Perforated	25.00	-	
Beefburger						
Perforated Pans (12 x 20 x 2½)	20	Vollrath, Co.	2002-3	20.70	-	
Spatula	12	Russell Harrington Cutter	-	4.00		
Tongs	12	-	-	-	7330-00-616-0997	MIL-T-40097-12
Conveyor or Broiler						
Wire Brush	12	-		-	-	
Cleaning Solution	12	-	Detergent & Ammonia	-	-	

TABLE 22

Accessory Items for Individual Operations (Continued)

OPERATIONS & ITEMS	TOTAL QUANTITY	MANUFACTURER	PART NUMBER	UNIT PRICE	NSN	SPEC
Potato Extruder						
Dredges	12				7330-00-266-7454	RR-B-263, Type II
Bagging Scoop	6	Prince Castle, Co.	152-ARN (right)	7.00	-	-
	6	"	152-MLN (left)	7.00	-	-
Mixing Valve	4	Taco Manufacturing Co.	500-1	18.43	-	-
Transfer Pans	6	Basic American Foods Co.	Transfer Pans	10.00	-	-
Deep-Fat Fryers						
Baskets						
Fish Fry	12	GE Company	CX 289 (twin)	50/pr	-	-
Cleaning Brush	12	Don	2J1187	1.53	-	-
Shake Mixer						
Aluminum Paddle	2	-	-	-	7330-00-577-5330	MIL-P-13044, Style 2 6x14 Blade, 55" Long
Bakery						
Roll Container	60	Rubber Maid	3301	27.42	-	-
Container Cover	60	" "	3302	7.68		
Roll Pans	100	Bundy Industries, Inc.	10" arrangement 2 of 6 (glazed)	5.40		
Sub Pans	100	"	3½" individual bun pan arrangement 6 of 4 (glazed)	4.50		

EQUIPMENT DISCREPANCIES

CONVEYOR BROILER

Conveyor broiler problems consisted of the malfunction of the quartz heating tubes, overheating of the control panel area, and flare-ups during the beefburger operation. The malfunctioning of the quartz heating tubes was due to the short length of tubes (i.e., 21 3/4" instead of 22¼"). Malfunctioning of the tubes was caused by incorrect securing. Breakage of the tubes was caused by careless handling and by accidentally dropping the ventilator filters on top of the broiler.

The short length quartz heating tubes were replaced by the manufactuer's representative during the refresher training period, and the new units were tested and operated satisfactorily. To eliminate the quartz heating element breakage problem, instructions were given for the handling and cleaning of these units and the ventilator filter. Prior to the removal of the overhead ventilator filter, the conveyor broiler should be completely disassembled. The frame which incorporates the quartz heating tubes for both the top and bottom units should then be removed. Adherence to this procedure eliminated quartz heating element breakage.

Another area of concern was in the control panel area where the heating tube electrical connectors showed evidence of melting. Electrical wires from both the top and bottom elements tended to become grease saturated. Two factors which may have caused the melting were overheating in the immediate area and undersized connectors. Overheating in the control panel area was caused by the cooling fan being inoperative and undersized. The omission of the inner heat deflector shield in the heat chamber also contributed to excessive heat build-up. The undersized electrical connectors were changed from 30-amp electrical connectors to 60-amp electrical connectors. The larger electrical connector along with the installation of the inner heat deflector shield corrected the melting of the electrical connectors.

Several steps were taken to eliminate the slight flare-up problem in the conveyor broiler heat zone during the beefburger operation. The flare-up was caused by the fat and meat accumulation on the following surfaces:

- chain links
- the large chain longitudinal support
- the horizontal surfaces on the ends of the quartz heating element
- *u* channel frame
- the diagonal surfaces of the drain trough and discharge end diagonal support.

These steps included covering all horizontal and diagonal areas in the heat zone with aluminum foil and removing the drain trough and replacing it with two roasting pans placed side by side under the broiler. Each roasting pan was filled with 1 inch of water to cool the hot grease and meat particles which dropped into it. Aluminum foil was used to cover the crack between the pans to prevent grease seepage onto the counter top. This served as a temporary fix until a drain drawer was fabricated by the ship's metal fabrication shop to replace the roasting pans. The drain drawer was inserted in the same brackets which formerly held the drain trough. This modification was relayed to the manufacturer for a permanent fix to all future broilers furnished the Navy. It was also suggested to the manufacturer that they should redesign these units to reduce the horizontal surfaces on the quartz heating tube frame to eliminate grease and meat particle build-up contributing to flare-ups.

DEEP-FAT FRYERS

Only minor problems were encountered in operation of the deep-fat fryers. On two occasions, faulty computers caused operational failures. New computers were installed and the deep-fat fryers have operated satisfactorily ever since. On all of the five fryers, it was necessary to install a louder audible alarm. Another deep-fat fryer problem was the dripping of the fat over the front of the fryer and down the face of the unit to the computer control and switch areas. This was caused by the method used in emptying the fully loaded fry basket forward instead of across the fryer to the work table.

Basket hangers on three fryers tore loose after short usage due to improper welds. All fryer basket hangers were removed and repaired by a ship's welder. This fix was given to the manufacturer's representative with the suggestion that all similar units furnished the Government be provided with a complete fillet weld on basket hangers.

BATTER/BREADING MACHINE

The only problem encountered with the batter/breading unit occurred during the breading operation. Larger pieces of chicken (breasts) were not completely covered with breading product. The cause of this problem was due to the forward and aft plows being out of adjustment. Readjustment of these plows corrected the problem, and the unit operated satisfactorily thereafter.

BLENDER/MIXER MACHINE

One of the problems encountered with the blender/mixer machine was rapid wearing of an area on the face of the mixing chamber plastic door where an adjusting screw contacted the plastic door. The adjusting screw has a small blunt contact surface which digs deeper into the door each time it is removed for cleaning. This problem could be corrected by installing a large surface area at the end of the adjusting screw, thus distributing the pressure over the larger area. Another way to eliminate this problem would be to replace the mixing chamber's plastic door with a stainless steel door. The advantage of the plastic door is that the proper water level may be observed prior to activating the unit for the mixing and blending operation. The first alternative is preferred.

After limited use, the mixing chamber door support arm cracked due to constant tightening and loosening during removal and installation of the mixing chamber door. This was corrected by welding the cracked area on the support arm. There was a problem of powder mix blow back when the powder mix spilt onto the top of the unit while being poured. This was due to the small diameter of the fill tube. This problem could be corrected by increasing the diameter of the fill tube.

Another problem occurred when discharging the mixed product from the unit into a stainless steel 5-gallon milk container. Due to the placement of the discharge nozzle location close to the face plate the milk container had to be placed on a diagonal to receive the product. This is an extremely awkward position.

Finally, the main drive shaft coupling, which was fabricated of cast material, wore excessively and had to be replaced by a steel unit.

SHAKE AND SOFT SERVE ICE CREAM MACHINE

The major problems encountered with the shake and soft service ice cream machines were excessive heat while running, refrigeration unit failures, product not having proper consistency, and a blown freeze plug.

The excessive heat temperature was caused by the wrong type of filter installed in the cooling line. The filter in the cooling line was for fresh water cooling and not for sea water cooling. When the correct filter was inserted, the unit operated satisfactorily. All other units were checked, and the proper filter was installed.

Inconsistent product was corrected by adjusting the temperature control. Once this was accomplished, the product was dispensed correctly. The cause of the freeze plug failure was the high setting of the high limit pressure switch (290 lb). The high limit on this unit was reduced to 175 lb and then the unit operated satisfactorily. The other three units were checked and found to have excessively high limit pressures which were all reduced to 175 lb pressure settings. After the high limit pressure reduction each unit operated satisfactorily.

COLD FOOD COUNTER & UNDERCOUNTER REFRIGERATOR

The same major problem was encountered for both the cold food counter and the undercounter refrigerator. Specifically, excessive temperature on the countertop area above the refrigeration unit. This area became too hot to touch. This problem was caused by insufficient ventilation to the refrigeration unit area, because the units were mounted on a foundation in lieu of legs. The problem was corrected by cutting out the exposed end of each unit and inserting a louvered panel.

OTHER ITEMS

Both the Frispo french fry extruder and the microwave oven operated reliably. One french fry extruder had to be recalibrated once and the task was easily performed.

ROLL DIVIDER AND ROUNDER

One problem encountered with the roll divider and rounder was that the operating rod was hitting the dough pallet causing a strain on the slotted cast iron link. The constant strain on the link would finally result in failure of the link and render the entire unit inoperative. This problem was corrected by removal of the operating rod and reforming the operating rod to provide a clearance between the dough pallet and operating rod.

PROOF BOX

A problem with the proof box was that the rack did not accept 4 sheet pans (18" x 26") when placed side by side. This was caused by the obstructions of the front angle vertical supports. To date, the problem has not been corrected. The intermediate shelves for bun operations are not easily installed or removed. These corrections to the rack are to be accomplished when the USS Saratoga returns to its home port.

COOKIE CUTTER

The only problem noted with the cookie cutter was that the unit did not deposit the cookie dough properly. This problem was easily corrected by adjusting the feeder travel. This adjustment was easily within ship's force capability.

EQUIPMENT RECOMMENDATIONS

General. All equipment except pizza ovens listed in Table 19 are recommended for inclusion in future galley and bakery modifications incorporating the fast food concept in aircraft carriers. Additional recommendations fall into two categories: short and long range. Unless otherwise specified, the following recommendations are for the short range.

Conveyor Broiler. Based upon the Saratoga's operating experience, the following modifications are necessary:

1. Install metal sheathed heating elements in lieu of the quartz heating tubes. This has been done in a similar broiler now operating in the USS Ranger, and the results to date have been excellent.

2. Install insulation between the cooking area and control panel area.

3. Reduce the heat protector baffle area.

In view of the intensive use to which conveyor broilers are subjected, the following proposals are made for an improved design. It is recommended that:

1. A unit be provided that can cook beefburgers from the frozen state without loss of production rate. This capability would reduce labor man-hours by eliminating the thawing step. This unit would eliminate product waste (thawed burgers) by utilizing only that amount of product required. It would also eliminate cleaning time required to clean the thawed product residue.

2. The controls be relocated out of the high heat zone. This should result in elimination of over-temperature of electrical connectors and also the elimination of grease saturation of electrical heating element leads and electrical components. Thus unit maintenance and down time should be reduced.

It should be pointed out that there are alternatives to the Fostoria unit currently in use. Some of these incorporate the features of high production from the frozen product and also the isolated controls. Thus, it is further recommended that:

Either the Marshal-Air or the Neico conveyor broilers be tested in an actual or simulated shipboard environment.

Powdered Mix Blender. From operational experience, it is recommended that:

1. On all units furnished the government the drive coupling be fabricated of steel instead of a cast material. The cast material drive coupling failed during operation (at sea) causing the unit to be inoperative. A steel drive coupling was fabricated by the ship's forces to correct the failure and make the unit operational.

2. A discharge chute be provided as an accessory to the blender/mixer units.

3. Fill tube diameter be increased at least one inch.

Potato Extruder. Based upon excellent performance of these units in the Saratoga test, it is recommended that:

Three Frispo-Matic potato extruding machines be installed as standard equipment in the forward galley for the fast food concept.

French Fry Potato Bagging Station. One of the lessons learned in the Saratoga test was that the bagging area was too small. Thus, it is recommended that:

The french fry bagging station be increased in size to provide adequate bagging area and work areas. The desired bagging station area should be 78" wide by 22" deep with a well located in the center between two work stations. The size of the work station on the left should be 38" wide and work station on the right 18" wide (viewing from fryer operator's side). The size of the french fry well should be 22" wide by 18" deep. A removable stainless steel drain screen should be provided to drain oil from the french fries. The bagging operation should be accessible from both sides of the bagging station.

Deep-Fat Filter. During the frying operation in the USS Saratoga fast food concept, the frying compound was filtered every evening after use. The frying compound used in the chicken and fish operations was changed every six days while the frying compound used in the french fry operation was changed every seven days. Chicken and fish were served once every third day whereas the french fry potato operation was done twice every day. The frying compound used in the deep-fryers aft, that is not filtered, typically must be disposed of after each use. Extending the life of the frying compound by filtering in this manner provided significant cost savings. Based on this finding, it is recommended that all carrier galleys be supplied with two deep-fat filters.

Warming Ovens. Although no operating problems were encountered with the Alto-Sham unit, its design holds a potential for time-consuming repair when failure does occur; thus, it is recommended that:

A warming oven with metal sheathed type heating elements be selected in lieu of the units incorporating the ribbon type heating elements.

Pizza Oven - Long Range Fix. Due to the limited specific need found for the pizza oven on the USS Saratoga, it is recommended that:

Pizza ovens not be installed in the forward galley fast food concept. A double-deck convection oven works just as well and is recommended, requiring a total of two double convection ovens for this galley. The following advantages would be gained by converting to the double-deck convection oven: (1) increased versatility of the convection oven; (2) greater shelf capacity, resulting in higher production; (3) purchase cost savings; (4) reduction of electrical power (14 kW); (5) reduction of floor area by 242 sq in ; and (6) weight reduction of 1200 lb.

Microwave Oven. Since the Saratoga test has shown no operational difficulties, it is recommended that:

A microwave oven be used in the forward galley fast food concept. The microwave oven should have an oven cavity capacity to accept a full-size steam table pan (nonmetallic). With this capability, a fully loaded steam table pan of 30 wrapped beefburgers/cheeseburgers can be heated at one time. The microwave also offers additional flexibility and responsiveness for other items, if required.

Warming Cabinet. While the warming cabinet units on the USS Saratoga worked reliably, the sides did occasionally get too warm to touch. Thus, it is recommended that:

Warming cabinets (identified in Table 19, item no. 10 and 22) be replaced by insulated units. The advantage gained by this change would be that the insulating type warming cabinet would reduce loss of heat and retain heat longer in all types of heated foods.

Shake Storage Cabinet. Another lesson learned in the Saratoga test was that excessive congestion occurred in the area in front of the ovens and work table. This occurred especially during the peak meal period whenever transferring loaded milk shake racks from the shake and soft serve machine on the port side to the shake storage cabinet on the starboard side and then from this storage cabinet to the port serving line when required. Therefore, it is recommended that:

An additional shake storage cabinet of the undercounter type be installed on the port side in close proximity to the port shake and soft serve machine, resulting in improved flow.

Proof Box. In the future, if a custom proofing unit is required the unit should:

Provide means whereby a change can be accomplished with minimum time and effort from the bread proofing mode to the roll proofing mode. On the Saratoga's unit the rack has to be removed from the proof box and shelves have to be installed by means of fasteners for the bread proofing set up.

Overall. A number of observations pertain to the overall galley and bakeries in terms of efficiencies and general capabilities. It is recommended that:

1. To the extent feasible, all facilities and equipment needed for the operation of the fast food system be located forward in the ship as near as practicable to the forward EDF. Because of space and funding constraints, certain decisions were made on the Saratoga that were less than optimal. Greater overall productivity would result if all the following could be in the proximity of the forward galley: roll production, salad preparation, storage spaces for all fast food items, thaw spaces, and an office.

2. Additional equipment should be provided in the forward galleys of larger ships. Although the Saratoga system worked well, it would have been desirable to have had additional equipment in the forward galley if space had permitted in order to have additional production capacity for peak hours, back-up capability in case of equipment maintenance and repair, and a better capability for full service meals, if and when required. Specific examples include equipment for thawing burgers (2 broilers), french fries (3 extruders and fryers), 2 complete milk shake operations (blender, shake machine, shake storage freezer, and serving cabinets), 2 microwave ovens, at least 2 steam jacketed kettles, more refrigeration, and a steamer.

SECTION VIII

SERVICE AND ACCESSORY ITEMS

BACKGROUND

In examining the *before* existing system, it became apparent that the methods used for serving food could not provide the high serving rates required to achieve higher throughput and reduced customer waiting times. Multiple entrees and many other food items were common on the serving lines. The number of food products sometimes totaled 10 to 12 items on the aft lines and 7 to 9 on the forward speed line. Further, the customer served himself everything except the entrees and desserts, and this involved awkward-to-serve items such as soup and vegetables. The number of items offered along with the serving methods clearly caused slowdowns stemming from customer indecision, customer slowness in serving himself, and customer and server interactions.

The development of the most suitable serving methods and serving products entailed detailed examination of procedures employed in commercial, institutional, and military foodservice establishments. Civilian fast food systems were of particular interest. Currently, a wide variety of approaches are utilized in these restaurants with a varying emphasis placed on different types of foam, foil, plastic film, and paper products. Each of these products has attributes which in a given situation make them more appropriate than other items. It was not possible to adopt completely the approach used by any particular organization without comprising the constraints or objectives applicable to carrier foodservice. Alternatives were evaluated to identify those items which were most compatible with the specific features of the new carrier foodservice system being developed.

It was decided that the new serving methods and products should:

a. Lend themselves to pre-packaging and self-service methods in order that a sustained serving rate of at least 6 customers per minute per line be maintained. This is considerably faster than single line speeds normally found in civilian fast food operations.

b. Be compatible with the individual products served in terms of appearance, heat retention, and product protection during serving and consumption.

c. Reduce the workload on scullery workers and the use of fresh water in the scullery, where possible.

d. Enable simple wrapping and serving procedures in the galley.

e. Be similar to the serving and merchandising presentations used in successful commercial fast food outlets and be coordinated with the decor package being designed.

f. Reflect active consideration of logistics and storage constraints particularly minimization of space requirements.

g. Minimize funding requirements consistent with meeting the above criteria.

SANDWICH WRAPPING MATERIALS

Various mediums for pre-packaging sandwiches were analyzed. Alternative items studied included both sandwich wraps and bags made from paper, foil, and plastic film, as well as foam insulated containers. In addition to the cost considerations, another important constraint involved the limited storage space available onboard carriers. The importance of this issue was noted earlier.

A dry wax paper wrap was selected as the best service medium for sandwiches and was distinguished by colors and chevron motif compatible with the selected decor package and lettered with the appropriate legend such as cheeseburgers. These wraps create immediate and lasting product identification. Availability of these paper wraps in a wide selection of assorted colors provides the system with the flexibility of serving additional fast food entrees while maintaining a distinctive identity for the primary products.

On the Saratoga, the following color patterns and paper sizes were used: blue (beefburger, 12" x 12"), yellow cheeseburger,(12" x 12"), and red (submarine, 12" x 16"). A plain white (12" x 12") sandwich wrap was also used on occasion for specialty sandwiches. Hot sandwiches served on the starboard line during the noon meal period were not wrapped as they were often prepared on-line. For these products, the server would place the sandwich on the customer's tray, which would be lined with a piece of dry wax paper (usually 9" x 12").

Paper and plastic film wraps were similar from a cost standpoint. However, when storage was considered, paper provided a significantly better utilization of space. Tables 23 and 24 provide information on representative quantities of comparably sized products. Fifty percent more paper can be stored in half the space required for the plastic film. While the plastic film allows for easy product identification, these wraps require greater dexterity when volume hand wrapping is needed. In addition, plastic film wraps are not the best suited for microwave use since in this application moisture tends to collect on the surface of the sandwich.

Foil wraps were not selected because of their cost and storage requirements. For the same volume of paper, foil wraps require three times as much space and cost approximately $0.01 (132%) more per sheet. Further, foil wrap is not compatible with microwave cookery, which is an integral component of the beefburger operation.

Bagging was also considered as an alternative. Foil bags were rejected on the same grounds as foil wrap. Dry wax paper bags were both similar in cost and storage to the paper wraps. From the standpoint of the worker doing the packaging, bagging is a more difficult procedure to learn and use. A further argument in favor of wraps derives from the fact that a flat, non-compartmented tray was selected for use in the forward EDF, and there was a

TABLE 23

Comparison of Alternative Products for Packaging Sandwiches

Product	Cost/ 1000($)	Cubic FT/ Case (FT^3)	Packaging Case (Each)
Sandwich Wraps			
Paper	6.00	0.5	6000
Plastic Film	5.50	1.0	4000
Foil	13.90	0.75	3000
Sandwich Bags			
Paper	6.50	0.5	6000
Foil	14.50	0.5	2000
Insulated Sandwich Container	13.50	0.4	600

TABLE 24

Comparison of Alternatives for Trays and Beverage Service

Product	Cost 1000($)	Cubic FT/ Case (FT^3)	Packing Case(Each)
Beverage Service			
Paper Cups	8.00	4.0	2500
Glassware*	270.00	2.5	72
Tumbler*	210.00	1.0	72
Trays*			
Plastic Compartmented	3700.00	2.0	48
Metal Compartmented	4400.00	1.0	48
Plastic Flat	2600.00	1.0	12

*Storage and packing information are provided for the reader's information. Inventories of these products are required for replacement purposes only since they are reusable.

need for a liner between the tray's surface and the food product. Wraps not only provided a packaging medium but the placemat as well. If bags were used, additional cost and storage would be incurred by the necessity to carry placemats or tray liners.

Insulated foam containers were not chosen because, as shown in Table 23, cost and storage requirements were excessive.

STARBOARD SUPPER ENTREES

Rotation of the evening meal entrees consisted of a three day cycle of fried chicken, fish and chips, and pizza on the starboard serving line. Service methods for both the fried chicken and fish and chips were identical. A pre-assembled basket containing the entree and french fried potatoes was available to the customer. The server prepared a limited quantity of baskets in order to stay slightly ahead of demand, thereby maintaining higher service rates. As demand tapered off during the meal, baskets were made to order. The perforated basket was made of a dishwasher safe durable plastic that came in assorted colors. A 9" x 12" paper basket liner was placed inside the basket prior to adding the chicken or fish.

When pizza was served, the customer entered the line, picked up a tray, and then a dry wax tray liner. Tray liners came in various sizes (e.g., 9" x 12", 12" x 12", 12" x 16") and may be ordered plain, with a checkerboard design, or in various other standard or ship designed patterns. For simplicity in ordering, the same wax liner was used for the basket and tray. At a serving window, the pizza portion requested was placed on the liner. The waxed paper prevented any oils in the pizza from permeating the paper. As described in the food product section, the pizza selected was not an overly oily product and has presented no difficulty with excess oil buildup on the tray liner or tray.

FRENCH FRIES

French fries were served at all dinner and supper meals except pizza. Bagging was selected as the primary delivery method for serving large quantities of french fries. An option which was normally used when fried chicken or fish was served *in the basket* was to place a portion of unbagged fries in the basket with the entree. Production of french fries taxed the potato extruders to their maximum capacity. To balance production and product availability, a portion size of 2½ - 3 oz was selected. Wax paper bags (4½" x 3½") with appropriate lettering and decorative colors were available commercially in this size. From a customer's viewpoint this portion size was compatible with the regular serving size found in commercial fast food establishments.

Boxes were considered as an option in the french fry service. Because boxes provided larger portions than bags, this alternative was considered unsuitable due to the production limitation of the potato extruders.

It was planned to present the bagged french fries in a serving rack on the serving line. In practice, bagged fries have been presented in steam table pans on the serving line, and no adverse customer reactions have been noted.

BEVERAGE SERVICE

Three options were considered for the service of thick shakes, carbonated, and non-carbonated beverages. These alternatives were paper, glass, or plastic tumblers. The pros and cons of the former two choices are presented below.

The 12.5 fl. oz. tumbler that was selected was made from a heavy duty poly-carbonate clear plastic which was stainproof and highly break-resistant. Etched sides prevented scratching. Stacking lugs kept the tumblers from sticking together.

At a cost of $0.21 per tumbler, the reusable nature of this product makes it more cost-effective than disposable paper or plastic cups costing about $0.08 each. Glassware costs are slightly higher than the plastic tumbler selected $0.23.

Paper or soft plastic cups are generally used to merchandise soft-serve milk shakes and other cold drinks in the commercial fast food industry. The cubic footage necessary to accommodate an estimated daily demand of 4000 or more milk shakes and soft drinks including seconds using these types of products discourages their use in an afloat situation. Table 24 indicates that one case of 12 to 14 oz cups has a volume of about 4 cubic feet. Conservatively, one case could supply the daily requirements. When deployed, the ship carries a minimum of thirty days supply, making storage limitations a severe problem. In addition, the need to consider damage or buffer stocks would require additional storage space.

Glassware was considered for beverage operations and determined to be unsuitable. Milk shake preparation and storage in the galley and on-line pick-up entailed several hand transfers. The potential for breakage was great. From a production viewpoint, a broken glass while drawing or storing shakes would not only slow operations but also probably require discarding significant quantities of product. This would be particularly true if the breakage occurred in the shake freezer where 280 shakes were stored. Further, breakage of glass-ware on the serving line would slow throughput which the system had been designed to achieve.

It was recognized that even if plastic tumblers were utilized for the milk shakes, glasses could be used for the self-serve drinks at the beverage bar on the mess deck. The time and effort involved in the separation of glasses and tumblers in the scullery for cleaning and for delivery to the galley and dining areas would be excessive. Therefore, it was simpler to stock only one type of item in the forward EDF. Thus, plastic tumblers were evaluated as being the best overall choice.

The original plan for beverage service called for the use of plastic lids and straws with the milk shakes. During the test it was found that the plastic lids were not required and, in fact, slowed down the shake preparation. In addition, the lids introduced additional costs ($0.007 ea.) and took up storage space. The ship decided not to offer straws because of the cost, storage space, and extra paper debris. The shakes that are served are thick shakes and in the opinion of the project team, a large diameter straw would be a convenience for the customer. Therefore, it is felt that each carrier should decide on whether to provide straws on the basis of their own storage space and funds availability.

TRAYS

Metal and plastic compartmented trays had been used in the pre-test EDF. A colorful flat tray with a distinctive Saratoga logo and compatible colors with the new decor was chosen for the fast food concept. An additional factor in selecting flat trays was that they contribute to the commercial fast food image change that was part of the design objective. Pre-packaged entrees were not compatible with the compartment sizes of the standard trays onboard. On the other hand, all of the food items offered, such as pre-wrapped sandwiches, chicken in a basket, and fish and chips, are suited to flat tray service where these items are placed on the surface along with french fries and milk shakes.

DISPOSABLE COSTS

Table 25 provides the actual mean attendance, daily usage, and daily costs by menu item onboard the Saratoga under normal operating conditions. For those interested in estimating costs associated with disposables for their ships, the attendance figures will be useful for beginning the necessary calculations. Adjustments to the mean attendance and other figures can be made as experience suggests.

Customers selecting cheeseburgers or beefburgers were assumed to take two portions. Therefore, the mean attendance for cheeseburgers and beefburgers was multiplied by two to determine the number of wraps needed. The required number of cold submarine wraps, tray, and basket liners equal the attendance estimate for that item.

TABLE 25

Summary of Daily Cost Estimates for Disposables

Dinner	Actual Mean Attendance	Actual Daily Usage	Actual Daily Cost
Beefburgers			
Cheeseburger Wrap	575	1150	$ 6.90
Hamburger Wrap	100	200	1.20
Submarines			
Tray Liner (Hot Sub)	450	450	2.25
Cold Wrap	250	250	2.25
French Fry Bags	1375	1375	8.25
Supper			
Beefburgers			
Cheeseburger Wrap	850	1700	10.20
Hamburger Wrap	100	200	1.20
French Fry Bags	950	950	5.70
Pizza Tray Liners*	900	900	4.50
Fried Chicken Basket Liners*	1050	1050	5.25
Fish and Chip Basket Liners*	1000	1000	5.00
Average Daily Cost			$ 42.85

*Served every third day.

The number of french fry bags required was approximately equal to the total projected attendance for dinner plus that of the port line at supper. Starboard entrees at supper did not need to be bagged as they came in the basket as part of the fish and chicken entrees. French fries were not served when pizza was offered.

Based upon the average number of enlisted personnel authorized to eat, the average cost per day for disposables is 1.2 cents per person. Costs have also been tabulated for the reported usage of disposables during six months of operations. (Table 26). In comparing the cost derived for the mean attendance (Table 25) and the actual costs as determined from the ending inventory for disposables (Table 25 and 26), no significant differences on a per person basis are noted. The total at sea daily cost per person was $0.010 as compared with the estimated $0.012 per day. At sea costs are given because the forward EDF was not normally open in port. That actual costs were lower may reflect such *real-world* factors as inadequate, not always bagging french fries, or not wrapping certain hot submarine sandwiches. Thus, the two sets of costs are presented as upper and lower bounds around a *true cost*.

NON-DISPOSABLE COSTS

Non-disposable consumption presents a different situation for cost comparisons. Table 27 includes the average monthly quantities and cost of the non-disposable serviceware consumed. Average monthly replacement factors for DSA/GSA assigned items were used in all preliminary calculations.[11] These factors represent the percent of the quantity of a particular product that might need replacing during a set period of time due to loss, theft, or damage. Replacement factors for plastic flat trays were 25% per month and for serving baskets 6%.

Calculations for both the tray and plastic baskets in use on the Saratoga have determined the average monthly replacement factors to be 7 and 3 percent, respectively. These percentages compare favorably with replacement factors for products in the existing system. Management aboard the Saratoga is very satisfied with the low loss-rate on the tray, even though some trays may have been taken as souvenirs.

[11] Publication SB 10-496, "Supply Control Wartime Replacement Factors and Consumption Rates for DSA/GSA Assigned Items", Washington: November 17, 1972.

TABLE 26

Disposable Costs Calculated from USS Saratoga Records

Product	6 Month Total Usage* (Cases)	Total Cost ($)
French Fry Bags	17	$ 595
Tray Liners	25	900
Beefburger Wrap	6	216
Cheeseburger Wrap	31	1116
Submarine Sandwich Wrap	29	1044
TOTAL		$ 3871

Total At Sea Daily Cost	$ 38
Total At Sea Daily Cost Per Person**	$ .01
Total Monthly Cost	$ 640
Total Quarterly Cost	$1920

*The forward EDF was generally only operating at sea.
**Average authorized to eat approximately equal to 3700.

TABLE 27

Replacement Factors for Non-Disposable Service Products*

Product	Average Monthly Turnover		Cost of Serviceware Consumed ($)	
	Dozen	Percent	Monthly	Quarterly
Plastic Tumbler	47	50	120	360
Plastic Serving Basket	1	3	2	6
Non-Compartmented (Flat) Tray	2	7	64	192
TOTAL			186	558

*Based upon the first 6 months of operations.

At first glance of Table 27 the turnover rate of tumblers would seem to be excessive. However, when viewed with respect to glassware, this rate is in line with other foodservice operations in both military and commercial environments. Estimates for breakage at university residence halls places yearly turnover at 100%.[12] Military sources also experience this type of breakage factor.[13]

Recent data collection during the Saratoga's Mediterranean deployment indicates that the turnover rate of tumblers has subsided. At the outset of the experiment, the ship was operating in the Caribbean. Water supplies were limited under extreme heat conditions, and beverage consumption was extremely high. It was at this time that the continual disappearance of tumblers was first noted and *walk-outs* became a large problem. Minimization of this problem can be accomplished through a concerted effort of the foodservice management and MDMAA's, with a resulting decrease in the recurring costs of non-disposables.

SUMMARY

Table 28 summarizes pertinent information concerning the service products used in this project on an item-by-item basis. The reasons for selecting these items have been discussed in this section and, based upon test results, these items are considered to be the most cost-effective solutions to the serving issues. In that respect, it will be noted that these products, and the manner in which they are used, are consistent with the criteria laid down at the beginning of this section.

RECOMMENDATIONS

The service methods and products that have been incorporated into the system design have proven to be well accepted by both foodservice management onboard the Saratoga and by customers alike. Therefore, it is recommended that:

- The methods of service used in the Saratoga test, particularly sandwich pre-wrapping, pre-assembly of baskets, pre-bagging of french fries, and pre-pouring of shakes continue to be employed to foster the concept of quality fast food and to enhance fast service.

- Plastic tumblers (12.5 oz) in both the milk shake and beverage bar service be adopted for future operations in all fast food EDF's.

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[12] B. B. West , et al., Food Service in Institutions, 5th ed, New York: John Wiley & Sons, Inc., 1977, page 803.

[13] Informal conversation with FSO, USS Saratoga.

- Plastic baskets continue to be utilized to promote the fish and chicken *in a basket* theme.

- Plastic flat trays become a component of all future systems of this type and the designs be developed that include individualized logos and colors.

- Distinctive wax paper sandwich wraps be used to assist customer identification of specific products and to provide a means for faster customer serving rates. All future systems should incorporate the use of tray liners for pizza and unwrapped hot sandwiches. Paper liners should be used in the plastic baskets.

TABLE 28

USS Saratoga Service Systems Specifications

	Description	Packing(No.)	Case Cost($)	Cubic Footage	Unit Cost($)
● Non-Disposables					
Plastic Tumbler	12.5 fl oz	6 dz	$ 15	1.0 cu ft	$ 0.21
Plastic Serving Basket	9" oval	3 dz	2	0.3	0.06
Non-Compartmented Tray*	12" x 16"	1 dz	32	1.0	2.67
● Disposables					
French Fry Bags	4½" x 3½"	8000 ea	35	0.5	0.006
Sandwich Wrap**	12" x 12"	6000	31	1.0	0.005
Tray Liners	9" x 12"	8000	36	1.0	0.005
Beefburger Wrap*	12" x 12"	6000	36	1.0	0.006
Cheeseburger Wrap*	12" x 12"	6000	36	1.0	0.006
Submarine Sandwich Wrap*	12" x 16"	4000	36	0.5	0.009

*Cost includes individualized logo.
**The sandwich wrap can be used as a tray liner if desired or for specialty sandwiches.

SECTION IX

PERSONNEL STAFFING AND TRAINING

BACKGROUND

Prior to implementation of the fast food concept aboard Saratoga, the forward galley was staffed entirely by air-wing personnel. The day watch (0800-2000) consisted of four MS's and the evening watch (2000-0800) was manned by three MS's. An E-6 Galley Supervisor had overall responsibility for both watch sections. Six foodservice attendants from the S-2M Division were assigned to each galley watch.

Productivity rates based on meals served per man-hour of foodservice labor are presented in the table. Two rates were computed: the first using total man-hours for MS and S-2M personnel combined and the second using only MS man-hours. No midrats meal was offered in the forward EDF.

TABLE 29

Productivity in the Forward EDF Prior to Fast Food System

EDF Manpower	Average Meals Served Daily Pre-Test Mediterranean	Meals/Man-hour
All EDF Personnel	2175	9
MS Only	2175	23

PERSONNEL ORGANIZATION FOR FAST FOOD SYSTEM

Personnel for the new fast food galley were selected by the Food Service Officer and Forward Galley CPO based on their desire to work in this galley and their general aptitude for the high production required. While this selection probably helped the efficiency of the galley, its impact, if any, is difficult to evaluate at this time.

Fast food menus customarily present a limited selection of easy-to-prepare items. The type and style of food preparation involved would typically not be attractive to an experienced cook. The average employee in a fast food restaurant requires no previous foodservice experience and can be trained on a specific task generally in a day or two.

In similar fashion, experienced MS resources could be conserved in the new fast food facility aboard Saratoga by making full use of the transient, unskilled labor force that makes up the S-2M Division. Use of this inexperienced labor force though, requires greater emphasis on management roles in the new operation.

EDF Management. A Chief Petty Officer (E-7) was assigned to head up the new fast food galley. Observations by NARADCOM personnel reinforced the apparent need for *khaki* in the forward galley. The uniform, while not nearly as important a factor as the person who wears it, does enhance the necessary management image. It likewise tends to have a more positive impact on functional duties both inside and outside the galley.

The following is a brief outline of the duties assigned the forward galley CPO:

1) organize and schedule in-port and at sea watch sections
2) assign individual duties
3) coordinate assignments and work details with the S-2M division
4) assure adherence to operational procedures and standards in the areas of:

    a) food preparation and holding
    b) food serving
    c) product quality
    d) cleanliness and sanitation
    e) equipment

5) coordinate forward galley requirements with the aft bakery, vegetable preparation room, and butcher shop
6) review breakout orders
7) assure that required bulk inventories of product are being maintained
8) assure that personnel are trained
9) maintain records, including headcounts, food waste, and other data

These tasks make it virtually impossible for the CPO to effectively supervise all galley operations. The requirement exists for an E-6 Galley Supervisor to assume some of the above duties and assist the Galley CPO, particularly in the areas of direct galley supervision, breakouts and drafting of the Food Preparation Worksheet. These two individuals need to coordinate their activities to generally ensure that one is actually in the forward galley between 0800 and 2300 hours. Experience showed that an E-7 and E-6 management team was an important ingredient in the effective operation of the Saratoga's new forward galley. Attempts to substitute lower rated personnel in these positions could have a serious negative impact upon future fast food operations. Personnel in these lower paygrades generally do not have sufficient management expertise and operational experience to direct a foodservice system of this scope. As testimony to the importance of effective management in the fast foodservice operation, the following message was received from Saratoga.[14]

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[14] "Fast Food Operations," USS Saratoga Msg 061442Z, December 1978.

"To make the program work it takes interested people. If the enthusiasm and willingness to innovate is not evident, the program is doomed to failure. A Chief Petty Officer is a necessity for the day to day operation, the Food Service Officer has to be fully involved and the Supply Officer and Assistant Supply Officer have to guide the project. Part of the success of the project has been the insistence on management's part that things be done right: (e.g., proper wrapping, display and appearance of food products to maintain the consistency of a fast food outlet, no short-cuts...")

Position Supervisor and Descriptions Roles. The following recommendations were proposed to the Saratoga for the staffing of each operation in the forward galley:

	Recommended Manning	
	MS	S-2M
1. Deep Sink		1
2. Trash Removal		1
3. Serving Lines		2
4. Line Runner		1
5. Beefburgers	1	3
6. Submarine Sandwiches	1	2
7. Milk Shakes	1	2
8. French Fries	1	2
9. Pizza	1	2
10. Fried Chicken	1	2
11. Fried Fish	1	1

The recommended manning level for the forward galley was based upon the most labor-intense combination of food items to appear during any given meal considering the needs of both serving line menus. Using this approach, a dinner meal offering a veal cutlet submarine sandwich would require the use of operations 1 thru 8 for a total of eighteen men. A supper meal serving pizza would involve operations 1 thru 5 and 7 thru 9, again using a total of eighteen men. It should be noted, however, that only during the type training exercises were the recommended staffing levels implemented. During the 1978-79 Mediterranean deployment, the forward EDF operated with only thirteen men per watch.

Following is a brief description of the operation for each fast food item. In most production areas an MS was assigned as a working supervisor with responsibility for one particular operation. Related duties included area setup, production start-up times and rates, finished product inventories, area cleanliness, safety, product quality, and the supervision of assigned personnel. In most instances, an MSSN or MS3 was used to fill these positions.

1) Operation. Deep Sink

Duties. Washing pans, containers, utensils, etc., during meal periods for recycling. During clean-up operations after the evening meal, the person assigned to trash removal will assist at the deep sink. Personnel assigned to this operation will familiarize themselves with the parts to the various pieces of equipment and keep them together during the washing operation.

2) Operation. Trash Removal

Duties. Remove trash from all work stations as it accumulates and transport topside for disposal.

3) Operation. Serving Line Attendants

Duties. A minimum of one server will be required on the port line for the noon and evening meal. One server will work the starboard line at noon provided the hot sandwiches have been pre-assembled.* On evenings when fried chicken or fish is offered, two servers will be required to assemble and serve the baskets. Servers will request more product from the line runner before a runout occurs. Keeping the serving lines clean is also part of these individuals' responsibility.

4) Operation. Line Runner

Duties. The line runner will be responsible for supplying both serving lines with product. The individual should be aware of upcoming line requirements to better organize the work load. Using the microwave to reheat burgers and keeping the serving lines clean (inside the galley) are additional duties of the line runner.

5) Operation. Beefburgers

Duties. A broiler loader and unloader and two sandwich wrappers are required for this operation. One wrapper will transport burgers to the warming cabinet or microwave oven, as required.

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*The word *assembly* means filling the sandwich roll or the serving basket with all ingredients required for a complete entree item. This includes the proper use of any paper products, such as wrappers or basket liners.

6) Operation. Hot Submarine Sandwiches

Duties. A hot veal cutlet submarine sandwich will require the most labor. One person will slice the cutlets, another will lay the meat in the roll and add sauce, and the third person will sprinkle on cheese and arrange the sandwiches on sheet pans.

7) Operation. Milk Shakes

Duties. One MS will operate the mixer/blender while one mess attendant operates each of the shake machines.

8) Operation. Frispo Potatoes

Duties. One man will operate each extruder and deep-fat fry the product. One man will bag the fried product. Whenever possible, the two production people will also assist in the bagging operation.

9) Operation. Pizza

Duties. The MS will operate the ovens and the two mess attendants will work on product assembly.

10) Operation. Fried Chicken

Duties. The MS will operate the deep-fat fryers while the mess attendant runs the batter/breading machine.

11) Operation. Fried Fish

Duties. The MS will operate the deep-fat fryers.

As a result of the fast food menu, roll requirements from the ship's bakery operations increased dramatically. However, by redesigning the system and installing labor-saving bread and roll equipment, additional staffing was not necessary in this area.

PRODUCTIVITY

One of the major benefits derived from Saratoga's fast food operation was in the reduced number of trained foodservice personnel required to support the new menu. A distribution of galley personnel, illustrated below, compares staffing levels between the two EDF's during the period (1978) when the test was being conducted.

	Forward EDF**	Aft EDF**
E7 - E8	1	2
E5 - E6	1	6
E3 - E4	8	21
E1 - E2*	16	20
	26	49

*Includes S-2M Personnel.

**Totals represent two 12-hour watch sections.

When man-hour figures in the forward and aft galleys are compared against respective headcount data as a measure of worker productivity, the following results emerge:

	Total Man-Hours (Two 12 hr. Shifts)	Avg. No.* Meals Served	Meals/Man-Hour (One 12 hr. Shift)
Forward	312	3650	12
Aft	588	7025	12

By maximizing S-2M personnel and minimizing MS labor in the forward galley, a very positive productivity ratio for MS's occurs. This ratio seems particularly appealing considering the MS is a critical Navy rate.

	MS	Avg. No. Meals Served	Meals/MS Man-Hour
Forward	10	3650	30
Aft	29	7025	20

It should be remembered that the forward galley is currently not serving a midrats meal. The facility has the capability to serve this additional meal with no increase in labor. Also, a more extensive breakfast menu as mentioned in Section V, would require no increased staffing and could be implemented. These modifications would result in an even more favorable forward galley productivity.

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*Forward (Continental Breakfast, Dinner, Supper), Aft (Breakfast, Dinner, Supper, Midrats)

When meals per man-hour are computed for the dinner and supper periods, the results are favorably inclined towards the new fast food menu.

	Man-Hours (One 12-hr. Shift)	Avg. Dinner and Supper Meals Served	Meals/Man-Hour
Forward	156	3100	20
Aft	294	4150	14

Productivity data such as these should come as no surprise. To produce an A-ration meal will always require a greater number of more highly trained personnel. The fast food menu demonstrates that a popular, nutritious alternative can be successfully supplemented in the daily meal routine and at the same time make better use of the Navy's limited MS resources.

TRAINING

As a prototype foodservice system, USS Saratoga's training in fast food operations was largely an evolutionary rather than a programmed effort. Now that operating experience has been gained, subsequent fast food installations can benefit from more detailed training plans.

The major training effort consisted of on-the-job instruction provided by members of the research team during two operating periods immediately following the Saratoga's SRA (Selected Restricted Availability). Prior to this instruction, production plans for each fast food operation had been prepared and were reviewed with Saratoga's Food Service Division personnel (Food Service Officer and Chiefs). Instruction was provided not only for galley personnel, but also for those working in the bakery.

In the future, a formal on-the-job training (OJT) program should be developed for the normal working staff, and OJT materials should be developed so that consistent and appropriate worker training is provided on all ships. Local Navy Food Management Teams should also be encouraged to take part in fast food OJT training on all ships. Prior familiarization with the new system allows them to provide valuable assistance in start-up operations.

Additional instruction in fast food operations was provided by manufacturer's representatives. Shortly after the galley was turned over to the ship, representatives from General Electric, Basic American Food Company, and Taylor Freezers spent approximately one-half day each in training foodservice and engineering personnel. Operations as well as maintenance and repair were covered in these sessions.

With the time constraints present in this project, very little written instructional material was prepared for or by Saratoga personnel other than new or revised menus and appropriate food production plans. However, training requirements for the new system were expressed in a general training plan provided by NARADCOM to COMNAVAIRPAC for start-up of the USS Ranger's fast food operation.

During the USS Saratoga's deployment, it was reported that further training was accomplished by rotating personnel between the forward and aft galley. In addition, the ship's Food Service Division held several OJT sessions in the forward galley.

Although no systematic management or supervisory training was provided, members of the NARADCOM team met frequently with the Saratoga Food Service Officer and Chief Petty Officers during data collection visits to the ship. It was through these meetings that intended procedures and policies were discussed and *training* was accomplished.

As part of the long-term development of fast food on board naval ships, operating manuals should be prepared to assist management in the introduction and use of this type of new system.

Additionally, formal training should be focused primarily on managers. Once new equipment is installed and new food products and recipes are available, management becomes the single most important factor in the success of a fast food galley. Formal schools and other training emphasis should be directed to the fast food system managers (Food Service Officer, senior MS, galley manager, watch captain) as is the case in commercial fast food companies.

RECOMMENDATIONS

Based upon USS Saratoga's experience and results of the test, the following recommendations are warranted:

1) Assign managers to the forward galley who are interested in fast food.

2) Assign at least one Chief Petty Officer and one E-6 to manage the operation.

3) Use S-2M personnel wherever possible in the various production, service, and sanitation operations.

4) Staff each operation with the recommended number of personnel.

5) Follow food production guide drafts designed for the Saratoga.

6) Have manufacturer's representatives on board to explain new pieces of equipment.

7) Designate forward galley management to perform all fast food training.

8) Rotate forward galley personnel between operations.

9) Rotate forward and aft galley personnel.

10) Stress formal school emphasis on management training.

11) Develop an OJT package to provide professionally prepared, consistent training material for all galley workers.

12) Prepare operating manuals to assist management in the introduction and use of the new fast food system.

13) Make full use of local Food Management Teams in the start-up operations of fast food systems.

SECTION X

FOODSERVICE WORKER JOB SATISFACTION

INTRODUCTION

Mess Management Specialists (MS) were surveyed and interviewed during four phases of the study (Table 30). In each of these four instances, paper and pencil surveys and a job satisfaction instrument, the Job

TABLE 30

Date and Location of the Four Worker Study Phases

Phases	Date	Location
Pre-test		
CAR-1	March 1977	Caribbean
MED-1	November 1977	Mediterranean
Post-test		
CAR-2	August 1978	Caribbean
MED-2	November 1978	Mediterranean

Description Index (Smith, et. al., 1969), were administered in group settings.[15] Table 31 summarizes the number of MS's surveyed and interviewed.

TABLE 31

Number of MS Personnel Interviewed and Surveyed with Each Instrument

	CAR-1	MED-1	CAR-2	MED-2
MS Opinion Survey	62	67	26	36
MS Interview	25	47	26	36
MS Job Description Index	53	64	26	32

The pre-test surveys administered in CAR-1 and MED-1 were identical and included questions concerning the present status of the galley motivation,

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[15] P. C. Smith, L. M. Kendall, and C. L. Hulin, The Measurement of Satisfaction in Work and Retirement, Chicago: Rand McNally and Co., 1969.

job satisfaction, and ideas for improvements in the foodservice operation. The two post-test surveys, CAR-2 and MED-2, omitted the question about potential improvements; and the CAR-2 survey was shortened even further because of time constraints.

The Job Description Index (JDI) is a standard paper and pencil instrument which measures satisfaction within five areas: the work itself, the supervision, the co-workers on the job, the opportunities for promotion, and the pay. Each area is evaluated by response to a list of adjectives and descriptive phrases; eighteen words and phrases are used for work, supervision, and co-workers, while nine each for pay and promotion.

In addition to the surveys and JDI's, interviews were administered on a one-to-one basis to MS's in each of the four data collection phases. As can be seen in Table 31, generally fewer personnel were interviewed than surveyed. In some instances, MS were interviewed and not surveyed, and vice versa.

RESULTS AND DISCUSSION

Demographics. The enlisted rates of the MS's sampled for the opinion surveys ranged from E-1 to E-7 (Table 32). Most survey respondents were E-3 and E-4, with slightly higher percentages at E-4 in the pre-test CAR-1 and MED-1 phases and at E-3 in CAR-2 and MED-2.

TABLE 32

Enlisted Rates of Foodservice Worker (MS) Survey Samples

	CAR-1* (N=62)	MED-1** (N=67)	CAR-2 (N=26)	MED-2 (N=36)
MSC, E-7	2%	---	4%	---
MS-1, E-6	10%	8%	---	8%
MS-2, E-5	23%	22%	12%	17%
MS-3, E-4	26%	36%	38%	23%
MSSN, E-3	13%	21%	31%	36%
MSSA, E-2	18%	12%	15%	8%
MSSR, E-1	---	---	---	8%

*8% did not respond to the question.
**1% did not respond to the question.

Job Satisfaction. Before discussing results from the Job Description Index (JDI), a brief explanation of the scoring should be undertaken. Each of the five areas of the JDI is evaluated by responses to a list of adjectives or descriptive phrases. Figure 32 shows the format and four of the adjectives from the work scale. The respondent circles *yes or no* to tell whether the work or phrase describes his job or not. He circles *?* for those items which he does not understand or on which he cannot decide.

WORK

Fascinating	Y	N	?
Routine	Y	N	?
Boring	Y	N	?
Good	Y	N	?

FIGURE 32: Format for the Worker Scale of the Job Description Index

Based on a large number of respondents who were asked to describe the best and worst possible jobs for themselves, the developers of the JDI determined which response should be scored as satisfied for each item. As shown, *routine and boring* are scored in the satisfied direction if the individual responds *N;* and *fascinating* and *good* are scored in the satisfied direction if he answers *Y*.

Smith suggests scoring satisfied answers as 3, dissatisfied answers as 0, and *?* answers as 1. For each scale of the JDI, the range of possible scores is from 0 to 54.

Table 33 shows the mean responses of the MS's in all four phases of the study to the work, supervision, and co-worker scales. One would not anticipate differences among the four phases on the other scales, pay and promotion. Since such differences did not occur, for simplicity these means are not included in the table. For comparison purposes, the table also provides *military cook norms,* mean responses from a sample of military foodservice workers at three Air Force bases: Travis, Minot, and Homestead (Symington and Meiselman, 1975).[16]

First, focusing on the combined scores of all S-2 MS's (forward and aft galley, bakery, vegetable prep, etc.), the most dramatic result is the difference between CAR-1 and the three other samples. On all three JDI scales - work, supervision, and co-workers - there was a lower level of job satisfaction in the CAR-1 sample. This improved markedly in the MED-1 sample, probably mostly due to a change in management occurring between the two pre-test phases. The level of job satisfaction remained relatively constant in the CAR-2 and MED-2 samples for the work and co-worker scales,

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16 L. E. Symington and H. L. Meiselman, The Food Service Worker and the Travis Air Force Base Experimental Food System: Worker Opinion and Job Satisfaction, US Army Natick Laboratories, 75-94-FSL, 1975.

TABLE 33

MS Mean Responses to Three Scales of the Job Description Index (JDI)*

All MS's

Scale	CAR-1 (N=53)	MED-1 (N=64)	CAR-2 (N=26)	MED-2 (N=32)
Work	17.72	24.39	24.89	23.94
Supervision	23.70	31.41	33.75	36.13
Co-Workers	23.85	30.16	31.30	30.81

Post Test MS's, Forward and AFT Galleys

	CAR-2		MED-2	
Scale	Forward (N=8)	Aft (N=7)	Forward (N=8)	Aft (N=16)
Work	20.12	21.50	26.75	21.25
Supervision	45.75	40.00	43.88	30.56
Co-Workers	37.25	24.33	40.00	28.06

Air Force Cook Norms**

Scale	
Work	23.72
Supervision	38.89
Co-Workers	34.98

*0 = lowest job satisfaction, 54 = highest job satisfaction.
**Data from Travis, Minot, and Homestead AFB's.

and appeared to increase gradually over each phase for the supervision scale. Since the post-test foodservice system changes were entirely customer oriented, the maintenance of worker job satisfaction levels in the post-test should be viewed quite positively. Note that the CAR-1 job satisfaction means were substantially lower than the Air Force norms, whereas those from the other three phases were virtually identical to the norms for the work scale and approaching them for the other two scales.

One of the major concerns related to the new forward galley food system was that, because of an anticipated increased workload, forward galley cooks' job satisfaction and motivational levels might be adversely affected. The middle section of Table 33 presents data which bear directly on this concern: the mean job satisfaction scores for forward galley MS's were slightly lower than those of their aft galley counterparts on the CAR-2 work scale, but from 5.50 to 13.00 points higher for the supervision and co-worker scales in CAR-2 and all three scales in MED-2. Further, when compared to the Air Force norms, the CAR-2 and MED-2 forward galley scores fall around the work norm, and exceed norms for supervision and co-workers.

A similar concern in the new system was that the bakers would likewise have their job satisfaction levels adversely affected because of a significant increase in the required volume of baked products. As can be seen in Table 34, the opposite was the case; post-test baker job satisfaction was higher than that of pre-test bakers on all three scales of the JDI.

TABLE 34

Bakers' Mean Responses to Three Scales of the Job Description Index (JDI)*

Scale	Pre-Test (N=19)	Post-Test (N-10)
Work	26.74	33.00
Supervision	35.26	39.50
Co-Workers	30.74	36.50

*0 = lowest job satisfaction, 54 = highest job satisfaction

Motivation. Patchen (1965)[17] has developed a four-question set of job motivation indices. Each question is scored on a five point basis with a score of five indicating highest motivation and a score of one, lowest

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17 M. Patchen, Some Questionnaire Measures of Employee Motivation and Morale: A Report on Their Reliability and Validity, Institute for Social Research, University of Michigan, Ann Arbor, 1965.

motivation. Table 35 shows the mean responses to these items from the four samples including all MS's, and then displays the CAR-2 and MED-2 forward and aft galley cooks' data.

Considering the data from all MS's, the overall mean motivation scores were extremely similar in the CAR-1 and MED-1 samples. A slight increase in CAR-2 reverts back to a lower motivation score in MED-2.

Examination of responses to the individual questions does show some trends in the total MS population. Apparently under the new management in MED-1, the MS's reported less time dragging, being more involved in their jobs, doing less extra work, and working less hard compared to others doing their type of work on the ship. When one compares the post-test CAR-2 and MED-2 to the pre-test CAR-1 and MED-1 data, it can be seen that the post-test MS's continued the trend of reporting less time dragging and less hard work. The data for the other two items are far more variable and difficult to interpret. It should be pointed out that a lower motivational response to item 4, "working less hard than other people doing your type of work on this ship" indicates that concerns about overworked MS's in the new food system are probably unfounded.

The lower portion of Table 35 breaks the post-test responses into forward and aft galley components. Clearly, forward galley MS's reported higher motivational scores than their aft galley counterparts, although this difference was not as large in the MED-2 sample. Note, again that forward galley cooks do not feel overworked as compared to others doing similar work on the ship.

MS Opinions of the Foodservice System. MS opinions of the foodservice system on the Saratoga have been garnered from both the opinion surveys and face-to-face interviews (Table 31). All but the CAR-2 sample of MS's were asked to compare their present mess to other ships' messes in which they had worked; those MS's for whom USS Saratoga was the first ship did not respond. There is a clear trend (Table 36) from an average *slightly worse* in CAR-1, to between *slightly worse* and *better or worse* in MED-1, to between *no better or worse* and *slightly better* in MED-2. Further, the percent of MS's saying that the Saratoga mess was to some degree better increased from 9% to 22% to 57%, respectively.

Table 37 provides the mean MS ratings of the present status of fourteen factors in the foodservice operation on the Saratoga. The data in the table represent responses on seven point scales by all MS's surveyed in the four phases of the study, and can be summarized as follows. In general, CAR-1 mean ratings were lower than those given by the three other samples. All four samples tended to agree in rating their own food preparation skills highest, and in showing concern about the effectiveness of the Mess Deck Master-at-Arms, the condition of equipment and utensils, and equipment maintenance.

TABLE 35

Mean MS Responses on Patchen's (1965) Job Motivation Indices[a]

	CAR-1 (N=62)	MED-1 (N=67)	CAR-2 (N=26)	MED-2 (N=36)
Item 1: Time dragging[b]	2.26	2.52	2.85	2.72
Item 2: Job involvement[c]	2.79	3.18	3.41	3.19
Item 3: Extra work[d]	3.92	3.66	4.18	3.51
Item 4: How hard work[e]	4.08	3.78	3.39	3.50
Overall Mean	3.26	3.28	3.46	3.23

Post Test MS's, Forward and AFT Galleys

	CAR-2		MED-2	
	Forward (N=8)	AFT (N=7)	Foward (N=8)	AFT (N=12)
Item 1: Time dragging[b]	3.38	2.00	2.88	2.58
Item 2: Job involvement[c]	4.00	3.40	3.25	3.08
Item 3: Extra work[d]	4.62	3.67	4.38	2.92
Item 4: How hard work[e]	3.50	3.50	3.50	3.42
Overall Mean	3.88	3.14	3.50	3.00

[a] 5 = highest satisfaction, 1 = lowest satisfaction.

[b] On most days on your job, how often does time seem to drag for you?

[c] Some people are completely involved in their job - they are absorbed in it day and night. For other people, their job is simply one of several interests. How involved do you feel in your job?

[d] How often do you do some extra work for your job which isn't really required of you?

[e] Would you say you work harder, less hard, or about the same as other people doing your type of work on this ship (base)?

TABLE 36

MS Comparison of Present Mess to Other Ships Messes in Which They Worked

Present Mess is:	CAR-1 (N=41)	MED-1 (N=41)	MED-2 (N=19)
1. Much worse	17%	12%	16%
2. Somewhat worse	20%	10%	11%
3. Slightly worse	37%	22%	11%
4. No better or worse	17%	34%	5%
5. Slightly better	2%	7%	26%
6. Somewhat better	2%	10%	26%
7. Much better	5%	5%	5%
MEAN	2.95	3.63	4.16

TABLE 37

Combined MS Mean Ratings of the Present Status of Several Factors in Their Enlisted Foodservice Operation

Factor	CAR-1 (N=62)	MED-1 (N=67)	CAR-2 (N=26)	MED-2 (N=36)
a. Food preparation skills of MS's	5.21 (1)*	5.34 (1)*	5.42 (1)*	5.14 (1)*
b. Customer satisfaction	4.1[illegible] (6)	4.60 (5)	4.77 (5)	5.06 (2)
c. Leadership of watch and galley captains	4.0[illegible] (8)	4.39 (9)	5.14 (3)	4.61 (3)
d. Leadership of leading MS	3.92 (10)	4.63 (4)	5.23 (2)	4.60 (4)
e. Forward galley menu	----	4.58 (6)	4.66 (6)	4.42 (5)
f. Sanitary conditions in galley and dining areas	4.70 (2)	4.90 (2)	4.14 (9)	4.40 (6)
g. Interest and support of Captain	4.35 (4)	4.50 (7)	3.94 (11)	4.39 (7)
h. Support and cooperation among MS's	3.71 (12)	4.30 (10)	4.64 (7)	4.33 (80
i. OJT program	4.13 (7)	4.21 (12)	4.12 (10)	4.31 (9)
j. Aft galley menu	----	4.79 (3)	4.78 (4)	4.28 (10)
k. Interest and support of Food Service and Supply Officers	4.26 (5)	4.49 (8)	4.40 (8)	4.22 (11)
l. Equipment maintenance	3.76 (11)	4.28 (11)	3.60 (12)	3.89 (12)
m. Condition of equipment and utensils	3.32 (13)	3.85 (13)	3.54 (13)	3.86 (13)
n. Effectiveness of Mess Deck Master-at-Arms	4.02 (9)	3.39 (14)	3.28 (14)	3.28 (14)
o. The menu selected to be served	4.56 (3)	----	----	----

*Rank order within sample

Scale: 1 - Very Bad; 2 - Moderately Bad; 3 - Slightly Bad; 4 - Neither Bad nor Good; 5 - Slightly Good; 6 - Moderately Good; 7 - Very Good

If one considers that relative rank order and means of the factors within each sample, some interesting CAR-1 vs. MED-1 and pre-test (CAR-1, MED-1) vs. post-test (CAR-2, MED-2) differences appear. MED-1 MS's were more positive than CAR-1 MS's about the leadership provided by the leading MS and about the support and cooperation among MS's, findings consistent with the JDI scores reported earlier. The post-test samples of MS's gave higher ratings than their pre-test counterparts to the leadership of the watch and galley captains, the leadership of the leading MS, support and cooperating among MS's, and customer satisfaction. The CAR-2 and MED-2 MS's gave generally lower ratings to sanitary conditions in the galley and dining areas, and to the aft galley menu.

The more instructive data for evaluating the new forward galley fast foodservice system are contained in Table 38 which compares responses of post-test forward and aft galley MS's. The data presented here are consistent with a picture of a generally satisfied forward galley cook in the new system. They feel more positive than their aft counterparts concerning their equipment and its maintenance, the menus, support among MS's, their training, sanitation, and customer satisfaction. Note especially that the forward galley cook rating of sanitation is quite high; therefore, the overall post-test drop in rating of sanitation is attributable to aft galley cooks and other MS's. Further, the data from the later MED-2 surveys show generally higher or equal ratings when compared to the CAR-2 data; in other words, the opinions of the post-test forward galley cooks are remaining positive over time.

Pre-test worker interviews were centered mainly around problems that they perceived in their foodservice system. CAR-1 MS's listed working hours, lack of leadership, and equipment problems as their major dislikes in that order. MED-1 MS's also gave working hours as by far their major complaint. Three times as many MS's mentioned this as any other category. Another complaint about one specific supervisor and not a general lack of leadership as in CAR-1 along with equipment problems tied for a distant second. The MS's who were upset about working hours believed without exception that their two twelve-hour watches could easily be converted to three, eight-hour watches.

The post-test interview in CAR-2 consisted of one question directed to forward and aft galley cooks only -- *In which galley would you prefer to work?* Of the eight forward galley cooks interviewed, five preferred forward, one aft, and two rotating between the two galleys. Of the six aft galley cooks interviewed, three preferred aft and three preferred rotating. In the MED-2 interview the same question was asked. Here, of the eight forward cooks interviewed, seven preferred the forward galley and one wanted to work in the aft bakery. Of the eleven aft cooks interviewed, eight preferred the aft galley, two preferred forward, and one preferred rotating. Beyond the tendency in both CAR-2 and MED-2 samples to state a preference for the galley in which they currently worked, it is clear that working in the forward galley was not offensive. As a matter of fact, of the sixteen forward cook preferences

TABLE 38

Post-Test Forward and Aft Galley MS Mean Ratings of Selected Factors in Their Enlisted Foodservice Operation

	CAR-2		MED-2	
Factor	Forward (N=8)	AFT (N=7)	Forward (N=8)	AFT (N=12)
a. Customer satisfaction	5.75	4.50	6.25	4.42
b. Forward galley menu	4.88	4.50	5.50	3.83
c. Sanitary conditions in galley and dining areas	5.25	4.67	6.00	3.75
d. Support and cooperation among MS's	5.50	5.00	6.25	3.17
e. OJT program	5.38	3.50	5.38	3.83
f. Aft galley menu	5.38	4.67	5.13	3.42
g. Equipment maintenance	5.00	2.67	5.00	3.50
h. Condition of equipment and utensils	5.50	2.67	5.00	3.25

Scale: 1 - Very Bad; 2 - Moderately Bad; 3 - Slightly Bad; 4 - Neither Bad nor Good; 5 - Slightly Good; 6 - Moderately Good; 7 - Very Good stated, only two preferred working elsewhere within foodservice while many aft cooks wished to be rotated or assigned forward.

The MED-2 interview also contained two other relevant questions. When asked if all carriers should have a forward galley similar to that on the Saratoga, all eight forward galley cooks and nine of the eleven aft galley cooks responded affirmatively. Forward galley cooks were also asked to suggest changes for the galley. Three of the eight reported that it was fine as it was. Four of the remaining five suggested that more menu variety be considered while three also commented that more space in the galley would be helpful.

Foodservice Attendant Opinions. During the MED-2 phase of the post-test, seventeen forward and seventeen aft galley foodservice attendants were interviewed concerning their preferences in work assignment. While none of the attendants were enthusiastic about their jobs, thirteen of the forward galley attendants reported preferring to work forward rather than aft, while the other four had no preference. Furthermore, seven of the aft galley attendants said they would prefer to work forward; six stated a preference for remaining where they were; and four had no preference. Apparently, the active role of the forward galley foodservice attendant was preferred by many.

SUMMARY

Navy Foodservice Workers (MS) were surveyed and interviewed concerning job satisfaction, motivation, and their opinion of the Saratoga foodservice system both before (CAR-1 and MED-1) and after (CAR-2 and MED-2) the implementation of forward galley fast foodservice.

The two major changes in MS job satisfaction measured were increases from the CAR-1 to the MED-1 phase, an increase maintained during CAR-2 and MED-2, and higher satisfaction displayed by the post-test forward cooks as compared to their aft galley counterparts. Maintenance of worker satisfaction after a customer oriented change should certainly be viewed as favorable. In addition, the job satisfaction measures of bakers and forward galley cooks clearly show favorable, rather than unfavorable, responses to the new customer oriented forward foodservice system. MS motivation improved in two aspects from CAR-1 to MED-1 and from pre-test to post-test. In addition, forward galley cooks and higher motivation scores than aft galley cooks after the fast food concept was implemented.

MS opinions were generally favorable concerning the new fast foodservice concept on the Saratoga. The percent of MS's feeling that the Saratoga mess was to some degree better than other ships increased from 9% and 22% in the pre-test to 57% in the post-test. While post-test cooks gave lower ratings than pre-test cooks concerning sanitation, and the aft galley menu, they gave higher ratings to watch captain, galley captain, and leading MS leadership, support and cooperation among MS's, and customer satisfaction. Within the post-test sample, the forward galley cooks expressed more positive reactions than the aft galley cooks to their equipment, the menus, support among MS's, training, sanitation, and customer satisfaction. Many post-test MS's preferred to work in the forward galley, particularly those who were assigned there. Seventeen of nineteen post-test cooks asked felt that all carriers should have a forward galley similar to that on the Saratoga. The only two suggestions for improvements given by forward galley cooks included increasing both food variety and space in the galley. Most foodservice attendants, while not enthusiastic about their jobs, nevertheless preferred forward galley duty to aft galley duty.

On balance, there appears to be no concern about the impact of the increased workload in the forward galley on the morale of assigned MS's; and, in fact, there is strong evidence that the new system has had a positive morale effect for MS's as compared with working in a conventional aircraft carrier galley.

SECTION XI

CUSTOMER OPINIONS

CUSTOMER OPINION METHODOLOGY

One of the main goals of this project was improved customer satisfaction. Great efforts were made to assess customer opinions to form a basis for system changes to determine their effect. All samplings of opinion were done while the ship was deployed or on type training, never when the ship was in its home port. This method was based on the philosophy that customer opinion might change dramatically when removed from the comforts of home, especially when the ship was underway for extended periods and perishable items such as milk were not always available. Testing was done in both the Caribbean (CAR) and Mediterranean (MED). The tests were carried out both pre-test, before food-service system changes in the ship (CAR-1, MED-1) and post-test, after these changes (CAR-2, MED-2) (Table 39).

Customer opinion was assessed in two different ways, brief face-to-face interviews and longer written questionnaires. Both were conducted by professional staff members of the Food Sciences Laboratory, NARADCOM. Interviews were carried out in two different settings. Some interviews were used to ask general and probing questions about shipboard foodservice. As an example, "What do you like best about foodservice on this ship?" These interviews were carried out at the same time as the written questionnaires and were conducted on a one-to-one basis.

Food acceptance interviews were also carried out on the mess decks during mealtimes. The interviewer would approach a diner, ask his permission to be interviewed, and then proceed to ask the diner to rate every item he was eating on a nine-point scale of food acceptability. Generally, twenty food acceptance interviews were obtained in both EDF's at every noon and evening meal when the interview teams were aboard.

The written questionnaire was originally designed for the pre-tests based on visits to a number of carriers, interviews with crews and foodservice personnel, and prior experience in studying a wide range of military foodservice systems. The written survey for the pre-test period covered a wide range of topics including the quality, quantity, and variety of food, decor, environment, the service, the convenience of the hours of operation, problems of waiting in line, and other issues. For the post-test, some questions which were irrelevant to the particular changes made on the ship were deleted from the survey in order to make it shorter. The post-test survey was designed to more specifically test reactions to what had been done on the ship.

Survey and interviews were conducted in the far forward mess decks during non-meal hours. Each ship's department was requested to send a specific number of people to the survey at certain test times. Respondents were asked where they usually ate (forward or aft) and were asked to rate that area in their

TABLE 39

Dates and Locations of the Four Consumer Study Phases*

Phase	Date	Location
Pre-tests:		
CAR 1	March 1977	Caribbean
MED 1	October 1977	Mediterranean
Post-tests:		
CAR 2	August 1978	Caribbean
MED 2	November 1978	Mediterranean

*Pre-tests refer to work done before the system was changed; post-tests refer to work done after system changes.

surveys. Information was thus obtained on both forward and aft food areas. Surveys were carried out while the ship was underway and when in foreign ports.

OVERALL CUSTOMER OPINION

One question on the written survey asked respondents how satisfied or dissatisfied they were with 9 aspects of Navy life. Table 40 shows the ranking of the answers with a rank of 1 indicating the aspect with which they were most satisfied and a rank of 9 the least satisfied. Friends, travel, jobs, and benefits were rated as the more satisfying areas of Navy life, while training, pay, discipline, food and berthing scored as less satisfying to some degree.

The initial data collection (CAR-1) ranked food 9th of 9 factors for the least satisfying aspect of Navy life. Anyone familiar with the crowded berthing situation on Navy carriers can appreciate what it means that food was ranked below berthing. The situation improved in MED-1 and generally stayed that way for the aft food area (rankings of 7 or 8). However, the forward fast food enlisted dining facility (EDF) moved up another position, ranking 6 in both post-tests. This is impressive, because the level of satisfaction with these fundamental aspects of Navy life are not changed easily. Food had become less of a morale problem in the new system.

Another general question asked, "How would you rate the mess on this ship in comparison to other ship's messes in which you have eaten?" In all sampling, this was the first ship and sea duty for at least half of the people surveyed. Those people are tallied at the top of Table 41 and are not included in the following discussion. In the initial pre-test (CAR-1), 77.2% of those respondents who had eaten on other ships thought the foodservice on this ship was worse to some degree, and only 10.8% thought this ship was better to some degree. The situation improved slightly in the second pre-test (MED-1), however only 22.8% thought this ship was better to any degree, and 44.3% thought the ship was equal or better (combining categories 4, 5, 6, 7). Similar results were obtained in the initial post-test (CAR-2) ratings of the aft mess decks, 22% rated the mess better and 40.8% rated it equal or better. The aft EDF was rated higher in the MED-2 test when the ship was underway with 32.3% rating it better and 61.3% rating it equal or better, perhaps because of the decrease in time spent waiting in line underway.

The forward EDF was rated substantially better than the pre-test in both post-tests, with up to 47% rating the ship better to some degree and over 60% rating it equal or better. Another way of looking at these data is to examine the most common response (model) given at each sampling. In CAR-1 the most frequent answer was that this ship was *somewhat worse*; in MED-1 this had moved to *slightly worse*. The aft EDF was most often rated either *slightly worse* or *no better or worse* in the post-tests. The forward EDF received as many ratings in the *slightly better* category as it did in the *no better or worse* category. Food on the Saratoga had moved from being the worst aspect of life on the ship to being favorably compared with food on other ships. It is apparent that the fast food system had had the greatest effect in this improvement.

TABLE 40

Customer Satisfaction With General Aspects of the Navy

Please indicate how satisfied or dissatisfied you are with these aspects of the Navy. Numbers in Table reflect rank ordering of factors based on mean scores.

	Pre-Test		Post-Test				
			CAR 2		MED 2		
					Underway		In Port
	CAR 1	MED 1	FWD	AFT	FWD	AFT	AFT
a. Travel	2	4	2	2	2	2	2
b. Pay	6	6	7	7	7	6	6
c. Food	9	7	6	7	6	8	7
d. Job	4	2	3	3	3	3	4
e. Benefits	3	3	4	5	4	5	5
f. Berthing	8	9	9	8	9	9	9
g. Friends	1	1	1	1	1	1	1
h. Training	5	5	5	4	5	4	3
i. Discipline	7	8	8	6	8	7	8

Scale:
1 - Very Satisfied
2 - Satisfied
3 - Slightly Satisfied
4 - Neither Satisfied Nor Dissatisfied
5 - Slightly Dissatisfied
6 - Dissatisfied
7 - Very Dissatisfied

TABLE 41

Customer Ratings of the Saratoga's EDF Versus Other Ships'

Please indicate how you would rate the mess of this ship in comparison to other ship's messes in which you have eaten. (Percent of those who have eaten in other ship's).

	Pre-Test		Post-Test				
			CAR 2		MED 2		
					Underway		In Port
	CAR 1	MED 1	FWD	AFT	FWD	AFT	AFT
0. This is My First Ship (Those Who Can Compare)	N=250	N=103	N=48	N=27	N=52	N=40	N=31
	N=176	N=79	N=41	N=27	N=38	N=31	N=28
1. Much Worse	22.7	7.6	7.3	22.0	7.8	9.7	7.1
2. Somewhat Worse	30.1	15.2	9.8	11.0	10.5	9.7	7.1
3. Slightly Worse	24.4	32.9	19.5	25.9	13.2	19.4	32.1
4. No Better Nor Worse	11.9	21.5	24.4	18.8	21.1	29.0	28.6
5. Slightly Better	5.7	17.7	24.4	11.0	21.1	9.7	10.7
6. Somewhat Better	4.0	3.8	12.2	11.0	18.4	12.9	14.3
7. Much Better	1.1	1.3	2.5	.0	7.8	9.7	.0
MEAN	2.6	3.4	4.0	3.2	4.2	4.0	3.4

TABLE 42

Customer Ratings of Specific Aspects of the Saratoga's EDF

Please indicate how you would describe the ship's enlisted mess? (1 - very bad; 7 - very good)

	Pre-Test		Post-Test				
			CAR II		MED II		
					Underway		In Port
	CAR I	MED I	FWD	AFT	FWD	AFT	AFT
1. General Mess Environment	3.3	3.7	3.6	2.8	3.4	3.4	3.4
2. Degree of Military Atmosphere Present	3.4	3.7	3.6	3.1	3.6	3.6	4.1
3. Chance to Sit with Friends	3.4	4.4	3.5	3.2	3.3	3.4	3.9
4. Mess Decks	3.7	4.6	4.0	3.6	4.1	4.1	4.2
5. Hours of Operation	4.8	5.3	4.8	4.9	4.5	4.5	4.0
6. Monotony of Same Facility	3.3	3.4	3.5	3.2	3.3	3.4	3.3
7. Quality of Food	2.9	3.5	3.8	3.5	3.6	3.4	3.2
8. Quantity of Food	3.6	4.3	4.5	4.4	4.2	4.1	3.9
9. Service of Dining Facility Personnel	3.5	4.0	3.8	3.4	3.6	3.1	3.5
10. Variety of Food	3.2	3.3	3.6	3.5	3.5	3.2	3.4
11. Speed of Service or Lines	2.4	3.9	3.6	2.3	3.2	2.2	2.2

Scale: 1 - Very Bad; 2 - Bad; 3 - Slightly Bad; 4 - Neither Bad nor Good; 5 - Slightly Good; 6 - Good; 7 - Very Good

The written survey (Table 42) asked respondents to describe the ship's enlisted mess on 11 different factors relating to food, decor, environment, and service. The interview asked people what one thing they liked best about shipboard foodservice, and what one thing they liked least. The answers to these interview questions were very telling.

In the pre-test and post-test situations, both in port and at sea, the interviewees said that long lines were their biggest problem. The percentage reporting this problem dropped over the course of the study.

In all four data sets (at sea, in port, pre-test, post-test), food quality was rated as the second biggest problem. In third place for all four data sets was food variety.

When asked what they liked best about shipboard foodservice, the clear winner in the post-test was the forward galley (29% at sea). Despite the fact that food quality was the second most frequently reported problem, it was also the second largest benefit of foodservice. Speed of service was rated the third best aspect in the at sea post-test.

Similar effects are described in the answers to the written survey (Table 42). Speed of service begins as the most important problem, retains that position in aft foodservice, but improves in forward foodservice. Food quality begins as the second most negative aspect of food, but improves. Detailed discussions of these and other variables are presented below.

CUSTOMER OPINION OF FOOD

The general survey question, "How would you describe the ship's enlisted mess?" contained a total of 11 variables, including three variables specifically related to food: food quality, food variety, food quantity.

Food Quantity. Quantity of food showed the most favorable food-related response from the crew both in the pre-test and post-test (Table 42, Item 8). Only in the original pre-test (CAR-1) was the result below neutral, and the results after that time (MED-1, CAR-2, MED-2) did not differ from each other in any clear pattern (range 4.1 - 4.5).

Two follow-up questions in the written survey dealt with the issue of food quantity. One question asked for a rating of portion size (*amount given*) on a seven-point scale (Table 43). As has been found in numerous previous military surveys, starch was desired in slightly less quantity, meat was most clearly wanted in greater quantity as were vegetables and desserts. While there was no clear pattern in comparing pre-test and post-test portion size data, there appears to be a consistency between forward and aft data in the post-test. In almost every instance, aft rated slightly better than forward. Differences between forward and aft ratings were in the range of 0.1 to 0.4 scale points on the seven-point scale. Keep in mind that these ratings are

TABLE 43

Customer Opinion of Serving Size

Please indicate your opinion of the amount given, for each of the following foods given in one serving.

	Pre-Test		Post-Test				
			CAR II		MED II		
					Underway		In Port
	CAR I	MED I	FWD	AFT	FWD	AFT	AFT
a. Meat	2.6	3.0	3.2	3.2	2.7	2.9	2.8
b. Starches	4.4	4.5	4.5	4.7	4.2	4.6	4.2
c. Vegetables	3.8	3.8	3.4	3.8	3.5	3.7	3.7
d. Desserts	3.1	3.3	3.2	3.4	2.9	3.3	3.3

Scale: 1 - Much Too Small
2 - Too Small
3 - Slightly Too Small
4 - Just Right
5 - Slightly Too Large
6 - Too Large
7 - Much Too Large

within the context of slightly too much starch, and slightly too little of the other items. Therefore, the post-test aft foodservice showed improvement in providing the customer with the portion size he wanted, although in both surveys the customer indicated a problem existed. It should be noted that the ship had an active policy of allowing seconds.

Food Variety. While food quantity rated generally above neutral, food variety never rated above neutral in either the pre-test or post-test (Table 42, Item 10). The pre-test ratings (3.2, 3.3) were similar to the aft EDF post-test ratings in the MED-2 test (3.2) but not the CAR-2 test (3.5). The forward post-test ratings were higher than the pre-test in both CAR-2 (3.6) and MED-2 (3.5). These ratings are beginning to approach the neutral scale-point of 4 indicating variety was nearing an acceptable level forward. This is interesting because from a traditional menu planning viewpoint, variety was more restricted forward than aft in that fewer total choices were available. The reason for this may be that the forward EDF in itself offered a distinct change from the conventional system aft; and, probably more important, the customer always had a choice of highly preferred items. This is clear from personal interview data collected during the post-test MED cruise (MED-2). When personnel were asked what items they wanted removed from the forward menu, 71% of a total of 157 said *nothing*. Only 9% said remove any one item (pizza), and less than 5% mentioned any other item. The vast majority of customers had no food dislikes on the forward menu.

Responses to the interview question, "What items should be added to the forward menu?" were interesting because conventional wisdom suggested that the limited menu would be boring. *In fact, 50% said add nothing, while only 13% requested an additional item which was an increased assortment of sandwiches. No particular sandwich was asked for more than another.* The next two most requested types of items were not entrees but salads (11%) and desserts (10%). The conclusion from these data is clear: the forward fast menu always offered a choice of highly preferred items providing acceptable variety. Proper menu development yielded a menu where no deletions or additions would substantially add to menu appeal.

Food Quality. Food quality was rated as one of the most serious problems in carrier foodservice in the pre-test (CAR-1) with a mean rating of 2.9 (Table 42, Item 7). Only long lines were rated lower at 2.4. In the second pre-test (MED-1), food quality increased to 3.5 where it stayed for the aft post-test. However, in the forward mess, the post-test ratings of food quality increased slightly to 3.6 - 3.8. These values approach the neutral point of 4 and represent a substantial improvement in the standing of food quality as a problem relative to other foodservice variables; it was no longer rated as one of the most serious problems to customers.

Another measure of the relative importance of food quality was provided by a face-to-face interview question asking customers to name the most serious problem in shipboard foodservice. In the pre-test (MED-1), 19.3% of in port and 7.2% of the at sea customers said that food quality was their most serious problem in shipboard foodservice. The post-test figures were 21% in port and 22% at sea. On the other hand, only 9.5% of both in port and at sea customers rated food quality as the best aspect of foodservice in the pre-test; this increased to 18% at sea and 16% in port in the post-test. Since, as mentioned previously, the factor receiving the most frequent favorable mention in the post-test was the forward galley itself, it is likely that some of the increased popularity of food quality was due to the forward system.

A direct measure of customer opinion of food quality was obtained from acceptance interviews with personnel while they were eating. People were asked to assign ratings from the typical nine-point food acceptance scale to each item they were eating, and to assign one scale rating to the overall meal. The average ratings for each meal component (entree, potato, etc.) are shown in Table 44. Food quality in the original pre-test was rated low, among the lowest ever recorded for full-service A-ration meals in surveys conducted by NARADCOM.

The aft EDF was changed relatively little from pre-test to post-test and thus provides some level of *control* in analyzing the food acceptance data.

Examination of the ratings of food acceptance over the course of the pre-and post-tests shows that overall meal rating aft began at 5.47, barely above the neutral point of 5. It improved to 6.27 (MED-1), dropped slightly to 5.87 (CAR-2), and rose to 6.41 (MED-2). In the original pre-test, it is important to note the especially low ratings for beverages (4.15, they were served warm), and bread (4.61, it was stale). The entree, which contributes most heavily to overall meal acceptance, stayed relatively stable (around 6.2) from the second pre-test through both post-tests. Vegetables also were stable in their ratings, and the other meal components varied with no clear pattern.

The food acceptance ratings for the forward mess area present a different pattern. Although ratings of both overall meal and entree acceptability increased from pre-test 1 (CAR-1) to pre-test 2 (MED-1), both post-test ratings of overall meal acceptability and entree acceptability are appreciably higher than pre-test ratings. The ratings of potatoes decrease from post-test 1 (CAR-2) to post-test 2 (MED-2), probably accounting for the slight drop in overall meal acceptance. The ratings of entrees and shakes remain stable over the post-tests.

Thus, aft meal acceptability improved from the original pre-test but remained variable. Forward meal acceptability clearly improved in both post-tests over both pre-tests for overall meals and for entrees.

The acceptance ratings of the fast food items served in the new forward system are shown in Table 45. Separate ratings are presented for the two post-tests and from another post-test cruise, TYT-1, July 1978. An unweighted mean of the three is also presented. The large amount of data presented makes discussion difficult, although a few comments are appropriate. There was a

TABLE 44

Customer Food Acceptance Ratings

Noon-Evening Meals

Forward EDF

	CAR-1		MED-1		CAR-2		MED-2	
	N	X	N	X	N	X	N	X
Entree	44	4.77	96	6.09	194	6.44	183	6.48
Potato and Sub	14	5.64	0	-	134	7.05	146	6.20
Milk	0	-	0	-	-	-	16	8.38
Milk Shakes	-	-	-	-	148	7.23	81	7.21
Beverages	0	-	5	7.20	108	5.11	105	6.63
Overall Meal	44	4.63	61	6.36	178	6.80	180	6.57

Noon-Evening Meals

AFT EDF

	CAR-1	MED-1	CAR-2	MED-2
Entree	5.55	6.28	6.18	6.23
Vegetable	6.16	6.49	6.53	6.51
Potato and Sub	5.54	5.43	6.07	6.31
Beverages	4.15	-	-	-
Salad	6.23	6.33	6.62	6.45
Desserts, baked	6.45	6.88	6.44	6.54
Bread	4.61	7.72	7.62	6.62
Milk	8.00	8.22	-	8.31
Desserts, other	7.47	6.19	-	-
Overall Meal	5.47	6.27	5.87	6.41
	(N=214)	(N=160)	(N=120)	(N=180)

Scale:
1 - Dislike extremely
2 - Dislike very much
3 - Dislike moderately
4 - Dislike slightly
5 - Neither like nor dislike
6 - Like slightly
7 - Like moderately
8 - Like very much
9 - Like extremely

TABLE 45

Customer Acceptance Ratings of Fast Food Items

	TYT-1	CAR-2	MED-2	MEAN
I. Entree				
1. Fried Chicken	6.70 (45)	6.84 (32)*	6.37 (27)*	6.63*
2. Fish Fillets	7.10 (43)	7.00 (9)	6.63 (19)	6.91
3. Beefburgers	6.50 (65)	6.33 (15)	6.26 (80)	6.40
4. Submarine Sandwiches				
Sausage	-	6.00 (4)	6.33 (6)	6.17
Ham and Cheese	-	7.25 (4)	7.25 (4)	7.25
Steak and Cheese	-	5.69 (13)	-	6.50
Combination	6.70 (22)	6.50 (10)	6.00 (12)	6.40
Peppersteak	-	6.36 (11)	-	6.36
Roast Beef	-	-	7.57 (7)	7.57
Meatball	-	-	6.43 (7)	6.43
5. Pizza, Cheese	-	6.00 (20)	6.67 (3)	6.34
Pizza, Pepperoni	6.40 (17)	6.44 (16)	7.10 (10)	6.65
6. Sandwiches				
Grilled Ham and Cheese	-	7.33 (9)	-	7.33
Chili Dog	-	7.00 (7)	-	7.00
Grilled Bacon and Cheese	-	5.90 (10)	-	5.90
II. Potato				
1. French Fries	7.10 (220)	7.05 (133)	6.20 (123)	6.78
2. Chips (as in fish and chips)	-	-	6.21 (14)	6.21
III. Milk	-	8.38	8.38 (16)	8.38

TABLE 45

Customer Acceptance Rating of Fast Food Items (cont'd)

		TYT-1	CAR-2	MED-2	MEAN
IV.	Other Drinks				
	1. Iced Tea	-	7.21 (28)	-	7.21
	2. Lemonade	-	8.58 (12)	6.33 (6)	7.46
	3. Bug Juice	-	5.12 (26)	6.62 (79)	5.87
	4. Cherry Juice	-	8.00 (9)	-	8.00
	5. Orange Drink	-	7.00 (6)	-	7.00
	6. Soda	-	-	6.74 (19)	6.74
V.	Milk Shakes				
	1. Vanilla	7.10 (111)	6.96 (69)	-	7.03
	2. Chocolate	7.10 (86)	7.44 (73)	7.14 (42)	7.23
	3. Strawberry	-	7.83 (6)	7.64 (25)	7.74
VI.	Overall	-	6.80 (178)	6.57 (180)	6.69

*Number of customers rating the item.

Scale: 1 - Dislike extremely
2 - Dislike very much
3 - Dislike moderately
4 - Dislike slightly
5 - Neither like nor dislike
6 - Like slightly
7 - Like moderately
8 - Like very much
9 - Like extremely

slight tendency for several important items to be rated slightly lower in the second post-test as compared with the first post-test (e.g., fried chicken (6.84, 6.37), and french fries (7.05, 6.20)). Several other items improved in acceptability. Acceptance ratings of submarine sandwiches (Table 45) revealed the following top ranking items in decreasing order: roast beef, ham and cheese, combination, meatball, and peppersteak.

Customer Opinion of Decor and Dining Environment. The written survey contained a general question in which respondents were asked to describe their mess (Table 42). Parts of this question dealt with decor and dining environment issues. Opinion about the *general mess environment and degree of military atmosphere present* showed no pattern of change over the course of the study, with ratings tending to slightly below the neutral rating of 4. Ratings of *cleanliness of mess decks* also showed no pattern of change over the study, but this factor rated at the neutral level, showing the customer did not see poor sanitation as a problem. Other general factors are discussed below.

Another question on the written questionnaire asked for an opinion about the general condition of the mess (Table 46). The format of this question was a series of 7-point scales with bipolar adjectives in the form usually referred to as a semantic differential. The scale for lighting (bright - dim) showed no consistent pattern over the study, generally rating just on the bright side of neutral. In other words, there was sufficient light. Since lighting did not change and customer perception of it did not change, lighting provides a control. The decor aspects of the mess areas were related to the scales of appearance (attractive - unattractive) and colorfulness (colorful - not colorful). In both cases the pre-test ratings were negative (unattractive, not colorful), while the post-test ratings in the forward area improved to near neutral (3.9 - 4.3 on a 7-point scale). Ratings on these scales for the aft mess were more negative than for the forward EDF.

Two other scales measured environmental aspects, noise (quiet - noisy), and crowdedness (crowded - uncrowded). The forward mess area was rated slightly less noisy but not quiet in the post-test, as compared with both the pre-test and with the post-test aft area.

The issue of crowding on the mess decks is more complicated. First of all, it is not clear what factors on the mess decks contribute to crowding. Does standing in line contribute to the perception of crowding? Does waiting for a seat to vacate contribute to crowding or do many customers simply sit on the deck and eat? The responses to the crowded - uncrowded item showed no change from pre-test 1 (CAR 1) to pre-test 2 (MED-1) and only slight improvement from pre-test to the initial post-tests of both forward and aft EDF's in the Caribbean (CAR-2). All ratings were in the range 5.2 to 5.5. However, there was an improvement in the situation in the direction of less crowding (4.8, 4.9) in the post-tests in the MED in both forward and aft areas. In considering the issue of crowding, it is important to note that only about 23% of customers ate in the forward EDF in the pre-test period and that attendance increased

TABLE 46

Customer Opinion of Physical Aspects of the Saratoga's EDF

Please indicate (on a scale of 1 to 7 as shown) your opinion of the General Condition of your Mess

			CAR 2		MED 2		
					Underway		In Port
	CAR 1	MED 1	FWD	AFT	FWD	AFT	AFT
a. Lighting	3.9	3.7	3.8	3.8	3.8	3.8	3.9
(1) Too Bright							
(7) Too Dim							
b. Appearance	5.5	4.8	4.2	5.1	4.3	4.7	5.2
(1) Attractive							
(7) Unattractive							
c. Noise	5.6	5.3	4.9	5.3	5.0	5.2	5.1
(1) Quiet							
(7) Noisy							
d. Crowdedness	5.3	5.2	5.5	5.5	4.8	4.9	5.2
(1) Uncrowded							
(7) Crowded							
e. Colorfulness		4.8	4.1	4.5	3.9	4.6	5.0
(1) Colorful							
(7) Not Colorful							

Scale: 1 - Extremely
2 - Moderately
3 - Slightly
4 - Neutral
5 - Slightly
6 - Moderately
7 - Extremely

about 100% after the new system was introduced. Therefore, the mess decks were actually much more crowded in the post-test period. The fact that customers did not perceive this suggests that the combination of vision screens, improved overall appearance, and faster service served its purpose.

The overall survey (Table 42, Item 3) asked people for a rating on *chance to sit with friends*. No consistent trend was seen in the results for pre-tests or post-tests. Similarly, no trend was discernible in reaction to the issue (Item 6), *monotony of the same facility*. Both of these issues, *chance to sit with friends, monotony of the same facility,* were rated slightly to the negative side or neutral.

The overall conclusion concerning decor and environment is that the changes in the forward mess clearly improved the customer's perception of the decor (more attractive and colorful), and environment (less noisy and crowded), but did not change the general impression of the *mess environment*, its *military atmosphere*, the *chance to sit with friends*, or the *monotony* of eating in the same place. It is not clear whether more can be effected within the severe constraints of aircraft carrier feeding.

Customer Opinion About Waiting In Line. Waiting in line is always a potential problem in institutional life and can be a very serious complaint in military foodservice. In the general description of the ship's enlisted mess (Table 42, Item 11), the *speed of service or lines* received the lowest (most negative) rating in the original pre-test (CAR-1). This rating rebounded in the second pre-test (MED-1), partly because the data from the forward area showed little problem with waiting in line because relatively few customers utilized this area. In the post-tests, the ratings for this variable were improved over CAR-1 for both samplings of forward mess opinion (CAR-2, MED-2), although both ratings were still slightly neutral, indicating continuing concern. In the aft mess area, the opinions continued near the pre-test (CAR-1) level with ratings near 2.5 on the 7-point scale.

The personal face-to-face interviews conducted with the customers indicate the seriousness of this problem. When asked what the one main problem was with foodservice on the ship, 56% of the MED-1 interviewees both at sea and in port said *long lines*. In the post-test (MED-2), 28% felt long lines were the most serious problem at sea, and 46% in port. In every sampling of opinion, pre-test and post-test, at sea or in port, long lines were the most frequent major complaint, except that the problem decreased markedly in the post-test at sea (down to 28%), probably because of the fast food operation forward. In fact 15% of post-test underway respondents said *speed of service* was the best thing about foodservice on the ship. Thus, the forward food operation made a substantial impact on the major customer complaint when the ship was underway. The fact that waiting lines in port are consistently perceived to be a worse problem than when at sea undoubtedly results from the fact that one of the two EDF's was usually closed in port, thereby creating longer lines. In the opinion of the project team, this problem, which is interwoven with granting adequate liberty for foodservice personnel when in port, merits continuing concern and experimentation.

SUMMARY

Customer opinion of the Saratoga foodservice system both before and after introduction of the new EDF was assessed by written surveys, face-to-face interviews, and food acceptance interviews. Food on the Saratoga moved from being the worst aspect of life on the ship in the customers' opinions to being favorably compared with food on other ships. The forward galley fast foodservice system greatly influenced this shift in opinion. The three main problems cited both pre- and post-test by the customers were long lines, food quality, and food variety. In each of these three areas, however, post-test ratings were higher than pre-test, particularly in reference to the forward galley. Food acceptance ratings obtained on the mess decks showed similar improvement from pre- to post-test for the forward galley. Considered in the absolute sense, however, all of the average post-test customer ratings fell near the middle of the rating scales used. In other words, the addition of the fast food operation in the forward EDF clearly improved customer opinions of foodservice on the Saratoga. Realistically, there are limits to the improvement potential which exist in such a constrained and dynamic environment. Finally, one of the major customer complaints, long lines in port, remains, since, at least for these tests, the forward galley was not open in port. When it was opened at sea, the rating of waiting in line improved.

SECTION XII

NUTRITIONAL EVALUATION

BACKGROUND

The objective of this research was to assess the nutritional impact of the new fast food system installed and operated on the USS Saratoga during its 1978-1979 cruise in the Mediterranean. In addition, a valuable side benefit of this research was to assess the adequacy of the nutrient intakes of naval personnel in shipboard situations and provide recommendations to improve their nutritional health. The Division of Nutrition Technology of the Letterman Army Institute of Research (LAIR) conducted the nutritional evaluation.[18] This portion of the Navy Afloat project was supported under Project No. 3M162772A811; Work Unit No. 001 - Nutrition Studies in Support of the DoD Food Program.

METHODOLOGY

Nutrient intake data were collected on the USS Saratoga during two periods:

1. July-August 1977: data collection from 203 subjects over 17 days enroute from CONUS to the Mediterranean, in port at Rota, Spain, and during initial operations in the Mediterranean. This was a pre-test period, prior to any change in the Saratoga's foodservice system.

2. November 1978: seven days of data from 150 subjects while at sea in the Mediterranean during the ship's first deployment following introduction of the fast food system in the forward EDF.

The subjects were selected by Department Chiefs to provide a sample of the Ship's Company and Air Wing stratified by rank, division assignment, and work shift. The subjects were briefed as to the purpose of the study and the measures used to maintain the confidentiality of individual data. The participants were instructed to itemize on pocket-sized diary cards all foods and beverages (except water) consumed daily. Guidance was also provided on how to record <u>when</u> (hour), <u>where</u> (aft or forward galley, gedunk, soda mess, etc.), and <u>how much</u> (household units, pkg. wt.) of each item was consumed. At 3-day intervals, the subjects returned the completed diary cards to the interviewer for review of completeness, assistance in estimating portion size, clarification of any unusual food items, and assignment of each food item as a component of either a meal or a between-meal snack. Demographic (age, rank, duty assignment, work shift) and anthropometric (height, weight, and skinfold

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[18] D. D. Schnakenberg, <u>Nutritional Evaluation of a Fast Food Service System on the USS Saratoga</u>, Letterman Army Institute of Research, Presidio of San Francisco, CA 94129, In Press.

thickness) information were also obtained from each subject. The LAIR Nutrient Factor File, which is a data base of nutrient composition values obtained from various sources for over 1200 food items, was used to compute nutrient intakes. The Recommended Daily Dietary Allowances for military personnel[19] were used to derive standards for evaluation of the nutritional adequacy of the individual dietary intakes.

RESULTS AND DISUCSSION

The nutrient intake data were expressed on a nutrient density basis by using the concept of Nutrient Ratio (NR) where:

$$NR = \frac{\text{nutrient intake/1000 kcal consumed}}{\text{nutrient standard}}$$

The data were reduced by categorizing the nutrient intakes as either *low*, *marginal*, or *adequate* according to the following arbitrarily selected criteria:

- *low* (NR<0.7) - intake less than 70% of standard
- *marginal* (0.7≤ NR <1.0) - intake between 70 and 100%
- *adequate* (NR≥1.0) - intake to or greater than 100%

The nutrient standards used to compute the nutrient ratios were derived by dividing the Military Dietary Allowances (MDA) for each nutrient per day by the daily allowance for calories. The MDA are based upon the National Research Council (NRC) Recommended Dietary Allowances (RDA).[20] The Nutrient Ratio concept is a useful tool to evaluate and compare the nutritional adequacy of meals consumed by individuals from various sources such as the aft and forward galleys. Although it was also used to evaluate total daily intakes, it is important to recognize that the incidence of *low* average daily nutrient intakes should not be taken to mean the incidence of nutritional deficiency in the population. However, low average daily intakes of a specific nutrient can be used to estimate the percentage of a population that may have reduced body stores of that nutrient. If these individuals continue their reported patterns of food selection and dietary habits, they will increase their risk of developing signs and symptoms of a nutritional deficiency. However, the incidence of nutritional deficiency in a population can be confirmed only by a comprehensive clinical examination and a biochemical assessment of nutritional status.

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[19] Departments of the Army, the Navy, and the Air Force. Army Regulation 40-25, BUMED Instruction 10110.3E, and Air Force Regulation 160-95. Medical Services Nutritional Standards, Washington, DC: Department of the Army, the Navy, and the Air Force, 30 August 1976 (as corrected).

[20] National Research Council. Recommended Dietary Allowances, Eighth revised edition. Washington, DC: National Academy of Sciences, 1974.

NUTRITIONAL INTAKES BEFORE FAST FOOD TEST

As shown in Table 47, only 19.3% of daily calories in the pre-test period were obtained from forward galley meals. This was taken as further indication that the speed line menu forward was not very popular with the ship's crew. Note that over 10% of daily calories were obtained from snack items and carbonated beverages bought at the ship's store (gedunk) or other sources such as soda messes.

TABLE 47

Percent of Daily Calories During Meals and Snacks from Various Sources. USS Saratoga 1977 (Before Fast Food Test)

	Percent of Daily Calories		
Source	Meals	Snacks	Total
Aft Galley	66.9	1.7	68.6
Forward Galley	19.3	0.6	19.9
Gedunk	0.9	5.4	6.1
Other	0.8	4.7	5.5
Total	87.7	12.4	100.1

The percentage of the population with *low, marginal,* or *adequate* average daily intakes of 8 important nutrients are shown in Table 48. The average daily intakes of 20.2% of the population were *low* in vitamin A and 8.4% were *low* in vitamin C. None of the individuals had *low* intakes of protein and the incidence of low intakes of the other nutrients was 3.0% or less. This table applies for nutrient intakes from all sources.

However, at the forward galley (Table 49), 61.4% consumed meals that were low in vitamin A, and 50.0% were low in vitamin C. Compared to aft meals, there was also a greater incidence of *low* and *marginal* intakes of protein, iron, riboflavin, and niacin. Thus, the nutritional quality of continental breakfast and speed line meals consumed in the forward EDF was not as desirable as the full course meals served at the aft galley.

The Nutrient Ratio concept was used to compare the eating habits and food type consumption patterns of individuals with *low, marginal,* and *adequate* intakes of vitamin A (Table 50). Individuals with *low* vitamin A intakes consumed greater percentages of their daily energy from forward meals and snacks. However, because of poor food habits, they selected meals in the aft galley with an average vitamin A ratio of only 0.73. Thus, poor food habits directly contribute to the vitamin A problem. An average

TABLE 48

Evaluation of Average Daily Nutrient Intakes
USS Saratoga 1977 (Before Fast Food Test)

Nutrient	Percentage of Population*		
	Low**	Marginal+	Adequate++
Protein	0	3.9	96.1
Calcium	1.5	21.2	77.3
Iron	3.0	52.7	44.3
Vitamin A	20.2	31.0	48.8
Thiamin	3.0	52.7	44.3
Riboflavin	0.5	24.1	75.4
Niacin	0.5	23.2	76.4
Vitamin C	8.4	18.2	73.4

*203 Subjects. **Nutrient Ratio < 0.7. +Nutrient Ratio 0.7 to <1.0.
++Nutrient Ratio $\geq$1.0.

TABLE 49

Evaluation of Forward Galley Meals
USS Saratoga 1977 (Before Fast Food Test)

Nutrient	Percentage of Population*		
	Low**	Marginal**	Adequate**
Protein	0.5	13.0	86.4
Calcium	7.1	17.9	75.0
Iron	8.7	43.5	47.8
Vitamin A	61.4	26.1	12.5
Thiamin	2.2	39.1	58.7
Riboflavin	1.1	32.6	66.3
Niacin	8.2	31.5	60.3
Vitamin C	50.0	14.1	35.9

*184 subjects who reported eating at least one meal in Forward Galley.
**See Table 48 and Text.

forward meal vitamin A ratio of only 0.77 for the group with *adequate* daily vitamin A intakes demonstrates that even individuals with good food habits were unable to obtain adequate amounts of vitamin A when they ate at the forward galley. Therefore, unless the vitamin A content of forward galley meals was increased, a greater utilization of the forward galley would predictably contribute to a higher incidence of *low* and *marginal* daily vitamin A intakes.

Food type consumption pattern data were examined to obtain suggestions on how to increase vitamin A consumption. As shown in Table 51, individuals with low vitamin A intakes almost totally excluded carrots, sweet potatoes, and liver from their diets, all excellent sources of dietary vitamin A. Serving these items more frequently was not likely to have much effect upon these men. They also consumed lesser amounts of other good sources of vitamin A such as tomato products, leafy green vegetables, and various melons, peaches, and plums. Dairy products were reasonably well accepted by these individuals and would be a potentially good candidate for fortification. French fried potatoes were also consumed in nearly equal quantities by each of the 3 subgroups and thus represented another candidate for fortification.

A nutritional problem was identified that was related to insufficient refrigerated storage space to maintain supplies of fresh milk for periods of more than about 7 days. As shown in Figure 33, foodservice exhausted its supplies of fresh milk on 15 July, was resupplied with filled milk while in port, and ran out again on 31 July. The consumption of carbonated and non-carbonated beverages increased when milk was not available. Reconstituted non-fat dry milk was offered only at continental breakfast and was not well accepted. On a daily basis, the percentage of the population with *low* and *marginal* intakes of calcium (Figure 34) markedly increased on those days (15 Jul to 20 Jul and 31 Jul to 7 Aug) when milk was not available. Riboflavin intakes were similarly affected.

When the fast food concept for the forward EDF was chosen by the NARADCOM project team in 1978, LAIR recommended that the vitamin A and vitamin C content of the meals be increased and that milk or milk products be made available to the crew at all times. Subsequently, several decisions affecting these issues were made:

1. Milk shakes, which had been selected for serving all dinner and supper meals in the forward EDF, would be made from a commercially-available dehydrated mix fortified with vitamin A to provide approximately 30% of the USRDA per serving. This product was also used in preparing soft serve ice cream served aft.

2. The modern salad bar, which was part of the new fast food concept, would be stocked with vegetables such as tomatoes, lettuce, carrots, and cole slaw.

TABLE 50

Comparison of Eating Habits of Subjects with Low, Marginal or Adequate Daily Vitamin A Intakes USS Saratoga 1977 (Before Fast Food Test)

	Daily Vitamin A Intakes		
	Low*	Marginal*	Adequate*
Number of Subjects	41	63	99
Percent of Daily Kcals			
Aft Meals	52	67	76
Forward Meals	25	20	14
Snacks	19	12	10
Vitamin A Ratio			
Aft Meals	0.73	1.06	1.97
Forward Meals	0.57	0.69	0.77

*See Table 48 and Text.

TABLE 51

Food Type Consumption of Subjects With Low, Marginal or Adequate Vitamin A Intakes USS Saratoga 1977 (Before Fast Food Test)

	Quantity (gm/day) Consumed by Subjects whose Daily Vitamin A Intakes Were:		
	Low*	Marginal*	Adequate*
Number of Subjects	41	63	99
Milk	137	236	178
Cheeses and Ice Cream	19	29	31
Tomato Products	9	25	38
Carrots, Raw and Cooked	0.2	1.5	8
Sweet Potatoes	0.3	1.8	2.0
Liver	0	0	1.3
Leafy, Green Vegetables	6	14	31
Melons, Peaches, Plums	11	12	28
Eggs	24	41	42
Potatoes, French Fries	8	11	11

*See Table 48 and Text.

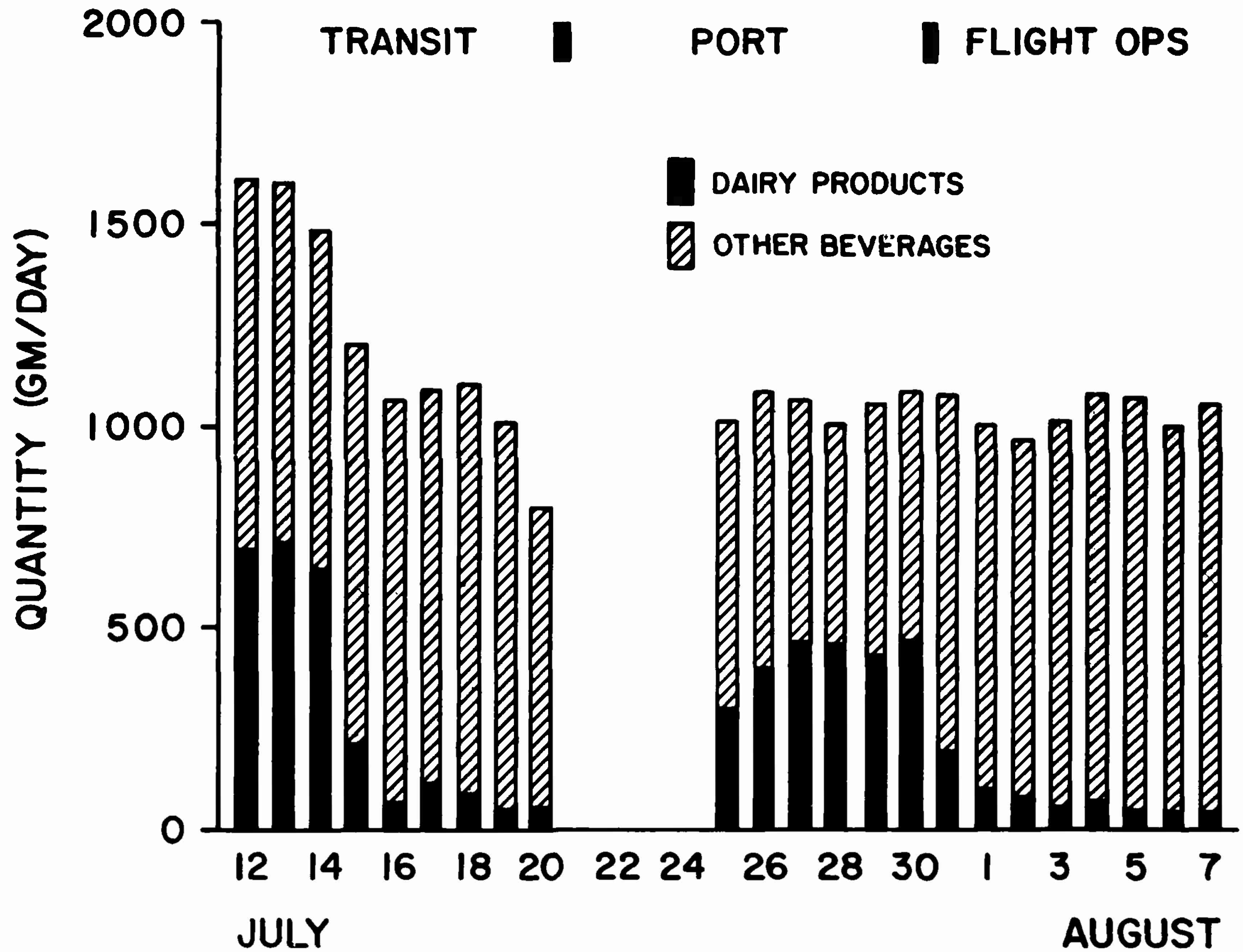

FIGURE 33. Daily Intake of Dairy Products and Beverage Consumption, USS Saratoga, 1977

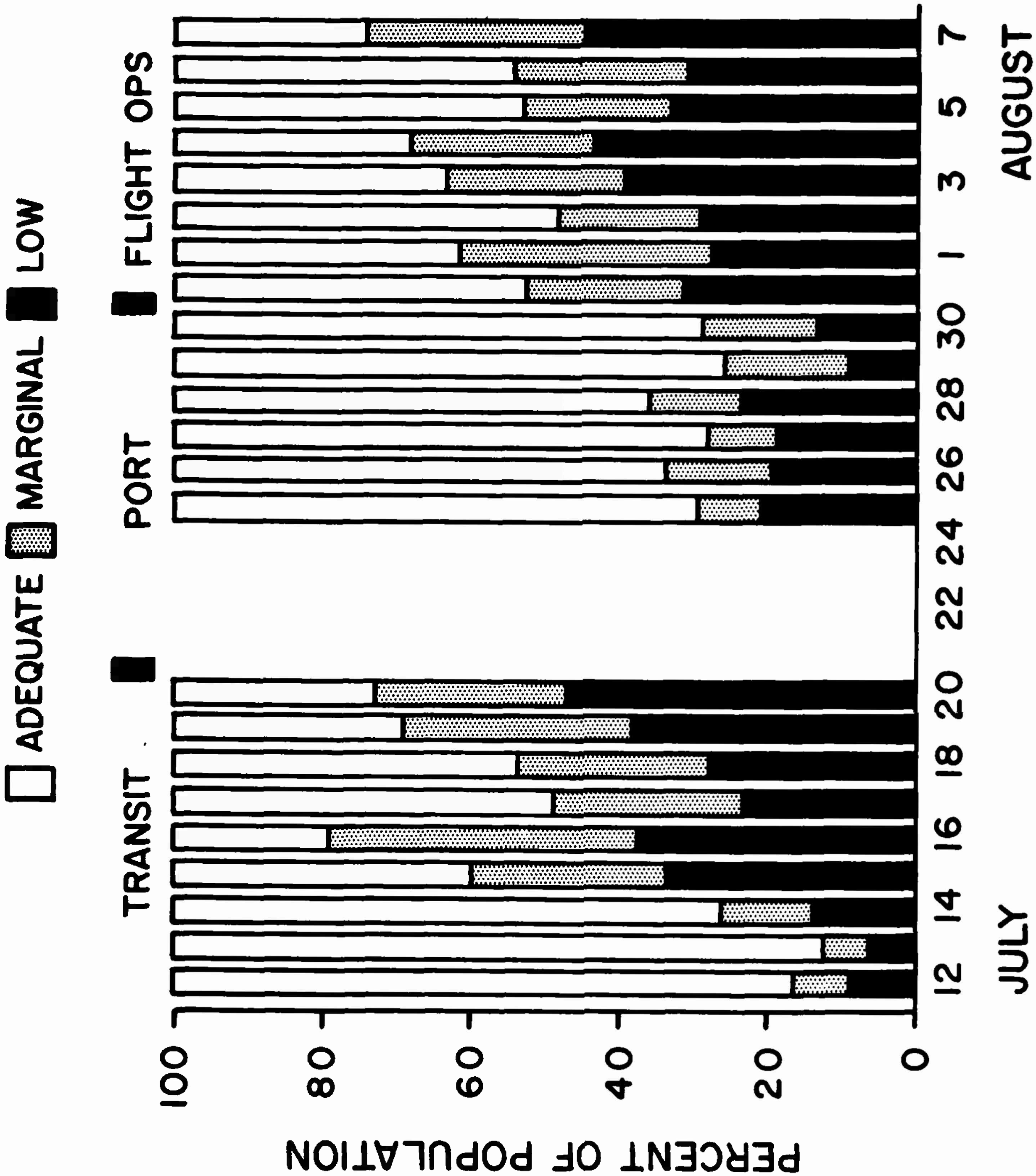

FIGURE 34. Daily Total Intake of Calcium, USS Saratoga, 1977

3. A vitamin C fortified dry beverage base available in grocery stores but not in the DPSC catalog was obtained for making non-carbonated beverages served from the beverage bar in the mess decks. Each regular drink provided about 15% of the vitamin C RDA.

4. A commercially-available dehydrated mix which had been previously selected for preparing extruded french fried potatoes for service twice daily in the fast food menu would also be fortified with vitamin C.

COMPARISON OF NUTRITIONAL INTAKES BEFORE AND DURING THE FAST FOOD TEST

Demographic and anthropometric comparisons of the test populations studied in 1977 and 1978 are shown in Table 52. The distributions by rank and activity were quite similar in the two studies and reasonably approximate that of the entire crew. With the exception of three individuals, a different group of subjects was studied in 1978.

As reported by the nutritional sample, the average percentage of total meals consumed in the forward EDF increased substantially from 23% before the new system was introduced to 38% after. However, the total attendance data include midrats, a meal served aft only, and breakfast, a meal which was not changed by the new system. For the dinner and supper fast food meals, the average attendance forward was up to 43%, a figure which is close to the 46% obtained from headcounts (See Section III). It is noted that the number of *meals* taken at the gedunk dropped from 5% before to less than 1% after the new system was in operation.

Although individuals from all ranks increased their utilization of the forward galley (Table 53), the forward galley was favored most by the junior pay grades and hence, younger sailors. It should be noted that on the USS Saratoga, a Petty Officer First Class (E-6) has the privilege of entering the head of the aft serving line and of eating his meal in an enclosed lounge off the aft mess deck. The availability of the First Class lounge undoubtedly contributed to the lower forward galley utilization by the E-6's. Nonetheless, the percentage of meals eaten forward by E-6's more than doubled. Because of the rapid rate of serving in the forward EDF, no head-of-line privileges were authorized or necessary at that facility.

The average nutrient intakes from the 1978 study are shown in Table 54. There were only moderate differences in average intakes per meal from the two galleys. Forward meals were somewhat lower in iron, vitamin A, and fat content. Milk was available during this entire period and as a result, calcium and riboflavin benefited. However, the milk served was obtained from Europe and was estimated to contain a higher (4%) fat content than the usual whole (3.3%) milk. If the whole milk had been served, the percent fat calories of the daily diet would have been 42.6% instead of 43.5% and if 2% fat milk had been served, percent fat calories would have dropped to 40.7%,

TABLE 52

Demographic and Anthropometric Comparisons of Test Populations
USS Saratoga

	July-August 1977		November 1978		Potential* Customers
No. of Subjects Studied	203		150		3800
Distribution by Rank (%)					
E-1	1.0		1.3		
E-2	12.8	44.8	10.0	45.3	51.9
E-3	31.0		34.0		
E-4	28.3		28.0		23.7
E-5	15.3		18.0		13.6
E-6	11.8		8.7		10.8
Work Shift					
Days	52.9		71.3		
Variable	30.1		12.7		
Nights	17.0		16.0		
Physical Activity Level					
Light	29.9		32.7		
Moderate	54.9		55.3		
Heavy	15.2		12.0		
Weight for Height					
Underweight**	0.6		1.3		
Within Standards**	74.6		83.3		
Overweight**	24.8		15.3		

*Estimated from ship's company and CAG's reports and manning documents.
**Per BUPERINST 6110.2A, 17 June 1976.

TABLE 53

Influence of Rank on Forward Galley Utilization
USS Saratoga Fast Food Test

	Forward Galley Utilization*			
	Before Fast Foods		After Fast Foods	
E-1, E-2, E-3	23.9%	(92)++	44.5%	(68)
E-4	25.2%	(57)	32.9%	(42)
E-5	22.9%	(31)	38.7%	(27)
E-6	8.3%	(24)	18.7%	(13)

*Number of Forward Galley meals ÷ number of total meals eaten x 100.
++Mean for number of subjects.

TABLE 54

Average Nutrient Intakes. USS Saratoga 1978

Nutrient	Per Day	Per Aft Meal	Per Forward Meal
Energy (kcal)	2850 ± 833*	1275 ± 350**	1186 ± 379+
Protein (gm)	120 ± 37	59 ± 19	54 ± 20
Fat (gm)	138 ± 44	68 ± 22	58 ± 22
Percent Fat Calories	43.5 ± 4.6	47.8 ± 5.8	43.9 ± 6.4
Carbohydrate (gm)	287 ± 94	106 ± 36	113 ± 39
Calcium (mg)	1376 ± 577	617 ± 279	621 ± 331
Phosphorus (mg)	1897 ± 611	862 ± 281	843 ± 329
Ca:P Ratio	0.72 ± 0.14	0.70 ± 0.17	0.71 ± 0.18
Iron (mg)	16.1 ± 5.0	7.94 ± 2.31	6.38 ± 2.16
Vitamin A (IU)	5018 ± 2395	2412 ± 1289	1962 ± 1122
Thiamin (mg)	1.50 ± 0.54	0.70 ± 0.26	0.64 ± 0.25
Riboflavin (mg)	2.58 ± 0.99	1.19 ± 0.43	1.17 ± 0.53
Niacin (mg)	23.5 ± 7.5	10.2 ± 3.5	11.0 ± 4.3
Ascorbic Acid (mg)	68.5 ± 40	29.5 ± 21	26.3 ± 19

*Values are mean ± SD for 150 subjects. **Values are for 144 subjects who ate at least one breakfast, lunch, supper, or midrats meal from the AFT Galley. +Values are for 140 subjects who ate at least one continental breakfast, dinner, or supper meal from the Forward Galley.

a value close to the military's desired goal of less than 40% of calories coming from fat sources. Vitamin C intake was lower than would normally be expected because during this period the ship was temporarily out of the vitamin C fortified beverage base.

An evaluation of the average daily nutrient intakes before and after *Fast Foods* is shown in Table 55. Milk was available during the entire 1978 study period, and this increased the percentage of individuals with *adequate* calcium intakes from 77.3% in 1977 to 96.7% in 1978. This also increased the incidence of *adequate* riboflavin intakes from 75.4% to 91.3%. With the introduction of fast foods the incidence of *low* vitamin A intakes decreased from 20.2% to 13.3%. It is estimated that if the vitamin C fortified non-carbonated beverages had been available, the incidence of *low* vitamin C intakes would have been reduced to 8.7% instead of 16.7%.

Marked differences in the nutritional adequacy of forward galley meals were noted after introduction of fast foods, as shown in Table 56. The incidence of *low* vitamin A intakes markedly decreased from 61.4% to 27.9% and the incidence of *adequate* vitamin A intakes increased from 12.5% to 50.7%. There was also an improvement in the nutritional adequacy of the vitamin C intakes from the forward galley. As stated above, vitamin C intakes would have been much better if the planned beverage base had been on hand.

A direct comparison of Aft and forward galley meals from the Nov. 1978 survey is shown in Table 57. As from the earlier evaluation of the mean intakes per meal (Table 53), Nutrient Ratio analyses indicate that aft and forward galley meals were quite comparable with the exception of somewhat greater incidences of *low* intakes of vitamin A and iron in forward galley meals.

There has been some concern about the possibility of low daily nutrient intakes by those individuals who consume a large proportion of their daily calories from fast foods. Therefore, the study population was grouped according to the percentage of the daily calories obtained from the forward galley. As shown in Table 58, the incidence of *low* intakes of vitamin A and vitamin C was not different in those individuals who consumed more than 50% or less than 25% of their daily calories from the forward galley.

It must be emphasized that vitamin fortification has significantly influenced the preceding evaluations of the nutritional adequacies of the forward galley meals and total daily nutrient intakes. As shown in Table 59 fortified foods contributed a total of 21% to the daily vitamin A and 23% to the daily vitamin C intakes of the population. Since all the milk shakes, french fries, and approximately 65% of the fortified dry cereals were consumed at meals served in the forward galley, the contribution of fortified foods there was even higher, approaching 30-35%. If the milk shakes and soft-serve had not been fortified with vitamin A, the incidence of *low* average daily vitamin A intakes would have been 25.3% instead of the reported 13.3%.

TABLE 55

Evaluation of Average Daily Nutrient Intakes. USS Saratoga Fast Food Test

	Percentage of Population*			
	Before Fast Foods		After Fast Foods	
Nutrient	Low**	Adequate**	Low**	Adequate**
Protein	0	96.1	0	98.7
Calcium	1.5	77.3	0.7	96.7
Iron	3.0	44.3	3.3	45.3
Vitamin A	20.2	48.8	13.3	53.3
Thiamin	3.0	44.3	6.6	56.7
Riboflavin	0.5	75.4	0.7	91.3
Niacin	0.5	76.4	0.7	84.7
Vitamin C	8.4	73.4	16.7	57.3

*203 subjects studied in Jul-Aug 1977 before and 150 subjects studied in Nov 1978 after implementing Fast Foods in Forward Galley.
**See Table 48 and text.

TABLE 56

Evaluation of Forward Galley Meals. USS Saratoga Fast Food Test

	Percent of Population*			
	Before Fast Foods		After Fast Foods	
Nutrient	Low**	Adequate**	Low**	Adequate**
Protein	0.5	86.4	0	96.4
Calcium	7.1	75.0	4.3	90.7
Iron	8.7	47.8	7.1	35.0
Vitamin A	61.4	12.5	27.9	50.7
Thiamin	2.2	58.7	5.0	52.9
Riboflavin	1.1	66.3	1.4	85.7
Niacin	8.2	60.3	2.1	89.3
Vitamin C	50.0	35.9	23.6	57.1

*184 subjects studied in 1977 and 140 subjects studied in 1978 who reported eating at least one Forward Galley meal. **See Table 48 and text.

TABLE 57

Evaluation of Forward and Aft Galley Meals. USS Saratoga 1978

Nutrient	Percent of Population*			
	Forward Galley		Aft Galley	
	Low**	Adequate**	Low**	Adequate**
Protein	0	96.4	0	97.9
Calcium	4.3	90.7	2.1	89.6
Iron	7.1	35.0	1.4	68.8
Vitamin A	27.9	50.7	11.1	57.6
Thiamin	5.0	52.9	6.3	59.0
Riboflavin	1.4	85.7	1.4	91.0
Niacin	2.1	89.3	3.5	77.1
Vitamin C	23.6	57.1	21.5	51.4

*140 subjects who reported eating at least one meal in Forward Galley and 144 subjects who reported eating at least one meal in Aft Galley. **See Table 48 and text.

TABLE 58

Evaluation of Average Daily Vitamin A and Vitamin C Intakes According to Percentage of Calories from Forward Meals. USS Saratoga 1978

Percentage of Calories from Forward Meals	No. of Subjects	Percent of Population			
		Vitamin A Ratio		Vitamin C Ratio	
		Low*	Adequate*	Low*	Adequate*
< 25	61	8.2	55.7	16.4	62.3
25 - 50	61	19.7	50.8	16.4	55.7
> 50	28	10.7	53.6	17.9	57.3
	150	13.3	53.3	16.7	57.3

*See Table 48 and text.

TABLE 59

Percentage of Daily Intake of Vitamin A and Vitamin C Obtained from Fortified Foods. USS Saratoga 1978

Fortified Foods	Intake gm/day	Percentage of Daily Intake from Fortified Foods	
		Vitamin A	Vitamin C
Milk Shake	79.5*	9.4	-
Soft Serve Ice Cream	17.2	2.4	-
French Fries	41.1	-	15.5
Dry Cereals	10.4	9.5	7.7
Total		21.3	23.2

*Mean of 150 subjects.

Similarly, if the french fries had not been fortified with vitamin C, 35.3% of the individuals would have had *low* daily intakes of vitamin C instead of the reported 16.7%. If the vitamin C fortified non-carbonated beverages had been available, it is estimated that the incidence of *low* vitamin C intakes would have been further reduced, as stated above, to 8.7%.

Recent developments in data processing capabilities have permitted computation and comparison of cholesterol intakes at breakfast, lunch, and supper meals from the aft and forward galleys. These values, plus the contributions of animal, plant, and fish fat to total fat intake, are shown in Table 60. Average energy intakes and the percent fat calories were lower at breakfast meals than at lunch or supper meals. The cholesterol intake at the aft breakfast meal (450 mg) was much greater than at the continental breakfast in the forward galley (88 mg) because eggs were served aft but not forward. Compared to aft galley dinner and supper meals, cholesterol intakes at the forward galley were lower. At forward galley meals, the percentage of fat derived from animal sources (mostly saturated) was also lower than at comparable aft galley meals. Therefore, it is unlikely that the type of foods served in the new foodservice system on the USS Saratoga will increase the cholesterol or saturated fat consumptions of Navy personnel at sea.

SUMMARY

Nutrient intake data obtained during the two studies on the USS Saratoga indicate that the nutritional health of the crew will not be adversely affected by introducing a fast foodservice system as a component of shipboard foodservice. The cholesterol, animal fat, percent fat calories, and energy content of the average fast food meal consumed at the forward galley were less than that of the average full course meal consumed at the aft galley. However, because of the low concentrations of vitamin A and C in foods that comprise the usual fast food dinner or supper meal, a modest fortification program is needed to prevent low intakes of vitamin A and C by individuals who obtain a large proportion of their daily calories from fast food meals. Fortification of milk shakes with vitamin A and extruded french fries and non-carbonated beverage with vitamin C was demonstrated to reduce the incidence of low daily intakes of these important nutrients. The milk shake prepared from a dehydrated base will also provide a highly acceptable source of calcium and riboflavin when fresh milk is not available. Citrus fruits and a salad bar including carrots and tomatoes should be available at fast food type meals to encourage the consumption of foods that are good sources of vitamin A and C.

TABLE 60

Average Intakes of Calories, Cholesterol, and Animal, Plant and Fish Fats at Breakfast, Lunch, and Supper Meals in the AFT and Forward Galleys. USS Saratoga 1978

	Breakfast		Dinner		Supper	
	Aft	Forward	Aft	Forward	Aft	Forward
Energy (kcal)	967*	722	1390	1282	1324	1273
Fat Calories (%)	43.2	33.8	50.2	46.5	48.1	44.7
Cholesterol (mg)	450	88	282	193	246	213
Animal Fat (%)	89.3	87.5	78.9	70.4	69.6	65.2
Plant Fat (%)	10.7	12.5	17.8	28.9	29.2	29.8
Fish Fat (%)	-	-	3.2	0.7	1.2	5.0
Number of Subjects	106	55	115	105	121	126

*Values are means of number of subjects indicated in table who consumed at least one meal during the 7-day study period.

SECTION XIII

DINING ENVIRONMENT AND DECOR

BACKGROUND FACTORS

There were several conditions in the enlisted dining facilities (EDF's) of the USS Saratoga that negatively affected the dining environment for the ship's crew. For example, the Saratoga was designed during the early 1950's and launched in 1955. Thus, the ship represents a 25-year-old living and dining environment. Personnel requirements have increased appreciably during that period and now the two galley and dining areas that were originally designed to handle approximately 2,550 men must accommodate around 3,800. Shipboard space constraints have required that the crew dining areas also be available as open areas for aircraft weapon assembly, and, if required, as emergency medical stations. Further, there are several weapon elevators, with their accompanying control equipment, that must be continuously available, thus becoming a visual part of the already busy EDF environment. Finally, the Saratoga dining areas are a part of the main fore and aft personnel circulation. Thus, the port and starboard sides of all eating spaces are also passageways for the general movement of crew.

OBJECTIVE AND SCOPE

The objective of this research has been to design and evaluate alternative dining area layouts and physical components to minimize the negative impact of the above-mentioned conditions of high density, multi-use of spaces, and non-diner passageway circulation through dining spaces in order to improve the dining environment in the new foodservice system on the USS Saratoga; also to determine the possible application of the improvements for the other U.S. Navy aircraft carriers. The forward enlisted dining facility of the Saratoga was selected as the site of the prototype foodservice system, and the forward dining area and serving line therefore became the focus of this habitability improvement effort. This portion of the overall project was carried out by the U.S. Army Construction Engineering Research Laboratory, Champaign, IL.[21]

APPROACH

The research was conducted in phases: (1) identification and design of potential improvements, (2) evaluation of proposed improvements, and (3) statement of findings and recommendations. The first step, design of the dining area improvements, was based on a three-part investigation:

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[21] R. L. Porter, Habitability Improvements for Aircraft Carrier Mess Decks, US Army Construction Engineering Research Laboratory, Technical Report E-156, October 1979.

- designer observation of dining conditions during peak use periods,
- designer interviews with a limited number of EDF customers, and
- survey questionnaire of customer opinions of approximately 440 men concerning *general* environmental items.

Later, the evaluation of the dining area improvements was derived from a different survey questionnaire of *specific* environmental items. Approximately 500 men filled in this survey both before and after the physical improvements were made. Four categories of typical user-occupant habitability requirements were investigated: (1) privacy, (2) efficiency, (3) comfort, (4) image. Other environmental conditions, such as light level, ventilation and ambient temperature, were also evaluated. The *before vs. after* user-occupant evaluation offers two criteria for comparison:

a. the percentage of men who responded negatively to particular environmental components, and

b. the percentage of men who responded positively or were neutral to particular environmental components.

An analysis of the user-occupant evaluations then provided habitability design findings and recommendations as to the current and future value of the various physical components introduced to the dining spaces.

The three methods of investigation were intended to complement rather than duplicate each other in order to identify the crew's response to the conditions of the forward EDF environment and to search for design information that would lead to reducing the negative impact of the cited conditions. The result of these three analyses are summarized below.

Designer Observations. The following designer assessments of the dining experience in the existing system were made during observations in the forward EDF while the ship was deployed in 1977.

1. The dining experience from entering the serving line area until leaving the EDF was necessarily involved with a sequence of separate spaces (compartments). It was judged that some *designed organization*, such as a strong color, pattern, or texture theme, could possibly establish a continuity that did not currently exist.

2. The numerous miscellaneous items mounted on or secured to the bulkheads and overhead dominate the compartment image, or character of the dining areas. The net effect is virtually the same as eating at one's work station.

3. There was a need to establish several smaller and defined dining *spaces* since the dynamic passageway circulation was a part of the existing EDF compartments.

4. About a third of the space assigned for crew seating in the forward EDF was not needed in this 1977 period because of the low attendance. In the

expectation that the new improved menu would attract more crew members to the forward EDF, it was considered necessary to utilize the entire available space for seating.

5. Essentially only one option of table size (6 or 7 persons) was available. The inclusion of 2- and 4-person tables would provide greater crew choice, and would enable seating in some areas where the larger tables will not fit.

6. There appeared to be no way to *cover* the overhead visual distractions of ducts, piping, and hoists because of the vertical dimension limitation. Many items were only 6' 5" from the deck. It was proposed that the entire overhead could be painted a dark, non-reflective color to minimize that condition.

7. Many dining areas were near weapon assembly equipment and elevators, requiring all foodservice items in those areas to be easily movable and constructed to withstand dynamic usage.

8. A traffic bottleneck was caused by having table seating too close to the beverage dispensers and salad bar.

Overall, this represented a different kind of design problem than found in shore-based dining facilities. The high density and occupant numbers required a primary *task performance* design solution. That is, while shore-based dining facility density and occupant numbers often allow for the addition of various table sizes and degrees of privacy for the satisfaction of the enlisted personnel, physical limitations aboard ship require the utilization of various table sizes in order to fit in more seating opportunities that conform to the configuration of the compartments.

Interviews by the Designer. The purpose of the interviews was to obtain a general orientation to the broad issues that concerned the enlisted personnel (E1 - E6). This encompassed the total shipboard living situation but focused on the crew's perspective of foodservice. Several specific comments (here paraphrased) that related to the foodservice experiences of the interviewees in the dining areas follow:

1. The food *collection* process takes so long that many times the meat is cold. Sometimes it also takes a few minutes to find an open seat, and that makes a bad situation worse.

2. General Quarters and other drills during meal time also cause many *unnecessary* cold meals.

3. Waiting time in lines is perceived to average about 20 minutes at sea and less time in port.

4. There is a major problem getting trays and dishes on the serving line from the scullery, especially clean dishes. Also, when they came directly

from the scullery without being cooled, hot glasses caused milk to become warm.

5. Some of the mess deck crew are neither trained adequately nor motivated to provide quality cafeteria service.

6. The menu is somewhat inconsistent. The volume of crew eating on a carrier seems to be a factor encouraging a more limited menu. Also, on a smaller ship the galley crews know most of the crew so they generally have more pride in their work.

7. The crew should have tablecloths like in the officer's mess.

8. It really helped when the ship put the new blue and white tile pattern on the deck and covered some of the pipes on the bulkheads in the mess deck compartments.

9. All the *action* makes you eat too fast; vision barriers would be great if they did not interfere with the weapons handling.

10. Things could be better on the ship if the whole crew could take pride in their dining facility.

11. There is a need to use all the mess deck space that is available.

General Survey Questionnaire. Eleven of the 59 questions in the consumer opinion survey reported in Section XI dealt with the physical conditions in the EDF or the dining experience preferences of the crew. The information contained in the responses is briefly summarized here:

- There was a strong leaning to less *military atmosphere* in the EDF, and it was felt that this should be achieved by making the dining area look more like a civilian restaurant.

- The dining area was clearly regarded as unattractive in appearance, noisy, crowded, and not colorful.

- As for type of table, the majority (69%) preferred a 4-person size; 21% opted for a 6-person table.

- The use of stand-up counters for the various meals was regarded neutrally or favorably as follows:

Breakfast	61%
Dinner	77%
Supper	59%

- On balance the general mess environment was viewed negatively, as was the monotony of dining in the same facility.

- Heavy traffic through the dining area was a major complaint.

- The most common suggestions for reducing waiting lines were: (1) more emphasis on fast-serve items, (2) set up another serving line, and (3) have a new food outlet in another location.

DESIGN SOLUTION

The information collected aboard ship was used in combination with design guidance recommendations developed in previous research in EDF's ashore. The physical modifications selected for testing are listed below. All were determined applicable within the constraints of shipboard dining area limitations and fire safety requirements. For convenience, the modifications are shown in terms of the four previously mentioned habitability factors.

Privacy

1. Provide vision screens around all dining spaces where extensive passageway traffic also occurs.

Efficiency

1. Utilize all three forward dining areas to provide more circulation space at the salad and beverage area and more space between tables.

2. Provide an indication of traffic flow by use of deck tile design.

3. Increase eating places available by adding stand-up counter stations and additional table seats.

Comfort

1. Replace rigid plastic shell chairs with more flexible *formed* seat and back chairs.

2. Introduce carpeting on vertical surfaces of vision screens to attenuate the high noise level.

Image

1. Establish a strong color *image* at the serving line bulkhead, augmented with vision screens, deck tiles, and chairs at the dining area.

2. *Paint out* the piping and gear at the overhead.

Functionally, the renovation design improved the forward EDF habitability by the use of 21 removable partition units that visually define and separate the passive activity of eating from the more dynamic activities such as the crew circulation to obtain the meal, the return of mess gear to the scullery, and the ship's fore and aft general passageway traffic through the dining areas. Several of the partition units are equipped with stand-up counters to provide 20 additional *places to eat*. Figure 35 shows a section of the stand-up counters (fore and aft traffic is on the other side of the partitions). Environmentally, the design improved the dining area habitability by establishing a strong, unifying color scheme utilizing three shades of blue, one shade of green, and white. These five colors are used on all surfaces (bulkheads, new partitions, decks) and even accessory gear (trays, food wrappers).

The unifying color scheme was established for all dining facility compartments by introducing a vivid horizontal stripe and chevron supergraphic on the bulkheads and decks of the two serving lines of the galley. This is the sailors' initial environmental awareness that the forward EDF is a distinct eating area for a *fast-serve* menu. Signs at each serving line opening (Figure 36) indicate the specific pre-packaged menu item pick-up location.

In the other three dining area compartments the vivid color scheme is continued on the deck tile design in two shades of blue and on the vision screen partitions in two shades of blue and one shade of green. Both surfaces are also designed in the stripe and chevron supergraphic motif. Deep blue carpet was to be used on most of the vertical panels of the vision screen partitions for a token amount of noise attenuation material in an otherwise highly sound reflective steel surface environment. However, during the construction of the vision screen units, it was determined that the carpet could not be used due to a change in the fire safety acceptability of Nomex fiber materials so all those surfaces were finished with deep blue plastic laminate. The extensive piping, ductwork, and conduits at the overheads were all *painted out* with a dark black in order to further *quiet* the spaces.

Design drawings of serving line, dining areas, vision screen and counter units are provided in reference 21, cited previously in this section.

EVALUATION OF NEW DESIGN

The before evaluation of the existing quality of the spaces for dining came from 484 user-occupants indicating their particular attitudes toward the dining facility environment. Of this sample, 61% indicated that this was not an enjoyable place to eat. After EDF physical components were modified in order to improve the environment related to the negative occupant factors, an analysis of data from a sample of 493 user-occupants indicated this negative evaluation of the forward dining area as an enjoyable place to eat had been reduced to 23% (a relative reduction of 62%). Complete before vs. after percentages of occupant negative and positive responses are listed in Table 61.

FIGURE 35. Forward Dining Area Showing Stand-Up Counters, USS Saratoga, 1978

FIGURE 36. Starboard Forward Serving Line, USS Saratoga, 1978

TABLE 61

Crew Evaluation of EDF Environment

		BEFORE* CHANGES		AFTER* CHANGES	
Habitability Requirements	Specific Factors of the Dining Environment	-%	+%	-%	+%
Efficiency	Finding place to eat	72	17	73	16
	Ease of obtaining meal	65	27	29	62
	Waiting time in chow line	74	20	59	32
Privacy	Crowdedness	88	8	74	17
	Separation of activities	67	20	28	60
	Visual distraction of other people	60	21	43	33
Comfort	Chair comfort	54	19	29	40
	Noise level	50	31	27	49
	Table size	16	76	26	66
Image	Furniture condition	45	25	23	52
	Visual distraction from physical items	37	36	16	63
	Furniture color	24	42	11	66
	Color throughout the space	51	22	22	52

*Neutral ratings are not shown.

CONCLUSIONS AND RECOMMENDATIONS

The habitability of the Saratoga dining area was improved both functionally and environmentally by a strong unifying color scheme and vision screen partitions. In combination, all the modifications were intended to (1) establish a distinct crew dining *place* within the dominant total ship environment, (2) transform the dynamic activity center into a quieter eating setting, and (3) complement the pre-packaged, fast-serve forward dining area menu with an appropriate, integrated environmental *package*.

Eleven of thirteen questionnaire items (Table 61) related to the specific physical component modifications received a greater positive occupant response to a statistically significant level. The two exceptions were table-size adequacy and finding a place to eat. It should be noted that it was easy to find a place to eat in the pre-test period because of the relatively low attendance in the forward EDF; the fact that this item was rated equally positively in the post-test evaluation was pleasantly surprising. Table size adequacy suffered slightly from the efforts taken to increase the number of seats for the greater attendance.

For the other eleven items, these very positive results were considered an indication that the physical component modifications made the crews' dining experiences more satisfactory. Four items reached the level of positive response that was considered *optimum*--over 60%. In these instances the before responses were only 20% to 40% positive. Next, three items reached the 50% level of positive response; these factors were between 22% and 31% positive initially. For the remaining four items, even though recording a statistically significant improvement percentage, less than half of the crew responded positively in the after evaluation. Table 62 summarizes the occupant response results, including a design guidance statement and recommendations for further use of the physical components on aircraft carriers.

The habitability research described in this section was located only at the forward EDF since the Saratoga's comprehensive food service improvement program was confined to that area. However, the existing conditions that defined the design information were also relevant to the aft mess deck compartments and similar spaces of other aircraft carriers. With the increased use of the forward mess deck, the aft mess deck density (turnover per hour) has been reduced; thus, both mess areas are now *carrying their fair share* (approximately). All of the physical components modified in the forward area design solution (summarized in Table 62) should also be considered relevant for application to the aft area, with the expectation that such physical component modifications would produce similar user responses in terms of the four habitability requirements of efficiency, privacy, comfort, and image.

TABLE 62

Summary of Design Information Conclusions and Recommendations From Saratoga Forward Mess Deck Occupant Responses to Physical Component Modification (cont.)

After Positive Response ≥ 50%

Factor	% Positive After vs. Before	Habitability Requirement	Physical Component Design Guidance	Conclusions and Suggestions/ U.S.S. Saratoga	Recommendations For Further Carrier Application
Color Throughout The Space	52% from 22% before	Image	All mess deck compartment surfaces (deck, bulkheads, overhead) were color coordinated to be integrated with the furniture items in blues, green and white.	The strong color statement of the total mess deck environment was considered a significant improvement; however, the 52% positive response is probably indicative that the blue color family used is not as *popular* for dining areas as yellows and reds.	The total mess deck environment should be designed with an integrated color scheme. Reds and yellows in combination would probably have the best, universal acceptance, if there were no other color constraints.
Furniture Condition	52% from 25% before	Image	All mess deck furniture items (chairs, tables and counter units) were purchased new and selected or designed to maintain their *new* condition.	Carrier mess deck furnishings receive extremely hard use through high turnover at meal times and repeated stacking between meals and during GQ; therefore even relatively new items show more than normal dining use wear, so that just over half the sample responded positive.	Select shipboard mess deck furnishing items that will not show hard use, (i.e., anodized metal rather than painted metal, *thru-color* chair backs and seats rather than *surface-color*, and repair requirements with on-board tool and workmanship capabilities.)
Noise Level	50% from 31% before	Comfort	The reduction in the apparent extent of dynamic traffic minimized the negative noise level in the mess deck compartments.	No specific sound attenuation materials were permitted on the test components, yet only 27% considered the compartments negatively noisy (as did 50% in the before condition). Seeing fewer people and less movement probably also encourages each diner to lessen the level of their conversations at the tables.	The break up of the larger mess deck compartments into obvious smaller dining areas should be continued for improved perception of distracting noise. An acceptable sound attenuating carpeting should be used on all reasonable vertical surfaces to quantitatively reduce the decibel level as well

After Positive Response ≥ 60%

Factor	% Positive After vs. Before	Habitability Requirement	Physical Component Design Guidance	Conclusions and Suggestions/ U.S.S. Saratoga	Recommendations For Further Carrier Application
Separation of Activities	60% from 20% before	Privacy	The dividers established a mess deck locale with apparent separation from the passageway traffic.	The vision dividers made a major difference in the total character of the Saratoga forward mess deck spaces by: (1) isolating the diners from the passageway traffic, and (2) establishing the enlisted mess deck as a distinct dining space. The screens and counter units held up extremely well during the initial year of usage.	Any mess deck compartments that also serve as part of the fore-aft passageway system should have some form of vision screening so that those dining will not seem to be a part of the more dynamic circulation activity.
Ease of Obtaining Meal	62% from 27% before	Efficiency	Providing ample space around salad and beverage bars enables the users easy access to their choices of salad and beverage selection by the necessary random circulation.	In an especially high density dining environment it is also especially important to have an efficient process to obtain the total meal -- such as the pre-packaged readily available items on the serving line and to have equally accessible the various salad and beverage choices.	The mess deck layout should be designed as a total environment for a systematic sequence of activities such that the user does not need to overcome a series of obstacles (thus delays) in any of the particular parts of the total experience.
Visual Distraction from Physical Items	63% from 36% before	Image	Painting the overhead piping and equipment black and using vision dividers to screen part of the bulkhead equipment items minimized the extensive amount of this gear in the mess deck compartments.	Controlling the apparent extent of the necessary mess deck overhead and bulkhead gear improves the opportunity to create a dining space image within the work compartments.	In order to establish a distinct character for a shipboard compartment, the apparent extent of piping and gear should be minimized within the constraints of emergency accessibility, low head room and multi-use of compartments.
Furniture Color	66% from 42% before	Image	All major visible furniture items, (chairs, table cloths, and counter units) were color coordinated in blues to integrate the diverse items with each other.	An acceptable, coordinated color selection for the mess deck and the dining furnishings can help establish a *sense of place* for the crew dining experiences.	All parts of the mess deck furnishings should be color coordinated, with a strong vivid color related to the other parts of the mess deck area (serving line, deck and bulkheads).

TABLE 62

Summary of Design Information Conclusions and Recommendations From Saratoga Forward Mess Deck Occupant Responses To Physical Component Modification

After Positive Response ≤ 40% (including two that decreased)

Factor	% Positive After vs. Before	Habitability Requirement	Physical Component Design Guidance	Conclusions and Suggestions/ U.S.S. Saratoga	Recommendations For Further Carrier Application
Chair Comfort	40% from 19% before	Comfort	Changing from the rigid plastic shell chair to a more flexible, *formed* chair improved user satisfaction.	Similar improvement in user/occupant comfort response has been shown in other dining facility research. The only chair types that have received over 70% positive response were either totally wood or had padded seats and backs, both impacting the shipboard requirements for stackability and durability.	Mess deck area chairs should be selected for user comfort as well as necessary stackability and durability.
Visual Distraction of Other People	33% from 21% before	Privacy	Using vision screens to separate the dining areas into smaller units improved user response to the distractions of the circulation traffic.	The carrier dining experience necessarily involves a lot of others in high density conditions. Separating out the moving passageway *through* circulation improved those conditions somewhat. The degree of expressed negative response was reduced from over half (60%) to less than half (43%).	Any panels or dividers used on mess decks should be located to maximize the *separation* of the dining area's other activities. Also, separating diners from each other should also be maximized.
Waiting Time in Chow Line	32% from 20% before	Efficiency	Opening a fourth serving line and increasing the capacity of the forward mess decks by 80 improved the crew perception of waiting times.	The 32% positive response was somewhat higher than expected since the similar after response for shore installations has been around 25%. Possibly the crew realized that all that physically could be done was being done. Staggered scheduling of groups would lessen the number available to eat at any one time.	Shipboard living for enlisted personnel necessarily involves an extensive amount of time waiting in lines. Whatever can be done to shorten mess lines should be tried since these occur three times every day.
Crowdedness	17% from 8% before	Privacy	Separating the areas with vision screens improves the occupants perception of *crowdedness*.	The high density conditions of the forward mess deck *cannot be modified* further and still have the required number of places to eat. The maximum positive response for crowdedness is probably close to 20%, unless additional compartments can be utilized so that the turnover per meal can be reduced from 10 per seat. (Shore facilities are approximately 3 per seat.)	Crowdedness and also finding a place to eat *appear* to be the *major* problems for carrier mess deck occupants (74% and 73%, respectively, responded negatively in the after condition.) The two factors are related and could both be only improved by providing more space. Staggered scheduling of meal times for different groups would help also.
Table Size	66% from 76% before	Comfort	Changing all of the tables to four-person 36" x 36" square tables reduced the user acceptance from the six or seven-person 32" x 84" rectangular tables.	Consistent with previous occupant response, tables less than 400 sq. inches per person vary in positive evaluation in almost direct relation to their size. The Before tables were 385 sq. inches per person and were evaluated 76% positive, and the After tables were 325 sq. inches per person and were evaluated 66% positive. If more seats are available at the smaller size it is probably a good trade-off since 66% positive is acceptable.	The size of table available per person is directly related to the total number of eating places available within the limited space for shipboard mess decks. The 325 sq. inches per person appears to be an *acceptable* size even though for tables per se, 400 sq. inches per person is considered optimum.
Finding Place To Eat	16% from 17% before	Efficiency	The increase of forward mess deck usage was greater than the opportunity to increase the capacity.	Even though the forward mess deck area capacity was increased by 80, a 50% increase, the number choosing to eat there increased by approximately 100%. Since the physical size of the compartments are limited, other means, such as staggered meal-break times, should be evaluated.	Delay in finding a place to eat with a full tray of food is probably considered the most frustrating condition of the mess deck; thus, even if it happens infrequently, it is remembered. When limited capacity is consistently less than the level of use (usually at the noon meals) -- other means of regulating the level of demand should be evaluated, such as a staggered schedule of meal-break times.

SECTION XIV

USS SARATOGA MODIFICATION COSTS

BACKGROUND

Since the USS Saratoga's fast food system was the first of its kind, the cost to implement this concept may be of interest in gauging resource requirements in future applications. Therefore, design and modifications costs associated with implementation of the fast food concept on the USS Saratoga will be emphasized in this Section.

It is important to stress that the estimated costs cited are based upon specific experience with the USS Saratoga and its particular conversion. Some expenditures would not be required on other ships. Conversely, other ships may have additional costs not incurred on this ship. Though an attempt will be made to point out those costs peculiar to the USS Saratoga, the distinction depends heavily on management decisions made in planning a new fast food facility. For example, such options as whether to install stainless steel sheathing as was done on the later installation on the USS Ranger, or to paint existing aluminum sheathing as was done on the USS Saratoga, have a discernible impact on the forward galley modification costs.

This section will present and discuss the two major types of costs incurred: those required for design and engineering drawings, and those required for facilities modifications. Since NARADCOM's effort in systems analysis and concept development of the new system is a non-recurring cost, these expenditures are not included in the present discussion.

SHIPCHECKS AND ENGINEERING DRAWINGS

As noted earlier, the NARADCOM systems analysis and engineering efforts preceded the detail design work outlined in this section. The preceding work had involved efforts such as menu design and food product selection to attract more customers to the forward EDF; development of the themes for the forward serving lines for dinner and supper; analysis of potential customer throughput in terms of number and turnover of seats, scullery capacity and serving line rate; selection of serving methods and materials; food production rates and work flow; and selection of foodservice equipment. Using measurements taken during data collection visits, the project team then produced *concept drawings* for the forward galley, the bakeries, and the forward dining areas. The drawings provided plan view layouts of these spaces, including the locations of all equipment. Significant benefits derived from the attention devoted to these layouts since the design contractor reported that the advance work made his job much easier. It is believed that any lesser effort would have led to higher design costs.

Given this preliminary concept development, the total detail design effort was estimated at $101,300. This included shipchecks as well as preparation, approval and revision of engineering drawings for the four major areas involved. Table 63 summarizes the costs for each job element.

As can be seen in Table 63, over 50% of the design cost effort was allocated to planning, conducting, and reporting shipcheck results. One of the reasons for this possibly disproportionate expenditure was the fact that the USS Saratoga was on deployment at the time these visits were required. Overseas travel could not be avoided in this case. It seems reasonable to assume that the overall cost would be somewhat reduced in future applications if requisite shipchecks can be performed while the vessel is in its home port.

TABLE 63

Cost Estimates for the Fast Food System Design Effort

Cost Factors	Cost Estimate
Shipcheck and Report: Forward Galley, Bakery, and Dining Areas	$ 50,000
Shipcheck and Report: Aft Bakery	6,100
Engineering Drawings for Forward Galley	34,200
Engineering Drawings for Forward Bakery and Dining Areas	4,500
Engineering Drawings for Aft Bakery	6,500
TOTAL	$101,300

Another factor which is reflected in the design cost estimate is the contract supervision and drawing review effort performed by the Norfolk Navy Shipyard. This was not broken out as a separate item. Although no specific man-hours or dollar information is available, the Norfolk supervisory costs were indicated to be as much as $25,000 or 25% of the total design cost.[22]

To aid in determining the effects of inflation if these costs are projected to future time periods for other ship conversions, the work was accomplished between August and November 1977. However, in the near future, inflationary effects should be offset to the extent that preparation of design

[22]Informal communication from Norfolk Naval Shipyard project manager.

drawings for other ships can be based on or copies of the USS Saratoga layouts and to the extent that a dual contractor and naval shipyard effort and overseas shipchecks can be avoided.

The scope of the engineering drawing effort may be just as useful as the Saratoga costs in gauging future funding requirements.[23] New galley layouts with electrical, foundations, dressers, piping and sheathing drawings will have to be produced on each subsequent carrier for which a fast food system is planned. Piping, power and layout drawings will also have to be developed for one or two bakeries. Additional drawings will be required for mess deck layouts, foundations, partitions, and stand-up counters. The work required to provide these documents for the USS Saratoga will probably have to be repeated at approximately the same level of effort less *learning curve* considerations for future carrier conversions. Since planners apparently have cost figures to estimate total design costs from the number of drawings required, the fact that about 34 sheets (Table 64) were needed in this case may be used to estimate future design costs.

SHIPBOARD MODIFICATION COSTS

Table 65 lists the cost estimates prepared by SUPSHIPS JAX for the contract specifications package for the ship modifications and foodservice equipment. These are estimated contract costs which for the total package were within 1% of the actual cost. Excluding equipment costs, modifications to the forward galley comprised 68% of the fast food installation costs. This expenditure included the following jobs:

- rip out existing equipment, deck covering, partitions, dressers, etc.
- remove old foundations, wiring, etc.
- install new foundations, new and saved equipment
- install new wiring
- install new bulkheads, aluminum sheathing, and formica panelling
- install new terrazzo decking
- clean and paint galley interior

As indicated in Table 65, some of the modifications were made after the Saratoga had had some experience in operating the new fast food system. These renovations were accomplished just prior to deployment and were a result of lessons learned during the type training cruises. Two such renovations were made: the beefburger assembly dresser was lengthened by removing an earlier installed bread storage rack, and a microwave oven was installed. The cost of these modifications was $40,000, exlcuding the price of the oven. A third renovation, planned for and included in the $40,000 will be to install two upright thaw boxes near the forward galley when the ship returns from its deployment. Wiring and foundations required for these thaw boxes have already been installed.

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[23] Informal communication with Norfolk Naval Shipyard project personnel.

TABLE 64

List of Drawings Required in Fast Food System Installed on USS Saratoga

Title	NAVSHIPS Drawing No.	Ref.	# Of Sheets
FDN INCID to INSTL of Partitions on Fwd Mess Deck	113 4716400	A	1
Arrangement Mod to Crew Galley No. 1	611 4715954	B	4
DRSR & DRSR Details Crew Galley No. 1	611 4715955	B	4
Foundations incidental to Crew Galley No. 1	113 4715956	C	2
MET J BHD MOD & BHD SHTNG Crew Galley No. 1	604 4715957	A	3
MISC Piping MOD INCID to Modernization Crew Galley No. 1	516 4715971	A	3
Deep-Fat Fryer Hood Modification Crew Galley No. 1	501 4715972	A	1
Power System Modification Crew Galley No. 1	302 4715973	B	4
PWR SYS MOD Fire Ext Sys Crews Galley No. 1	302 4715974	A	1
Fire Extinguishing Sys for Deep-Fat Fryers-Crew Galley	507 4715975	-	2
Arrangement MOD to FWD Bakery and Bread Room	611 4716399	A	2
Power System Modifications Forward Bakery	301 4716411	A	1
Arrangement MOD to AFT Bakery	611 4716723	-	3
Piping MOD INCID to Proofer Replacement	516 4716724	-	2
Lighting SYS MOD AFT Bakery	303 4716724	-	1
TOTAL			34

TABLE 65

Cost Estimates: CV-60 Fast Food Installation*

	Amount ($000)	Percentage
Galley Modifications - Original	$317	
New**	40	68%
Galley Deck	45	
(Galley Total)	(402)	
FWD Bakery	29	14%
AFT Bakery	57	
Mess Deck Screens and Counters	20	
Equipment - Original	75	18%
New**	11	
TOTAL	$594	100%

NOTE: *Above Program Costs are Ship Peculiar

**Added after the original planning

It should be pointed out that not all galley renovation costs can be attributed to the requirements of a fast food system. Certain items, such as fire-suppressant features in hoods over fryers and grills, are required by current Navy standards; and some of the existing hoods on the Saratoga did not come up to standard. Thus, there was an expenditure of $25,000 for the fire protection and for replacement of one hood which would have been required whether or not the galley was renovated to the fast food concept. Other significant expenditures which can be placed in the *required fix-up* category but which cannot be separated out of the cost estimates include considerable electrical upgrading and piping renovations.

It should also be noted that roughly $40,000 of the $402,000 galley modification estimate was required for work on the forward mess decks. This expenditure, which is not broken out in Table 65, covered the installation of foundations for stand-up counters and vision screens, as well as the testing of the deck for watertight integrity since penetrations were required.

Except for equipment costs, renovations in the forward and aft bakeries comprised 14% of the fast food system installation cost estimates. As the figures indicate, the majority of work done was in the aft bakery. In discussions with Saratoga management, it was decided that bread, beefburger, hot dog, and submarine rolls would be produced in the aft bakery. All doughnuts and dessert pastries items would be produced forward. Although this arrangement was not the most desirable from a product flow viewpoint, it was the least costly alternative, most feasible in view of the short lead times, and preferable from the standpoint of devoting the largest bakery to the high production requirements for buns, rolls and bread.

Cost estimates for the modification of the aft bakery included such jobs as:

- rip out selected existing dressers and foundations
- fabricate and install new dressers and foundations
- patch existing deck covering as required
- install new electrical panels and wiring where required
- fabricate new racks for storing roll and bun containers.

As was true with galley modifications, all renovations in the aft bakery were performed by contract effort.

Cost estimates for work performed in the forward bakery, however, reflect a combination of work performed by the contractor as well as the ship's force. All of the rip outs in the forward bakery were performed by ship's force. This effort included taking up the old deck covering. Thus, the $29,000 expended in the forward bakery covers only the fabrication of a new dresser and a new doorway, several new foundations, and minor sheathing, sheet metal, and electrical work.

Of all the cost elements summarized in Table 65, those that involve equipment are probably the most reliable in projecting costs in further applications of the fast food concept. Since these are itemized in another section, only two points need to be stressed at this time. First, galley and mess deck equipment represented 18% of the total cost estimate for implementing the fast food system. Since the great majority of equipment selected performed satisfactorily and since approximately the same or similar equipment will be needed for implementing the new system in any carrier, the $86,000 total estimate for the originally selected (*Original*) and later added (*New*) galley bakery equipment, salad and beverage bars seems a fairly reliable guideline for future planning.

While the unit cost of food production equipment is available (see Section VII), such is not the case with mess deck screens and counters. The exact cost for 11 stand-up counter units cannot be separated from the cost for 11 vision screens. It can only be said that the vision screens were simpler units to produce, involving less material, fewer surfaces, and fewer joints. It is also important to note that cost estimates include the manufacturer's setup costs since these items were the first of their kind.

The USS Saratoga shipboard modification costs were intentionally constrained because fiscal resources for the overall project were limited. Since no other ship had had experience with a fast food system anything like that proposed, there were no hard data available to convince Navy management that tangible habitability improvements would be achieved if funds for the ship's restricted availability were programmed for the new foodservice system. Therefore, anticipated results such as reduced waiting lines and increased customer satisfaction were only paper projections at the time COMNAVAIRLANT was asked to commit financial resources to the test of this concept.

While the combined NARADCOM and Navy funds did permit the hardware phase of the project to go forward, the design and modification costs reflect some compromises in order to live within the budget. Though it would have been more efficient from sanitation and work flow criteria to relocate galley deep sinks, for example, they were left in place. As a result, the installation of the equipment required for production of fried chicken had to be located in the only available space along a bulkhead. Also, a preferred design includes more than one steam-jacketed kettle. Such would have been possible given the rearrangement of warewashing and fried chicken production equipment. But the necessity to save dollars took precedence. It would also have been desirable to replace other outdated ventilation hoods if funding had permitted. And as was cited earlier, where stainless steel sheathing would have made the new galley a much more attractive and easy to clean workplace, a less costly alternative within existing specifications was adopted. Finally, the Supply Department of the Saratoga gave significant support to the project cost avoidance efforts by the ripping out of the forward bakery, providing tiles for the forward mess deck, obtaining two convection ovens for the forward bakery, and similarly helpful activities.

In seeking to take an objective look at the ship modification costs in the clear light of hindsight, it is difficult to find many areas where costs could have been saved, but it is clear that the effort could have cost considerably more.

SECTION XV

MERCHANDISING IN CARRIER FOODSERVICE

BACKGROUND

The assumption that marketing* is an important function in military foodservice is reflected in several features of the new foodservice system concept. Some of the same conditions that lead commercial operations to advertise were seen to apply in the carrier environment. For example, there was a clear need to attract customers to the new forward EDF, and an information program was seen to have a role in meeting this objective. Additionally, early interviews with customers indicated that some individuals perceived *fast food* as *junk food*. Since a generally well-rounded meal was being provided, and nutrients had been added to certain menu items, there was a need to inform and educate customers. Commercial operations employ advertising or marketing tools for similar purposes.

But the more important values of marketing in military foodservice are less explicit than those in the above examples. In the process of providing information, advertising also conveys a message that the customer is important. In a sense, the failure to advertise or attractively merchandise a product indicates an indifference to the customers.

It was not unusual on carriers to find that food on the serving line was not what was posted on the menu board - particularly during the latter part of the meal period. This is a marketing mistake and one which quite clearly gives the customer the impression that management doesn't care or isn't capable of planning well.

An aggressive marketing effort also implies that management is proud of its product. In the present case, it was felt that the new fast foodservice system was an innovative yet practical design. New foods were being offered, new methods of service were introduced, and new types of equipment were being tested. For example, although pizza had appeared on carrier menus in the past, the new concept offered this popular item much more frequently, because of the new food products and recipes being used and with a much higher level of quality than had been previously possible to achieve. The new concept was in many ways very different from the older *speed line* operation in the forward EDF. To make this point to the customers, marketing was seen as an essential requirement in the new foodservice operation.

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*As used in this discussion, merchandising and marketing are defined as actions taken to inform or influence customers of the foodservice system.

The merchandising efforts observed in the pre-test visits appeared to be rather limited in scope. Menu boards were used, but they were usually rather small and colorless with individual white letters on a black background. At times, food on the serving line differed from the posted menu. Some ships reportedly included printed menus in their *Plan of the Day* and distributed menus to crew berthing areas. While this may have been true on other carriers, it was not a common practice on the USS Saratoga. Other than menu boards, the only other salient marketing practice on carriers seemed to be serving line decorations made from such components as artificial flowers, mashed potatoes with food coloring and a demonstration tray of food which, although attractive at the start of the meal soon lost its appeal as, for example, a breaded cutlet dried out and curled.

MERCHANDISING CONCEPT

Basic Objectives. Increasing customer satisfaction was cited earlier as a major design objective in the new foodservice concept. Just as a new menu was developed toward this end, marketing efforts were planned for the same purposes. Since two serving lines were planned to offer different menus, there was a clear need to communicate to the customer what was on each line. Failure to do this effectively could create confusion, and this in turn would produce customer dissatisfaction.

Given the customer's negative image of the prior *speed line* operations, the need to establish an original identity for the new system was deemed an important one. Toward this end, there was a need for a broad theme around which marketing efforts could be organized. The development of a coherent marketing package is perhaps the most obvious difference between the present and past merchandising efforts aboard carriers.

Two examples from traditional practice can illustrate this point. One such tactic is the *Division Night* observed aboard one carrier and reportedly practiced on others. Special menus and reserved seating usually after regular meal hours are the essential features of this special event. In terms of whose image is enhanced in the customer's eyes by this concept, an interesting outcome occurs in the absence of a coherent foodservice marketing strategy. Some sailors attribute the idea to their division management, not to the Food Service Officer. Thus, it is the Division Officer who appears to care about providing something special for the sailors, and the Food Service Division may receive slight credit.

Decorations on the serving line seemed to be a pervasive practice in the traditional foodservice merchandising approach. But since, on the Saratoga at least, the decorations seldom varied, they soon blended into the environment so completely as to go unnoticed by many customers. If they were periodically varied in consonance with an overall marketing concept, customers might notice, and appreciate the *extra effort* put forth by foodservice personnel.

The theme chosen for marketing efforts in the new fast food system was based upon the popular movie *Close Encounters of the Third Kind.* For the Saratoga's overall foodservice system, the words were changed to *Food Encounters of the Sara Kind* and because of the new forward menu and type of service, the theme for the forward EDF became *Food Encounters of the Fast Kind.* The image intended to be conveyed in this theme is that the new foodservice system is an advanced, rapid and efficient concept -- characteristics associated with *space age* systems.

Specific Elements. The following actions were taken to provide a new image for the fast food concept implemented on the USS Saratoga:

- Illuminated picture menu boards similar to those found in some modern commercial establishments.

- Bright decorative colors on the serving line facade and in the dining area.

- Colored flat serving trays with *Saratoga* logo.

- Colorful sign boards on the serving line with appropriate product identification.

- Wrapping paper with appropriate colors and lettering to identify the food within.

- Television interviews on the Saratoga's MCPOC hour.

- Posting menus on Saratoga's closed circuit television.

- Articles in the USS Saratoga's daily newspaper *The Fighting Cock.*

- Highly preferred menu and high quality, attractively served food products.

The service trays and paper wrapping have been described in an earlier section. The choice to use colorful, attractive wraps and bags was essentially a marketing decision. Plain paper would have worked just as well if the only criteria were to keep food warm and provide a self-service capability.

The illuminated menu boards -- with the Food Encounters logo and attractive color pictures and names of the menu items -- was another marketing tool introduced to carrier foodservice during the USS Saratoga test. Figure 37 shows one of two units installed on the USS Saratoga. The physical dimensions of each board were 24" wide by 41" high. With accessories such as item pictures and word panels, the total cost was $2,040.

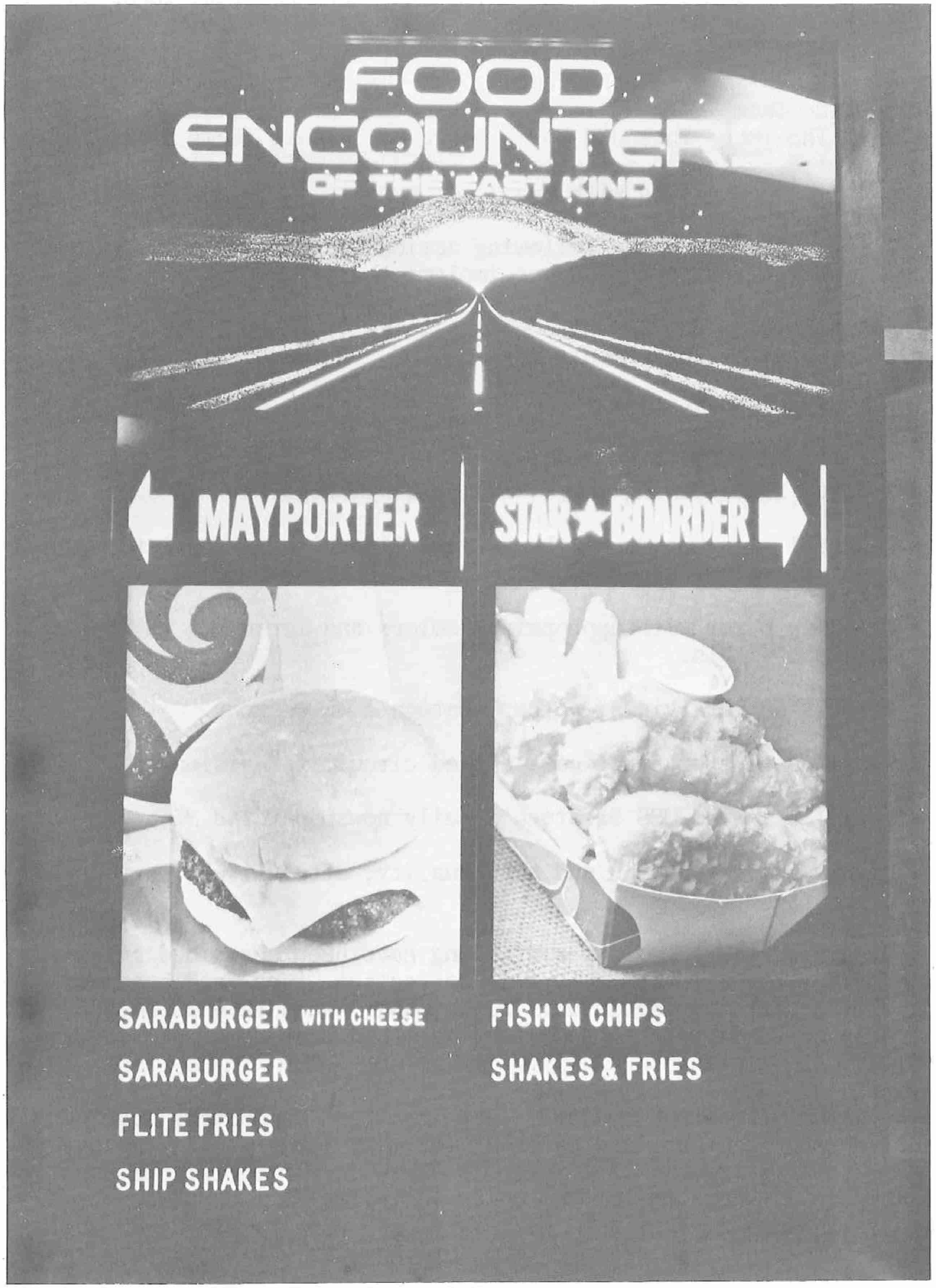

FIGURE 37. Illuminated Menu Board Used in Fast Food Test

One of the reasons these boards were appreciated by foodservice personnel was that the word panels were quickly removable in one motion. As opposed to the removable, individual letter menu boards used aft, the illuminated boards were much easier to update each day. Since they were kept current and since they were kept colorful, neat, and easy to read, the customer also found them useful as well as attractive.

The menu boards were placed at each end of an athwartships passageway where it joined the main forward and aft passages leading to the forward serving lines. These junctions were chosen because they were the last choice point before customers were committed to entering one or the other forward serving line.

Carrier foodservice managers have a merchandising tool that few of their Navy afloat colleagues share: the capability afforded by an on-site television studio. The effectiveness of television as an advertising medium is widely recognized, yet neither carrier on which the pre-test surveys were accomplished utilized their capability to merchandise foodservice via television spots. The use of this medium made it possible to provide information for those numerous personnel who otherwise would have arrived to eat without any knowledge of what the menu was.

During part of the Saratoga's deployment, the menus for both forward and aft EDF's were superimposed on the TV screen during a time interval set aside for ship's announcements. However, the broadcast was presented only once a day from 1100-1115; thus the broadcast of menus could have been more effective if more time had been devoted to it.

A broader audience was reached during the televised Master Chief Petty Officer of the Command (MCPOC) *show*. During one interview, the purpose of the new concept was explained. During a follow-up interview the crew was given information on how the system was working. Topics included special features such as the new equipment and the vitamin additions to the french fries and milk shakes. The crew's comments after these shows indicated that significant numbers of them had watched and listened.

The ship's newspaper was also used to provide information about the new concept. A copy of one such article is included as Figure 38. As was true with television, neither carrier surveyed in the pre-test period utilized the newspaper to publish menus or to provide information about foodservice. The fact that articles about the new concept were readily accepted by the newspaper suggests that foodservice management can make use of this medium in the future.

Since the project's resources were limited, some attractive merchandising ideas were not tested. The Saratoga's Supply Officer, for example, asked for a series of short television spots focused around such areas as: nutrition, what the new system was trying to accomplish, new foods being tested, and new equipment being used. Greater use could have been made of the ship's newspaper by submitting menus daily and by writing additional articles. Since food-

SARA CREW TO MAKE DECISION: WILL SAILORS SWALLOW "FAST FOOD"?

Hamburgers, cheeseburgers, submarine sandwiches, pizza, fish and chips, fried chicken, french fries and thick shakes - these are the kinds of menu items currently being offered at the ship's forward Enlisted Dining Facility.

This new fast food system was designed by a team of systems specialists from the Natick Research and Development Command, Natick, Mass.

Modifications to the forward galley and Enlisted Dining Facility were completed during the recent SRA period under the supervision of SUPSHIPS, Jacksonville.

The major objective of this project is to increase the dining satisfaction of the enlisted mess customers. The approach to this objective is to offer an improved menu of high preference foods, to emphasize fast service in order to reduce waiting times, and to provide colorful, more attractive appearance to the messdecks and serving lines. Bright new partitions and standup counters have been designed for the messdeck spaces to increase the number of eating stations and to improve the meal environment by screening fore and aft personnel traffic and the scullery line from the diner's view.

The forward galley now contains several types of equipment that are used in commercial fast food restaurants but that are not found in other ships. These include a hamburger broiler, a blender for milkshake mix, a freezer to hold 280 shakes, a three deck pizza oven, a speical means of preparing french fried potatoes, semi-automated equipment to bread chicken, and high production-rate deep fat fryers. Thus, the SARATOGA has the most advanced galley in the entire fleet. The aft bakery has also been outfitted with high production equipment to enable it to produce the large required number of hamburger and submarine rolls. Because of this and because the Navy Food Service Systems Office, sponsor of this project, has permitted several non-standard, new food products to be used during the current test, the SARATOGA is the only Navy ship to offer a truly fast food menu designed on commercial principles.

Staff professionals from Natick will be working with CW04 Cox and selected S-2 and S-2M division personnel during type training and the early Med deployment. MSC Rice will supervise forward galley operations during this period. The Natick personnel will be conducting various types of surveys to determine the crew's opinions of the new system, and your cooperation will be greatly appreciated.

Mr. Dick Richardson, Natick Program Manager, points out there is high interest in this test both at COMNAVAIRLANT and COMNAVAIRPAC. It has already been decided to convert the USS Ranger's (CV-61) forward galley, and plans to proceed with similar systems on other carriers will undoubtedly be approved if the SARATOGA test is successful. Rear Admiral Grinstead, Commander, Naval Supply Systems Command, is also following this effort closely. Thus, we on the SARATOGA are at the focal point of an innovative experiment which has the potential to make a significant impact on shipboard food service Navy-wide.

HALF HITCH

FIGURE 38. "SARA Crew to Make Decision: Will Sailors Swallow "Fast Food"?"

service management is generally aware of when there are no waiting lines, this information could be printed in the newspaper with as simple a lead-in as, "Yesterday, there were no waiting lines at the forward EDF from ____ hours to ____ hours." These examples are just a few of the ways an imaginative Food Service Officer could find to *sell* his operation to the customer.

The need to provide information on foodservice is a continuous one. A series of articles describing the new fast food concept, for example, might be published in the ship's newspaper during type training exercises or during the period while the carrier is in transit to its deployed location. Given the numbers of new personnel on each cruise, the information would be fresh for many crew members. Articles or television spots on nutrition might also be worth repeating periodically. In this case, the objective is not necessarily to present new material so much as to persuade sailors to adopt better eating habits. Publicity in home port newspapers and TV is also of interest to the crew and their families. Advertising is not seen as a one-time requirement in commercial operations and, from the authors' viewpoints, neither is it a temporary requirement in a military application of the fast food concept.

In summary, food is an important element in shipboard morale and a lot of effort and expense is devoted to turning out a good product. This is particularly noteworthy in the case of a new service, such as the fast foodservice system. The marketing effort conveys the thought that the ship is concerned about its crew's welfare and that the Food Service Division has pride in its work. The crew of the Saratoga seemed interested in and appreciative of the actions taken to create the new image and to provide information about it. Thus, all concerned benefited from the marketing effort.

RECOMMENDATIONS

Based upon experience gained during the test of fast food aboard the USS Saratoga, the following recommendations are made:

- Continue to use illuminated menu boards with food item photographs, menu item names, and a distinctive logo.

- Continue posting menu entrees and feature items on the ship's TV.

- Public menus and special foodservice related items in the ship's newspaper.

- Develop material and produce TV cassette features on topics relevant to the new fast food concept. Some of the topics that have been suggested are:

Basic nutritional information
Nutritional value of new fast food items
New equipment in fast food operations
New food products used in fast food menu

- Write newspaper articles and bulletins that can be submitted to, and published by, the ship's paper. The relevant topics might be:

Purpose of the fast food concept
New foods in the fast food menu
New equipment in the fast food operations
Consumer reactions to the fast food system
Times when minimal waiting lines occurred
Human interest stories on personnel involved

- Publicity on special foodservice features in journals such as All Hands, Navy Times, and home port newspapers, TV, and radio.

The communication of helpful and interesting marketing information is limited only by the imagination and initiative. Thus, the above does not propose to be an exhaustive list of possibly rewarding actions.

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APPENDIX A

SARA Sandwich Shop

APPENDIX A

SARA Sandwich Shop

Forward Galley

Day 1

Continental Breakfast 0600-1030	Soup, Sandwiches, Salads 1230-1630/1730-2100	
Chilled Fruit Juice	Chicken Rice Soup W/Crax	P1-2
Chilled Fresh Fruit	Fishburger Sandwiches	L-108
Asst Pastry	Hamburger Buns	
Asst Dry Cereal	Potato Chips	
Hot Toast, Butter, Jelly	Salad Bar	
Coffee, Milk	Baked Beans	Q-3

Day 2

Continental Breakfast 0600-1030	Soup, Sandwiches, Salads 1230-1630/1730-2100	
Chilled Fruit Juice	Split Pea Soup	P-23
Chilled Fresh Fruit	Sloppy Joes on Split Buns	L-26
Asst Pastry	Potato Chips	
Asst Dry Cereal	Salad Bar	
Hot Toast, Butter, Jelly	Baked Beans	Q-3
Coffee, Milk		

Day 3

Continental Breakfast 0600-1030	Soup, Sandwiches, Salads 1230-1630/1730-2100	
Chilled Fruit Juice	Beef Rice Soup	P-24
Chilled Fresh Fruit	Variety Meat Sandwich	H-17
Asst Pastry	on Hamburger Buns	
Asst Dry Cereal	Baked Beans	Q-3
Hot Toast, Butter, Jelly	Salad Bar	
Coffee, Milk		

Day 4

Continental Breakfast 0600-1030	Soup, Sandwiches, Salads 1230-1630/1730-2100	
Chilled Fruit Juice	Tomato Veg Soup	P-6
Chilled Fresh Fruit	Chicken Salad Sandwich	N-8
Asst Pastry	on Hamburger Buns	
Asst Dry Cereal	French Fried Potatoes	Q-45
Hot Toast, Butter, Jelly	Potato Chips	
Coffee, Milk	Salad Bar	

APPENDIX A (CONT'D)

Day 5

Chilled Fruit Juice	Manhattan Clam Chowder	P-12
Chilled Fresh Fruit	Ham Salad Sandwich	N-13
Asst Pastry	on Hamburger Buns	
Asst Dry Cereal	Spiced Pork and Beans	
Hot Toast, Butter, Jelly	Cold Potato Salad	
Coffee, Milk	Salad Bar	
	Potato Chips	

Day 6

Chilled Fruit Juice	Tomato Bouillon	P-16
Chilled Fresh Fruit	Ravioli	
Asst Pastry	French Fries	Q-45
Asst Dry Cereal	Potato Chips	
Hot Toast, Butter, Jelly		
Coffee, Milk		

Day 7

Chilled Fruit Juice	Puree of Mongole Soup	P-17
Chilled Fresh Fruit	Chili Macaroni	L-28
Asst Pastry	Potato Salad	
Asst Dry Cereal	Salad Bar	
Toast, Butter, Jelly		
Coffee, Milk		

Day 8

Chilled Fruit Juice	Knickerbocker Soup	P-18
Chilled Fresh Fruit	Turkey Salad Sandwich	N8-1
Asst Dry Cereal	Baked Beans	Q3-1
Pastry		
Toast, Butter, Jelly		

Day 9

Chilled Fruit Juice	Chicken Gumbo Soup	P-10
Chilled Fresh Fruit	Rueben Sandwich	
Asst Dry Cereal, Pastry	French Fries	Q-45
Toast, Butter, Jelly		

APPENDIX A (CONT'D)

Day 10

Chilled Fruit Juice	Cream of Potato Soup	P-23
Chilled Fresh Fruit	Grilled Franks	L-63
Asst Dry Cereal	Steamed Frankfurter Buns	
Pastry	Spiced Pork and Beans	
Toast, Butter, Jelly		

Day 11

Chilled Fruit Juice	Manhattan Clam Chowder	P-12
Chilled Fresh Fruit	Sloppy Joes on Split Buns	L-26
Asst Dry Cereal	Cold Potato Salad	M-40
Pastry		
Toast, Butter, Jelly		

Day 12

Chilled Fruit Juice	Corn Chowder	P-11
Chilled Fresh Fruit	Tuna Salad Sandwich	L116-1
Asst Dry Cereal	Baked Pork and Beans	
Pastry		
Toast, Butter, Jelly		

Day 13

Chilled Fruit Juice	Cream of Tomato Soup	P-16
Chilled Fresh Fruit	Submarine Sandwich	
Asst Dry Cereal	Hamburger on Split Buns	
Pastry	Baked Pork and Beans	
Toast, Butter, Jelly		

Day 14

Chilled Fruit Juice	Beef Noodle Soup	P-1
Chilled Fresh Fruit	Grilled Cheese Sandwich	N-6
Asst Dry Cereal	Hamburger on Split Buns	
Pastry	Baked Beans	
Toast, Butter, Jelly		

APPENDIX A (CONT'D)

Day 15

Chilled Fruit Juice	Creole Soup W/Crax	
Chilled Fresh Fruit	Grilled Frankfurters	L-63
Asst Pastry	Steamed Buns	
Asst Dry Cereal	Baked Pork and Beans	
Hot Toast, Butter, Jelly	Potato Chips	
Coffee, Milk	Salad Bar Selection	
	Cherry Pie	I53-1

Day 16

Chilled Fruit Juice	Beef Noodle Soup W/Crax	P-1
Chilled Fresh Fruit	Grilled Cheese Sandwich	N-6
Asst Pastry	Baked Beans	Q3-1
Asst Dry Cereal	Potato Chips	
Hot Toast, Butter, Jelly	Salad Bar	
Coffee, Milk	Yellow Cake W/Icing	

Day 17

Chilled Fruit Juice	Veg Supreme Soup	P28-5
Chilled Fresh Fruit	Chili Con Carne	L-28
Asst Pastry	Kidney Beans	
Asst Dry Cereal	Steamed Yellow Rice	E-4
Hot Toast, Butter, Jelly	French Fried Potatoes	Q-45
Coffee, Milk	Salad Bar	
	Apple Crisp	J-1

Day 18

Chilled Fruit Juice	Minestrone Soup	P-19
Chilled Fresh Fruit	Hot Fishburgers	L-108
Asst Pastry	Baked Beans	
Asst Dry Cereal	Potato Chips	
Hot Toast, Butter, Jelly	Salad Bar	
	Peanut Butter Cake	G-20

Day 19

Chilled Fruit Juice	Cream of Tomato Soup W/Crax	
Chilled Fresh Fruit	Submarine Sandwich on	N-19
Asst Pastry	Hamburger Buns	
Asst Dry Cereal	Potato Chips	
Hot Toast, Butter, Jelly	Baked Pork and Beans	Q-3
Coffee, Milk	Salad Bar	
	Blueberry Pie	I53-3
	Frosted Strawberry Jello	

APPENDIX A (CONT'D)

Day 20

Chilled Fruit Juice Chilled Fresh Fruit Asst Pastry Asst Dry Cereal Hot Toast, Butter, Jelly	Chicken Noodle Soup W/Crax Grilled Hot Dogs/Steamed Buns Baked Beans Potato Chips Salad Bar Boston Cream Cake

Day 21

Chilled Fruit Juice Fresh Fruit Chilled Asst Pastry Asst Dry Cereal Hot Toast, Butter, Jelly	Split Pea Soup Sloppy Joes on Split Buns Baked Beans Q-3 Potato Chips/Corn Chips Salad Bar Spice Cake W/Icing

Day 22

Chilled Pineapple Juice Chilled Fresh Fruit Dry Cereal Hot Buttered Hominy Grits E-2 Hot Buttered Oatmeal E-2 Pastry Bar	Split Pea Soup P-27 Croutons D-16 Soda Crackers Reuben Sandwich N-20

Day 23

Chilled Tomato Juice Chilled Fresh Fruit Dry Cereal Hot Rice and Raisins Hot Buttered Farina E-2 Pastry Bar	Chicken Noodle Soup P-24 Croutons D-16 Soda Crackers Grilled Cheese and Luncheon Meat Sandwich N-6

Day 24

Chilled Orange Juice Chilled Fresh Fruit Dry Cereal Hot Buttered Oatmeal E-2 Hot Hominy Grits E-2 Pastry Bar	Vegetable Soup P-26 Croutons D-16 Soda Crackers Barbequed Beef on Buns N-27

APPENDIX A (CONT'D)

Day 25

Chilled Grapefruit Juice		Tomato Soup	P-6
Chilled Fresh Fruit		Croutons	D-16
Dry Cereal		Soda Crackers	
Hot Buttered Farina	E-2	Chicken Salad Sandwich	N-8
Hot Rice and Raisins		Baked Pork and Beans	Q-3
Pastry Bar			

Day 26

Chilled Apple Juice		French Onion Soup	P25-1
Chilled Fresh Fruit		Croutons	D-16
Dry Cereal		Soda Crackers	
Hot Buttered Hominy Grits	E-2	Salmon Salad Sandwich	N-16
Hot Buttered Oatmeal	E-2	Chilled Macaroni Salad	M-34
Pastry Bar			

Day 27

Chilled Pineapple Juice		Tomato Bouillon Soup	P-5
Chilled Fresh Fruit		Croutons	D-16
Dry Cereal		Soda Crackers	
Hot Rice and Raisins		Baked Ham Sandwich	N-11
Hot Buttered Farina	E-2		
Pastry			

Day 28

Chilled Grape Juice		Split Pea Soup	P-27
Chilled Fresh Fruit		Croutons	D-16
Dry Cereal		Soda Crackers	
Hot Buttered Oatmeal	E-2	Baked Ravioli	M-23
Hot Buttered Farina	E-2		
Pastry Bar			

APPENDIX B

21-Day Fast Food Cycle Menu*

APPENDIX B

21-Day Fast Food Cycle Menu*

Week 1

Day	Dinner: Port Serving Line	Dinner: Starboard Serving Line	Supper: Port Serving Line	Supper: Starboard Serving Line
1	Beefburgers Cheeseburgers French Fries Strawberry Shake Special Shake**	Tuna Sub Pepper Steak Sub French Fries Strawberry Shake Special Shake	Beefburgers Cheeseburgers French Fries Strawberry Shake Special Shake	Fish and Chips Cole Slaw Strawberry Shake Special Shake
2	Beefburgers Cheeseburgers French Fries Chocolate Shake Vanilla Shake	Veal Cutlet Sub Ham and Cheese Sub French Fries Chocolate Shake Vanilla Shake	Beefburgers Cheeseburgers French Fries Chocolate Shake Vanilla Shake	Pepperoni Pizza Cheese Pizza Chocolate Shake Vanilla Shake
3	Beefburgers Cheeseburgers French Fries Orange Shake Strawberry Shake	¼ lb Frankfurter Steak and Cheese Sub French Fries Orange Shake Strawberry Shake	Beefburgers Cheeseburgers French Fries Orange Shake Strawberry Shake	Fried Chicken French Fries Orange Shake Strawberry Shake
4	Beefburgers Cheeseburgers French Fries Vanilla Shake	Combination Sub Meatball Sub French Fries Vanilla Shake	Beefburgers Cheeseburgers French Fries Vanilla Shake	Fish and Chips Cole Slaw Vanilla Shake Chocolate Shake
5	Beefburgers Cheeseburgers French Fries Strawberry Shake Special Shake	Steak and Egg Sub Chicken Salad Sub French Fries Strawberry Shake Special Shake	Beefburgers Cheeseburgers French Fries Strawberry Shake Special Shake	Sausage Pizza Cheese Pizza Strawberry Shake Special Shake

* Salad bar and assorted beverages were available during dinner and supper meals.
** Flavor selection to be made by Food Service Office.

APPENDIX B (Cont'd)

	Dinner		Supper	
Day	Port Serving Line	Starboard Serving Line	Port Serving Line	Starboard Serving Line
6	Beefburgers Cheeseburgers French Fries Chocolate Shake Special Shake	Ham and Cheese Sub Italian Sausage Sub French Fries Chocolate Shake Special Shake	Beefburgers Cheeseburgers French Fries Chocolate Shake Special Shake	Fried Chicken French Fries Chocolate Shake Special Shake
7	Beefburgers Cheeseburgers French Fries Vanilla Shake Special Shake	Combination Sub Pepper Steak Sub French Fries Vanilla Shake Special Shake	Beefburgers Cheeseburgers French Fries Vanilla Shake Special Shake	Fish and Chips Cole Slaw Vanilla Shake Special Shake
Week 2				
1	Beefburgers Cheeseburgers French Fries Orange Shake Strawberry Shake	¼ lb Chili Dog Veal Cutlet Sub French Fries Orange Shake Strawberry Shake	Beefburgers Cheeseburgers French Fries Orange Shake Strawberry Shake	Hamburger Pizza Cheese Pizza Orange Shake Strawberry Shake
2	Beefburgers Cheeseburgers French Fries Chocolate Shake Special Shake	Steak and Cheese Sub Ham Salad Sub French Fries Chocolate Shake Special Shake	Beefburgers Cheeseburgers French Fries Chocolate Shake Special Shake	Fried Chicken French Fries Chocolate Shake Special Shake
3	Beefburgers Cheeseburgers French Fries Vanilla Shake Strawberry Shake	Ham and Cheese Sub Fishwich Sandwich French Fries Vanilla Shake Strawberry Shake	Beefburgers Cheeseburgers French Fries Vanilla Shake Strawberry Shake	Fish and Chips Cole Slaw Vanilla Shake Strawberry Shake

APPENDIX B (Cont'd)

	Dinner		Supper	
Day	Port Serving Line	Starboard Serving Line	Port Serving Line	Starboard Serving Line
2	Beefburgers Cheeseburgers French Fries Strawberry Shake Special Shake	Combination Sub Italian Sausage Sub French Fries Strawberry Shake Special Shake	Beefburgers Cheeseburgers French Fries Strawberry Shake Special Shake	Fish and Chips Cole Slaw Strawberry Shake Special Shake
3	Beefburgers Cheeseburgers French Fries Chocolate Shake Special Shake	Steak and Egg Sub ¼ lb Chili Dog French Fries Chocolate Shake Special Shake	Beefburgers Cheeseburgers French Fries Chocolate Shake Special Shake	Sausage Pizza Cheese Pizza Chocolate Shake Special Shake
4	Beefburgers Cheeseburgers French Fries Orange Shake Special Shake	Hot Ham and Cheese Sub Veal Cutlet Sub French Fries Orange Shake Special Shake	Beefburgers Cheeseburgers French Fries Orange Shake Special Shake	Fried Chicken French Fries Orange Shake Special Shake
5	Beefburgers Cheeseburgers French Fries Strawberry Shake Vanilla Shake	Pepper Steak Sub Sloppy Joe on Bun French Fries Strawberry Shake Vanilla Shake	Beefburgers Cheeseburgers French Fries Strawberry Shake Vanilla Shake	Fish and Chips Cole Slaw Strawberry Shake Vanilla Shake
6	Beefburgers Cheeseburgers French Fries Chocolate Shake Special Shake	Meatball Sub Ham Salad Sub French Fries Chocolate Shake Special Shake	Beefburgers Cheeseburgers French Fries Chocolate Shake Special Shake	Hamburger Pizza Cheese Pizza Chocolate Shake Special Shake

APPENDIX B (Cont'd)

Day	Dinner: Port Serving Line	Dinner: Starboard Serving Line	Supper: Port Serving Line	Supper: Starboard Serving Line
4	Beefburgers Cheeseburgers French Fries Chocolate Shake Vanilla Shake	Combination Sub Steak and Egg Sub French Fries Chocolate Shake Vanilla Shake	Beefburgers Cheeseburgers French Fries Chocolate Shake Vanilla Shake	Combination Pizza Cheese Pizza Chocolate Shake Vanilla Shake
5	Beefburgers Cheeseburgers French Fries Orange Shake Special Shake	Meatball Sub ¼ lb Frank French Fries Orange Shake Special Shake	Beefburgers Cheeseburgers French Fries Orange Shake Special Shake	Fried Chicken French Fries Orange Shake Special Shake
6	Beefburgers Cheeseburgers French Fries Strawberry Shake Vanilla Shake	Pepper Steak Sub BBQ Beef on Bun French Fries Strawberry Shake Vanilla Shake	Beefburgers Cheeseburgers French Fries Strawberry Shake Vanilla Shake	Fish and Chips Cole Slaw Strawberry Shake Vanilla Shake
7	Beefburgers Cheeseburgers French Fries Chocolate Shake Special Shake	Tuna Sub Pastrami Sub French Fries Chocolate Shake Special Shake	Beefburgers Cheeseburgers French Fries Chocolate Shake Special Shake	Pepperoni Pizza Cheese Pizza Chocolate Shake Special Shake
Week 3				
1	Beefburgers Cheeseburgers French Fries Orange Shake Vanilla Shake	Steak and Cheese Sub Chicken Salad Sub French Fries Orange Shake Vanilla Shake	Beefburgers Cheeseburgers French Fries Orange Shake Vanilla Shake	Fried Chicken French Fries Orange Shake Vanilla Shake

APPENDIX B (Cont'd)

Day	Dinner: Port Serving Line	Dinner: Starboard Serving Line	Supper: Port Serving Line	Supper: Starboard Serving Line
7	Beefburgers Cheeseburgers French Fries Orange Shake Strawberry Shake	Steak and Cheese Sub Fishwich Sandwich French Fries Orange Shake Strawberry Shake	Beefburgers Cheeseburgers French Fries Orange Shake Strawberry Shake	Fried Chicken French Fries Orange Shake Strawberry Shake

APPENDIX C

Fast Food Recipes

HOT ITALIAN SAUSAGE SUBMARINE SANDWICH

N. Experimental Sandwich

YIELD: 100 Sandwiches

EACH PORTION: 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Submarine Rolls		100 each		1. Slice rolls.
	Hot Italian Sausage	22 lb			2. Bake sausages according to directions in baked Italian Sausage L-88. Cut into 1 inch slices when cool.
	Pizza sauce, prepared	22 lb	3-½ - #10 cans		3. Heat sauce thoroughly.
	Cheese, Pizza shredded	6 lb 4 oz			4. Spread 1 oz of sauce on bottom of roll. Arrange 3-½ oz of sausage in roll. Top with additional 2-½ oz of sauce. Sprinkle 1 oz of cheese over sauce. Serve immediately.

HOT MEATBALL SUBMARINE SANDWICH — N. Experimental Sandwich

YIELD: 100 Sandwiches — **EACH PORTION:** 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Submarine rolls		100 each		1. Slice rolls.
	Sexton Brand Meatballs in Tomato Sauce	33-41 lbs	8-10, #10 cans		2. Thoroughly heat in steam jacketed kettle or 12" x 20" plastic insert in microwave oven for 2-4 minutes.
	Cheese, pizza, shredded	6 lb 4 oz			3. Open roll and spread 1 oz. of sauce in bottom of roll. Add 4 to 5 meatballs and top with an additional 1 oz. of sauce. Sprinkle 1 oz. of cheese over top. Serve immediately. NOTE: Keep meatballs and sauce hot.

COMBINATION SUBMARINE SANDWICH — N. Experimental Sandwich

YIELD: 100 Sandwiches — **EACH PORTION:** 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Submarine Rolls		100 each		1. Slice Rolls
	Cold Meat Sliced:				2. Cut cheese slices in half. On a roll, arrange in order shingle fashion, 1 slice of bologna, ½ slice provolone cheese, 1 slice salami, 1 slice bologna, ½ slice provolone cheese, and 1 slice ham. Wrap and chill.
	Salami, cooked	6 lb 4 oz	100 slices		
	Bologna	12 lb 8 oz	200 slices		
	Ham, canned, pullman shaped	6 lb 4 oz	100 slices		
	Provolone cheese, thinly sliced	6 lb 4 oz			
	Tomatoes, fresh, thinly sliced	15 lb			3. Make available on salad bar.
	Lettuce, fresh trimmed shredded	4 lb			
	Onions, fresh, chopped	5 lb			
	Pickles, fresh, chopped	5 lb			
	Peppers, hot, chopped	3 lb			

Cont'd

COMBINATION SUBMARINE SANDWICH — N. Experimental Sandwich

YIELD: 100 Sandwiches — **EACH PORTION:** 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Salad Oil Vinegar Oregano		3 Cups 1 Cup 5 Tbsp		4. Combine 3 ingredients, place in plastic squeeze bottles and offer on salad bar.

TUNA FISH SUBMARINE SANDWICH

N. Experimental Sandwich

YIELD: 100 Sandwiches

EACH PORTION: 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Submarine Rolls		100 each		1. Slice rolls.
	Tuna Salad (N-15)	31 lb 3 oz			2. Prepare 232 portions. Follow steps 1 and 2. Spread 5 oz of salad in sandwich extending filling to ends of roll. Wrap and chill.
	Tomatoes, fresh, thinly sliced Lettuce, fresh trimmed, shredded Onions, fresh, chopped Pickles, chopped Peppers, hot, chopped	15 lb 4 lb 5 lb 5 lb 3 lb			3. Make available on salad bar.

CHICKEN SALAD SUBMARINE SANDWICH — N. Experimental Sandwich

YIELD: 100 Sandwiches — **EACH PORTION:** 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Submarine rolls		100 each		1. Slice rolls.
	Chicken Salad (N-8)	31 lb 3 oz			2. Prepare 186 portions. Follow steps 1 and 2. Use canned chicken meat. 3. Spread 5 oz of salad in sandwich extending filling to ends of roll. Wrap and chill.
	Tomatoes, fresh, thinly sliced Lettuce, fresh, trimmed, shredded Onions, fresh, chopped Pickles, chopped Peppers, hot, chopped	15 lb 4 lb 5 lb 5 lb 3 lb			4. Make available on salad bar.

HAM SALAD SUBMARINE SANDWICH

N. Experimental Sandwich

YIELD: 100 Sandwiches

EACH PORTION: 1 Sandwich

PERCENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Submarine Rolls		100 each		1. Slice rolls.
	Ham Salad (N-13)	31 lb 3 oz			2. Prepare 209 portions. Follow step 1. 3. Spread 5 oz of salad in sandwich extending filling to ends of roll. Wrap and chill.
	Tomatoes, fresh, thinly sliced Lettuce, fresh trimmed, shredded Onions, fresh, chopped Pickles, chopped Peppers, hot, chopped	15 lb 4 lb 5 lb 5 lb 3 lb			4. Make available on salad bar.

HOT VEAL CUTLET SUBMARINE SANDWICH

N. Experimental Sandwich

YIELD: 100 Sandwiches

EACH PORTION: 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Submarine Rolls		100 each		1. Slice rolls.
	Veal cutlets, frozen	22 lb			2. Deep-fat fry 350°, 5-7 minutes. Cool. Slice diagonally in ½ inch strips.
	Pizza sauce, prepared	22 lb	3-½ - #10 cans		3. Heat sauce thoroughly.
	Cheese pizza, shredded	6 lb 4 oz			4. Spread 1 oz. of sauce on bottom of roll. Arrange 3-½ oz of veal in roll and top with additional 2-½ oz of sauce. Sprinkle 1 oz. of cheese over sauce. Serve immediately.

PEPPER STEAK SUBMARINE SANDWICH

N. Experimental Sandwich

YIELD: 100 Sandwiches

EACH PORTION: 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Beef, boneless frozen, cooked	18 lb 12 oz			1. Partially thaw roast beef in thaw box. 2. Remove roast beef from packaging. Reserve juice for use in gravy. Trim off all fat. Slice beef thin, about 16 slices per pound.
	Peppers, green, dehydrated Water for peppers Onions, dry, thinly sliced Shortening	1 lb 5 lb 1 lb 12 oz	4 No. 2½ cn 2 gal. 1 qt		3. Cut slices lengthwise to form strips. Set aside for use in Step 7. 4. Cover peppers with cold water. Soak for 1 hour. Drain well before using. 5. Saute onions and peppers in shortening until tender and lightly browned. Stir occasionally to prevent burning. Set aside for use in Step 8.

Cont'd

PEPPER STEAK SUBMARINE SANDWICH

YIELD: **EACH PORTION:**

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Water, boiling Soup and gravy base, beef Garlic, Dehydrated Reserved juice	 6 oz	1½ gal. 3/4 tsp Variable		6. Add soup and gravy base and dehydrated garlic to boiling water. Add reserved juice from the meat. Simmer 10 minutes. Keep hot.
	Shortening for Grill	4½ cups	2 lb		7. Saute sliced beef on well greased griddle until it is just browned. Place in pan and cover.
	Submarine rolls				8. Slice rolls lengthwise almost in half. Assemble sandwiches. Using tongs lift about 6 or 8 beef strips (about 3 oz) and place on bottom part of roll. Ladle 1 oz hot gravy over meat. Top with 1-3/4 oz of the pepper-onion mixture. Serve immediately.

NOTE: 1. If desired onions and peppers can be prepared ahead of time and kept warm. Hot gravy may be prepared ahead of time and kept warm.

2. Brown Gravy Mix may be substituted. Delete Step 6 and follow label directions on brown gravy mix to yield 1½ gal of finished product.

Cont'd, Pepper Steak Submarine Sandwich

VARIATION

1. Steak and Cheese: Delete steps 3-5. In Step 8 replace pepper and onion mixture with ½ cup cheese, shredded, pizza blend. (approximately 3-¼ No. 10 cans).

2. Steak and Egg: Delete steps 3-5. In step 8 replace pepper and onion mixture with ½ cup scrambled eggs. Place scrambled egg mixture on roll first then add beef. Follow recipe F13 for scrambled eggs using 6 - No. 3 cyl. cans of dehydrated egg mixture.

CHILI DOG

N. Experimental Sandwich

YIELD: 100 Sandwiches

EACH PORTION: 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Frankfurters 4 oz. variety	25 lb	100 each		1. Heat frankfurters until hot in steam jacketed kettle (do not boil) or single layer in plastic 12" x 20" pan in microwave oven for 2 minutes.
	Chili Con Carne, canned	12 lb 5 oz	2- #10 cans		2. Heat Chili thoroughly.
	Frankfurter Rolls		100 each		3. Place frankfurter in split frankfurter roll (D-G-6(1)-2). Ladle 2 oz hot chili over frankfurter. Serve immediately.

HAM AND CHEESE SUBMARINE SANDWICH

N. Experimental Sandwich

YIELD: 100 Sandwiches

EACH PORTION: 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Submarine Rolls		100 each		1. Slice rolls.
	Ham, canned, pullman, sliced	25 lb	200 slices		2. Cut sliced cheese in half diagonally.
	Cheese, American, white, sliced	16 lb 4 oz	100 slices		3. Arrange 2 slices of ham in roll with 2 half slices of cheese. Wrap and chill.
	Tomatoes, fresh thinly sliced	15 lb			4. Make available on salad bar.
	Lettuce, fresh trimmed, shredded	4 lb			
	Onions, fresh chopped	5 lb			
	Pickles, chopped	5 lb			
	Peppers, hot, chopped	3 lb			

VARIATION

1. Hot ham and cheese sub: line unwrapped sandwiches on 18" x 26" pan and warm in 350^{o} oven for 3-5 minutes.

SLOPPY JOE SANDWICH ON BUN — N. Experimental Sandwich

YIELD: 100 — **EACH PORTION:** 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Hamburger rolls		100 each		1. Slice rolls
	Beef, ground	15 lb			2. Brown beef in its own fat in a steam jacketed kettle or roasting pan. Drain or skim off excess fat during cooking period.
	Onions, dry, chopped	3 lb 4 oz			3. Combine ingredients, add to beef and stir to mix well.
	Catsup, tomato	6 lb	4/5-No. 10 cn		4. Cover; simmer 45 minutes; stir occasionally.
	Mustard, prepared	8 oz			
	Salt	1 oz			5. Open sliced roll and place 1/3 cup of mixture on heel of roll. Serve immediately.
	Sugar, brown	1 oz			
	Vinegar	8 oz	1 cup		
	Water	2 lb	1 qt		

BARBEQUED BEEF SANDWICH — N. Experimental Sandwich

YIELD: 100 Sandwiches — **EACH PORTION:** 1 Sandwich

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Hamburger Rolls		100 each		1. Slice rolls.
	Smithfield's James River Brand Beef Barbeque	22 lb	3-½ - #10 cans		2. Thoroughly heat in steam jacketed kettle or 12"x 20" plastic insert in microwave oven for 2-4 minutes. 3. Open sliced roll and place 3-½ oz of mixture on heel of roll. Serve immediately.

PIZZA (BY PAN)

D. Experimental Recipe

YIELD: 8 Servings (one 18" x 26" sheetpan)

EACH PORTION: 2 pieces

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Pizza shells - shelf stable 4" x 6" thin style shells.	1 lb 8 oz	16 each		1. Spray 18" x 26" pan with food release spray. Line up shells 4 x 4, dark side down.
	Prepared pizza sauce	1 lb 1-½ oz	2 cups		2. Spread sauce evenly over shells (cover completely).
	Cheese, pizza blend, shredded	1 lb	3-½ cups		3. Sprinkle cheese over pizza (cover completely).
					4. Bake in 550^{0} pizza oven for 8-9 minutes using high bottom heat and low top heat or in 350^{0} convection oven for 8 minutes. Serve immediately.

VARIATIONS

1. Pepperoni Pizza: Sprinkle 1-lb (3-½ cups) of diced frozen pepperoni over cheese on an 18" x 26" pan.

2. Sausage Pizza: Sprinkle 1-lb (3-½ cups)of diced frozen sausage over cheese on an 18" x 26" pan.

3. Combination Pizza: Combine equal amounts of chopped onion and reconstituted dehydrated green peppers. Sprinkle 4 oz. of the mixture over sauce on an 18" x 26" pan. Add cheese and sprinkle 1 lb (3-½ cups) of cooked, drained ground beef over cheese.

NOTE: 1. 1/3 oz. of dehydrated green pepper is equivalent to 2 oz. fresh green pepper.
2. 1 lb 5 oz of raw ground beef yields 1 lb cooked ground beef.

PIZZA

D. Experimental Recipe

YIELD: 104 Servings

EACH PORTION: 2 Pieces

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Pizza shells - shelf stable 4" x 6" thin style shells.	19 lb 8 oz	208 each		1. Spray 18" x 26" pans with food release spray. Line up shells 4 x 4, dark side down.
	Prepared pizza sauce	14 lb 3-½ oz.	3 - #10 cans		2. Spread 2 cups of sauce evenly over shells (cover completely).
	Cheese, pizza blend, shredded	13 lb			3. Sprinkle 3-½ cups cheese over each pan. (Cover completely)
					4. Bake in 550° pizza oven for 8-9 minutes using high bottom heat and low top heat or in 350° convection oven for 8 minutes. Serve immediately.

VARIATIONS

1. Pepperoni Pizza: Use 13-lb- of diced, frozen pepperoni. Sprinkle 1 lb (3-½ cups) over cheese on each 18" x 26" pan.

2. Sausage Pizza: Use 13-lbs of diced, frozen sausage. Sprinkle 1 lb (3-½ cups) over cheese on each 18" x 26" pan.

3. Combination Pizza: Reconstitute 4-1/4 oz. dehydrated green peppers in 2 quarts + ½ cup of cold water for 2-6 hours. Drain well. Combine with 1-lb 11 oz.chopped onion. Sprinkle 4 oz. of mixture over sauce on an 18" x 26" pan. Add cheese and sprinkle 1 lb (3-½ cups) of cooked, drained, ground beef over cheese. (Note - use 17 lb 5 oz of raw ground beef per 104 servings).

SARATOGA FRIED CHICKEN

L. Experimental Recipe

YIELD: 100 Portions

EACH PORTION: 1 Drumstick, 1 Thigh, ½ Breast

TEMPERATURE: 350°F Deep Fat

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Chicken pieces (broiler-fryer) thawed	62 lb 8 oz	100 drumsticks 100 thighs 100 breasts		1. Wash chicken thoroughly under cold running water. Drain well.
	Water, boiling Soup and gravy base, chicken flavored	 1 lb 6 oz	5½ gallons 3¼ cups		2. In steam jacketed kettle add soup and gravy base to boiling water. 3. Place chicken in broth and when broth returns to boil, simmer twenty minutes or until thermometer inserted into thigh registers 170°F or above. 4. Remove chicken immediately and drain. Cool to about 80°F to facilitate handling.
	Seasoned flour: Flour, wheat, general purpose, sifted	3 lb 4 oz	3¼ qt		5. Combine flour and seasonings, mixing thoroughly.

Cont'd

SARATOGA FRIED CHICKEN

YIELD: **EACH PORTION:**

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
	Soup and gravy base, chicken flavored	1 lb 5 oz	3 cups		6. Dredge chicken in seasoned flour; shake off excess.
	Pepper, black, ground Ginger, ground Garlic, dehydrated Poultry seasoning	2 oz ½ oz 3/4 oz 1 oz	½ cup 2 tbsp 2 tbsp ¼ cup		
	Egg mix, dehydrated Milk, nonfat, dry Water	12 oz 6 oz	3 cups 1-1/3 cups 2½ qts		7. Blend egg mix and nonfat dry milk. 8. Add half of water to make a slurry; then add remaining water and mix. 9. Dip floured chicken in egg and milk mixture; drain.
	Bread crumbs, dry, ground	4 lb	4 qts		10. Roll in bread crumbs; shake off excess.

Cont'd

SARATOGA FRIED CHICKEN

YIELD: **EACH PORTION:**

PER-CENT	INGREDIENTS	WEIGHTS	MEASURES		METHOD
					11. Fry in deep-fat 1½ minutes or until golden brown and chicken is heated through.
					12. Drain in basket or on absorbent paper.

NOTES:

1. Boiling water in Step 2 must completely cover chicken. For each quart of water used, add one ounce of soup and gravy base if more water is needed.
2. Chicken must be thoroughly cooked in Step 2 as further cooking is only for browning and reheating of the breaded chicken. To further check for doneness chicken should be examined to see that there is no pink around the bone and that meat is done.
3. If chicken is to be held in Step 4, it should be cooled quickly to $40^{o}F$ in shallow pans and held under refrigeration until needed.
4. If using the Sam Stein Breader, a minimum of 20 lb bread crumbs and one gallon milk and egg mixture is needed for operation of the equipment.
5. The minute and a half cooking time is established using a late model "quick recovery" type deep-fat fryer.