



*Department of Defense
Combat Feeding
**Food Service
Equipment and
Field Feeding Systems***

WILL
FIGHT FOR
HOT CHOW



1st Edition, January 2004

*Approved for public release;
distribution unlimited*

1st Edition

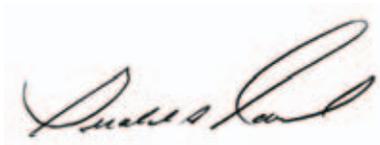
January 2004

The proponent of this pamphlet is the DoD Combat Feeding Directorate [AMSRD-NSC-CF-D], US Army Natick Soldier Center (NSC).

This pamphlet is posted at the NSC website address given on the back cover. For the most current equipment updates prior to publication of an updated Pamphlet, please consult the website. General comments and suggested improvements from readers are most welcome. Please send them to the Combat Feeding Directorate at the address on the back cover.

FOR THE COMMANDER:

OFFICIAL:

A handwritten signature in black ink, appearing to read "Gerald A. Darsch", is centered on the page. The signature is fluid and cursive.

Gerald A. Darsch

Director,

DoD Combat Feeding Directorate

DISTRIBUTION: A,B



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The Military Service's visionary documents are built around a common core. That core is the individual warfighter. The warfighter must maintain optimum cognitive and physical performance to transition from preparing for war, to actual combat, to peace keeping missions. Nutritionally fueling the warfighter is essential to optimizing performance.

Coupled with the need to fuel the warfighter is the requirement for lighter weight, lower cube (smaller logistics footprint), and globally compatible equipment that will enhance mobility and increase agility enabling the warfighter to go farther, faster and be more lethal. In order to create and enhance these capabilities there needs to be continual technological breakthroughs in combat food service equipment. The Department of Defense Combat Feeding program provides state-of-the art combat food service equipment and systems for the warfighter, through extensive research, development and leveraging with industry. These systems are essential to the warfighters ability to operate effectively and efficiently on the battlefield; regardless of location, environmental extremes, or mission requirements.

Through CF's highly focused science and technology equipment and energy initiatives, revolutionary advances in field feeding systems will be key contributors in the transformation to a more strategically responsive and dominant combat force. This transformation will create a force that is superior in all military operations, it will include combat food service systems that will utilize field food service technologies and multifunctional equipment that will help to reduce the logistical burden in both combat food service and supply systems.

This joint service program involves a partnership between the Natick Soldier Center's Combat Feeding Directorate (CFD) and Program Manager Force Sustainment Systems (PM FSS). CFD is responsible for the management and execution of all science and technology programs, and advanced development/full-scale development for the Navy, Marine Corps, and Air Force field food service equipment. The PM FSS manages advanced development and full-scale development for Army* managed field food service equipment.

This booklet highlights CFD's combat food service equipment, and systems and selected S&T initiatives, which will revolutionize the way the Department of Defense will sustain warfighters of the future.



* Army programs under the Product Manager Force Sustainment Systems appear in a separate publication.





Afloat 21, Navy Food Service Equipment

Purpose

The Afloat 21 program provides for replacement of traditional galley equipment with commercial items that are both economical and multifunctional.

Galley equipment being tested is aimed at reducing both cooking and cleaning times and improving sailor quality of life.

Characteristics

New galley equipment that has been investigated includes the Accutemp grill and the clamshell grill, pressureless steamers, a multifunctional “skittle” that steams, grills, roasts and brazes plus nonstick pan coatings that reduce cleaning time up to 70%. Two new ovens types have been tested; the combi oven and a stainless steel interior lined convection oven. The stainless steel lined convection oven is

economical and easy to clean. The combi oven operates as a convection oven and steamer or cooks foods using a combination of steam and hot air. In addition, a hatchable version of the stainless steel lined oven has been developed. The oven is engineered so that its components fit through a submarine hatch and are easily assembled.

Each piece of equipment that has been tested and has been introduced to the fleet represents significant cost savings based upon equipment life cycle along with decreased labor and maintenance costs when compared to traditional equipment.

System Highlights/Benefits

- ▲ Grills that reduce cooking time and are easy to clean.
- ▲ Combination ovens that can be used to steam, bake or “oven fry”.
- ▲ Pressureless steamers that do not require de-liming or dedicated plumbing.
- ▲ A multifunctional “skittle” that can be used to steam, grill, roast or braze.
- ▲ Nonstick pan coatings that are easily cleaned.
- ▲ A “hatchable” oven that can be assembled on board.

Comments

The Afloat 21 is currently under development.





AccuTemp Griddle

Purpose

Replace traditional grills with advanced technology that will reduce cooking and cleaning times.

Characteristics

The Accutemp grill uses steam in a closed chamber to evenly transfer heat to a stainless steel cooking surface. Just below the cooking surface, heating elements are permanently sealed within this chamber. The unique process used to heat the grill eliminates the problems of uneven cooking surface and recovery time associated with traditional grills. The grill surface temperature varies less than 2° Fahrenheit from edge to edge. The grill can uniformly cook a full load of hamburgers in 4 minutes.

The grill is easy to clean; ice water can be poured directly onto the hot grill surface without causing warping. The ice water lifts food particles from the surface eliminating the need for extensive scrubbing.

Capacity:

The 36 inch grill has a production capability of 306 tempered (3 oz) hamburgers per hour. Hamburger cook time equals 4 minutes.

Dimensions:

The cooking area is 36" W × 28" D. Three grill widths are available, 24, 36 and 48 inches.

Utilities:

16 kW, 440 Volts, 60 Hz, 3-phase electricity.

Transportation:

For shipboard use; normal transport delivery.

System Highlights/Benefits

- ▲ Cooking time reduced by 50% in comparison to a standard grill.
- ▲ Uniform grill temperature with no heat recovery time.
- ▲ Easy to clean stainless steel grill surface; reduced labor.
- ▲ The grill can be placed directly on a serving line.

Comments

NSN 7310-01-492-5828.





Clam Shell Griddle

Purpose

To meet the demanding requirements of high volume cooking environments with advanced technology that reduces cooking and cleaning times.

Characteristics

The Vulcan Hart clamshell griddle has hinged top platens that allow foods to be cooked from top and bottom surfaces simultaneously. The dual sided cook process not only cooks food extremely fast but also locks in natural juices. Tests results determined that cook times were reduced by 50 to 70% in comparison to a standard grill. A full load of hamburgers can be prepared on the griddle in 2 minutes. Other food products including sandwiches may be cooked on the griddle by adjusting the height of the platens according to the thickness of the item being prepared.

The griddle is available in 2, 3, 4 or 5 feet widths. Top platens may be specified over any portion or the entire griddle surface. The platens have a removable cover with a non-stick cooking surface that can be wiped clean with a cloth. The steel grill surface requires scrubbing and oiling after cleaning to prevent rusting.

Capacity:

The 4-ft griddle has a production capability of 288 tempered (3 oz) hamburgers per hour. Hamburger cook time equals 2 minutes.

Dimensions:

With the platens open, the 4-ft griddle measures 52" wide by 36" deep by 66" high.

Utilities:

440 Volts, 50/60 Hz, 3-phase electricity.

Transportation:

For shipboard use; normal transport delivery.

System Highlights/Benefits

- ▲ Cooking time reduced by 50 to 70% in comparison to a standard grill.
- ▲ Reduces airborne grease; decreasing exhaust cleaning and labor maintenance.
- ▲ Dual-sided cook process retains food moisture and quality.

Comments

See Afloat 21, Navy Food Service Equipment.





Combi-Oven

Purpose

Replace traditional ovens aboard ships with a multifunctional oven that reduces time and labor required for cleaning.

Characteristics

A combi-oven is a versatile piece of equipment that combines three modes of cooking in one oven, steam, circulated hot air or a combination of both. The combi mode is used to re-heat foods, roast, bake and “oven fry”. When the combi mode is used for “oven frying”, food develops a crisp texture and taste similar to deep fat fried items. Foods that are oven fried have a lower fat content in comparison to items that have been deep fat fried. In addition, the combi mode decreases overall cook times, reduces product shrinkage and eliminates flavor transfer when multiple items are cooked simultaneously.

The steam mode is ideal for rapid cooking of vegetables, fish and shellfish. The hot air mode operates as a convection oven for baking cookies, cakes and pastries.

Combi ovens are extremely easy to clean. The oven is cleaned by spraying the interior cavity with an oven cleaner, set to the steam mode for five to ten minutes and then rinsed with water using the oven’s spray hose. Cleaning time and labor is reduced by 50 to 60 percent in comparison to a traditional convection oven.

A single combi oven can be used to replace one standard convection oven, a deep fat fryer, exhaust hood, and two high-pressure steamers.

The Blodgett’s combi oven is hatchable. The oven design was engineered in modular sections that fit through a 26-inch wide hatch.

Capacity:

Holds ten (12" × 2-½" × 20") steam-table pans.

6 (18" × 26") sheet pans.

2 (24" × 18" × 4") roasting pans.

Dimensions:

The double-stacked oven measures 68" high by 38" wide by 42" deep.

Utilities:

44 kW, 440 Volts, 50/60 Hz, 3-phase electricity.

Transportation:

For shipboard use; normal transport delivery.

System Highlights/Benefits

- ▲ Foods cook in less time resulting in increased product yield.
- ▲ Multiple foods may be cooked simultaneously without flavor transfer.
- ▲ Easy to clean oven reduces labor costs and workload.
- ▲ Multifunctional oven reduces capital equipments costs.
- ▲ “Oven frying” in the combi mode improves nutrition and eliminates the hazard of operating a deep fat fryer.

Comments

NSN 7310-01-463-4724 (Model C05-5HA).





Stainless Steel Lined Convection Oven

Purpose

Replace traditional convection ovens on board submarines and ships with a stainless steel lined oven that is easy to clean.

Characteristics

Modified commercial convection ovens from Blodgett and Market Forge are lined with a stainless steel interior to reduce time and labor required for cleaning. The stainless steel oven interior can be easily cleaned with oven cleaner and a water spray hose. Cleaning time is reduced by 50 to 60 percent in comparison to a traditional convection oven.

The Blodgett and the Market Forge stainless steel ovens are "hatchable". Each oven was engineered in modular sections that fit through a 26-inch wide hatch.

Blodgett Stainless Steel Convection Oven:

Capacity:

Holds ten (12" × 2-1/2" × 20") steam-table pans.

Dimensions:

The oven measures 25-1/2" high by 38" wide by 40" deep.

Utilities:

440 Volts, 50/60 Hz, 3-phase electricity.

Transportation:

For shipboard use; normal transport delivery.

Market Forge Stainless Steel Convection Oven:

Capacity:

Holds ten (12" × 2-1/2" × 20") steam-table pans.

Dimensions:

The oven measures 25-1/4" high by 36-3/16" wide by 35-1/8" deep.

Utilities:

440 Volts, 50/60 Hz, 3-phase electricity.

Transportation:

For shipboard use; normal transport delivery.

System Highlights/Benefits

- ▲ Commercial ovens fitted with stainless steel liner are economical.
- ▲ Easy to clean oven reduces labor costs and workload.

Comments

See Afloat 21, Navy Food Service Equipment.





Non-Stick Coatings

Purpose

Reduce the workload for Navy food service personnel by replacing aluminum roasting and sheet pans with non-stick coating cookware.

The coatings applied to these pans prevent food residues from adhering to the pan surface during cooking.



Characteristics

Aluminum alloy pans have Dupont, Select non-stick coating applied to them. The coating consists of three layers; primer, midcoat and topcoat. New state of the art coatings are designed to last longer and take more abuse. Commercial suppliers continue to improve coating formulations and tougher coatings will be specified as they become available.

System Highlights/Benefits

- ▲ Coated pans can be cleaned in 1/3 the time required to clean a conventional pan.
- ▲ Use of coated pans reduces “drudge” work.
- ▲ Coatings reduce workload and deliver labor savings.
- ▲ Multi-layer coatings provide more durability and abrasion resistance.

Comments

The Navy has procured approximately 8,000 to 10,000 coated pans for the fleet and intends to continue to purchase new pans every other year.



Skittle

Purpose

Equip Navy galleys with multifunctional equipment that increases efficiency and includes savings in capital investments.

Characteristics

The versatile Skittle can grill, steam, roast and braise food. Different types of food can be steamed together in the Skittle without transferring flavors. It also functions as a holding cabinet and a small-capacity kettle. A flexible spray hose is attached to the unit for filling the body with water needed for cooking.

The unit is constructed of stainless steel and is fully insulated. The Skittle's stainless steel surface is easily cleaned using the attached spray hose. The unit requires minimal maintenance with no de-liming or gaskets to replace.

The Skittle is available in a "hatchable" version for easy access through a ship hatch.

The Skittle can replace 2 pressure steamers and a holding cabinet, providing great versatility in the galley.

Capacity:

The Skittle holds six 2-1/2" deep full size steam-table pans. The griddle area is 4.8 ft².

Dimensions:

The Skittle measures 39.5" wide by 53.3" high by 38" deep. An additional 17" of height clearance is needed when the Skittle is open.

Utilities:

440 Volts, 50/60 Hz, 3-phase electricity.

Transportation:

For shipboard use; normal transport delivery.

System Highlights/Benefits

- ▲ Multifunctional cooking use increases galley efficiency.
- ▲ The replacement of traditional equipment with the Skittle reduces capital equipment and maintenance costs.
- ▲ Easy cleaning reduces labor costs.

Comments

NSN 7310-01-484-9755.





Steam 'N' Hold Pressureless Steamer

Purpose

Replace pressure steamers with pressureless steamers that do not require dedicated plumbing, de-liming and are low maintenance.

Characteristics

The AccuTemp Steam 'N' Hold, cooks different types of food in the same compartment, holds food after cooking is complete, and is easily cleaned and maintained.

The Steam 'N' Hold is a connectionless pressureless steamer that does not require water and drain connections. Steam is created by manually pouring water into the unit reservoir. The steamer uses an adjustable vacuum pump to lower the temperature at which water turns to steam from 140° F to the usual 212° F. The lower temperature helps preserve the color and texture of vegetables such as broccoli. Once cooking is complete the unit automatically holds food at safe serving temperature without compromising quality.

With its two capabilities, cooking and holding food, the Steam 'N' Hold saves space aboard ships. This appliance steam-cooks food without any of the plumbing and maintenance complexities of pressure steamers.

Capacity:

The Steam 'N' Hold can accommodate up to six full-size steam-table pans (12" × 20" × 2") or four (12" × 20" × 4").

Dimensions:

The interior chamber measures 23" wide by 23-1/4" deep by 31-1/2" high.

Utilities:

440 Volts, 60 Hz, 3-phase electricity with a 9.5 kW heating element.

Transportation:

For shipboard use; normal transport delivery.

System Highlights/Benefits

- ▲ Does not require dedicated plumbing, making installation simple.
- ▲ Multifunctional; steams and holds food for serving.
- ▲ Vacuum pump lowers steaming temperature, preserves food quality.
- ▲ Low maintenance, does not require de-liming.

Comments

NSN 7310-01-493-9138.





Market Forge Eco-Tech Steamer

Purpose

Replace pressure steamers with pressureless steamers that do not require dedicated plumbing, or de-liming and are low maintenance.

Characteristics

The Market Forge Eco-Tech is a connectionless pressureless steamer that does not require water or drain connections. Steam is created by manually pouring water into the unit reservoir. Additional features include automatic shut off with a beep sound to alert low water level and the ability to hold food at 160° F until ready to serve.

Capacity:

Five (12" × 20" × 2-½") steam table pans or three (12" × 20" × 4") pans.

Dimensions:

The interior chamber measures 14" wide by 22-½" deep by 17-½" high.

Utilities:

440 Volts, 60 Hz, 3-phase electricity.

Transportation:

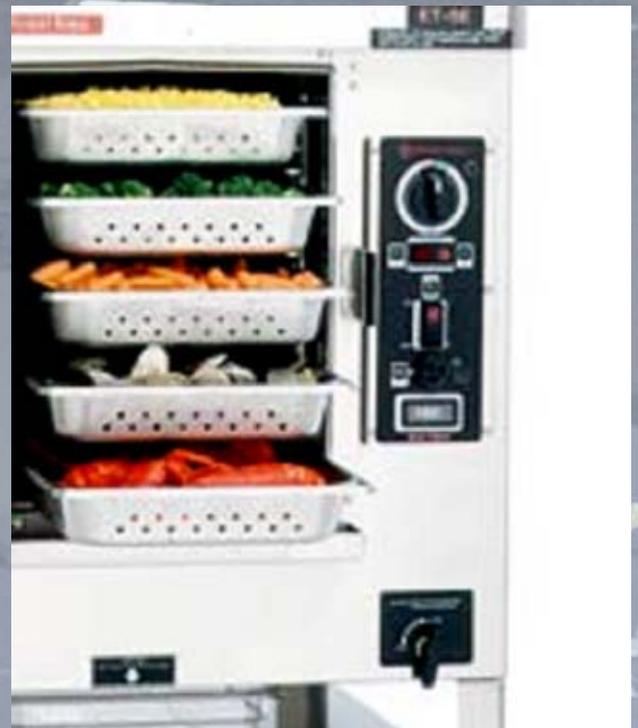
For shipboard use; normal transport delivery.

System Highlights/Benefits

- ▲ Does not require dedicated plumbing, making installation simple.
- ▲ Multifunctional; steams and holds food for serving.
- ▲ Low maintenance, does not require de-liming.
- ▲ Automatic shut off with a beep sound to alert low water level.

Comments

See Afloat 21, Navy Food Service Equipment.





Shipboard Modular Refrigeration (SMR)

Purpose

Use of advanced foods in Navy Food Service has been implemented to meet manning reductions in the fleet. A considerable percentage of the advanced foods such as precooked meats; entrees, produce, breads and desserts are frozen items that necessitate increases in freezer capacity. Shipboard Modular Refrigeration (SMR) is a commercially fabricated "walk-in" refrigeration box suitable for Navy ships to provide a quick easy way to expand freezer capacity.

Currently, most ships in the fleet have fixed refrigerated and freezer storage capacities limiting the use of advanced foods and endurance loading. To accommodate the transition to advanced foods and support shortages in mission endurance loading requirements additional freezer space aboard Navy ships is required.



Characteristics

The SMR is a modular, panelized refrigerated compartment with hatchable components that can be manually transported within the ship. The refrigeration machinery will be self-contained within the SMR, requiring only electrical power be provided for the modular refrigeration compartment. Complete installation takes less than 24 man-hours.

Capacity:

Approximately 350 cu ft of usable interior volume to support immediate Galley feeding operations.

Dimensions:

Size is 10'L x 8'W x 7'H, Stainless Steel; Modular.

Utilities:

440 VAC shipboard power converted to 220 VAC.

Transportation:

For shipboard use; normal transport delivery.



System Highlights/Benefits

- ▲ Supports endurance loading with advanced foods; adds critical freezer space.
- ▲ Operates as either a refrigerator or freezer.
- ▲ Easily installed, inexpensively and quickly.
- ▲ Hatchable and transported manually within ship.
- ▲ Does not require major ship modifications; can easily be utilized across multiple ship types.







Tray Ration Heater System (TRHS) Improvement

Purpose

Provide a portable field heating unit for the rapid rethermalization of previously cooked food such as polymeric trays and number 10 cans.

The TRHS is a fully mobile system and is used for the "heat-on-the-move" concept capability.

Characteristics

The TRHS is comprised of a Tray Ration Heater and associated equipment that form a component of the Marine Corps Combat Feeding System. The TRHS can be installed on an M998 High Mobility Multipurpose Wheeled Vehicle (HMMWV) and is equipped with support items including insulated beverage containers, serving tables, insulated front load pan carriers, insulated ultra pan carriers and gloves.

Capacity:

15 gallons Water.

18 Heat & Serve Rations.

5 gallon mil Fuel Container Standard.

Dimensions:

The TRHS is 25" High x 53" Long x 23" Wide and weighs 285 lbs.

Utilities:

Airtronic Burner.

Burner requires 120 VAC, 60 Hz 3 amps power.

Diesel/JP-8 fuel.

Transportation:

Wheeled Vehicle/Air Craft.

System Highlights/Benefits

- ▲ Approximately ten years in production.
- ▲ Highly Mobile...Eat-on-the-move capabilities.
- ▲ Quick...Rapid rethermalization of previously cooked foods.
- ▲ One-Stop-Shop...comes equipped with support items.

Comments

Natick researched, designed, tested and procured 450 sets of new TRH racks for the Marine Corps, the above figures show the racks which have been distributed world wide to replace the original issued racks. These better accommodate the UGR H&S rations which consists of number 10 cans and tray rations.

In addition Natick procured improved hot gloves to protect the warfighters when handling the hot rations.

An updated technical data package, which includes a performance specification, was prepared, MIL-PRF-32046, and issued. NSN 7310-01-512-6089 was assigned by DLA for this item.





Refrigerated ISO 8' x 8' x 10'

Purpose

Develop new improved, thermally efficient 8' x 8' x 10' ISO Refrigerated containers to satisfy the emphasis on providing warfighters cook-prepared perishable meals.

Characteristics

The Marine Corps' current refrigerated ISO containers are obsolete, heavy, thermally inefficient, and require excessive maintenance. The bulky insulation used in these containers deteriorates over time and limits/degrades their thermal performance. The 8' x 8' x 10' ISO Refrigerated Container keeps perishable rations safe, is reliable, energy-efficient, and easily transported. The container also interfaces with the Marine Corps' new commercially available TK-VM405 4500-BTU refrigeration units.

Capacity:

This system provides a minimum of 390 ft³ of usable space, with a minimum of 120 ft² of shelving space.

Dimensions:

8' x 8' x 10'.

Utilities:

The commercially modified electric-driven refrigeration unit uses external 208/230 Volt, 3-phase, 50/60 Hz power.

Transportation:

This container system can be transported by C-130 and larger aircraft, by the Medium Tactical Vehicle Replacement (MTVR), and by the Logistics Vehicle System (LVS). It can also be sling loaded by a USMC helicopter.



System Highlights/Benefits

- ▲ Provides more usable internal volume with the same exterior footprint than its predecessor.
- ▲ Maintains a constant temperature (frozen or refrigerated) during subsistence missions.
- ▲ Will maintain desired temperatures for longer time periods, if power loss occurs.
- ▲ Extremely thermally efficient insulated container requires less power to operate.

Comments

The Refrigerated ISO 8' x 8' x 10' has undergone contractor testing and is scheduled for Government Production Verification. A performance specification will be prepared and provided to the US Marine Corps Systems Command (MARCORSYSCOM) for procurement.



Squad Stove

Purpose

Soldiers need a safe, quick way to heat meals and boil water used for beverages or sanitation and sterilization. This portable, state-of-the-art stove, will provide soldiers that capability. The stove helps soldiers sustain themselves more independently while they are on their own in remote locations.



Characteristics

The new stoves, used in outdoor expeditions, meet the military's criteria for a stove that is easy to preheat, lightweight, has safe flame regulation, is stable on uneven terrain, and most importantly can burn diesel and JP-8 fuel. The fuel bottle can be detached from the stove during transport. Replacing the old M1950 squad stove which operated on gasoline — and then became obsolete when the military's tactical vehicles all were converted to diesel and JP-8 fuels — the Squad Stove can be used with logistically available diesel or JP-8 fuel, and is safer and easier to use. The Squad stove is compact, lightweight and low cost. The new stove will be used during remote combat operations.

Capacity:

Boils 32 ounces of water in 3.5 minutes with a minimum heat output of 9500 BTU per hour.

Weight:

Weighs 25 ounces including the stove, the empty fuel bottle, the pump and all accessories. It is foldable for compact storage.

Utilities:

Burns military fuels such as JP-8.

Transportation:

Transported by individuals.

System Highlights/Benefits

- ▲ Easy to preheat.
- ▲ Compact, lightweight and low cost.
- ▲ Uses readily available JP-8 fuel.
- ▲ Safe flame regulation.

Comments

Available from Defense Supply Center, Philadelphia, PA.

- ▲ Optimus Nova: NSN 7310-01-470-3683
- ▲ MSR Dragonfly: NSN 7310-01-475-7020



Rapid Deployment Kitchen (RDK)

Purpose

Military cooks need a work environment that is not only safe but also clean, quiet, efficient and rapidly deployed. The Rapid Deployment Kitchen is a highly mobile kitchen, developed to prepare both perishable and shelf-stable rations, known as A, B, and Tray ration meals.

Characteristics

The RDK is equipped with two convection ovens, a griddle, a skillet, one 20-gallon and two 30-gallon kettles, a tankless water heater, and hand-wash and food-preparation sinks and a 30 cubic foot refrigerator.

The RDK uses a heating technology known as “thermal fluid heat transfer”. A pump circulates a nontoxic “thermal fluid” through a central heater and the heater then supplies hot thermal fluid at a controlled temperature of 450° F; which is adequate for heating water and all cooking appliances. Each appliance is connected in parallel across constant pressure supply and return lines. The thermal fluid passes through a heat exchanger in the appliance and returns to the heater at a lower temperature. A thermostat controls the appliance temperature acting in conjunction with a solenoid valve. This state-of-the-art system responds quickly with more heat and is very fuel-efficient compared to conventional field burners. The RDK generates less noise than other kitchen systems, uses no open flames, and vents combustion products safely outside.

Capacity:

- Provides a minimum of 650 meals, twice daily.
- 5 gallon mil standard fuel container.
- 5 personnel can set up the kitchen in 1 hour.

Dimensions:

- 8' × 8' × 20' two side expandable ISO Container.
- Weight 12,320 lbs.

Utilities:

- Beckett Burner.
- Burner Requires 120 VAC, 60 Hz, 6 Amps Power.
- Diesel / JP-8 Fuel.
- 10 kW Generator.

Transportation:

- Rail, Aircraft, M1022A1 Dolly Mobilizers, Truck.

System Highlights/Benefits

- ▲ Burner provides 350,000 BTU/ hour with 75% efficiency.
- ▲ Quiet operating conditions with approximately 70 dB.
- ▲ No open flame burners; provides a clean and quiet environment with no combustion by products.

Comments

Advanced Tested Prototype.





NOT RAZOR CUT
FLAP TO OPEN

0300
0300



Multi-Ration Heater (MRH)

Purpose

The Multi-Ration Heater (MRH) is a portable field-heating unit that is used to rethermalize Heat and Serve Rations and number 10 cans or a combination of both. The MRH is the primary piece of equipment integrated within the Air Force Single Pallet Expeditionary Kitchen (SPEK).

Characteristics

The MRH heats approximately 15 gallons of water to 185°/195° F. The combination of 18 Heat & Serve Rations or number 10 cans provide for feeding up to 100 personnel per load in 30 to 45 minutes. The commercial off the shelf (COTS) Beckett Burner is a reliable, efficient, low cost burner capable of burning either JP-8 or diesel fuel. The double pass heat manifold allows for high heat transfer, resulting in superior efficiency with low exhaust temperature. Additionally, the MRH has the capability to heat foods packaged in various sizes and shaped containers. The MRH is fabricated with all stainless steel and meets NSF approval. A simple on/off switch makes the MRH user friendly with minimal training for the user.

Capacity:

Heats up to 15 gallons of water.

Heats 18 Heat & Serve rations or number 10 cans feeding up to 100 personnel per load in 30-45 minutes.

5 gallon mil standard fuel container.

Dimensions:

29" High × 47" Long × 22" Wide.

Dry Weight 287 lbs.

Utilities:

Model AF 85 II Beckett Burner.

Burner Requirements 120 VAC, 60 Hz, 6 Amps Power.

Diesel/JP-8 Fuel

Transportation:

Any wheeled vehicle or Air Craft.

System Highlights/Benefits

- ▲ Reliable low cost Beckett Burner with logistic support.
- ▲ Double pass heat manifold fabrication allows for high heat transfer with 87% efficiency.
- ▲ Highly portable.

Comments

Tested to Military Performance (MIL-PRF) - 32046





Advanced Design Refrigerator (ADR-300)

Purpose

The ADR-300 gives the Air Force a refrigeration system that is environmentally safe, more efficient, and designed for air transportability. The ADR-300 maintains a constant temperature during transportation and keeps perishable and semi-perishable rations from spoiling in the field.

Characteristics

With over 120 ft³ of shelving space, the ADR-300 provides twice as much usable volume as the old 150-ft³ refrigerators. The new commercial refrigeration unit uses a refrigerant that is environmentally friendly, and offers reduced system weight through application of advanced insulation and container materials.

Capacity:

Provides 302 ft³ of internal storage space.

Dimensions:

The container's outside dimensions are 88" wide by 108" long by 96" high.

Utilities:

The commercially modified, electric-driven refrigeration unit uses external 208/230 Volt, 3-phase, 50/60 Hz power.

Transportation:

Transported by military aircraft (C-141, C-5A, C-17 and C-130), 5-ton Family of Medium Tactical Vehicles (FMTV), rail car or by 10,000 pound forklift.

System Highlights/Benefits

- ▲ Extremely thermally efficient and can maintain safe cargo temperatures during flight or in case of a power failure.
- ▲ Doubles storage capacity of its predecessor while maintaining similar exterior footprint.
- ▲ Utilizes environmentally friendly refrigerant in a commercially modified refrigeration unit.
- ▲ Certified for Internal Air, External Air and Rail transportation by authorized DoD facilities.
- ▲ The ADR300 can be utilized in all three forward-pallet positions aboard a C-130 aircraft.

Comments

The ADR300 has been designed, fabricated and tested. A production contract has been awarded to AAR Cadillac.





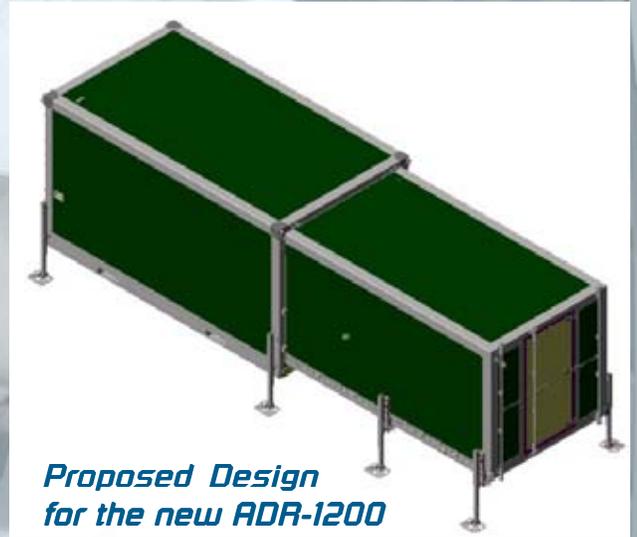
Advanced Design Refrigerator (ADR-1200)

Overview

In meeting their objective for feeding the warfighter with perishable subsistence items, the Air Force's current refrigeration infrastructure needs to be updated. The ADR-1200 will provide a modernized refrigeration infrastructure with greater mobility, updated technology, and a reduced footprint for transportation.

Characteristics

The ADR-1200 is an expandable and highly mobile refrigerated container system that will store and distribute temperature-sensitive cargo. The container will use a Polyisocyanurate foam core sandwich bonded between an external aluminum and armor tough fiberglass interior skin. The container has lifting and tie down rings for helicopter and tactical truck transportability. During flight it utilizes two pallet positions and when deployed provides 1200 cubic feet of usable internal volume. It will be internal air certified, external air certified and rail transport certified by the approved DoD facilities. It will utilize a commercially available refrigeration unit designed for container transport.



Proposed Design for the new ADR-1200

Capacity:

When deployed the ADR1200 provides up to 1200 ft³ of internal storage space.

Dimensions:

The outside dimensions are 96" wide by 176" long by 96" high in its shipping mode.

Utilities:

The commercial, electric-driven refrigeration unit uses external 208/230 Volt, 3-phase, 50/60 Hz power. It provides 16,500 BTU/hr of cooling.

Transportation:

Transported by the C-130 and larger military aircraft (C-141, C-5, KC-10 and C-17), 5-ton Family of Medium Tactical Vehicles (FMTV), rail car or by 10K forklift.



The Services currently use pre-fabricated panel type refrigerators in the field.

System Highlights/Benefits

- ▲ Compatible with 463L pallet system.
- ▲ Utilized two pallet position aboard military aircraft.
- ▲ Expandable to 1200 cu feet when deployed.
- ▲ Anti racking feature for added structural strength.
- ▲ Ease and safety of slinging, hoisting and tie-down procedures.

Comments

The ADR-1200 is designed and is currently being fabricated. Contractor and Government testing will begin 2QFY04. A performance specification will be prepared in FY04 and provided to the Air Force.



All Electric Kitchen, Bare Base

Purpose

The Air Force's Harvest Falcon and Harvest Eagle kitchens use equipment that is unique to the military and powered by gasoline-fired M2 burners. Since gasoline is dangerous and is now being removed from the battlefield, the Air Force is replacing its gasoline equipment with an All-Electric Kitchen. The All-Electric Kitchen is equipped with new commercial electric equipment.

Characteristics

The All-Electric Kitchen is outfitted with: convection ovens, tilting fry pans, hot food wells, refrigerators, steam-jacketed kettles, coffee urns, salad bars, a mixer, a food slicer, sanitation sinks with booster heaters and tankless water heaters.

Capacity:

Feeds three meals a day to 550 Air Force personnel (in the Harvest Eagle version) and 1100 Air Force personnel (in the Harvest Falcon version).

Dimensions:

The Harvest Eagle and Harvest Falcon kitchens are housed in Temper Tents with total areas of 3360 ft² and 4960 ft² respectively.

Utilities:

Field generators power the kitchen's appliances.

Transportation:

The All-Electric Kitchen is transported in Conex containers.

System Highlights/Benefits

- ▲ Electric equipment removes hazardous fuel from the kitchens.
- ▲ The All-Electric Kitchen creates improved and enhanced working conditions.
- ▲ The new system provides ventilation hoods over the grease producing cooking equipment.

Comments

This project was to replace the fuel fired (gasoline) food service equipment in all of the Air Forces 1100 and 550 men field kitchens. Natick designed the layout and selected the equipment and sanitation system; Air Force is presently procuring 50 Harvest Falcon and 29 Eagle kitchens based on Natick's work.

Also designed and procured equipment ventilation systems for these field kitchens.



Containerized Deployment Kitchen

Purpose

This completely self-contained kitchen can be rapidly deployed into the field during the first days of a mission to provide food service until more extensive kitchens are established. The CDK is an all-electric kitchen fully outfitted with commercial food-service equipment.

Characteristics

The CDK has two convection ovens, two tilt griddles, two steam-jacketed tilt kettles, two 29-ft³ refrigerators, a five-well steam table, a three-well sanitation sink with water heaters, a meat slicer, an ice machine, a coffee urn, and work tables.

Capacity:

Four cooks can provide meals within two hours, feeding up to 500 people two times per day.

Dimensions:

The CDK is installed in a one-sided, expandable ISO shelter (8' × 16' × 20').

Utilities:

The kitchen has its own commercial 150 kW generator to power the electric appliances. Only fuel and water are needed to operate the kitchen.

Transportation:

Transported by Sea, C-130 Aircraft, M1022A1 Dolly Mobilizers.

System Highlights/Benefits

- ▲ All electric containerized deployment kitchen.
- ▲ The kitchen can be set up or taken down and packed for transport by four people within four hours.
- ▲ The CDK has both heat and air conditioning and operates in temperatures ranging from -25° F to 120° F.

Comments

This system was fielded by the Air Force in 1990; there are 21 systems in inventory.





Single Pallet Expeditionary Kitchen (SPEK)

Purpose

The Single Pallet Expeditionary Kitchen (SPEK) is designed to be deployed as a highly mobile, temporary kitchen for usage at remote undeveloped areas. The SPEK feeds 300 Airman, Unitized Group Rations- Heat & Serve, twice per day in a 2-hour time period.

Characteristics

The SPEK is logistically transported by a C-130 and all of its equipment fits onto a single 463L air cargo pallet. When deployed the SPEK can be easily unpacked and assembled.

The entire kitchen can be set-up by a minimum of 8 personnel in less than 2 hours and requires only 4 food service personnel to operate its equipment and serve food.

The SPEK also shelters the operators and equipment from the environment in a 3-section tempered tent, along with 480 ft² of specialized flooring that is tough, light weight, weather proof and maintenance free for easy sanitation after serving.

The SPEK's critical equipment items are the Multi-Ration Heater (MRH), which is used for the preparations of the UGR-H&S menu items, and the Sanitation Hot Water Heater (SHWH) for cleaning, washing and sanitizing kitchen utensils. The MRH and SHWH have been designed to operate at temperatures ranging from -20° to 120° F and relative humidity ranging from 20 to 100 %.

Feeding Capacity:

Feeds 300 airmen UGR-H&S menus in a 2 hour period.

Tent Shelter:

One 3 section TEMPER tent, with 20' x 24' weather proof flooring.

Power Source:

One Military Tactical 2 kW diesel generator.

Transportation:

Fits onto a C-130, 463L air cargo pallet.

System Highlights/Benefits

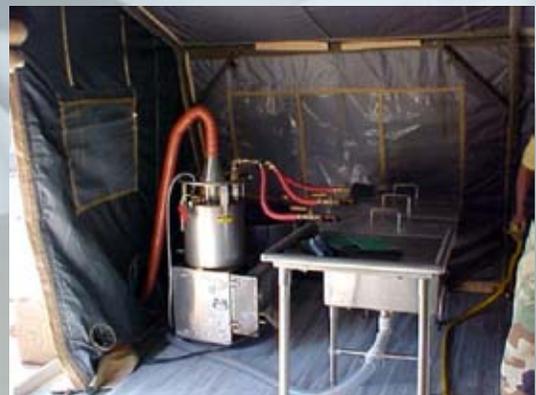
- ▲ Fits on a single 463L air cargo pallet.
- ▲ Easily unpacked and assembled.
- ▲ Shelters operators and equipment from environmental conditions.
- ▲ Requires only 4 food service personnel to operate.
- ▲ Highly mobile system for early entry remote site applications.

Comments

SPEK Feeding capabilities will be expanded to serve UGR-As and extend the deployment and delay the deployment of a bare base kitchen.

The SPEK – UGR – A is planned to add an oven and griddle which will use the same burner base as the Sanitation steam heating system. A 3 kW generator would replace the two kW for reduced maintenance

A technical data package has been completed with a manual and the first unit has been fielded by the Air Force.





Commercial Single Pallet Expeditionary Kitchen (CSPEK)

Overview

The US Army Natick Soldier Center, Combat Feeding Directorate has designed for the Air Force, a thermal fluid feeding system that is built on a 463L pallet for deployment to remote and undeveloped sites that are being prepared as Air Force facilities. This expeditionary kitchen will be used for the initial deployment and integrated into the Harvest Falcon/Eagle kitchen when either is deployed. It is a highly mobile, temporary lightweight kitchen and will be used to prepare the Unitized Group Ration, Heat and Serve using commercial food service equipment.

Characteristics

For ease of operation, the kitchen will consist of modified commercial electrical equipment to be heated by thermal fluid. The CSPEK uses "Wet Base" technology, which is also used on the Rapid Deployment Kitchen (RDK). A pump continuously circulates thermal heat transfer fluid, such as mineral oil, through a central thermal fluid heater using a single burner supplying heat to each modified commercial appliance on demand. It also heats hot water for cleaning and sanitizing.

This thermal fluid system includes a skittle, which can be used for steaming UGR H&S; it can also be used as a kettle, griddle or tilt skillet. In addition a full size stainless lined, for easy cleaning, convection oven; and a three-compartment sink with hot water and sanitation capabilities.

Capacity:

Feeds 350 Airmen three meals per day

Dimensions:

1- 463L pallet, 88 × 106 inches

Utilities:

3 kW generator, diesel-fired boiler

Transportation:

Air transportable on a C-130 aircraft

System Highlights/Benefits

- ▲ Easy to operate commercial food service equipment
- ▲ Modular design accommodates feeding requirements and scale up
- ▲ Highly mobile
- ▲ Compact...fits on one 463L air cargo pallet
- ▲ Quick set up and take down
- ▲ Improved sanitation

Comments

The CSPEK is the basis of a new Joint Statement of Needs (JSN), scheduled to start in FY06, for a Joint Service Modular Kitchen. Due to its modularity, Commercial food service equipment and the ability to start with an initial deployment kitchen and scale up as the force structure increases, all the services are interested.



Sanitation Steam Heater

Purpose

Provide Field Sanitation for the Air Force Single Pallet Expeditionary Kitchen (SPEK). The system is comprised of a burner base, steam generator, sparge assembly, and a three well sink with a drain hose assembly.

Characteristics

The Burner Base: The burner base is installed with a low cost, reliable, commercial off the shelf Beckett Burner which outputs 119,000 BTU/hr, and capable of burning diesel and JP-8 fuel. A high temperature alloy casting is used for the combustion chamber that will increase operating life and reliability.

Steam Generator: The steam generator provides steam at approximately 2.5 psig for maintaining the water temperature in the washing, rinsing, and sanitizing sinks. Through a hose and spray nozzle, it also provides hot water for rinsing pots, pans, and utensils. It will also provide hot water for preparation of food items such as coffee and warm water for hand washing.

The Sanitation Steam Heater-Improved will include a single unit providing steam to heat and maintain the hot water in the washing, rinsing and sanitation sinks of the field kitchen sanitation center. It will also provide hot water for preparation of food items such as coffee and warm water for hand washing. A commercial off the shelf Beckett Burner is used for reliability and logistic support. The burner will burn both JP-8 or diesel fuel. Operation of the system is fully automatic. When the power switch is turned on the pump will self-prime to fill the steam generator; the burner will go through a pre-purge cycle, which will prime and ignite. Water level within the steam generator will be maintained automatically, the burner will cycle on only as required to maintain steam generation on demand.

Capacity:

3 Well Stainless Steel Sinks.

5 gallon mil standard Fuel Container.

17 gallons Water per Sink.

Dimensions:

Burner Base 24" High × 29" Long × 22" Wide,
Weight 140 lbs.

Steam Generator (Cylindrical) 22" High × 18" Wide,
Weight 62 lbs. (empty).

Utilities:

Beckett Burner.

Burner Requires 120 VAC ,60 Hz, 6 Amps Power.

Diesel/JP-8 Fuel.

Transportation:

Two man lift integrated within the Air Force Single Pallet Expeditionary Kitchen (SPEK).



System Highlights/Benefits

- ▲ Cost effective...uses COTS burner.
- ▲ Capable of burning JP-8 fuel in compliance with fuel standardization per DoDD 4140.25, DoD Management Policy for Energy Commodities and Related Services.
- ▲ Fully automatic.
- ▲ Provides hot water for cleaning and food preparation.

Comments

Recently major improvement and refinements have been made and incorporated into the TDP supplied to the AF. This provides steam to heat the sink water, 120° F water for hand washing and 180° to 190° F water for coffee and other food preparations. It uses a high temperature alloy combustion chamber designed for field use.



Mess Kit Laundry and Mess Kit Sanitation

Purpose

Provides a safer, upgraded system for Air Force personnel to wash and sanitize mess kits in the field. Previous mess kit laundries used dangerous gasoline fired immersion heaters placed in metal trash cans. Because gasoline has been eliminated from field use, the immersion heaters have become obsolete.

Characteristics

The Mess Kit Sanitation Program includes non-stick coatings that promote easier cleanup and a novel anti-microbial agent that inhibits bacterial growth for the dining kit surface.

Each new mess kit laundry consists of a stainless steel prewash sink, wash sink, rinse sink and sanitizing sink. Water temperature is controlled by means of electric immersion booster heaters.

Capacity

Serves 400 Air Force personnel per set of sinks.

Dimensions

Single compartment sinks measuring 24" Long x 30" Wide x 14" Deep.

Utilities

Field generators provide power for the booster heaters.

Transportation

Transported in Conex containers.

System Highlights/Benefits

- ▲ Mess kits will be easier to sanitize and maintain.
- ▲ Threat of disease from contaminated mess kits will be reduced.
- ▲ Electric powered; mess kit eliminates gasoline fired immersion heaters and improves safety.







Insulated Food Container

Purpose

As a replacement to the standard, military specification Mermite container previously used to maintain food temperatures during transport, the IFC is a commercially available item providing improved handling, loading, stacking and serving capabilities.

Characteristics

The IFC is used to maintain food at acceptable serving temperatures at environmental extremes (-25° F to 120° F) during transport from field kitchens to soldiers at remote sites. The IFC is durable, uses standard size steam table pans, allows for easy field sanitation, and is produced using high-density polyethylene for impact resistance. The container is issued with three 1/3-size, 6" deep stainless steel insert pans with covers and gaskets.

Capacity:

Holds 3 1/3-size, 6" deep insert pans.

Dimensions:

25" Long × 17" Wide × 9-1/4" Deep.

Utilities:

N/A

Transportation:

The Insulated Food Container is easily transported in the field kitchen or by truck.

System Highlights/Benefits

- ▲ Commercially available
- ▲ Uses standardized steam pan tables
- ▲ Durable; produced using high density polyethylene.

Comments

Two types of the IFCs are available 10" deep:

NSN 7360-01-419-6261, Brown (Desert Sand), Class 1

NSN 7360-01-419-8500, Green (Olive), Class 2

and two 12" deep versions are available.

NSN 7360-01-452-0686, Brown (Desert Sand), Class 1

NSN 7360-01-408-4911, Green (Olive), Class 2

The IFCs conform to Commercial Item Description (CID) A-A-52193. Cambro Manufacturing Company (CAGE Code 21669) also offers repair parts.





Field Feeding & Advanced Sustainment Technology (FAST)

Purpose

Replaces burners, generators and military unique appliances with a compact, efficient central heat concept that enables reliable, quiet cogeneration, labor saving high capacity commercial appliances.

Characteristics

Fast Food Service is a revolutionary change in field feeding. Designed as a liquid injected cogeneration system that provides heat and electric power to kitchen appliances, FAST, will reduce the logistics of field feeding including manpower, equipment, vehicles, and consumables, while maintaining the quality of food service. By integrating commercial appliances with cogeneration, this new technology offers a very efficient high quality versatile heat source that will be used for heat-driven refrigeration and integral sanitation. Heat will be used to recycle the kitchen's gray water via multistage distillation.

Capacity:

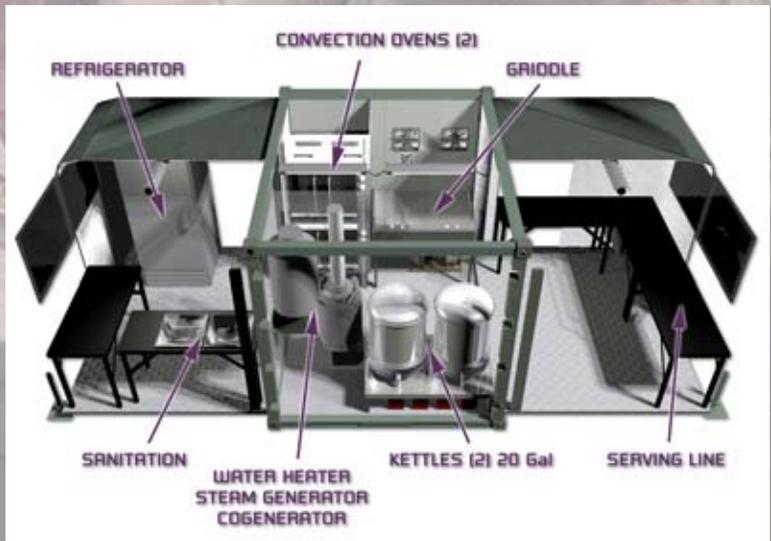
Supports 500+ warfighters/meal.

Dimensions:

8' x 10' Expandable ISO Container (expands to 24' x 10').

Transportation:

HMMWV and LMTV towable platform or air pallet.



System Highlights/Benefits

- ▲ Central heater with cogenerator provides heat and electric power.
- ▲ Reduced footprint.
- ▲ Integrated heat driven refrigeration, sanitation, and grey water recycling.
- ▲ Enables use of commercial appliances.

Comments

Prototype design, fabrication and testing are expected to be completed in 3Q04 with demonstrations and metrics validation to follow. Technology transition planned for PM FSS C3I Program for the Containerized Kitchen.



Pocket Stove

Overview

A pocket-sized stove that burns battlefield fuel will provide soldiers a safe way to heat water for beverages, dehydrated rations and limited personal hygiene. The Pocket Stove is a small lightweight stove that requires one ounce of fuel and can burn for about 10 minutes, heating 16 ounces of water. Within a few minutes the stove will cool and can be packed and stowed.

Characteristics

To operate the stove, soldiers first add an ounce of fuel that is stored in a small reusable container. The fuel is ignited using a match from the MRE. A canteen cup, part of the soldier's standard issue, is filled with water and placed in a stand over the stove.

Capacity:

Can burn for 10 minutes on 1oz of fuel heating 16 oz of water.

Dimensions:

Weighs less than 4 oz, pocket-sized and collapse for packing.

Utilities:

Battlefield fuels (JP-8 and diesel).

Transportation:

Stowed in backpack pocket or canteen cover.

System Highlights/Benefits

- ▲ Logistic Support...The pocket stove burns battlefield fuels (JP-8 and diesel).
- ▲ Compact Design...Weighing less than 4 ounces.

Comments

The Pocket Stove is anticipated to enter the Soldier Enhancement Program (SEP) and/or Marine Corps Enhancement Program (MEP).





Future Navy Galley

Overview

State of the art food service equipment and modular systems are needed to support future feeding on board all new Navy ships and submarines. Food service equipment emerging technologies, which have potential to reduce cooking times and accommodate labor reductions; need to be integrated into complete modular systems.

With the introduction and increased use of prepared foods, and the continued use of scratch cooking, a need exist to better equip and design future galleys. Information on future design and manning requirements will need to be evaluated to determine the requirements for feeding onboard all new ship platforms. The goal of this program is to provide the Navy with improved specifications and guidelines for the construction of future galleys, treat the galley as a system, and improve the quality of life for the mess specialists.

System Highlights/Benefits

- ▲ Modular Food Service Systems (MFSS) designed for individual shipboard platforms can ensure that the very best in food service equipment technology and design is placed on board each newly constructed Navy Ship and Submarine.
- ▲ Modular Food Service Systems (MFSS) will incorporate, equipment, storage space and manpower for each new class of ship.
- ▲ Uses most effective technology.

Comments:

Only approved food service equipment from the Navy's Food Service Equipment Catalog will be used in future Navy Galleys.

Design prototype Modular Food Service System; 4Q04-3Q05.





Product Improvements for Fielded Food Service Equipment (PIFFSE)

As we provide critical food service equipment to our service members we must also maintain a focus on continuously retaining and developing a superior product. Through the Product Improvements for Fielded Food Service Equipment (PIFFSE) Program, the Combat Feeding Program along with the Product Manager-Force Sustainment Systems has implemented many enhancements to food service components. Some recent Improvements include:

- ▲ Improved gasket system for the Insulated Food Container (IFC) insert pan covers to prevent tearing during removal and installation (FY02).
- ▲ Upgraded roof jack assembly components for the Mobile Kitchen Trailer (MKT) to reduce wear and prevent corrosion (FY02).
- ▲ Redesigned lid and closure system for Cambro ice storage chests used on the MKT (FY02).
- ▲ Transitioned a new squad style stove to the CID A-A-59378 (FY01).
- ▲ Developed a tray ration heater accessory to adapt the field range cabinet square head roasting pan and the tray ration heater tank into a warming table (FY00).
- ▲ Added a fluorescent lighting system with tandem plug-in features to the MKT (FY00).
- ▲ Portable commercial hand wash stations for the soldiers to wash their hands prior to getting their meals at field kitchens transitioned (FY99).
- ▲ MKT griddle/grease-chute was redesigned (FY99).
- ▲ Developed a durable gasket for the field oven used in the Modular Field Kitchen (FY98).
- ▲ Modified the roof vent assembly on the MKT to allow the procurement of the vent's screen component to be procured separately from the entire vent assembly (FY98).



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