ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

February 2002

BUDGET ACTIVITY	PE NUMBER AND TITLE
2 - Applied Research	**0602786A - LOGISTICS TECHNOLOGY**

	COST (In Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
	Total Program Element (PE) Cost	26529	33474	25502	23655	23141	23736	24304
283	AIRDROP ADV TECH	3614	6534	3112	1860	2462	2540	2599
C60	AC60	873	1454	0	0	0	0	0
H98	CLOTHING & EQUIPM TECH	15623	16803	16667	16329	14954	15577	15917
H99	JOINT SERVICE COMBAT FEEDING TECHNOLOGY	6419	7683	5723	5466	5725	5619	5788
WA1	CENTER FOR RELIABLE WIRELESS COMM TECH	0	1000	0	0	0	0	0

A. Mission Description and Budget Item Justification: This Program Element (PE) improves soldier survivability and performance by researching and investigating technologies for: combat clothing and personal equipment; combat rations and combat feeding equipment; and the air delivery of personnel and cargo. This program element supports the Army Transformation in the areas of improved dismounted soldier capabilities (project H98), logistics footprint reduction (project H99), and rapid deployment (project 283). The Clothing and Equipment Technology project (H98) funds cutting edge research and technologies for clothing, equipment, and high-pressure airbeam supported shelters. Technologies will enhance warfighter survivability from both combat threats (e.g., ballistics, flame, directed energy) and the field environment; enhance signature management and integration; provide alternative self-sufficient power; and significantly lighten the soldier's load. Human science is incorporated into modeling and analysis tools that will enable technologists and military users to trade-off potential warrior system capabilities and develop a human-centered warrior system design. The Joint Services Combat Feeding Technology program (H99) supports all Military Services, the Special Operations Command, and the Defense Logistics Agency with research and development of high impact/high payoff technologies for performance enhancing combat rations, packaging, and combat feeding equipment/systems. Research will enhance nutrient composition and consumption to maximize cognitive and physical performance on the battlefield; minimize physical, chemical and nutritional degradation of combat rations during storage; meet the needs of individual soldiers in highly mobile battlefield situations; and provide equipment and energy technologies to reduce the logistics footprint of field feeding while improving the quality of food service. Similarly, the Airdrop Advanced Technology project (283) supports all Services' requirements for air dropping larger combat and logistics loads while improving delivery accuracy, minimizing vulnerability of aircraft, and reducing life cycle costs. Investigation of technologies for safer, more combat efficient personnel parachutes addresses a critical capability for rapid deployment force projection, particularly into hostile environments. Contractors performing the work for this PE include: Alliant Technology, Inc., MN; General Dynamics, MI; South West Research Institute, TX; Ceradyne, Inc. CA; University of Virginia, VA; University of Rhode Island, RI; H.P. White Laboratory, MD; Irvin Aerospace, Inc., CA; Vertigo, Inc., CA; Simulation Technologies, Inc., OH; University of Massachusetts/Lowell, MA; Rensselaer Polytechnic Institute, NY; UMASS, Amherst, MA; and CERCOM, Inc., CA. The cited work is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance. It adheres to Tri-Service Reliance agreements on clothing, textiles, and operational rations and field food service

equipment, with oversight and coordination provided by the Human Systems Reliance Panel, the Warrior Systems Technology Base Executive Steering Committee, and the Department of Defense (DoD) Food & Nutrition Research & Engineering Board. The program element contains no duplication with any effort within the Military Departments. Efforts are coordinated with those in PE 0603001A (Warfighter Advanced Technology). Work is performed by the Natick Soldier Center, Natick, MA.

B. Program Change Summary	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2002 PB)	27901	27061	23260
Appropriated Value	28159	33761	0
Adjustments to Appropriated Value	0	0	0
a. Congressional General Reductions	0	-287	0
b. SBIR / STTR	-516	0	0
c. Omnibus or Other Above Threshold Reductions	0	0	0
d. Below Threshold Reprogramming	-857	0	0
e. Rescissions	-257	0	0
Adjustments to Budget Years Since FY2002 PB	0	0	2242
Current Budget Submit (FY 2003 PB)	26529	33474	25502

Change Summary Explanation:

FY01 - Congressional adds were made for Combat Feeding, Project H99 ($1500); Affordable Guided Airdrop System, Project 283 ($1000); and Blisterguard Socks, Project H98 ($1000).

FY02 - Congressional adds were made for Airbeam Manufacturing Process, Project H98 ($1000); Center for Reliable Wireless Communications Technology for Digital Battlefield, Project WA1 ($1000); Combat Feeding, Project H99 ($1700); Standoff Precision Aerial Delivery System, Project 283 ($2000); and Army Nutrition Program, Project H99 ($1000).

- ($1000) Center for Reliable Wireless Communications Technology for Digital Battlefield, Project WA1: The objective of this one year Congressional add is to support research in a wireless testbed facility for potential application to digital communications. No additional funding is required to complete this project.

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602786A - LOGISTICS TECHNOLOGY**	**283**

COST (In Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
283 AIRDROP ADV TECH	3614	6534	3112	1860	2462	2540	2599

A. Mission Description and Budget Item Justification: This project researches technologies to enhance personnel and cargo airdrop capabilities. These are key Army Transformation rapid deployment capabilities for force projection, particularly into hostile areas. Areas of emphasis include parachute technology for improved performance, precision offset aerial delivery, soft landing system development, airdrop simulation, and low altitude/high speed airdrop systems technologies. Efforts will result in increased personnel safety, more survivable and more accurate cargo delivery and reduced personnel, aircraft, and cargo vulnerability. This project will enhance the military's capability for global precision delivery and rapid force projection and supports the rapid deployment goal of the Army Transformation. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2001 Accomplishments:

- 1714 - Identified and analyzed candidate concepts for a low cost, precision airdrop resupply capability for humanitarian and other one-time-use operations.
  - Conducted market analysis for state-of-the-art technologies for decreasing rate of descent and automatic activation capabilities for personnel parachutes.
  - Conducted feasibility experiments with candidate low cost precision airdrop concepts and advanced cargo airdrop mechanisms.
  - Fabricated and conducted preliminary tests on miniaturized airdrop instrumentation package.
- 900 - Incorporated additional advanced features into a second-generation three-dimensional high performance airdrop system model and validated with concurrent experimentation as part of a High Performance Computing (HPC) Grand Challenge program.
  - Simulated airdrop systems of interest to DoD, incorporated results to enhance Guidance, Navigation, and Control (GN&C) logic, and packaged software into a user-friendly Graphical User Interface (GUI) environment for use as an "airdrop virtual proving ground".
- 1000 - FY 2001 Congressional plus-up furthered research for an Affordable Guided Airdrop System (AGAS) to include GN&C and improved pneumatic control systems.
  - Performed an integrated flight test utilizing AGAS technologies.

Total 3614

FY 2002 Planned Program

•	1064	- Research additional components and technologies in support of the Precision Roll-on/Roll-off Air Delivery STO and transition to 6.3 STO programs.
•	700	- Design automatic opening capability system prototypes and conduct systems integration/human factors analysis.
•	799	- Utilize Airdrop System Modeling to simulate brassboards and prototypes in tech base and development programs (such as the Affordable Guided Airdrop System and the Advanced Tactical Parachute System) while validating the results with flight test data.
•	1971	- Research concepts for, and feasibility of, developing a 20-ton, high altitude (25,000 ft), high offset (30 km) precision airdrop system to provide greater deployability and sustainability for the Objective Force.
•	2000	- FY 2002 Congressional plus-up for Standoff Precision Aerial Delivery System. Funding will develop a computer based airdrop mission planner to improve the accuracy of ballistic and autonomous airdrop systems.
Total	6534	

FY 2003 Planned Program

•	972	- Complete GUI front end for Airdrop System Modeling tools and complete the approved HPC Grand Challenge program objectives. - Optimize the design of advanced low cost autonomous controllable airdrop systems utilizing HPC modeling tools.
•	1140	- Design and conduct scaled tests on smaller and less expensive autonomous GN&C systems for low and primarily high altitude airdrop applications.
•	1000	- Fabricate system component prototypes for automatic opening capability and conduct component-level field experiments.
Total	3112	

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

February 2002

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602786A - LOGISTICS TECHNOLOGY**	**H98**

COST (In Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
H98	CLOTHING & EQUIPM TECH	15623	16803	16667	16329	14954	15577	15917

A. Mission Description and Budget Item Justification: This project supports the Army Transformation in the area of improved dismounted soldier capabilities by researching and investigating technologies to improve soldier survivability and performance. Areas of emphasis include: research to significantly lighten the soldier's load; lightweight materials for personal survivability (e.g., improved ballistic, flame, and directed energy protection, enhanced signature management); human science, modeling and analysis tools for optimizing soldier system clothing and equipment; three-dimensional textiles for achieving rapidly deployable wide-span airbeam supported shelters. These advanced technologies are being investigated to support the requirements of the Objective Force. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2001 Accomplishments:

- 5744 - Evaluated simulations for virtual prototyping tools to develop warrior system designs, with a focus on integrated load carriage, helmet design, and component/capability placement on the torso and head; developed virtual prototyping approaches to analyze biomechanic effects of soldier systems designs; demonstrated the feasibility of incorporating nano-scale materials in soldier system components to reduce weight and/or enhance performance; fabricated lab scale quantities of carbon nanotube materials for prototype ballistic testing.

  - Determined required level of human system data points to enable quantitative measures of soldier system performance, validation of small unit combat analysis models, and development of soldier system virtual prototyping and design tools; collected required human system data to accomplish those tasks.

- 5600 - Extended the IUSS individual/small unit combat model to provide the initial ability to assess the effects of restricted terrain (e.g., rooms, hallways, trenches) on warrior system performance.

  - Transitioned improved test methodology/assessment criteria for protective helmet systems to the acquisition community to enable the trade-off of protection, weight, and affordability; continued to mature novel concepts to increase protection and decrease the weight of personnel armor components.

- 2164 - Determined effects of varied topographic and terrain conditions on soldier performance through biomechanical evaluations; extended the passive dynamic gait model to encompass terrain data; augmented 3-D anthropometric scanning capabilities to include tools for applications supporting human-based modeling/simulation and novel uniform and equipment virtual prototyping and design concepts.

FY 2001 Accomplishments: (Continued)

- Investigated and processed electronic and photonic materials using electrospinning and electrostatic layer-by-layer deposition techniques into novel, high surface area nano-structures; assessed energy density and conversion efficiency potential for future power generating devices for soldier use.

• 2115 - Showed a 30% cost decrease compared to the cost of existing flame-resistant combat clothing systems while maintaining multiple threat protection levels; demonstrated flame resistant knit fabrics with a cost savings from 10-30%.

- Modified the breadboard design of millimeter-lens arrays for laser eye protection devices to decrease the length of the optical assembly to make them more compatible with human factors criteria. This technology will support all soldiers, including mounted and infantry, in the Objective Force.

- Demonstrated the ability of an airbeam-supported structure to span a cross section exceeding 85 feet in width and developed a rapidly deployable large weapons platform maintenance shelter prototype 85' x 120' long.

Total 15623

FY 2002 Planned Program

• 7293 - Enhance the capabilities of virtual prototyping tools, focusing on the head and torso areas, to advance the state-of-the-art in designing body worn soldier clothing and equipment.

- Produce breadboard prototype panels or system components made with nanomaterials for performance testing to determine the potential for significant system weight reduction and/or enhanced performance.

- Collect additional required human system performance data to support soldier system design decisions.

• 6042 - Develop close combat/small arms algorithms to assess warrior survivability and lethality at distances less than 25 meters.

- Complete an improved personnel armor casualty assessment model that will permit evaluation of personnel armor systems against conventional and emerging ballistic threats.

• 2468 - Provide design guidance for load carrying equipment that enhances mobility performance across squad positions by 15%.

- Improve energy density and conversion efficiencies of photovoltaic nanostructures to promising levels for soldier system use through unique materials, modeling, processing and fabrication strategies.

• 1000 - FY 2002 Congressional plus-up for Airbeam Manufacturing Process. Funding will develop manufacturing technology to improve affordability and reliability of new inflatable textile based structures for deployable shelters.

Total 16803

FY 2003 Planned Program

- 6300 - Collect/use human system data to enhance and verify virtual prototyping tools for soldier systems with human biomechanical and performance data.

  - Evaluate the performance of breadboard prototype panels or system components made with nanomaterials to determine technology readiness for transition to the planned Objective Force Warrior program (PE63001, Proj J50), and to determine the path for further nanotechnology refinement and manipulation.

- 6037 - Show a capability to represent human behavior using reactive intelligent agents in the close combat/MOUT environment. Modeling will significantly improve combat worth assessments of warrior systems.

  - Investigate an improved material system breadboard (over FY99 insertions) for 2nd generation multiple ballistic threat protection prototype with 25% decrease in weight (or an increase in protection or a combination, depending on user requirements). Display a protective (opaque) armor system with 30% reduced area density (over FY00 baseline) against fragment threat without incurring significant cost, bulk, or flexibility penalties.

- 2856 - Show that physical training programs improve locomotor performance by 15%. Provide physics-based model of locomotion to enable soldier system equipment developers to design more efficient system components.

  - Fabricate conformal solar cell devices with a minimum 30% reduction in weight (when compared to power devices of similar current devices) for use in soldier systems.

- 1474 - Research, identify and analyze multiple materials and design concepts for form fitting combat uniform that provides a 20% weight reduction over standard uniform.

  - Enlarge breadboard lens array design to the size required for eyewear and define the curvature requirements for using arrays in a goggle. This will lead to a goggle that provides agile laser eye protection, vs. the current fixed line approach, for all soldiers.

  - Evaluate the unique dynamics which an urban battlefield imposes on the soldier's total camouflage signature and explore effective signature management treatments for the urban warrior.

Total 16667

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602786A - LOGISTICS TECHNOLOGY**	**H99**

COST (In Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
H99	JOINT SERVICE COMBAT FEEDING TECHNOLOGY	6419	7683	5723	5466	5725	5619	5788

A. Mission Description and Budget Item Justification: The Joint Services Combat Feeding Technology project researches and applies combat feeding and food system technologies to revolutionize the manner in which we sustain and support the Armed Forces, ensuring optimal nutritional intake. This project supports the Army Transformation in the areas of sustainability and reduced logistics footprint. Thrust areas include: applied research of combat rations, packaging, and combat feeding equipment/systems. Near-term goals include: enhancing nutrient composition and consumption to maximize cognitive and physical performance on the battlefield; reducing ration weight/volume and food packaging waste to minimize the logistics footprint; tailoring rations to the combat situation and radically improving mobility; reducing replenishment demand by extending shelf-life, permitting more extensive prepositioning of stocks, while maintaining initial quality; and providing equipment and energy technologies to reduce the logistics footprint of field feeding while improving the quality of food service. The work in this project supports all military Services, the Army's Objective Force, Special Operations Command, and the Defense Logistics Agency. The Army has Executive Agency responsibility for this DoD program. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2001 Accomplishments:

- 1702 - Completed prototype design, fabrication and testing of innovative scroll expander for Liquid-Injection Cogeneration that enables silent efficient and reliable heat and power production for field kitchens; transitioned to another task within this project (Field-feeding and Advanced Sustainment Technology (FAST Food Service)).

  - Completed research for three competing cogeneration concepts for current field kitchens based on Thermophotovoltaics, Stirling Cycle, and Liquid-injected cogeneration. Designed for a nominal output of 500 watts, the cogenerators will replace the current 2 kW engine driven generator used in current kitchens with less noise, fuel consumption, and maintenance requirements.

  - Conducted a design study for thermoacoustic refrigeration that uses environmentally friendly refrigerants and only has one moving part to enhance reliability.

  - Completed design and testing of a lightweight self-powered sanitation center based on one sink. Using a standard shelter heater and four 30-watt thermoelectric modules, the center provides a spray wash capability and uses 1/3 the water of conventional systems. Tested and evaluated non-stick coating and sanitizing solutions for future waterless sanitation system for use in field kitchens.

FY 2001 Accomplishments: (Continued)

- 565 - Completed research and prototype development of Soldier Pocket Stove technology to validate/demonstrate revolutionary non-powered combustion technology; transitioned to Soldier Enhancement Program (PE/Proj 654713/668). Stove technology provides effective capability for soldiers to heat water for beverages, rehydrated rations, and personal hygiene.

  - Researched technology for Remote Unit Self-Heating Meals (RUSHM) including integration of food and heaters, and heat transfer modeling and testing to ensure environmental compliance and optimum performance at lowest cost. RUSHM provides hot group meals for the Objective Force prior to arrival of Combat Support Augmentation Team.

- 2450 - Completed research and conducted initial testing of combat optimized ration components to include engineered carrier matrices for bioengineered proteins, encapsulation technology for smart food ration components, and new delivery systems (i.e., gels) to increase cognitive/physical performance. Transitioned mature technology/components to First Strike Ration (FSR) and Performance Enhancing Delivery Systems (PEDS).

  - Completed concept evaluation of products produced with advanced dehydration technologies which reduce ration weight, volume and total logistics costs; transitioned to System Demonstration and Developpment (SDD) phase (PE/Proj 643747/610 Food Advanced Development).

  - Evaluated commercial components for ration quality status indicators for potential use by military logistics personnel to ensure least fresh, first out; designed integrated sustainment supply/requisition/distribution concepts that support DoD/Department of Army logistic initiatives and minimize logistical impacts, theatre stockpiles and resupply requirements.

  - Conducted technical research and developed initial design of smart packaging system prototypes that: will respond to the environment and have potential to provide a reduced signature single packaging system for all rations; will prevent lipid oxidation and help prolong quality retention of shelf stable ration items; and will use intercomponent films for multi-component ration items to increase product quality and menu variety.

- 1702 - Researched technology and evaluated pressure effects on texture mediated by activation/release of native enzymes in fresh vegetables (pectin esterases) or meats (proteases) as a pretreatment to reduce dehydration or thermal processing requirements for ration components, while maintaining initial quality.

  - Conducted processing trials to determine feasibility of utilizing and/or modifying existing methods and techniques; optimized processing parameters to enhance orientation of nanocomposite fillers, such that gas diffusion will be minimized, extending barrier protection for combat rations.

  - Conducted research and initiated technical testing of mixed culture samples to evaluate the potential and time for detecting and differentiating specific volatile compounds from food pathogens for use in easy-to-use, lightweight, field biosensor.

FY 2001 Accomplishments: (Continued)

- Investigated innovative food preservation technologies (thermal and non-thermal); awarded contract to assess the feasibility of novel nutrient delivery systems; researched foundations for enhancing human performance in stressful situations through nutritional initiatives; researched and evaluated material sciences for advanced food packaging systems to maintain barrier properties while improving environmental compliance; identified food safety detection and intervention methodologies for countering both bioterrorism threats and natural microbial pathogens in military feeding operations.

Total 6419

FY 2002 Planned Program

- 1807
  - Investigate technology and conduct validation testing of selected carriers for "smart" food ration components to sustain cognitive and physical performance. Transition to SDD phase (PE/Proj 643747/610 Food Advanced Development).
  - Complete data analysis from Combat Optimized Rations Concept demo, implement changes and transition to First Strike Ration to reduce combat ration weight and volume.
  - Identify pathogen specific Volatile Organic Compounds (VOCs) and initiate exploratory development of recognition elements for incorporation into a surface scanning biosensor for ration contamination assessment.
  - Research and evaluate sensors and other components of the computer-based externally monitored ration quality system.
  - Research and produce a prototype of a shelf stable meat and vegetable bar and a family of shelf stable breakfast concepts that will expand menu choice, enhance mobility and reduce weight and cube.
  - Investigate ration packaging technologies, including nanocomposites, ultra-high barrier polymers, barrier films, and films with chromatic pigments, to extend quality/shelf-life of combat rations, reduce their weight and signature and minimize environmental impact while meeting operational requirements.
- 1260
  - Complete technology maturation of high pressure ration processing to dramatically improve nutrient retention and sensory quality; transition to Fielded Individual and Group Ration Improvement Programs.
  - Complete research of mixed culture samples and develop strategy for identification of bacterial volatile compounds with field biosensors for ration contamination assessment to improve sensitivity and reduce identification time.
  - Design and assess methodologies for indexing the satiety value of military rations to improve acceptance and reduce battlefield waste.

FY 2002 Planned Program (Continued)

- Research novel delivery systems for performance enhancing nutrients. Based on contract results, determine feasibility of transdermal nutrient delivery systems and identify candidate nutrients based on bioactivity, physical/chemical properties, and cognitive, physical enhancement potential; determine relationship between gelled/emulsified/slurried ration components and consumer acceptability/ration stability.

• 1260 - Fabricate and test three competing prototype cogenerators for field kitchens which demonstrate high reliability, quiet operation, and high efficiency; downselect and transition to SDD phase (PE/Proj 643747/610 Food Advanced Development).

- Research technology for thermoacoustic refrigeration and test concepts for tempering frozen meats in a field environment to improve food safety.

- Research technology, design and fabricate experimental filtration and distillation prototypes for water conservation and re-utilization program for field kitchens to significantly reduce water requirement and gray water produced by field kitchens.

- Develop heat transfer models, investigate materials, and develop designs for a lightweight insulated food container to reduce weight and cube by 50%.

- Complete assessment of the effects that new technology and proposed kitchen systems have on field feeding manpower requirements.

• 656 - Integrate second generation cogenerator with kitchen appliances in a 10-foot expandable ISO container for FAST Food Service, an integrated field feeding concept that reduces logistics by 75% (parts, weight, footprint, fuel and water) and reduces manpower requirements by 50%. Conduct preliminary test and evaluation of container concept to determine user requirements for an FY04 demonstration; transition to 6.3 FAST program.

- Complete research and testing of heating element and heat transfer mechanism for RUSHM and transition to SDD phase (PE/Proj 63001/C07 FAST Program).

• 1700 - FY 2002 Congressional plus-up to research food and field feeding technologies to improve food quality to the warfighter.

• 1000 - FY 2002 Congressional plus-up to support research in nutrition for the warfighter.

Total 7683

FY 2003 Planned Program

•	2007	- Downselect Surface Scanning technology and modify coupled biochemical recognition elements for ration contamination assessment; complete research to validate zero false positive and negatives; transition to SDD (6.4).
		- Research technology for shelf stable meat/vegetable bars and breakfast bars/components to optimize quality and weight/cube reduction; transition to SDD phase (PE/Proj 643747/610 Food Advanced Development).
		- Investigate the use of encapsulated proteins to improve protein profile of high carbohydrate/high fat ration items enhancing ration acceptability while reducing volume, as compared to traditional meals.
		- Evaluate prototype film technology produced using nanocomposites and combining microlayering techniques; assess the barrier properties of the non-foil films for ration packaging and evaluate effectiveness and shelf-life properties of polychromide pigments.
•	1481	- Research, design and fabricate concept Transdermal Nutrient Delivery System that lightens the soldier's load and provides targeted performance enhancement during high intensity, short duration missions. Identify candidate nutrients and develop protocols for limited human testing of selected nutrients to assess impact on performance.
		- Evaluate physical and sensory properties of gels, emulsions and slurries developed to optimize eat-on-the-move and performance enhancing capabilities of combat rations for the Objective Force.
		- Mature technology for a microelectronic analog of the petri dish to reduce detection times and improve sensitivity to identify pathogenic bacteria; transition to Surface Scanning Biosensor program.
•	741	- Mature technologies for individual FAST Food Service subsystems including appliance heat exchangers, steam generator, control system, heat driven refrigeration, and water recycling sanitation system.
•	1494	- Explore thermoelectric technology and model concept designs for a lightweight device to provide hot water to heat/rehydrate meals and to provide cold drinking water for crew sustainment in Future Combat Systems and Objective Force vehicles.
		- Complete initial technology demonstration of Non-Powered Tempering System to determine the feasibility of safely tempering frozen meat products in the field.
		- Continue evaluation of experimental filtration and distillation technologies for water conservation and re-utilization to significantly reduce the logistics impact of field feeding and sanitation systems.
Total	5723	