Fiscal Year:	FY 2012	**Task Last Updated:**	FY 10/20/2011
PI Name:	Catauro, Patricia M.S.		
Project Title:	Suited Contingency Ops Food		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Space Human Factors Engineering		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **SHFH**:Space Human Factors & Habitability (archival in 2017)		
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	Houston	**State:**	TX
Zip Code:	77058	**Congressional District:**	22
Comments:			
Project Type:	Ground	**Solicitation / Funding Source:**	Directed Research
Start Date:	10/01/2008	**End Date:**	10/01/2011
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NASA JSC
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Flight Program:			
Flight Assignment:	NOTE: End date changed to 10/1/2011 for reporting purposes (Ed., 9/26/2011) NOTE: Start date changed to 10/01/2008 per M. Perchonok (was 10/01/2007)--5/2009		
Key Personnel Changes/Previous PI:	Co- Investigator John Glass (MEI Technologies) added for FY2011.		
COI Name (Institution):	Glass, John W (MEI Technologies)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The Advanced Food Technology (AFT) project aims to provide astronauts with a food system that will maintain safety and ensure performance throughout NASA exploration missions. Part of this task has involved the development of a nutrition delivery system for use in suited survival operations. In addition to the constraints of mass, volume, and crew resources that influence design of all spaceflight systems, design of a contingency food system is also affected by other constraints. A contingency food system must have adequate interface with mission pressure suits and relevant vehicle hardware, and must function in a hypobaric and microgravity contingency environment. Proposed in FY2009, the Suited Contingency Ops directed research project has sought to define the requirements for and facilitate the development of such a contingency food system. Although the need for NASA to develop a food system to support contingency events is no longer immediate, the tasks conducted to date for this project offer valuable insight into hardware design for nutrition delivery to suited crewmembers, and are likely to have relevance to NASA in the future. These tasks and the corresponding findings are summarized within this report.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	The study seeks to define a nutrition delivery system for in-suit use. The results likely have relevance to future manned spaceflight programs, and may also prove useful for pharmaceutical, medical, and performance foods industries.
Task Progress:	To ensure that the NASA food system promotes crew safety and performance in all mission phases, AFT has worked to develop a nutrition system that would feed astronauts in pressurized spacesuits. In addition to the constraints of mass, volume, and crew resources that influence the development of all spaceflight systems, design of a contingency food system is also affected by other constraints. The designed delivery system hardware must interface with pressurized spacesuits and vehicle hardware, and must function in the absence of pressure and gravity. Additionally, the beverage for use in this system must meet a variety of requirements related to crew health and nutrition in contingency events. After working to identify all considerations from hardware design teams and health-related disciplines, AFT continued to act as the primary integrator in developing delivery hardware and selecting an appropriate nutritional beverage. In light of the findings of the FY2010 glove box assessment of contingency feeding system design concepts, 8 new designs were created during the period, as part of “Generation 2” hardware design for this project. Five of these designs represented modifications to the most successful “Generation 1” hardware to further improve its performance. The remaining 3 designs, although relying on some hardware tested in Generation 1, represent distinct (new) design concepts. The main proposal in Generation 2 that was expected to improve on earlier hardware was the modification of the feedport nozzle adapter hardware to incorporate a backfill prevention mechanism. Such a backfill prevention mechanism was a resultant recommendation from the glove box testing, as a means to overcome the pressure differential between suit and cabin, but still allow effective dispensing of beverages to a crewmember. The backfill prevention mechanism identified as part of Generation 2 was a one-way check valve that would prevent air from flowing out of the suit and into the feeding system, but still allow liquid to dispense from feeding system into suit. Several watch items were identified relating to the placement of the one-way valve on the nozzle adapter, including a need to confirm that the valve could be cleaned adequately, and that it would function with both low and high viscosity nutritional beverages and nutritional beverage dispersions. Follow on testing is encouraged to verify these watch items for future applications. Furthermore, if the placement of the one-way check valve on the nozzle adapter is verified, testing of the Apollo Soft Goods Pouch, Toothpaste Key, Toothpaste Turnkey, and Commercial Spouted Pouch designs should also be performed at differential pressure. This would assess the combined effects of backfill prevention and mechanical aids on the effectiveness of dispensing fluid from these designs. In addition to these proposed modifications to articles evaluated in the glove box assessment, three new designs were proposed to build on the evaluated concepts: a Ratcheting Key, Cable Constricting Restrainer Pouch, and Bag in Bag Concept. The Ratcheting Key design would rely on a rotating key as a mechanical aid. Due to changes in agency direction, the direct need for a contingency food system is no longer present. This project has, therefore, been concluded prematurely. Still, the work conducted to date on this project is likely to be relevant to NASA needs in the future. In the event that there becomes an interest in pursuing this type of development in the future, researchers have made a diligent effort to summarize project methods, task findings, and specific recommendations for future work.
Bibliography Type:	Description: (Last Updated: 03/22/2018)
Abstracts for Journals and Proceedings	Catauro P. "Design of a Nutrition Delivery System for Use in Suited Contingency Survival Operations." Poster Presentation. 2010 NASA Human Research Program Investigators' Workshop, Houston, TX, February 3-5, 2010. 2010 NASA Human Research Program Investigators' Workshop, Houston, TX, February 3-5, 2010. , Feb-2010