Fiscal Year:	FY 2010	**Task Last Updated:**	FY 11/12/2010
PI Name:	Deaconu, Stelu Ph.D.		
Project Title:	Compact, Controlled Force Crew Exercise System		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Biomedical countermeasures		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Muscle**:Risk of Impaired Performance Due to Reduced Muscle Size, Strength and Endurance		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	INDUSTRY	**Phone:**	(256) 256-1220
Organization Name:	Streamline Automation, LLC		
PI Address 1:	3100 Fresh Way SW		
PI Address 2:			
PI Web Page:			
City:	Huntsville	**State:**	AL
Zip Code:	35805-6720	**Congressional District:**	5
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	SBIR Phase II
Start Date:	02/04/2010	**End Date:**	02/01/2012
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
Contact Monitor:	Norsk, Peter	**Contact Phone:**	
Contact Email:	Peter.norsk@nasa.gov		
Flight Program:			
Flight Assignment:	NOTE: End date is 2/1/2012 per HRP Master Task List information (previous end date was 9/3/2011)--Ed., 11/22/2011		
Key Personnel Changes/Previous PI:			
COI Name (Institution):			
Grant/Contract No.:	NNX10CB13C		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Spaceflight adaptations include muscle atrophy, decreased bone mineral density and reduced aerobic capacity making effective resistance exercise countermeasure hardware necessary for safe and successful space exploration. Real-time control is applied to an electric servo-motor to provide resistance in a lightweight, compact, and reconfigurable design. The key real-time force control with the ability to accurately simulate a freeweight lift was successfully demonstrated during Phase 1. A cycle ergometer will be integrated into the system to provide aerobic exercise and power generation. The technical objectives for Phase 2 include the development of a compact flight configuration prototype that supports a variety of exercise modes. The loads are adjustable in 2.5 kg increments to maintain muscle strength and bone density. Limited human subject testing will demonstrate functionality spanning entire anthropometric range. POTENTIAL NASA COMMERCIAL APPLICATIONS: The proposed exercise countermeasure could be used in virtually any aspect of NASA's current and proposed human spaceflight missions. Near-term application aboard the International Space Station could serve as an on-orbit trial for the system. The next major application envisioned for the system is aboard the Altair lunar lander. Initial lunar missions are expected to be a week duration, but Altair is designed to allow the crew to operate on the lunar surface for more than 200 days. Later missions are expected to be of relatively long duration in order to enable NASA to prepare for Mars missions that will involve extended stays. These long term missions will require a resistance exercise system in order to enable the crew to maintain muscle mass and bone density.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Free weights are the gold standard for resistance exercise, but a sizable market has developed that revolves around alternatives to free weights. Spring-based systems are well known, do not accurately simulate the lifting of free weights. Free weights and weight stack-based system tend require significant floor space. There is a market for a compact exercise system that can be easily stored, but that provides the benefits associated with free weights. Stroke victims often experience muscle weakness and paralysis of one or both sides of the body. Intensive movement practice helps "rewire" the brain. More specifically, undamaged cortical areas can assume control functions that were previously allocated to damaged areas. Streamline Automation is pursuing the development a derivative controlled physical therapy system. It will be capable of providing motion assistance to guide the upper and lower-body limbs to help restore coordination, balance, and strength.
Task Progress:	New project for FY2010. Reporting not required for this SBIR Phase 2 project.
Bibliography Type:	Description: (Last Updated:)