Fiscal Year:	FY 2010	**Task Last Updated:**	FY 12/22/2009
PI Name:	Phillips, Andrew J Ph.D.		
Project Title:	Physiologically-Based Modeling of Sleep-Wake Scheduling and the Effects of Pharmaceuticals		
Division Name:	Human Research		
Program/Discipline:	NSBRI		
Program/Discipline--Element/Subdiscipline:	NSBRI--Human Factors and Performance Team		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	None		
Human Research Program Risks:	(1) **Sleep**:Risk of Performance Decrements and Adverse Health Outcomes Resulting from Sleep Loss, Circadian Desynchronization, and Work Overload		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	UNIVERSITY	**Phone:**	617-278-0057
Organization Name:	Brigham and Women's Hospital		
PI Address 1:	Division of Sleep Medicine		
PI Address 2:	221 Longwood Ave. Suite 438		
PI Web Page:			
City:	Boston	**State:**	MA
Zip Code:	02115	**Congressional District:**	8
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2009 NSBRI-RFA-09-01 Postdoctoral Fellowships
Start Date:	10/01/2009	**End Date:**	09/30/2011
No. of Post Docs:	1	**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:**	NSBRI
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Klerman, Elizabeth (MENTOR/Brigham and Women's Hospital)		
Grant/Contract No.:	NCC 9-58-PF02101		
Performance Goal No.:			
Performance Goal Text:			
	POSTDOCTORAL FELLOWSHIP NASA astronauts and ground crew must meet high-level cognitive and physical demands around-the-clock. These tasks place extreme stress on human physiology, which evolved under conditions of 24-hour days with ample rest. The effects of sleep loss, circadian misalignment and extended schedules on performance and alertness pose serious risks to mission success. It is therefore crucial that countermeasures are developed for optimizing schedules and guiding pharmaceutical use. Mathematical modeling provides a means of predicting performance and alertness under many different, including untested, conditions. Improved knowledge of sleep physiology has enabled development of more sophisticated models.		

Task Description:	A physiologically-based model of the sleep-wake switch has been developed and applied to sleep deprivation, shift work, pharmacologic stimuli and fatigue. Meanwhile, a circadian model developed at the Brigham and Women's Hospital has been applied to predicting neurobehavioral performance and alertness, designing pre-mission countermeasures and optimizing mission scheduling. This project will combine the sleep-wake switch and circadian models, including physiological interactions between these systems, yielding the most comprehensive model to date. This will result in improved estimates of performance measures and new diagnostics for assessing schedule suitability on an individual basis, including chronotype (morning/evening preference). Alloying our complementary expertise in sleep-wake switch and circadian modeling will thus provide a significant step forward in assessment and design of mission schedules. Since the model is physiological, it is readily extended to include pharmaceuticals. We will thus also predict the efficacy of drugs such as caffeine, modafinil and melatonin as countermeasures for reducing fatigue and combating insomnia. This will facilitate recommendations for administration before, during and after missions.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	This research project will not only significantly reduce risks on future NASA missions but also will have broad applications to optimizing shift work and other work schedules on Earth, and better understanding and regulating pharmaceuticals use in treating sleep disorders
Task Progress:	New project for FY2010.
Bibliography Type:	Description: (Last Updated: 04/08/2019)