Fiscal Year:	FY 2006	**Task Last Updated:**	FY 01/17/2006
PI Name:	Czeisler, Charles A. M.D., Ph.D.		
Project Title:	Sleep-Wake Actigraphy and Light Exposure During Spaceflight		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Behavior and performance		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HFBP**:Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) **BMed**:Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders (2) **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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City:	Boston	**State:**	MA
Zip Code:	02115-5804	**Congressional District:**	8
Comments:			
Project Type:	FLIGHT	**Solicitation / Funding Source:**	98-HEDS-02
Start Date:	01/24/2001	**End Date:**	04/30/2009
No. of Post Docs:	0	**No. of PhD Degrees:**	4
No. of PhD Candidates:	2	**No. of Master' Degrees:**	2
No. of Master's Candidates:	0	**No. of Bachelor's Degrees:**	2
No. of Bachelor's Candidates:	0	**Monitoring Center:**	NASA JSC
Contact Monitor:	McCollum, Suzanne	**Contact Phone:**	281 483-7307
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Flight Program:	Shuttle/ISS		
Flight Assignment:	STS 121, STS 115, Increment 13 and Increment 14		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Barger, Laura K. Ph.D. (Harvard Medical School) Wright, Kenneth (University of Colorado) Ronda, Joseph (Harvard Medical School)		
Grant/Contract No.:	NCC9-119		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Subjects will wear a small light-weight activity and light recording device for the entire duration of their mission. The sleep-wake activity and light exposure patterns obtain in-flight will be compared with baseline data collection collected for two weeks at L-90 and from L-11 through L-0. Recovery from space flight will also be assessed from R+0 through R+7. These data should help us better understand the effects of space flight on sleep as well as aid in the development of effective countermeasures for both short and long-duration space flight.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	The success and effectiveness of manned space flight depends on the ability of crew members to maintain a high level of cognitive performance and vigilance while operating and monitoring sophisticated instrumentation. Astronauts, however, commonly experience sleep disruption, together with misalignment of circadian phase during space flight. Both of these conditions are associated with impairment of alertness and cognitive performance. A survey of 58 crew members from 9 shuttle missions revealed that most suffered from sleep disruption and were unable to sleep more than six hours per day of flight as compared to 7.9 hours per day on the ground. Ground-based studies have revealed that chronic exposure to such partial sleep loss results in progressive decrements in neurobehavioral performance during waking hours. In fact, nineteen percent of crew members on single shift missions and 50 percent of the crew members in dual shift operations have resorted to sleeping pill usage (principally benzodiazepines) during their missions, which represents more than 40% of all medication used by shuttle crew. Although benzodiazepines are effective hypnotics, their adverse next-day side effects include sedation, performance decrements, amnesia, and distortions in the sleep EEG. Relatively little is known of the severity or cause of space flight-induced insomnia in short duration mission, and less is know about the effect of long-duration space flight on sleep and circadian rhythm organization. This experiment will use state-of-the-art ambulatory technology to monitor sleep-wake activity patterns and light exposure in all crew members aboard Space Shuttle missions. The proposed research could have significant implications for both sleep disorders medicine and space life sciences. The results of the proposed research could lead to the development of a new treatment regimen for sleep disturbances of various etiologies during space flight, which could enable crew members to avoid the decrements in alertness and performance associated with sleep deprivation. This work could therefore have a profound impact on the health, productivity and safety not only of astronauts during space flight, but also of other groups with a high prevalence of insomnia, such as shift workers and older people.
Task Progress:	In the past year (January 1, 2005- December 31, 2005), the Space Shuttle returned to flight (STS-114) and two crewmembers completed the protocol. Baseline data (L-90) data were collected in January 2005, preflight baseline data (L-11) and inflight data were collected in July 2005, and postflight data were collected in August 2005. Four crewmembers on STS-121 were trained in January 2005 and their L-90 baseline data were collected for two weeks in April 2005. We also made substantial progress on the International Space Station portion of this project and have continued preparations for implementing this experiment with ISS crewmembers. The sleep log software is being finalized and will allow implementation of our experiment on ISS. We completed our first crew pitch for ISS crewmembers (Increment 13) in October, 2005 and training was completed in November 2005. Although a crewmember is interested in participating in this experiment, it is unclear at this time whether the research can be supported on Increment 13. Additionally, we have focused on data analysis. Actigraphy data were scored and are undergoing interpretation and analysis. Preliminary data were presented at a joint NSBRI/NASA conference in Houston on May 5, 2005. Computer programming continues that will allow direct input of Actiwatch data into our Computer Performance Simulation Software. This will allow us to estimate the circadian phase of each subject pre-launch, inflight and post-flight. We are also considering the development of new algorithms that determine sleep and wake from actigraphy data to enhance our analysis of the data.
Bibliography Type:	Description: (Last Updated: 12/13/2023)