

Fiscal Year:	FY 2007	Task Last Updated:	FY 11/15/2006
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		
PI Email:	caczeisler@rics.bwh.harvard.edu	Fax:	FY 617-732-4015
PI Organization Type:	UNIVERSITY	Phone:	617-732-4013
Organization Name:	Brigham and Women's Hospital/Harvard Medical Center		
PI Address 1:	Division of Sleep Medicine		
PI Address 2:	221 Longwood Ave., Ste. 438		
PI Web Page:			
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:	0
No. of PhD Candidates:	0	No. of Master' Degrees:	0
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	0
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
Contact Monitor:	McCollum, Suzanne	Contact Phone:	281 483-7307
Contact Email:	suzanne.g.mccollum@nasa.gov		
Flight Program:	Shuttle/ISS		
Flight Assignment:	STS 116, STS 118, STS 120, ISS Increments 14, 15, 16 (additional flight info provided 11/06) STS 121, STS 115, Increment 13 and Increment 14 STS 104, STS 109, STS 111, STS 112, STS 113, STS 114		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Barger, Laura 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. They will complete a sleep log each day on Shuttle flights and for three 1-week periods during an ISS mission. The sleep-wake activity and light exposure patterns obtain in-flight will be compared with baseline data 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:	<p>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 known 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 crew members aboard Space Shuttle and ISS missions.</p> <p>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.</p>
Task Progress:	<p>In the past year (January 1, 2006- December 31, 2006), 10 subjects on two Space Shuttle flights (STS-121 and STS-115) completed the protocol. We anticipate two more subjects to complete the protocol when STS-116 launches in December 2006. Additionally, our first ISS subject has begun the experiment. Actigraphy data continue to be scored and are undergoing interpretation and analysis. 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. Protocol. Our data collection protocol remains the same.</p> <p>Equipment. The sleep log software was finalized and is being utilized by our first ISS subject.</p> <p>Recruitment of Subjects. STS-118 and STS-120 crewmembers were briefed in August 2006 and October 2006, respectively. Increment 14 crewmembers were briefed in January 2006; Increment 15 crewmembers were briefed in July 2006; and Increment 16 crewmembers were briefed in October 2006.</p> <p>Training. A repeat FAM session was conducted with STS-115 crewmembers in February 2006 and STS-116 crewmembers were trained in June 2006. Increment 14 crewmembers were trained in January 2006; Increment 15 crewmembers were trained in July 2006.</p> <p>Baseline Data Collection. Baseline (L-90) data were collected for STS-121 (repeated BDC; February 2006), Increment 14 (May 2006), STS-115 (June 2006) and STS-116 and Increment 15 crewmembers (October 2006). Postflight data were collected for STS-121 crewmembers in July 2006 and for STS-115 crewmembers in October 2006.</p> <p>Inflight Data Collection. Postflight data were collected for four STS-121 crewmembers in July 2006 and for six STS-115 crewmembers in September 2006.</p>
Bibliography Type:	Description: (Last Updated: 12/13/2023)
Awards	Czeisler, Charles A., Ph.D., M.D., for the Harvard Work Hours, Health and Safety Group. "NIOSH Director's Award for Scientific Leadership in Occupational Safety and Health, April 2006." Apr-2006
Awards	Czeisler, Charles A., Ph.D., M.D., for the Harvard Work Hours, Health and Safety Group. "National Sleep Foundation 2006 Healthy Sleep Community Award, March 2006." Mar-2006