

Fiscal Year:	FY 2008	Task Last Updated:	FY 01/08/2008
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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Zip Code:	02115-5804	Congressional District:	8
Comments:			
Project Type:	Flight	Solicitation / Funding Source:	98-HEDS-02
Start Date:	01/24/2001	End Date:	04/30/2012
No. of Post Docs:	0	No. of PhD Degrees:	3
No. of PhD Candidates:	0	No. of Master' Degrees:	1
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	3
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
Contact Monitor:	Shea, Camile	Contact Phone:	281-244-2017
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Flight Program:	Shuttle/ISS		
Flight Assignment:	STS 122, STS 123, STS 124, STS 125, ISS Increment 17 (additional flight assignments, per PI office, 1/2008) STS 116, STS 118, STS 120, ISS Increments 14, 15, 16 (additional flight info provided 11/06) STS 121, STS 115, ISS Increment 13 and Increment 14 STS 104, STS 109, STS 111, STS 112, STS 113, STS 114		
Key Personnel Changes/Previous PI:	Laura K. Barger, Ph.D. was assigned to Co-Principal Investigator.		
COI Name (Institution):	Barger, Laura Ph.D. (Harvard Medical School) Wright, Kenneth Ph.D. (University of Colorado) Ronda, Joseph M.S. (Harvard Medical School)		
Grant/Contract No.:	NCC9-119		
Performance Goal No.:			

Performance Goal Text:	NOTE--end date should be around 4/30/2012 per JSC (11/08)
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, 2007- December 31, 2007), 10 subjects on two Space Shuttle flights (STS-118 and STS-120) completed the protocol. Thirteen additional crewmembers assigned to STS-122, STS-123, STS-124 and STS-125 have volunteered to participate in this protocol. Additionally, 3 ISS crewmembers have completed this experiment and data collection is ongoing for 2 additional ISS crewmembers. 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, in-flight and post-flight. Through the FAS Science Challenge Internship Program, a Ph.D. student from Ireland was assigned the Division of Sleep Medicine; he will devote the majority of his efforts to data analysis on this project for approximately 8 months (September 2007 until April 2008). Protocol. Our data collection protocol remains the same.</p> <p>Equipment. In response to crewmembers' requests, we have designed and implemented a new band to hold the Actiwatch. It is made of neoprene and crewmembers have told us that it is more comfortable than the old-style velcro bands. We have also reduced the size of the daily sleep log to a size compatible with the crew notebooks. This change was implemented on STS-118 and feedback from crewmembers indicates that it is easier to complete the log each day when it is located in the notebook. The ISS sleep log software is being revised to accommodate crewmembers' request for additional default values.</p> <p>Recruitment of Subjects. STS-122, STS-123, STS-124 and STS-125 crewmembers were given an informed consent briefing in this past year. At least 3 crewmembers on each Shuttle mission volunteered to participate. All U.S. crewmembers (primary and back-up) scheduled for ISS missions were also briefed. All of the ISS crewmembers volunteered to participate.</p> <p>Training. FAM training sessions were conducted with volunteer participants from STS-118 (Feb 07), STS-120 (Jun 07), STS-122 (Jun 07), STS-123 (Aug 07), STS-124 (Nov 07). ISS crewmembers assigned to Increments 15, 16 and 17 were trained as well.</p> <p>Baseline Data Collection. Baseline (L-90) data were collected for STS-118, STS-120, STS-122 and STS-123 crewmembers. Baseline (L-90) data were also collected for ISS crewmembers assigned to Increment 15, 16 and 17. Preflight (L-11 until launch) data were collected for STS-118, STS-120 and STS-122 crewmembers and ISS crewmembers assigned to Increment 15 and 16. (The STS-122 L-11 BDC will be repeated in 2008 when launch is rescheduled). Postflight data (landing until R+7) were collected for STS-118 and STS-120 crewmembers and for ISS crewmembers assigned to Increments 14 and 15. [Both prime and back-up ISS crewmembers participated in BDC data collection].</p> <p>Inflight Data Collection. In flight data were collected for STS-118 (4) and STS-120 (6) crewmembers and ISS crewmembers assigned to Increments 14 (2), 15 (1) and 16 (data for collection for 2 crewmembers ongoing).</p>
Bibliography Type:	Description: (Last Updated: 12/13/2023)