Acronym: Sleep-Wake Actigraphy and Light Exposure During Spaceflight - Short

Title: Sleep-Short

Principal Investigator(s): Charles A. Czeisler, M.D., Ph.D. and Laura K. Barger, Ph.D., Brigham and Women's Hospital, Harvard Medical School, Boston, MA

Co-Investigator(s):
Kenneth P. Wright, Jr., Ph.D., University of Colorado, Boulder, CO
Joseph Ronda, Brigham & Women's Hospital, Boston, MA

Contact(s):
PI - Charles A. Czeisler, (617) 732-4013
Primary - Laura K. Barger, (530) 753-2876

Mailing Address:
Dr. Charles A. Czeisler
Division of Sleep Medicine
Department of Medicine
Brigham and Women's Hospital
Harvard Medical School
221 Longwood Avenue, BLI 438
Boston, MA 02115

Developer(s): Johnson Space Center, Human Research Program, Houston, TX

Sponsoring Agency: National Aeronautics and Space Administration (NASA)

Increment(s) Assigned: 11, 13, 14, 15, 16, 17, 18


Brief Research Summary (PAO): Sleep-Wake Actigraphy and Light Exposure During Spaceflight - Short (Sleep-Short) will examine the effects of spaceflight on the sleep of the astronauts during space shuttle missions. Advancing state-of-the-art technology for monitoring, diagnosing and assessing treatment of sleep patterns is vital to treating insomnia on Earth and in space.

Research Summary:

- Previous research on Space Shuttle crewmembers has shown that sleep is disrupted on orbit.
- A wrist-worn Actiwatch will record the activity of the crewmembers and the ambient light to which they are exposed.
- The crewmembers' subjective evaluation of their sleep and alertness, recorded in a daily log book, will also be investigated.

Detailed Research Description: The success and effectiveness of manned spaceflight depends on the ability of crewmembers to maintain a high level of cognitive performance and vigilance while operating and monitoring sophisticated instrumentation. Astronauts during short space flights, however, commonly experience sleep disruption and may experience misalignment of circadian phase during spaceflight. Both of these conditions are associated with insomnia, and impairment of alertness and cognitive performance.

Relatively little is known of the prevalence or cause of spaceflight induced insomnia in short duration
missions. This experiment will use state of the art ambulatory technology to monitor sleep-wake activity patterns and light exposure in crewmembers aboard the Space Shuttle. Subjects will wear a small, lightweight activity and light recording device (Actiwatch) for the entire duration of their mission. The sleep-wake activity and light exposure patterns obtained in-flight will be compared with baseline data collected on Earth before and after spaceflight. The data collected should help us better understand the effects of spaceflight on sleep as well as aid in the development of effective countermeasures for short duration spaceflight.

**Project Type:** Payload

**Images and Captions:**

This image shows an Actiwatch Activity Monitor next to a ruler to demonstrate the size of the Actiwatch. Image courtesy of NASA, Johnson Space Center.

NASA Image: S104E5114 - Astronaut, Janet Kavandi on STS-104 wearing an Actiwatch on her right wrist for recording activities.

**Operations Location:** Sortie

**Brief Research Operations:**

- The crewmembers will wear Actiwatches (that will record wrist activity, allowing estimation of sleep duration and also records the light exposure of the crewmember).

- Crewmembers will complete daily sleep logs.

**Operational Requirements:** Short-duration (Space Shuttle) crewmembers are needed as subjects for the experiment. This is on a volunteer basis, obtaining as many volunteers as possible until the Space Shuttle program is retired. Baseline data for each subject must be collected for two weeks between L-120 (launch minus 120 days) and L-75 and from L-11 through L-0. Recovery in sleep patterns after spaceflight will be assessed from R+0 (return plus 0 days) through R+7.

**Operational Protocols:** Crewmembers will don Actiwatches as soon as possible upon entry into orbit (FD1) and wear the Actiwatches continuously throughout the flight. Sleep logs will be completed each day within 15 minutes of awakening. On the last day of the mission, crewmembers will doff and stow the Actiwatches.

**Category:** Human Research and Countermeasure Development for Exploration

**Subcategory:** Human Behavior and Performance
**Space Applications:** The information derived from this study will help to better understand the effects of spaceflight on sleep-wake cycles. The countermeasures that will be developed will improve sleep cycles during missions which in turn will help maintain alertness and lessen fatigue of the Space Shuttle astronauts.

**Earth Applications:** A better understanding of insomnia is relevant to the millions of people on Earth who suffer nightly from insomnia. The advancement of state of the art technology for monitoring, diagnosing, and assessing treatment effectiveness is vital to the continued treatment of insomnia on Earth. This work could have benefit the health, productivity and safety of groups with a high prevalence of insomnia, such as shift workers and the elderly.

**Manifest Status:** Ongoing

**Availability:** Operated on Space Shuttle

**Supporting Organization:** Exploration Systems Mission Directorate (ESMD)

**Previous Missions:** STS-104/7A, STS-109/HST, STS-111/UF2, STS-112/9A, STS-113/11A, STS-107 STS-114/LF1, STS-121/ULF1.1, STS-115/12A, Soyuz TMA-1/5S Odessa, STS-116/12A.1, STS-118/13A.1, STS-120/10A, STS-122/1E, STS-123/1J/A, STS-124/1J, STS125/HST

**Results:** Analysis is ongoing.

**Results Publications:** Analysis is ongoing.

**Related Publications:**


**Web Sites:** [Sleep Medicine at Harvard Medical School](http://www.snm.org/sleep/html)  
[International Space Station Medical Project (ISSMP)](http://www.snm.org/sleep/html)  

**Related Payload(s):** Sleep-Long