|  |  |                          | TV 00/20/2010                 |
|--|--|--------------------------|-------------------------------|
| Fiscal Year:                                 | FY 2011  | Task Last Updated:       | FY 09/20/2010                 |
| PI Name:                                     | Shea, Steven Ph.D.   |                          |                               |
| Project Title:                               | Identification of cardiometabolic vulnerabilities caused b<br>encountered during space missions  | by effects of synergisti | c stressors that are commonly |
| Division Name:                               | Human Research   |                          |                               |
| Program/Discipline:                          | HUMAN RESEARCH   |                          |                               |
| Program/Discipline<br>Element/Subdiscipline: | HUMAN RESEARCHBiomedical countermeasures   |                          |                               |
| Joint Agency Name:                           | TechPort:  |                          | No                            |
| Human Research Program Elements:             | (1) <b>HHC</b> :Human Health Countermeasures   |                          |                               |
| Human Research Program Risks:                | (1) <b>Cardiovascular</b> : Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes   |                          |                               |
| Space Biology Element:                       | None   |                          |                               |
| Space Biology Cross-Element<br>Discipline:   | None   |                          |                               |
| Space Biology Special Category:              | None   |                          |                               |
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| PI Organization Type:                        | UNIVERSITY   | Phone:                   | 503 494 2517                  |
| Organization Name:                           | Brigham And Women's Hospital, Inc./Harvard Medical S   | School                   |                               |
| PI Address 1:                                | Sleep Disorders Research Program   |                          |                               |
| PI Address 2:                                | 221 Longwood Ave, 036 BLI  |                          |                               |
| PI Web Page:                                 |  |                          |                               |
| City:  | Boston   | State:                   | MA                            |
| Zip Code:                                    | 02115-5804 Co  | ngressional District:    | 8                             |
| Comments:                                    | NOTE: PI currently at Oregon Health & Science University   | sity as of June 2016.    |                               |
| Project Type:                                | Ground Solicitation  | on / Funding Source:     | 2009 Crew Health NNJ09ZSA002N |
| Start Date:                                  | 10/01/2010   | End Date:                | 09/30/2014                    |
| No. of Post Docs:                            |  | 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:       | NASA JSC                      |
| Contact Monitor:                             | Meck, J@n  | <b>Contact Phone:</b>    | 281-244-5405                  |
| Contact Email:                               | janice.v.meck@nasa.gov   |                          |                               |
| Flight Program:                              |  |                          |                               |
| Flight Assignment:                           |  |                          |                               |
| Key Personnel Changes/Previous PI:           |  |                          |                               |
| COI Name (Institution):                      | Barger, Laura (Brigham And Women's Hospital, Inc.)<br>Lockley, Steven (Brigham And Women's Hospital, Inc.)<br>Scheer, Frank (Brigham And Women's Hospital, Inc.)<br>Wang, Wei (Brigham And Women's Hospital, Inc.) | 2. )<br>-                |                               |
| Grant/Contract No.:                          | NNX10AR10G   |                          |                               |
| Performance Goal No.:                        |  |                          |                               |
| Performance Goal Text:                       |  |                          |                               |

| Task Description:  | hort and long term duration space missions (e.g. Lunar sorti, Lunar outpost, and mission to Mars); (2) to characterize<br>he effects of different types of stressors (postural, exercise, and mental stressors; except microgravity) on<br>ardiovascular and cardiometabolic functioning during short and long term duration space missions; and (3) to identify<br>he synergetic effects of chronic sleep restriction, circadian misalignment, and different stressors, potentially identifying<br>n vulnerable periods with an increased likelihood of adverse cardiac events during short and long term duration space<br>nissions.<br>During space missions astronauts are exposed to unusual light-dark cycles (e.g. Martian day length: 24.65 hrs) that leads<br>o circadian misalignment resulting in sleep disturbances, sleep loss, and poor quality sleep. In addition, almost all<br>ustronauts report chronic sleep curtailment due to mission requirements such as working ¿slam shifts; before EVAs and<br>etat, also add to the reported sleep curtailment. Data from laboratory and epidemiological studies have shown that<br>shronic sleep curtailment and circadian misalignment changes endocrine, inflammatory, and cardiovascular function;<br>shanges that potentially result in adverse health events, including cardiac arrhythmias, myocardial and peripheral<br>vascular dysfunction, risk of syncope, hypertension, diabetes, and metabolic syndrome. Moreover, adverse cardiac<br>events show a clear day-night pattern, with a peak in the morning. In addition, it is well know than microgravity itself<br>mpacts cardiovascular functioning resulting in decreased circulating blood volume, decreased central venous blood<br>pressure, increased stroke volume and increased cardiac output, potentially leading to cardiac rhythm disturbances that<br>iave been documented during spaceflight previously.<br>With the anticipated return of humans to the moon in 2020 and the preparation for human explorations of Mars and<br>other destinations in the solar system it becomes imperative to determine the cardiovascular risks for crew me |
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| Rationale for HRP Directed Research:   |  |
| Rationale for HRP Directed Research:<br>Research Impact/Earth Benefits:                  |  |
| Rationale for HRP Directed Research<br>Research Impact/Earth Benefits:<br>Task Progress: | New project for FY2011.  |