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| <b>Fiscal Year:</b>                               | FY 2011   | <b>Task Last Updated:</b>             | FY 03/14/2011                 |
| <b>PI Name:</b>                                   | Moore, Steven T. Ph.D.  |                                       |                               |
| <b>Project Title:</b>                             | Assessment of Operator Proficiency Following Long-Duration Spaceflight  |                                       |                               |
| <b>Division Name:</b>                             | Human Research  |                                       |                               |
| <b>Program/Discipline:</b>                        | HUMAN RESEARCH  |                                       |                               |
| <b>Program/Discipline--Element/Subdiscipline:</b> | HUMAN RESEARCH--Biomedical countermeasures  |                                       |                               |
| <b>Joint Agency Name:</b>                         | <b>TechPort:</b>  | No                                    |                               |
| <b>Human Research Program Elements:</b>           | (1) <b>HHC:</b> Human Health Countermeasures  |                                       |                               |
| <b>Human Research Program Risks:</b>              | (1) <b>Sensorimotor:</b> Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks                                    |                                       |                               |
| <b>Space Biology Element:</b>                     | None  |                                       |                               |
| <b>Space Biology Cross-Element Discipline:</b>    | None  |                                       |                               |
| <b>Space Biology Special Category:</b>            | None  |                                       |                               |
| <b>PI Email:</b>                                  | <a href="mailto:s.moore@cqu.edu.au">s.moore@cqu.edu.au</a>  | <b>Fax:</b>                           | FY                            |
| <b>PI Organization Type:</b>                      | UNIVERSITY  | <b>Phone:</b>                         | 212-241-1943                  |
| <b>Organization Name:</b>                         | Mount Sinai School of Medicine  |                                       |                               |
| <b>PI Address 1:</b>                              | Human Aerospace Laboratory  |                                       |                               |
| <b>PI Address 2:</b>                              | Department of Neurology   |                                       |                               |
| <b>PI Web Page:</b>                               |   |                                       |                               |
| <b>City:</b>                                      | New York  | <b>State:</b>                         | NY                            |
| <b>Zip Code:</b>                                  | 10029   | <b>Congressional District:</b>        | 14                            |
| <b>Comments:</b>                                  | NOTE: PI moved to Central Queensland University, Australia, July 2016.  |                                       |                               |
| <b>Project Type:</b>                              | FLIGHT,GROUND   | <b>Solicitation / Funding Source:</b> | 2008 Crew Health NNJ08ZSA002N |
| <b>Start Date:</b>                                | 06/02/2009  | <b>End Date:</b>                      | 09/05/2012                    |
| <b>No. of Post Docs:</b>                          | 2   | <b>No. of PhD Degrees:</b>            |                               |
| <b>No. of PhD Candidates:</b>                     | 1   | <b>No. of Master' Degrees:</b>        |                               |
| <b>No. of Master's Candidates:</b>                |   | <b>No. of Bachelor's Degrees:</b>     |                               |
| <b>No. of Bachelor's Candidates:</b>              |   | <b>Monitoring Center:</b>             | NASA JSC                      |
| <b>Contact Monitor:</b>                           | Baumann, David  | <b>Contact Phone:</b>                 |                               |
| <b>Contact Email:</b>                             | <a href="mailto:david.k.baumann@nasa.gov">david.k.baumann@nasa.gov</a>  |                                       |                               |
| <b>Flight Program:</b>                            | Pre/Post Flight   |                                       |                               |
| <b>Flight Assignment:</b>                         | NOTE: End date is now 9/5/2012 per PI, D. Stillwell/JSC, and NSSC (Ed., 2/28/2013)<br>NOTE: End date is now 6/1/2013 per NSSC (Ed., 5/8/2012) |                                       |                               |
| <b>Key Personnel Changes/Previous PI:</b>         | Co-Principal Investigator is Hamish MacDougall/University of Sydney (Australia).  |                                       |                               |
| <b>COI Name (Institution):</b>                    | MacDougall, Hamish ( University of Sydney (Australia) )   |                                       |                               |
| <b>Grant/Contract No.:</b>                        | NNX09AL14G  |                                       |                               |
| <b>Performance Goal No.:</b>                      |   |                                       |                               |
| <b>Performance Goal Text:</b>                     |   |                                       |                               |

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| <b>Task Description:</b>                    | Long-term exposure to microgravity has the potential to negatively impact the ability of crewmembers to navigate and land the crew exploration vehicle and perform post-landing surface operations on Mars. Based on our NASA-funded research on head-eye coordination during simulated shuttle landings and automobile control, we will implement a battery of tests, to be performed seated pre- and post-flight on ISS crewmembers, that target physiological mechanisms potentially underlying post-flight deficiencies in manual control. We will develop a portable testing device utilizing a chair mounted on a 6 degree-of-freedom motion base, suitable for implementation at Russian or US post-landing data collection sites. Sensorimotor tests target the vestibulo-ocular reflex, vestibulo-colic reflex, pursuit, dynamic visual acuity, motion perception and manual dexterity. In addition, we will adapt a subset of the computer-based cognitive Test of Basic Aviation Skills, used in pilot selection by the US Air Force, that have demonstrated a significant correlation with subject performance during actual flight training. The results from these test batteries will be correlated with astronaut performance on three operationally-relevant simulator tasks: control of an automobile, landing a T-38, and operating a Mars rover. Our primary aim is to define the effects of long-duration spaceflight on operator proficiency, and identify microgravity-related sensorimotor or cognitive deficits (or combinations thereof) associated with degradation of operator effectiveness. Successful completion of this study will not only fill the IRP gap SM6, but provide a basis for countermeasure development that could be incorporated into pre- and in-flight training. |
| <b>Rationale for HRP Directed Research:</b> |   |
| <b>Research Impact/Earth Benefits:</b>      | The techniques developed as part of this grant have potential application to assessment and rehabilitation of patients with a variety of neurological conditions, such as stroke.   |
| <b>Task Progress:</b>                       | In the past year we have built and installed three fully operational flight simulators; at Johnson Space Center in Houston (for pre- and post-flight testing); Mt Sinai School of Medicine in New York (used for development and validation of the test and simulation software); and the University of Sydney (for hardware development/testing under the supervision of Dr. MacDougall). In January 2011 we passed a User Readiness Review (URR) and Test Readiness Reveiw (TRR) of the experiment hardware (simulator) which is now approved for use with human subjects. In April 2011 we will finalize the instrument pod inside the simulators with the addition of a removable steering wheel and a set of 3 pedals (the center/right pedals used for brake/accelerator for driving simulations; the outside pedals used for rudder control during flight simulations), to complement the existing joystick (used for flight and rover control).   |
| <b>Bibliography Type:</b>                   | Description: (Last Updated: 09/07/2020)   |