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| Fiscal Year:                                   | FY 2017  | Task Last Updated:                | FY 04/28/2017   |
| PI Name:                                       | Fischer, Ute Ph.D.   |                                   |   |
| Project Title:                                 | Understanding Key Components of Successful Autonomous Space Missions   |                                   |   |
| Division Name:                                 | Human Research   |                                   |   |
| Program/Discipline:                            |  |                                   |   |
| Program/Discipline--<br>Element/Subdiscipline: | HUMAN RESEARCH--Behavior and performance   |                                   |   |
| Joint Agency Name:                             | TechPort:  | No                                |   |
| Human Research Program Elements:               | (1) <b>HFBP</b> :Human Factors & Behavioral Performance (IRP Rev H)  |                                   |   |
| Human Research Program Risks:                  | (1) <b>BMed</b> :Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders<br>(2) <b>Team</b> :Risk of Performance and Behavioral Health Decrements Due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team |                                   |   |
| Space Biology Element:                         | None   |                                   |   |
| Space Biology Cross-Element<br>Discipline:     | None   |                                   |   |
| Space Biology Special Category:                | None   |                                   |   |
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| Zip Code:                                      | 30332-0165   | Congressional District:           | 5   |
| Comments:                                      | NOTE: The NSSC also lists the PI as Ute Fischer-Loss (Ed., March 2025).  |                                   |   |
| Project Type:                                  | Ground   | Solicitation / Funding<br>Source: | 2015-16 HERO NNJ15ZSA001N-Crew Health (FLAGSHIP, NSBRI, OMNIBUS).<br>Appendix A-Crew Health, Appendix B-NSBRI, Appendix C-Omnibus |
| Start Date:                                    | 06/29/2016   | End Date:                         | 06/28/2019  |
| 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:                               | Williams, Thomas   | Contact Phone:                    | 281-483-8773  |
| Contact Email:                                 | <a href="mailto:thomas.j.will1@nasa.gov">thomas.j.will1@nasa.gov</a>   |                                   |   |
| Flight Program:                                |  |                                   |   |
| Flight Assignment:                             | NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/18/17)  |                                   |   |
| Key Personnel Changes/Previous PI:             |  |                                   |   |
| COI Name (Institution):                        | Mosier, Kathleen Ph.D. ( Teamscape LLC )<br>Tofighi, Davood Ph.D. ( Georgia Tech Research Corporation )  |                                   |   |
| Grant/Contract No.:                            | NNX16AM16G   |                                   |   |
| Performance Goal No.:                          |  |                                   |   |
| Performance Goal Text:                         |  |                                   |   |

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| <b>Task Description:</b>                    | Exploration space missions will require that space crews manage tasks more autonomously than in current operations, although they will continue to be part of the multi-team system (MTS) comprised of members in space and on the ground. The overall goal of the proposed research is to develop countermeasures that will enhance the ability of MTS members to maintain effective team performance and manage autonomous operations during Long Duration Exploration Missions (LDEMs). We will use NASA Life Sciences Data Archive (LSDA) data collected in space analogs and the International Space Station (ISS) to develop models of the individual- and team-level relationships between crew autonomy, emergent states, and team performance. Additionally, several simulations will be conducted in space analogs to assess the impact of different autonomy implementations on MTS performance in long-duration missions. Data from this study will be used to refine the individual- and team-level models, and to create a MTS-level model of the autonomy-performance relationship. Our approach is comprehensive in that we will examine different implementations and levels of autonomy, experience with interdependent and autonomous operations, individual and team process variables as well as varying task constraints. A set of products to support space and mission control teams during long-duration exploration missions will be delivered. These include: a validated model of factors related to team autonomy and team performance in LDEMs; recommendations for how team autonomy should be managed within a MTS during LDEMs, including countermeasures to mitigate potential negative effects; and recommendations for future research on autonomous team functioning. |
| <b>Rationale for HRP Directed Research:</b> |  |
| <b>Research Impact/Earth Benefits:</b>      | Multiteam collaboration is not a unique feature of spaceflight operations but common to many organizations, as is the question of how best to implement task autonomy within a multiteam system. We therefore expect that our research findings not only generalize to other isolated and confined extreme (ICE) environments, such as Antarctica, but also apply to any organization that require the collaboration by different work units.  |
| <b>Task Progress:</b>                       | We are currently completing the definition phase for this research. In August, 2016, we met with NASA Johnson Space Center (JSC) scientists to discuss the parameters of the definition phase for our project. We were asked to demonstrate the availability of sufficient data from the Life Sciences Data Archive to support our modeling effort planned for Phase 1; to specify required characteristics of Human Exploration Research Analog (HERA) missions, in particular concerning the duration and number of missions, experimental manipulations and measurements; to describe how our deliverables will complement and inform existing NASA performance models and training approaches. Subsequently we had several meetings with LSDA managers to identify data sets suitable for our statistical modeling efforts. We have submitted the required material and data request forms to the LSDA and the Lifetime Surveillance of Astronaut Health (LSAH) Board for approval. The definition phase also involved discussions with representatives of the NASA Flight Analogs Group to specify how our research needs can be met by space analog missions conducted in the HERA facility. As a result of these discussions we submitted an addendum to our proposal addressing the issues raised during our meetings with NASA officials. We expect to transition out of the definition phase by mid- to end of May.  |
| <b>Bibliography Type:</b>                   | Description: (Last Updated: 03/22/2024)  |