INTRODUCTION
To carry out critical tasks during missions, astronauts must maintain a high level of performance fitness in the face of prolonged confinement, demanding work schedules, and other stressors. The NSBRI Neurobehavioral and Psychosocial Factors Team (NBPF) works closely with NASA’s Behavioral Health and Performance (BHP) Program to develop countermeasures for risks to cognitive performance in space flight due to behavioral conditions that include stress, fatigue, and conflict. The NBPF Team focuses on 4 ways to maintain crew behavioral health: 1) PREDICT factors that elevate behavioral risks in space; 2) PREVENT risks to individual and group behavioral health; 3) DETECT behavioral problems in individuals and crews during flight; and 4) INTERVENE to counter behavioral decrements during flight. Briefly reviewed here are projects directed by the first author and Dr. James Cartreine that illustrate NSBRI work in these areas.

DETECTING STRESS
In collaboration with Dr. Dimitris Metaxas (Rutgers University) we have been developing optical computer recognition (OCR) to unobtrusively detect and track facial expressions of stress and negative emotions in spaceflight. We validated an OCR detector of stress during performance using a computational deformable model-based tracker based on Active Shape Modeling for face tracking and Conditional Random Fields for stress detection. The computerized deformable mask has been successfully automated to track head and face movements in real time. The cue integration-based tracking system accurately captures rigid and non-rigid parameters of parts of the face. Recently, four major improvements were made to the OCR system. These changes are now being used to train the system to identify negative emotional states from facial expressions, as well as fatigue from sleep loss (by tracking aspects of eyelid closures).

RESOLVING CONFLICTS
Conflicts in space flight among astronauts are inevitable in long-duration missions, creating a need for on-board interventions. Dr. James Cartreine (NSBRI P.I.) and colleagues are continuing their development of an interactive multimedia intervention program based on cognitive-behavioral therapy (CBT) that will assist astronauts in managing interpersonal conflicts on long-duration missions. The program architecture has been developed to organize the types of content and experiences to be presented. The current project is designing and producing an interactive media intervention program to assist astronauts in the management of ongoing conflicts on long-duration missions. A preliminary evaluation of the conflict intervention will be conducted with first responders—firefighters and emergency medical technicians.

MITIGATING FATIGUE
To prevent the cumulative effects of chronic sleep restriction on cognitive performance in space we studied reduced sleep schedules and found individuals with low vulnerability to the effects of sleep loss. This led to work on biomarkers to predict cognitive vulnerability to sleep restriction to improve biomathematical model prediction of fatigue effects in individuals, using Bayesian forecasting in collaboration with Dr. Hans Van Dongen (Washington State Univ.). The work also led to a new mathematical model for the homeostatic effects of chronic sleep restriction on performance with Dr. Van Dongen and colleagues, and to our current experiment on the synergistic effects of sleep restriction and high cognitive workload. To objectively detect the performance effects of fatigue in space, we developed the 3-min. PVT Self Test. It is based on an optimized algorithm and astronaut performance norms, and has a feedback interface developed with Dr. Daniel Mollicone (Pulsar Informatics) through work we did in NEEMO missions 9, 12 and 13, and other analogs. The PVT Self Test is currently being studied on ISS and used in a sleep medication protocol by Dr. Smith Johnston (JSC). We recently completed an NSBRI study evaluating recovery sleep durations as an intervention for fatigue effects on performance.