

<b>Fiscal Year:</b>	FY 2011	<b>Task Last Updated:</b>	FY 06/16/2011
<b>PI Name:</b>	Salas, Eduardo Ph.D.		
<b>Project Title:</b>	Optimizing Crew Performance in Long Duration Space Exploration: Best Practices for Team Training and Cohesion Measurement		
<b>Division Name:</b>	Human Research		
<b>Program/Discipline:</b>	HUMAN RESEARCH		
<b>Program/Discipline--Element/Subdiscipline:</b>	HUMAN RESEARCH--Behavior and performance		
<b>Joint Agency Name:</b>	<b>TechPort:</b>	No	
<b>Human Research Program Elements:</b>	(1) <b>BHP</b> :Behavioral Health & Performance (archival in 2017)		
<b>Human Research Program Risks:</b>	(1) <b>Team</b> :Risk of Performance and Behavioral Health Decrements Due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team		
<b>Space Biology Element:</b>	None		
<b>Space Biology Cross-Element Discipline:</b>	None		
<b>Space Biology Special Category:</b>	None		
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<b>Zip Code:</b>	77005	<b>Congressional District:</b>	7
<b>Comments:</b>	NOTE: Previous affiliation was University of Central Florida, until mid-2015		
<b>Project Type:</b>	GROUND	<b>Solicitation / Funding Source:</b>	2008 Crew Health NNJ08ZSA002N
<b>Start Date:</b>	08/15/2009	<b>End Date:</b>	08/14/2012
<b>No. of Post Docs:</b>	0	<b>No. of PhD Degrees:</b>	0
<b>No. of PhD Candidates:</b>	2	<b>No. of Master' Degrees:</b>	0
<b>No. of Master's Candidates:</b>	4	<b>No. of Bachelor's Degrees:</b>	1
<b>No. of Bachelor's Candidates:</b>	1	<b>Monitoring Center:</b>	NASA JSC
<b>Contact Monitor:</b>	Leveton, Lauren	<b>Contact Phone:</b>	
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<b>Flight Program:</b>			
<b>Flight Assignment:</b>	NOTE: period of performance changed to 8/15/2009-8/14/2012 (from 5/22/09-5/21/12) per JSC (3/10)		
<b>Key Personnel Changes/Previous PI:</b>	NA		
<b>COI Name (Institution):</b>	Fiore, Stephen ( University of Central Florida ) Smith-Jentsch, Kimberly ( University of Central Florida )		
<b>Grant/Contract No.:</b>	NNX09AK48G		
<b>Performance Goal No.:</b>			
<b>Performance Goal Text:</b>			

<b>Task Description:</b>	<p>This project addresses questions regarding methods and technologies for training crews to maintain crew cohesion and optimal performance during exploration missions (BHP Team GAP5; IRP Gap - BHP 2.3.1) and metrics for monitoring crew cohesion (BHP Team GAP2; IRP Gap - BHP 2.2.1). Specific aims of this project are threefold: (1) identify evidence-based guidelines/best practices for training to maximize team cohesion, and team performance, (2) design, develop, and validate evidence-based instructional strategies to mitigate performance failures from cohesion decrements among spaceflight crews and coordinating ground crews, and (3) design, develop, and validate an evidence-based index measuring and diagnosing cohesion over the course of a mission. These specific project aims meet NASA goals and objectives (BHP Team Gap 2 and Team Gap5) by capturing cohesion levels shown to be integral to long duration spaceflight mission success as well as developing countermeasures designed to mitigate the negative impact of cohesion issues. Organized as a multi-year project, primary tasks for the first year included the development of recommendations for training crews to optimize cohesion and team performance, mitigate negative impacts of long-duration missions, and measuring crew cohesion over time. Second and third years of the project focus on applying recommendations derived from year one research by developing, implementing, and evaluating instructional strategies to maximize crew cohesion and mitigate negative psychosocial impacts of long-duration missions. Overarching project goals are to: (1) mitigate performance failures due to a lack of cohesion between spaceflight crews and coordinating ground crews, (2) diagnose cohesion decrements during exploration missions, and (3) provide just-in-time training to improve any noted cohesion decrements during spaceflight.</p>
<b>Rationale for HRP Directed Research:</b>	<p>Working together on long-duration space exploration missions in conjunction with ground control requires the ability to communicate, coordinate, and cooperate for extended durations under complex, dynamic conditions such as extreme isolation and confinement (NASA, 2009). Factors related to team cohesion (e.g. interpersonal conflict, impaired communication) were noted as contributors in both the Challenger and Columbia shuttle accidents. Determining the best strategies for equipping crew members with the cognitive, behavioral, and attitudinal tools necessary to cope under such intense conditions while maintaining optimal performance, and developing a means to unobtrusively monitor crew adaptation over time are critical to the success of such missions. The multipronged research approach will yield (1) an understanding of the factors that contribute to a lack of cohesion and (2) the identification of stressors relevant to spaceflight crews, which will aid in pinpointing training strategies and methodologies to equip team members with the competencies necessary for coping with isolated, confined environments for long durations. Additionally, the focus on self-correction and regulation will enable teams to maintain levels of cohesion and team performance as well as to mitigate the negative impact of cohesion decrements over the course of LDSF.</p>
<b>Research Impact/Earth Benefits:</b>	<p>Year two (Y2) efforts have focused on: (1) identifying team training strategies relevant for long-duration space flight based on a team training needs analysis conducted in Year One, (2) developing and pilot testing a guided team self-correction training strategy designed to enhance team cohesion and performance, (3) continued analysis of archival analogue data collected from US Navy Submarine teams and US air traffic control teams, (4) planning for the first of two workshops dedicated to bringing together a diverse community of experts around the topic of team training in complex environments, and (5) development and planning in coordination with NASA grant officers and analogue population representatives for experimental studies to investigate toolkit strategies and cohesion measures. Efforts within Research Thrust 1 (Cohesion) were dedicated to identifying relevant team training strategies and methods for optimizing team performance based on the team training needs analysis conducted in Year 1. Efforts related to Thrust 2 (Stress) focused on identifying team training strategies relevant for mitigating and managing the negative impact of stress on crew cohesion and performance during long duration space flight. These efforts were summarized into manuscript form and are currently under review for publication in a peer-reviewed outlet relevant to NASA. Thrust 3 (Self-regulation) efforts focused on development and pilot testing of a guided team-self correction training program. Specifically, training materials were developed and two sets of training workshops were held to pilot test training materials (December 2010; February, 2011). The pilot tests included a sample of flight controllers, BHP operations personnel, and astronauts with long-duration flight experience. Furthermore, significant work was dedicated to development of experimental plans for both lab-based and analogue sample studies. For example, a full experimental plan and MOR was developed for planned studies to be completed as part of NEEMO 15. While the potential to participate in NEEMO 15 did not come to fruition, we are working with NASA sponsors to identify an alternative sample. Additionally, in support of transition to operations efforts, the team training concept was briefed at the Flight Operations Integration Group (FOIG) meeting held in February 2011.</p> <p>Thus, Y2 progress included several core tasks: scientific advisory board convened for tele-meeting (Task 2), analysis of data sets collected from analogous samples and reviews of existing literature (Task 3), preparation for experimental studies (Task 5), development and piloting of a guided team self-correction instructional strategy based on the team training needs analysis completed in Year One (Task 6), planning for the first project workshop (Task 8), and coordination with both NASA BHP and analogue population officials to begin planning and development of training validation studies (Task 9).</p>
<b>Task Progress:</b>	<p>Specific work products during Year 2 are as follows:</p> <p>Unpublished White Papers</p> <p>WP4. Driskell, J. E., Dietz, A.S., Weaver, S. J., Bedwell, W. L., Sierra, M.J., &amp; Salas, E. (2010). Stress training taxonomy. Unpublished white paper.</p> <p>WP5. Weaver, S. J., Bedwell, W. L., Sierra, M. J., Dietz, A. S., &amp; Carter, D. (2010). Project pegasus: Scientific advisory board conference call report. Unpublished white paper.</p> <p>WP6. Smith-Jentsch, K. A., Sierra, M. J., Weaver, S. J., Bedwell, W. L., Dietz, A. S., Carter-Berenson, D., Olgesby, J., Fiore, S. M., Salas, E. (2011) Team training needs analysis (part 1 of 3): Task analysis. Unpublished white paper. i. **Revised after vetting with sponsors &amp; participants</p> <p>WP7. Sierra, M.J., Carter-Berenson, D., Smith-Jentsch, K., Bedwell, W.L., &amp; Salas, E. (2011). TDT Dimensions mapped to SFRM dimensions and flight controller performance evaluation criteria (part 1 of 2). Unpublished white paper.</p> <p>Team Dimensional Training (TDT) Materials for Pilot Testing (Dec 2010 &amp; Feb 2011)</p> <p>D5. Smith-Jentsch, K. A. Smith-Jentsch, K. A., Sierra, M. J., Carter-Berenson, D., Weaver S. J., Bedwell, W. L., Dietz,</p>

	<p>A. S., &amp; Oglesby J. M. (2011). TDT facilitator workshop curriculum slides.</p> <p>D6. Smith-Jentsch, K. A., Sierra, M. J., &amp; Carter-Berenson, D. (2011). TDT prebriefing/debriefing facilitation guide.</p> <p>D7. Smith-Jentsch, K. A., Sierra, M. J., &amp; Carter-Berenson, D. (2011). TDT guidebook.</p> <p>Formal Briefings</p> <p>D8. Smith-Jentsch, K. A. (2011, February). Team dimensional training: A strategy for developing high performance LDSF teams. Briefing presented to the Flight Operations Integration Group.</p> <p>Other</p> <p>O1. DRAFT of Mission Objective Request for NEEMO 15 **Note: BHP has since decided to not participate in NEEMO 15</p>
<b>Bibliography Type:</b>	Description: (Last Updated: 09/04/2023)
<b>Abstracts for Journals and Proceedings</b>	<p>Bedwell WL, Smith-Jentsch KA, Weaver SJ, Sierra MJ, Fiore SM, et al. "Long-duration space flight crews: A team training needs analysis." Paper presented at the 26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011.</p> <p>26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011. , Apr-2011</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Sierra MJ, Smith-Jentsch KA, Carter-Berenson D, Weaver SJ, Bedwell WL. "Disentangling the Unique Effects of Team Dimensional Training's Design Elements." Poster presented at the 26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011.</p> <p>26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011. , Apr-2011</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Salas E. (Panelist) "The unwieldy world of teams: Teamwork issues in applied settings." Panel presentation at the 26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011.</p> <p>26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011. , Apr-2011</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Salas E. (Panelist) "In extremis teams: What do we need to know?" Panel presentation at the 26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011.</p> <p>26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011. , Apr-2011</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Salas E, Weaver SJ. (Co-Chairs) "Teams in the wild: Do existing theories, methods, and inferences still fit?" Panel presented at the 26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011.</p> <p>26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011. , Apr-2011</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Smith-Jentsch KA, Sierra MJ, Weaver SJ, Bedwell WL, Salas E. "Training multi-team systems to self-correct." Paper presented at the 26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011.</p> <p>26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011. , Apr-2011</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Weaver SJ, Smith-Jentsch KA. "Composition, cohesion, and climate in air traffic control teams." Paper presented at the 26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011.</p> <p>26th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago, IL, April 14-16, 2011. , Apr-2011</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Dietz AS, Driskell JE, Salas E. "Identifying training strategies to mitigate and manage the negative effects of stress on performance in long-duration spaceflight." Paper presented at the 16th International Symposium on Aviation Psychology, Dayton, OH, May 2-5, 2011.</p> <p>16th International Symposium on Aviation Psychology, Dayton, OH, May 2-5, 2011. <a href="http://www.wright.edu/isap/">http://www.wright.edu/isap/</a> , May-2011</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Sierra MJ, Carter-Berenson D, Smith-Jentsch KA. "Meeting the needs of long-duration spaceflight crews through guided team self-correction." Paper presented at the 16th International Symposium on Aviation Psychology, Dayton, OH, May 2-5, 2011.</p> <p>16th International Symposium on Aviation Psychology, Dayton, OH, May 2-5, 2011. <a href="http://www.wright.edu/isap/">http://www.wright.edu/isap/</a> , May-2011</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Carter-Berenson DR, Smith-Jentsch KA, Sierra MJ, Bedwell WL, Weaver SJ, Dietz AS, Oglesby JM, Fiore S, Salas E. "Long duration space flight work characteristics: A team task analysis." Poster presented at the 16th International Symposium on Aviation Psychology, Dayton, OH, May 2-5, 2011.</p> <p>16th International Symposium on Aviation Psychology, Dayton, OH, May 2-5, 2011. <a href="http://www.wright.edu/isap/">http://www.wright.edu/isap/</a> , May-2011</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Bedwell WL, Smith-Jentsch K, Weaver SJ, Sierra MJ, Fiore SM, Dietz A, Carter-Berenson D, Oglesby J, Salas E. "Extreme teams: A training needs analysis for long-duration spaceflight." Poster presented at the 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011.</p> <p>18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. , Apr-2011</p>

Abstracts for Journals and Proceedings	Dietz AS, Driskell JE, Weaver SJ, Bedwell WL, Sierra MJ, Salas E. "Assessing the role and effects of stress in long-duration spaceflight teams: A framework and training taxonomy." Poster presented at the 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. , Apr-2011
Abstracts for Journals and Proceedings	Oglesby JM, Bedwell WL, Dietz AS, Fiore SM. "Developing a research methodology for studying aerospace teamwork in the laboratory." Poster presented at the 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. , Apr-2011
Abstracts for Journals and Proceedings	Smith-Jentsch K, Salas E, Fiore SM, Weaver SJ, Bedwell WL, Sierra MJ, Dietz A, Carter-Berenson D, Oglesby J. "Integrated team training to support optimal crew performance in long duration space exploration." Poster presented at the 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. , Apr-2011
Abstracts for Journals and Proceedings	Sierra MJ, Carter-Berenson D, Smith-Jentsch KA. "The application of guided team self-correction in long-duration spaceflight." Poster presented at the 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. , Apr-2011
Abstracts for Journals and Proceedings	Young BL, Sierra MJ, Smith-Jentsch KA. "Determinants of individual motivation and learning in the context of team training: A multilevel perspective." Paper presented at the 6th Annual Conference of the Interdisciplinary Network for Group Research (INGRoup), Minneapolis, MN, July 2011. 6th Annual Conference of the Interdisciplinary Network for Group Research (INGRoup), Minneapolis, MN, July 2011. , Jul-2011
Abstracts for Journals and Proceedings	Bedwell WL. "Teamwork Today: Do We Really Know Anything?" Panel presented at the 6th Annual Conference of the Interdisciplinary Network for Group Research (INGRoup), Minneapolis, MN, July 2011. 6th Annual Conference of the Interdisciplinary Network for Group Research (INGRoup), Minneapolis, MN, July 2011. , Jul-2011
Abstracts for Journals and Proceedings	Bedwell WL, Carter-Berenson D, Sierra MJ, Smith-Jentsch KA. "Organizational Analysis for Long-duration Spaceflight Teams: A Fresh MTS Perspective." Poster presented at the 6th Annual Conference of the Interdisciplinary Network for Group Research (INGRoup), Minneapolis, MN, July 2011. 6th Annual Conference of the Interdisciplinary Network for Group Research (INGRoup), Minneapolis, MN, July 2011. , Jul-2011
Abstracts for Journals and Proceedings	Bedwell WL, Dietz AS. "Extreme teams: Is a paradigm shift required?" Panel accepted to the 55th Annual Meeting of the Human Factors and Ergonomics Society, Las Vegas, NV, September 2011. 55th Annual Meeting of the Human Factors and Ergonomics Society, Las Vegas, NV, September 2011. , Sep-2011
Articles in Peer-reviewed Journals	Dietz AS, Driskell J, Weaver SJ, Salas E, Sierra MJ, Keeton KE. "Teams in space: A framework for understanding and optimizing teamwork under stress." Aviation, Space, and Environmental Medicine. Under Review, as of June 2011. , Jun-2011
Books/Book Chapters	Dietz AS, Bedwell WL, Oglesby JM, Salas E, Keeton KE. "Synthetic task environments for understanding performance at work: Principles and the road ahead. (In Progress)." in "Frontiers of methodology in organizational research." Ed. J.M. Cortina, R.S. Landis. New York, NY : Routledge Academic, in press. June 2011. Expected publication January 2012., Jun-2011