Final Event Program

LAST UPDATED 11/10/03

HP 2003 explored the technology needs and solutions that must drive the next advances in individual and team performance. The future of human performance lies in seamless interaction between team members and the systems that support them, regardless of whether the environment is a hostile battlefield, a civilian workspace, or a spacecraft traveling through the vast reaches of space.

> **!** Check the online Presentation Archive to hear from the speakers themselves: http://advtech.jsc.nasa.gov/humanperf.asp#archive

BRIEF BACKGROUND

Human Performance 2003 (HP) was a technology-focused event for representatives from NASA, the military, other government agencies, and academia.

The Advanced Technology Integration Group (http://advtech.jsc.nasa.gov/) at NASA's Johnson Space Center (JSC) organized it, while NASA and personnel from the National Institute of Occupational Safety and Health (NIOSH) served as co-chairs.

Tuesday, 28 October

Session 1, Overview of Programs and Projects: features government managers and scientists discussing the programs and projects that further critical technologies for human performance	
Mueller (Futron Corporation / ATIG) & Maye (NASA Johnson - ATIG)	Welcome and Preliminary Results from Technology Needs Survey Networking and Approaches to Partnering
Grier (US Navy) & Chavez (Basic Commerce Industries)	Human Performance Metrics: Improving the Navy by Measuring Sailor Performance
Schopper (NIOSH / CDC)	Characterizing Work Demands and Associated Physiological Costs: Project ABACAS
Networking break	
Barnes (Air Force Research Laboratory)	Team Communication and Performance During Sustained Command and Control Operations
‡ Foley (NASA Johnson)	Personal Protective Clothing Enhancements for Firefighters: Metabolic Heat Stress, Ambient Environmental Protection, and Breathable Air
Lunch	
Session 2, Technology Needs and Challenges: technology developers and users emphasize specific technology needs and emerging solutions in monitoring and measurement	
Krog (NASA Johnson / NSBRI)	Physiological Monitoring: A New Paradigm for NASA
Hatfield (U of Colorado)	Development of Ultrasonic Physiological Measurement Methodologies Appropriate for Space Flight: Scanning Checkout with Simulations and Limb Surrogate Sampling
Networking break	
Tennant (Aberdeen Test Center)	Objective Measures of Human Performance in Military Test and Evaluation
Bing (Naval Submarine Medical Research Laboratory)	SUBSCREEN Program: Psychological Screening of Prospective Submariners
Networking break	
Smith (Ergotech)	Human Functional Performance in Soldier Day Field Experiments
Rajulu (NSBRI / Baylor College of Medicine)	Whole Body Scanning and Its Applications in Space Human Factors
Day 1 of HP 2003 over	

‡ *Technology demonstration*

Wednesday, 29 October

Session 3, Technology Solutions and Applications: technology developers and users present technology solutions or new applications of existing technologies	
Bruins (NASA Johnson)	NASA and Non-NASA Virtual Environment Applications: Featuring The 3-D Virtual Digital Human Project
Graham (Boeing)	Human Modeling System: A Software Tool for Solutions
Haney (NPS Associates)	FRANCIE, An Emerging Technology for the Characterization and Prediction of Human Performance and Human Errors
Networking break	
Whitmore (NASA Johnson)	Space Human Factors Technology Development Projects
Zhang (U of Texas-Houston)	Human-Centered Intelligent Flight Surgeon Console
Lunch	
Session 3, continued	
O'Quinn (Medical Education Technologies, Inc.)	Human Patient Simulations for Space Medicine Applications
Beutter (NASA Ames)	Oculometric Monitoring of Human Perceptual Performance in Search and Tracking Tasks
Networking break	
Bishop (U of Texas Medical Branch)	Assessing Group Dynamics and Stress in a Simulated Mars Mission: Results from a Study on the MDRS Crew 6 in Early 2002
Merkle (Sandia National Laboratories)	A Prototype Group Collaboration Environment: Physiologic Monitoring for the MENTOR/Pal System
Networking break	
Chappell (U of Colorado)	Adaptation of Terrestrial Methods for Exploration of Challenging Terrain on the Moon and Mars
Picciano (U of Utah)	Integrated System for Cardiac (Defibrillation) and Respiratory Emergency Support Through Just-in-Time Training
*Null & Beutter (NASA Ames)	Computational Modeling of Human Performance
HP 2003 over	

**Alternate speaker*

ABSTRACTS

Abstracts are listed here in alphabetical order by the speaker's last name. Where available, Web links to the speaker's organization, faculty page, or project are provided.

1LT Christopher Barnes, Air Force Research Lab

TITLE: Team Communication and Performance During Sustained Command and Control Operations

ABSTRACT: This study examines the effects of fatigue on Command and Control teams. Subjects perform simulations alternating with cognitive test batteries from 1800 Friday evening through 1030 Saturday morning. The multilevel modeling approach is discussed, with some very preliminary data.

SESSION: 10/28 at 11:00, Overview

SITE: www.afrl.af.mil/

Dr. Brent Beutter, NASA Ames

TITLE: Oculometric Monitoring of Human Perceptual Performance in Search and Tracking Tasks

ABSTRACT: Although rigorous psychometric techniques allow for quantitative analysis of human perceptual performance, these techniques do not lend themselves to aerospace applications because they are too intrusive and interfere with the task at hand. We have developed and validated oculometric methods for quantifying human perceptual and cognitive performance indirectly by monitoring eye movements in both visual search and tracking tasks. Our methods provide novel quantitative metrics of human performance that have been shown to be as rigorous as standard proven psychophysical metrics.

SESSION: 10/29 at 13:30, Solutions

SITE: vision.arc.nasa.gov

Dr. Mark Bing, Naval Submarine Medical Research Lab

TITLE: SUBSCREEN Program: Psychological Screening of Prospective Submariners

ABSTRACT: In 2001 a large-scale empirical validation study was performed on the SUBSCREEN test, which is used to screen prospective submariners for psychological traits (e.g., claustrophobia) that interfere with successful adaptation to the submarine environment. This study resulted in the development of the SubMarine Attrition Risk Test (SMART), which is an optimal linear composite of several scales within the SUBSCREEN test. SMART predicts fleet attrition among submariners with a 70% hit rate ($r=0.25$, $p<0.001$), as well as non-judicial punishment events that occur during training with a 74% hit rate ($r=0.35$, $p<0.001$). This presentation describes the technology used to develop SMART, and the potential application of SMART to the screening, training, and retention of future submariners.

SESSION: 10/28 at 15:00, Needs & Challenges

SITE: www.nhrc.navy.mil/nsmrl/index.html

Dr. Sheryl Bishop, University of Texas Medical Branch

TITLE: Assessing Group Dynamics and Stress in a Simulated Mars Mission: Results from a Study on the MDRS Crew 6 in Early 2002

ABSTRACT: Data from five team members was collected: two men and three women, age ranged from 32-50 years of age. This program included psychological research, the administration of several human factors (HF) and habitability questionnaires, crew habitability/HF and psych debriefs, and operational HF and psychological support measures. A specific focus of this study was to investigate the role of personality and stress levels on crew interactions and mission functioning.

SESSION: 10/29 at 14:30, Solutions

SITE: www.utmb.edu/pmch

Mr. Tony Bruins, NASA Johnson – Mission Operations

TITLE: NASA's 3-D Interactive Virtual Digital Human

ABSTRACT: NASA Johnson Space Center is developing a 3-D interactive virtual human that is anatomically precise, physiologically realistic, biomechanically accurate; can simulate disease, dysfunction, and trauma; is amenable to training; is operative in diverse computing environments (desktop, laptop, etc.) as well as virtual environments; and can be used to develop countermeasures for zero g, bone demineralization, and calcium deficiencies. The integration of a haptic user interface will allow the user to touch, feel, and manipulate the virtual human. The virtual human simulation may be executed in simulated zero gravity, 1/6-g, and 1/3-g at the user's desktop. The user can execute interactive "What if?" scenarios. The project adds dynamic and immersive attributes to the Visible Human data sets visualized in a real-time, high-resolution, full-immersion environment and on a projection workbench. Model attributes include high-performance rendering of surfaces and volumes, synchronization of multiple displays (visual, auditory, haptic) and direct integration of third-party software including simulations.

SESSION: 10/29 at 09:00, Solutions

Mr. Steve Chappell, University of Colorado

TITLE: Adaptation of Terrestrial Methods for Exploration of Challenging Terrain on the Moon and Mars

ABSTRACT: An eventual return to colonize the Moon or the launch of a human exploration mission to Mars will drive the need for developing novel surface Extravehicular Activity (EVA) technologies as well as require new operational and planning techniques. These advances are necessary to enable EVA access to the planetary surface locales that are most likely to yield exciting scientific knowledge, such as in the sedimentary deposit regions recently found on Mars or within and around large craters formed from asteroid collisions; as these represent the areas thought most likely to contain fossilized evidence of life or geological information pertaining to the origins and age of the planets. These sites, while rich in potential for scientific discovery, also introduce challenging terrain for exploration by surface EVA teams. In order to gain access to these areas, surface EVA systems will be needed to assist astronauts in negotiation of high-angle slopes and vertical terrain in a safe and efficient manner.

SESSION: 10/29 at 16:00, Solutions

SITE: lasp.colorado.edu/

Dr. Lisa Chavez, Basic Commerce and Industries
Ms. Rebecca Grier, US Navy – NAVSEA

*TITLE: Human Performance Metrics: Improving the Navy by Measuring Sailor Performance

ABSTRACT: This presentation addresses the progress of NAVSEA 03 during the past year, in developing Human Performance Metrics for total integration of the sailor into the systems and ships the Navy is designing, engineering, and acquiring as the only way to guarantee the most effective total system performance at the lowest total ownership cost. This objective is to be reached by ensuring that that the sailor is given equal consideration with technology, equipment, computers, and computer programs during ship development.

SESSION: 10/28 at 09:30, Overview

SITES: www.bcisse.com and www.navsea.navy.mil

** Presentation given for Captain Steve Huber, US Navy*

Ms. Terri Graham, Boeing

TITLE: Human Modeling System: A Software Tool for Solutions

ABSTRACT: The primary purposes of the Human Modeling System (HMS) computer program are to assist in formulating human factors design requirements and to aid evaluations of human interaction with work site designs. The major benefits of using human modeling in electronic design include: 1) reducing the need for physical development fixtures by performing evaluations electronically; 2) reducing design costs by enabling the design team to more rapidly prototype and test a design; 3) avoiding costly design "fixes" later in the program by considering human factors requirements early in design; and 4) improving customer communications at every step of product development by using compelling animated graphics.

SESSION: 10/29 at 09:30, Solutions

SITE: www.boeing.com/assocproducts/hms

Mr. Lon N. Haney, NPS Associates

TITLE: FRANCIE, An Emerging Technology for the Characterization and Prediction of Human Performance and Human Errors

ABSTRACT: An overview of the FRamework Assessing Notorious Contributing Influences for Error (FRANCIE) that was created in two NASA Research Announcement grants is presented. Its applicability and potential uses throughout system life cycle and in multiple domains by multiple user types are discussed. Potential benefits for the space domain include enhancing crew autonomy in response to unanticipated events during expedition class missions.

SESSION: 10/29 at 10:00, Solutions

SITE: www.inel.gov/capabilities/human-systems/simulations.asp

Mr. Thomas Hatfield, University of Colorado

TITLE: Development of Ultrasonic Physiological Measurement Methodologies Appropriate for Space Flight: Scanning Checkout with Simulations and Limb Surrogate Sampling

ABSTRACT: The overall objective of this research is to develop novel methodologies that bypass the need for ultrasonic image formation, decomposition, and analysis steps by using quantitative ultrasound techniques to determine cross-sectional area of muscle more effectively in the field than current state of the art processes. The presentation will cover the most current work using simulations to validate a 360º ultrasonic scanning methodology for limb measurement and the limb surrogate sampling experimentation used to confirm the simulations provided a proper limb tissue analog.

SESSION: 10/28 at 13:30, Needs & Challenges

SITE: snowwhite.colorado.edu/

Mr. Ralph Krog, NASA Johnson / NSBRI

TITLE: Physiological Monitoring: A New Paradigm for NASA

ABSTRACT: A new paradigm on how to collect and analyze data featuring example experiments from NEEMO5.

SESSION: 10/28 at 13:00, Needs & Challenges

SITE: www.nsbri.org

Dr. Peter Merkle, Sandia National Laboratories

TITLE: A Prototype Group Collaboration Environment: Physiologic Monitoring for the MENTOR/Pal System

ABSTRACT: We have designed a prototype small group collaboration environment using physiologic and environmental monitoring. The group is challenged by increasing difficulty of cooperative tasks and changing group composition over a period of weeks in an instrumented environment. The MENTOR/Pal system concept may be useful in long-duration missions to facilitate group cohesion and cooperation.

SESSION: 10/29 at 15:00, Solutions

SITE: www.sandia.gov/acg

Ms. Alyssa Mueller, Futron / Technology Integration
Ms. Ambrosia Maye, NASA Johnson – Techn. Integration

TITLES: Preliminary Results from Technology Needs Survey and Approaches to Networking

ABSTRACT: Large government investments in technology development result in many ready-to-use, licensable technologies, but significant benefits often come from long-term collaborations with government innovators and scientists. Collaborative efforts, using Space Act Agreements and other techniques, can provide solid protection for intellectual property rights of industry partners while benefiting both government and industry. This brief presentation will cover how to find, start, and nurture such relationships.

SESSION: 10/28 at 09:00, Overview

SITE: http://advtech.jsc.nasa.gov

Dr. Cynthia H. Null and Dr. Brent Beutter
NASA Ames - Human Factors Division

TITLE: Computational Modeling of Human Performance

ABSTRACT: n/a

SESSION: *alternate speaker*

Ms. Veronica O'Quinn, Medical Education Technologies, Inc.

TITLE: Human Patient Simulations for Space Medicine Applications

ABSTRACT: Highlights of ongoing NASA-sponsored research on the use of human patient simulators will be discussed. This research includes replicating microgravity physiology for the creation of an "astronaut patient", developing a simulator with distinct visual and audible cues for medical emergencies in space and modifying a simulator to function in rugged environments such as the International Space Station.

SESSION: 10/29 at 13:00, Solutions

SITE: www.meti.com

Mr. Paul Picciano, University of Utah

TITLE: Integrated System for Cardiac Defibrillation and Respiratory Emergency Support through Just-in-Time Training

ABSTRACT: A graphical, computer-based, just-in-time training system is in development to provide emergency cardio-pulmonary treatment for space travel. Deployment of the computer-based system is believed to support superior treatment compared to paper instruction/protocol. We already have data indicating that novices and experts are able to complete life-critical tasks more quickly when using the display.

SESSION: 10/29 at 16:00, Solutions

SITE: www.psych.utah.edu/frontpage/index.html

Dr. Sudhakar Rajulu, NSBRI / Baylor College of Medicine

TITLE: Whole Body Scanning and Its Applications in Space Human Factors

ABSTRACT: Currently, ergonomists and possibly anthropometrists rely upon the static, uni-variate based anthropometric data to provide solutions for human-machine interface issues. Unfortunately, work postures are dynamic; hence, the interface issues are best dealt with multi-dimensional and multi-segmental anthropometric parameters that are unique representative of work postures. This paper will discuss how we at NASA are enhancing and utilizing three-dimensional anthropometric data coupled with motion analysis parameters.

SESSION: 10/28 at 16:30, Needs & Challenges

Dr. Aaron "Ron" Schopper, NIOSH / CDC

TITLE: Characterizing Work Demands and Associated Physiological Costs: Project ABACAS

ABSTRACT: The Health Effects Laboratory Division of the National Institute for Occupational Safety and Health (NIOSH) is pursuing the development of an integrated means of objectively characterizing both work demands and their associated physiological costs. These efforts reside within Project ABACAS (Advanced Biomechanical and Physiological Assessment Suite). The goal of the project is to integrate emerging technologies into the areas of biomechanics and exercise physiology to create a fully instrumented, wearable suit that is compatible for use in industrial and other work environments-in both hazardous and non-hazardous domains.

SESSION: 10/28 at 10:00, Overview

SITE: www.cdc.gov/niosh/homepage.html

Mr. Jan R. Smith, Ergotech

TITLE: Human Functional Performance in Soldier Day Field Experiments

ABSTRACT: ERGOnomics TECHnologies (ERGOTECH) has been involved with human performance measurement (task performance, physiological and psycho-physiological responses) in a series of Soldier Day experiments. The presentation will discuss the measurement methods, the baseline concept and the significance of the performance measurement results for systems integration. It will also address shortcomings of the approach for field experimentation and a measurement tool that was developed to measure at task level.

SESSION: 10/28 at 16:00, Needs & Challenges

SITE: www.ergotech.com

Mr. Paul Tennant, US Army Aberdeen Test Center

TITLE: Objective Measures of Human Performance in Military Test and Evaluation

ABSTRACT: Aberdeen Test Center (ATC) is leading a tri-service effort to develop common, validated, metrics, methodologies, instrumentation, etc., to perform objective systems-of-systems test & evaluation (T&E) where the warfighter/operator is considered to be an integrated component of the overall war fighting system. As the designated lead for this effort, I would welcome the opportunity to present what this tri-service working group has accomplished to date, the requirements/needs we have identified, and some proposed solutions. My objective would be to garner feedback/input from a wider audience, and to solicit potential collaborators.

SESSION: 10/28 at 14:30, Needs & Challenges

SITE: www.atc.army.mil

Mihriban Whitmore, NASA Johnson – Habitability and Human Factors Office

TITLE: Space Human Factors Technology Development Projects

ABSTRACT: One means to conduct space human factors studies is a technology development project. An overview of two such projects will be discussed: human factors assessment of ISS emergency medical procedures and innovative imagery systems for enhanced habitability on ISS.

SESSION: 10/29 AT 11:00, Solutions

SITE: http://jsc-web-pub.jsc.nasa.gov/hefo/hhfo/

Dr. Jiajie Zhang, University of Texas-Houston

TITLE: Human-Centered Intelligent Flight Surgeon Console

ABSTRACT: This is a presentation of a NASA-sponsored research project on human-centered design of a teamwork system that supports the work of flight surgeons and biomedical engineers at the NASA Johnson Space Center Mission Control Center.

SESSION: 10/29 at 11:30, Solutions

SITE: acad88.sahs.uth.tmc.edu/people.htm

ARCHIVE

In mid-November 2003, look for the HP Presentation Archive to be published on the event homepage: http://advtech.jsc.nasa.gov/humanperf.asp.

> **!** **Reminder:** check the Archive often to hear talks that you missed or to review particularly interesting ones.

The archive will consist of streaming audio talks* - audio recordings of speakers synchronized with slides presented in a user-friendly Web interface. This allows the widest possible audience to learn from HP 2003 presentations and also establishes a lasting resource for potential collaborators. Until HP 2003 talks are published, hear the diverse talks from past events:

- BioE / Biotech 2003, http://advtech.jsc.nasa.gov/bioEng.asp
- Environmental Sentinels 2002, http://advtech.jsc.nasa.gov/enviroSent.asp
- Human Operations 2001, http://advtech.jsc.nasa.gov/humanOps.asp

**The free audio player, Real Player Basic, is required to hear streaming audio*

CO-CHAIRS & CONTACTS

HP 2003 CO-CHAIRS	
Don Stilwell NASA JSC Advanced Technology Integration donald.j.stilwell@nasa.gov http://advtech.jsc.nasa.gov	**Dr. Ron Schopper** National Institute for Occupational Safety & Health aws0@cdc.gov http://www.cdc.gov/niosh

Twice a year, we organize events like HP 2003. Check the Events section (http://advtech.jsc.nasa.gov/events_of_interest.asp) of our site to learn about upcoming events or email us. And please contact us if you have any questions about HP 2003:

TECHNICAL LEAD	IT LEAD	NETWORKING LEAD
Program and speakers: **Alyssa Mueller** smueller@ems.jsc.nasa.gov	Recordings and A / V: **David Kiss** dkiss@futron.com	ATI Apprentice **Ambrosia Maye** amaye@ems.jsc.nasa.gov