Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
JAN 2003	**Final**	**00-01-2001 to 00-12-2002**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Recent Human Factors Contributions to Improve Military Operations	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER **62205F**
6. AUTHOR(S) **Dee Andrew; Franklin Moses; Harold Hawkins; Michael Dunaway; Robert Matthews**	5d. PROJECT NUMBER **1123**
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Air Force Research Laboratory/RHA,Warfighter Readiness Research Division,6030 South Kent Street,Mesa,AZ,85212-6061**	8. PERFORMING ORGANIZATION REPORT NUMBER **AFRL; AFRL/RHA**
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) **Air Force Research Laboratory/RHA, Warfighter Readiness Research Division, 6030 South Kent Street, Mesa, AZ, 85212-6061**	10. SPONSOR/MONITOR'S ACRONYM(S) **AFRL; AFRL/RHA**
	11. SPONSOR/MONITOR'S REPORT NUMBER(S) **AFRL-RH-AZ-JA-2003-0003**

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
Published in the Human Factors and Ergonomics Society Bulletin, 2003, 46(12), 1-2 Additional author: Singer, Tim

14. ABSTRACT
Recent world events have again highlighted the necessity for the United States military and its coalition allies to be prepared for all manner of military operations. These operations run the full gamut from large-scale, theater-wide combat, as witnessed in Operation Iraqi Freedom, to small-scale operations against terrorists, to operations-other-than-war that include peacekeeping and humanitarian aid. Here, we briefly describe recent Air Force, Army, and Navy human factors efforts to improve the preparation of military personnel.

15. SUBJECT TERMS
Human factors; Military operations; Operations other than war; Military applications; Military personnel; Distributed mission operations; Skills and knowledge

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Public Release**	**2**	

Human Factors and Ergonomics Society

Bulletin

Volume 46
Number 12
December 2003

CONTENTS

Recent Human Factors Contributions to Improve Military Operations

By Dee Andrews, Franklin Moses, Harold Hawkins, Michael Dunaway, Robert Matthews, & Tim Singer

Recent world events have again highlighted the necessity for the United States military and its coalition allies to be prepared for all manner of military operations. These operations run the full gamut from large-scale, theater-wide combat, as witnessed in Operation Iraqi Freedom, to small-scale operations against terrorists, to operations-other-than-war that include peacekeeping and humanitarian aid. Here, we briefly describe recent Air Force, Army, and Navy human factors efforts to improve the preparation of military personnel.

Distributed Mission Operations (Air Force)

Air Force personnel are being sent to foreign theaters much more frequently than was the case during the Cold War. Time away from home station has reduced the time they have to acquire and sustain necessary skills and knowledge.

The Air Force Research Laboratory's Warfighter Training Research Division (Human Effectiveness Directorate) has developed a concept called Distributed Mission Training (DMT) to address this challenge. DMT combines live (i.e., aircraft flying on a range), virtual (human-in-the-loop), and constructive (computer models) assets to form a synthetic battlespace. These battlespaces can be used for a variety of purposes, such as training, test and evaluation, and mission preparation. Human factors issues and solutions lie at the heart of the DMT concept. The lab has made human factors improvement a major goal of any DMT activities. These human factors considerations include learning acquisition and retention, performance measurement, visual perception for simulator visual displays, brief and debrief capabilities, team interactions, mission rehearsal requirements, and advanced distributed learning.

Air Force Chief of Staff General John P. Jumper has embraced the DMT concept and wants to use the technologies and methods for training and functions other than training. He has coined the term "Distributed Mission Operations" (DMO) to connote this broader view.

Under the DMO concept, a Distributed Mission Operations Center at Kirtland Air Force Base, New Mexico, will serve as a command control that connects various DMO nodes around the world. These nodes will consist of human-in-the-loop, high-fidelity simulators; constructive models; and a variety of weapon systems. These networked assets can be used for stand-alone training, small-scale mission drills, and large-scale exercises. The DMO network will provide wartime decision support training during peacetime. It will also allow full-scale mission rehearsal.

A key challenge for human factors and training researchers has been to develop a training strategy for DMO that will provide instructors, trainees, and warfighters with the training methods to take full advantage of the DMO capabilities. Science and technology work for DMO continues.

Multifaceted Soldier Support (Army)

The U.S. Army's soldiers are regularly deployed for extended periods to multiple theaters and different types of conflicts throughout the world. The approach taken by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is therefore multifaceted. Examples of ARI's work show how research has assisted soldiers to gain the adaptability, flexibility, and readiness they need.

Deployment preparedness. The Army wanted to better understand the stresses placed on soldiers and their families by frequent and extended overseas deployments in remote locations. Two projects illustrate ARI's response: (1) studying the steps that can be taken to reduce the family stresses, and (2) helping solders to understand foreign cultures prior to operations.

In research about families, ARI collected 10 years of lessons learned and identified changing support needs over four phases of deployment: predeployment, deployment, rest and recuperation, and reunion. ARI developed a practical guide for both families and family service providers with common problems and advice such as how, while deployed, to handle family problems and related issues such as the inability to sleep.

ARI's approach to helping soldiers understand a culture different from their own was to develop a generic template that lists the specific aspects of a culture that can be used as an aid to understanding. That template includes content areas such as religious customs, language, laws, politics, housing, and humor, providing a framework for observing and learning about other cultures.

Leader development. Leaders need to understand how to make decisions and solve problems for a variety of deployments. The Army has a major initiative to improve decision making whereby leaders learn to (a) use what they already know, (b) recognize what they don't know, and (c) explore possibilities of gaining new knowledge. Decision-making guidelines resulted from a course for leaders that ARI helped develop at the Command and General

continued on page 2

Recent HF Contributions to Improve Military Operations

(continued from page 1)

Staff College, Fort Leavenworth, Kansas. The guidelines include how to take multiple perspectives, how to adapt to a situation, how to find hidden assumptions, and how to enhance practical reasoning and integrative thinking.

Reserve mobilization. Mobilization in an all-volunteer Army increasingly depends on the call-up of Reserve soldiers and on their capacity for relearning skills that may have grown rusty. ARI's research found no significant difference in what reservists had forgotten either six months or three years since last performing their military duties. Therefore, rapid relearning succeeds well for a much longer period than expected. Overall, skill reacquisition during rapid training is easier for soldiers with a higher aptitude for learning, for those whose prior active duty was longer, and for those whose civilian occupations were similar to their Army jobs. For such soldiers, short videotape presentations of their Army tasks were sufficient to prompt recall of many procedures.

The ARI products described here, along with others developed in response to soldiers' needs, are available now for direct application, including handbooks, tools, guidelines, and recommendations on what to do and how to do it.

Virtual At-Sea Training (Navy)

In early 2001, the Secretary of the Navy announced that the Navy would vacate its live-fire training range on the island of Vieques, Puerto Rico, by mid-2003. The impact of this decision on training and combat readiness was significant: For 30 years, Vieques had provided a unique spectrum of combat training capabilities, including naval surface fire support, strike aviation, undersea warfare, Marine Corps amphibious assault, and combined arms operations.

In the spring of 2001, the Chief of Naval Research formed a team to explore technological alternatives to the Vieques range. Drawing on decades of research and development on modeling and simulation, human-system interface design, training technology, and systems engineering, the Office of Naval Research was able to demonstrate a modeling and simulation-based system for naval surface fire support training and qualification within a few months. This system, Virtual At-Sea Training (VAST), has been well received and now is in use as an effective and affordable method to train and qualify ships for combat operations in naval surface fire support.

VAST generates a 3-D environment in cyberspace and locates the ship within that space. The ship's sensors and weapons systems are stimulated by an embedded training system called the Battle Force Tactical Trainer to display target and navigational information that conforms exactly to the synthetic battlespace in which the ship is operating. The ship then deploys an array of floating buoys – centered on the synthetic target area – each of which has a hydrophone suspended beneath the water's surface, a Global Positioning System receiver, and a radio transmitter. VAST calculates the projectile's trajectory according to ballistic flight models and determines where a shell would have struck the computer-generated target area in the synthetic battlespace, taking into account target elevation or height above sea level on the 3-D landmass.

VAST then creates a realistic visual scene of the target as it would appear to a spotter ashore or from an aircraft or uninhabited air vehicle overhead. That display appears on the video monitor of the forward observer, who sees the rounds hit the target area as would occur when directing a real surface fire mission.

Under current development through ONR support is an entire family of VAST capabilities, including systems that provide training and mission rehearsal for coordinated antisubmarine warfare, strike aviation, Marine Corps long-range artillery fire control, and, in partnership with the Defense Modeling and Simulation Office, joint operations in urban synthetic terrain. All these capabilities are planned for use in the Navy and Marine Corps within the next two to three years.

The speed with which these systems will be developed, their effectiveness, and their affordability are directly attributable to investments made by the Department of the Navy and Department of Defense over the past 50 years in basic and applied research on human factors, modeling and simulation, and training technologies.

Dee Andrews is a senior scientist with the Air Force Research Laboratory's Human Effectiveness Directorate (Warfighter Training Research Division), Mesa, AZ. Franklin Moses is a senior research psychologist with the U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA. Harold Hawkins is a senior scientist, and Michael Dunaway, Robert Matthews, and Tim Singer are scientists with the Human Systems Science & Technology Department, Office of Naval Research, Arlington, VA.

United States Postal Service Statement of Ownership, Management, and Circulation. (1) Publication Title: *HFES Bulletin*. (2) Publication Number: 1527-3660. (3) Filing Date 10/24/03. (4) Issue frequency: Monthly, except for one combined issue. (5) Number of issues published annually: 11. (6) Annual subscription price: $42.00. (7) Complete Mailing Address of Known Office of Publication: Human Factors and Ergonomics Society, P.O. Box 1369, Santa Monica, CA 90406-1369. Contact Person: Lois Smith. Telephone: (310) 394-1811. (8) Complete Mailing Address of headquarters or General Business Office of Publisher: Same as 7. (10) Owner: Human Factors and Ergonomics Society P.O. Box 1369, Santa Monica, CA 90406-1369. (11) Known Bondholders, Mortgages, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities: None (12) Tax status: Has not changed during preceding 12 months. (13) Publication Title: *HFES Bulletin*. (14) Issue date for Circulation Data Below: September 2003. (15) a) Total number of copies: Average (Ave.) 5263, Single issue nearest to filing date (Sing.) 5289) Paid/Requested Outside-County Mail Subscriptions: Ave. 546, Sing. 547. b2) Paid In-County Subscriptions: Ave. 3794, Sing. 3805. c) Total Paid and/or requested circulation: Ave. 4340, Sing. 4352. g) Total Distribution: Ave. 4340, Sing. 4352. h) Copies Not Distributed: Ave. 932, Sing. 937. i) Total: Ave. 5263, Sing. 5289. j) Percent Paid and/or Requested Circulation: Ave. 100, Sing. 100. 16) Publication of Statement of Ownership: Publication Required, December 2003. 17) Signature and Title: Lynn Strother, Executive Director, 10/24/03.

Human Factors and Ergonomics Society **Bulletin**

Volume 46, Number 12 December 2003

The *HFES Bulletin* (ISSN 1527-3660) is published monthly by the Human Factors and Ergonomics Society, 1124 Montana Ave., Suite B, Santa Monica, CA 90403 USA, http://hfes.org. Address inquiries and address changes to HFES, P.O. Box 1369, Santa Monica, CA 90406-1369 USA, 310/394-1811, fax 310/394-2410, http://hfes.org.

The *HFES Bulletin* is provided to members of the Society ($10 of annual dues covers member subscriptions); nonmembers may subscribe for $40/year. Periodicals postage paid at Santa Monica, CA, and additional mailing offices. USPS #018-206.