

# **Helmet-Mounted Displays: Sensation, Perception and Cognition Issues**

## CONTRIBUTORS

**Bruce E. Amrein**, Research Engineer  
 Visual and Auditory Processes Branch  
 Human Research and Engineering Directorate  
 U.S. Army Research Laboratory  
 AMSRD-ARL-HD / Bldg. 520  
 Aberdeen Proving Ground, MD 21005-5425

**Michael M. Bayer**, Display Systems Consultant  
 1624 The Alameda #41  
 San Jose, CA 95126

**Mary S. Binseel**, Research Engineer  
 Visual and Auditory Processes Branch  
 Human Research and Engineering Directorate  
 U.S. Army Research Laboratory  
 AMSRD-ARL-HD / Bldg. 520  
 Aberdeen Proving Ground, MD 21005-5425

**James H. Brindle**, Display Systems/Electronics  
 Engineer  
 LME, Inc.  
 P.O. Box 2303  
 Warminster, PA 18974

**Frederick T. Brozowski**, General Engineer  
 Injury Biomechanics Branch  
 Warfighter Protection Division  
 U.S. Army Aeromedical Research Laboratory  
 P.O. Box 620577, Bldg. 6901  
 Fort Rucker, AL 36362-0577

**John A. Caldwell**, Research Psychologist  
 Senior Scientist  
 Archinoetics, LLC  
 700 Bishop Street, Suite 2000  
 Honolulu, HI 96813

**J. Lynn Caldwell**, Senior Research Psychologist  
 Human Performance Directorate  
 Air Force Research Laboratory  
 Wright-Patterson Air Force Base, OH 45433

**Jose E. Capo-Aponte**, Research Optometrist  
 Visual Sciences Branch  
 U.S. Army Aeromedical Research Laboratory  
 P.O. Box 620577, Bldg. 6901  
 Fort Rucker, AL 36362-0577

**Kara D. Cave**, Military Audiologist  
 Hearing Program Section  
 Soldier Family Medical Center  
 Ricker Road / Bldg. 2596  
 Fort Bliss, TX 79916

**Ian P. Curry**, Flight Surgeon  
 Royal Army Medical Corps  
 Joint Helicopter Command  
 Wilton, UK

**Diana C. Emanuel**, Professor  
 Department of Audiology, Speech-Language Pathology  
 and Deaf Studies  
 Towson University  
 8000 York Road  
 Towson, MD 21252-0001

**Gregory S. Francis**, Professor  
 Psychological Sciences  
 Purdue University  
 Lafayette, IN 47907

**Thomas G. Ghirardelli**, Assistant Professor  
 Department of Psychology  
 Goucher College  
 1021 Dulaney Valley Road  
 Baltimore, MD 21204-2794

**Thomas H. Harding**, Neurophysiologist  
 Director, Sensory Research Division  
 U.S. Army Aeromedical Research Laboratory  
 P.O. Box 620577, Bldg. 6901  
 Fort Rucker, AL 36362-0577

**Keith L. Hiatt**, Flight Surgeon  
 Medical Director  
 U.S. Army Research Institute of Environmental Medicine  
 Natick, MA 01760

**Melvyn E. Kalich**, Research Optometrist  
 Visual Sciences Branch  
 U.S. Army Aeromedical Research Laboratory  
 P.O. Box 620577, Bldg. 6901  
 Fort Rucker, AL 36362-0577

**Ronald P. King**, Flight Surgeon  
Director, Warfighter Protection Division  
U.S. Army Aeromedical Research Laboratory  
P.O. Box 620577, Bldg. 6901  
Fort Rucker, AL 36362-0577

**Gregory T. Lang**, Senior Flight Surgeon  
Diving Medical Officer  
Medical Corps, United States Army

**Tomasz R. Letowski**, Senior Research Scientist  
Visual and Auditory Processes Branch  
Human Research and Engineering Directorate  
U.S. Army Research Laboratory  
AMSRD-ARL-HD / Bldg. 520  
Aberdeen Proving Ground, MD 21005-5425

**Sumalai Maroonroge**, Associate Professor  
Communication Disorders Department  
Lamar University  
Beaumont, TX 77710

**William E. McLean**, Research Optometrist  
Visual Sciences Branch  
U.S. Army Aeromedical Research Laboratory  
P.O. Box 620577, Bldg. 6901  
Fort Rucker, AL 36362-0577

**James E. Melzer**, Manager of Research and  
Technology  
Rockwell Collins Optronics  
2752 Loker Avenue West  
Carlsbad, CA 92010

**Kimberly P. Myles**, Human Factors Engineer  
Visual and Auditory Processes Branch  
Human Research and Engineering Directorate  
U.S. Army Research Laboratory  
AMSRD-ARL-HD / Bldg. 520  
Aberdeen Proving Ground, MD 21005-5425

**Robert K. Noback**, Flight Surgeon  
Commander/Dean  
U.S. Army School of Aviation Medicine  
301 Dustoff Avenue  
Fort Rucker, AL 36362

**Allan J. Pantle**, Professor Emeritus  
Department of Psychology  
Miami University  
Oxford, OH 45056

**Alan R. Pinkus**, Research Psychologist  
Warfighter Interface Division  
Air Force Research Laboratory  
Wright-Patterson Air Force Base, OH 45433

**Clarence E. Rash**, Research Physicist  
Visual Sciences Branch  
U.S. Army Aeromedical Research Laboratory  
P.O. Box 620577, Bldg. 6901  
Fort Rucker, AL 36362-0577

**Michael B. Russo**, Neurologist/Sleep Disorders  
Specialist  
Tripler Army Medical Center  
1 Jarrett White Road  
Tripler Army Medical Center, HI 96859

**Thomas O. Salmon**, Associate Professor of Optometry  
Northeastern State University  
1001 N. Grand Avenue  
Tahlequah, OK 74464

**Angélique A. Scharine**, Research Psychologist  
Visual and Auditory Processes Branch  
Human Research and Engineering Directorate  
U.S. Army Research Laboratory  
AMSRD-ARL-HD / Bldg. 520  
Aberdeen Proving Ground, MD 21005-5425

**Elmar T. Schmeisser**, Research Physiologist  
Program Manager, LS/Neurosciences  
U.S. Army Research Office,  
Research Triangle Park, NC 27709

**H. Lee Task**, Optical Physicist  
Task Consulting  
Tuscon, AZ 85745

**Leonard A. Temme**, Research Psychologist  
Chief, Visual Sciences Branch  
U.S. Army Aeromedical Research Laboratory  
P.O. Box 620577, Bldg. 6901  
Fort Rucker, AL 36362-0577

**Phuong K. Tran**, Research Engineer  
Visual and Auditory Processes Branch  
Human Research and Engineering Directorate  
U.S. Army Research Laboratory  
AMSRD-ARL-HD / Bldg. 520  
Aberdeen Proving Ground, MD 21005-5425

**Corina van de Pol**, Research Optometrist  
Vice president, Clinical Studies  
AcuFocus, Inc.  
32 Discovery, Suite 200  
Irvine, CA 92618

**Robert M. Wildzunas**, Research Psychologist  
U.S. Army School of Aviation Medicine  
301 Dustoff Avenue  
Fort Rucker, AL 36362

# **Helmet-Mounted Displays: Sensation, Perception and Cognition Issues**

Edited by

**Clarence E. Rash**

**Michael B. Russo**

**Tomasz R. Letowski**

**Elmar T. Schmeisser**

U.S. Army Aeromedical Research Laboratory  
Fort Rucker, Alabama

U.S. Army Research Laboratory  
Aberdeen Proving Ground, Maryland

With a foreword by

CW4 J. Kevin Heinecke

U.S. Army Master Aviator

AH-64/AH-1/UH-72/UH-60/UH-1/OH-58/OH-6 and C-12 Pilot

Library of Congress Cataloging-in-Publication Data

Helmet-mounted displays: Sensation, perception and cognition issues/ edited by Clarence E. Rash,  
Michael B. Russo, Tomasz R. Letowski and Elmar T. Schmeisser

ISBN 978-0-615-28375-3

Published by

U.S. Army Aeromedical Research Laboratory  
P.O. Box 620577  
Fort Rucker, Alabama 36362-0577

The views, opinions, and/or findings contained in this book are those of the authors and should not be construed as an official Department of the Army position, policy, or decision unless so designated by other official documentation.

Printed in the United States of America