

Aerospace Medical Association 2007 Workshop

Commercial Human Spaceflight: The Next Challenge for Aerospace Medicine”

- Location: New Orleans Sheraton - Bayside C
- Date: Sunday, May 13, 2007
- 0900 - 1500
- 5 CME hours
- Offered for Continuing Medical Education

Chair/Coordinator: Dr. Vernon McDonald – Wyle Laboratories

Schedule:

TIME	TOPIC	SPEAKER
0830 – 0900	Assemble / Coffee	
0900 – 0915	Introduction to the workshop & presenters	Dr. Vernon McDonald
0915 – 1000	Overview of the market/industry	Mr. Derek Webber
1000 – 1045	Space medicine/physiology evidence base today	Dr. Jay Buckey
1045 – 1130	Review of incidents in spaceflight	Dr. Jon Clark
1130 – 1230	LUNCH	
1230 – 1315	Legal implications for commercial spaceflight	Mr. Doug Griffith
1315 – 1400	Standards and processes for flight certification	Dr. Jim Vanderploeg
1400 – 1500	Panel Q&A / Discussion	All speakers plus Dr. Melchor Antunano, Dr. Jeff Davis, Dr. Richard Jennings, Mr. Chris Faranetta,

Objectives

- Describe the characteristics of the emerging commercial human spaceflight industry and the implications for aerospace medicine
- Describe basic physiological responses to environmental factors associated with suborbital and orbital spaceflight
- Describe known spaceflight incidents to date and the impact of these incidents on crew health and performance
- Describe the legal and regulatory environment pertaining to the commercial human spaceflight industry
- Compare and contrast federal and commercial spaceflight risk management objectives and strategies and suggested implications for human health and performance

AsMA 2007 Workshop Summary

- Compare and contrast Federal and Commercial approaches to medical certification of spaceflight participants including the International Space Station Multilateral Space Medicine Board (MSMB), NASA's Aerospace Medicine Board (AMB), Russia's GMK, the regulatory position of the FAA, and suborbital operator efforts in developing medical standards for suborbital flight certification

Participant Biographies:

Vernon McDonald, Ph.D

Vernon McDonald attended the University of Illinois at Urbana-Champaign, where he received an M.S. and Ph.D in Kinesiology, with an emphasis on adaptation and exploration in human learning and performance. Dr. McDonald is currently Director of Commercial Human Space Flight for Wyle Laboratories, Houston, TX. Prior to this appointment, Dr. McDonald spent 14 years supporting NASA, during which time he participated in the Extended Duration Orbiter program, acted as co-investigator on four joint U.S./Russian investigations that have flown on the Space Shuttle and Mir, and most recently developed and deployed clinical systems for the International Space Station. Prior to his current appointment, Dr. McDonald managed the Medical Informatics and Health Care Systems group for Wyle in support of NASA Space Medicine, leading efforts to enhance the standard of clinical care available during space missions before being promoted to Manager, Space Medicine Group in May, 2003, responsible for the coordination and oversight of support services for all aspects of crew health care as it pertains to human space flight, including Space Shuttle, International Space Station, and future lunar and Mars exploration missions. In June 2006, Dr. McDonald became the Director of Commercial Human Spaceflight for Wyle Laboratories leading business development and program management efforts in support of the emerging private spaceflight industry. Dr. McDonald's experience and qualifications span basic and applied advanced research and development, government contract management, and he has published over 20 refereed articles and book chapters, and presented his work in numerous conferences in the fields of biomechanics, neuroscience, Space life sciences, and human engineering.

Derek Webber

Derek Webber is Washington DC Director of Spaceport Associates. Derek directed three landmark studies in commercial space business planning: the *ASCENT Study of Space Markets*, for NASA's Marshall Space Flight Center, the *Futron/Zogby Study of Space Tourism Demand*, and the *Adventurers' Survey* which he recently completed jointly with Incredible Adventures. Derek's career began as a launch vehicle and satellite engineer in Europe. Then he began two decades of leadership in the international satellite communications business. He was successively Head of Procurement at Inmarsat, (contracting for over a billion dollars worth of communications satellites and their launch vehicles), and Managing Director of Tachyon Europe (providing satellite broadband and Internet access across the continent). He has entries in "Who's Who in the World" and "Who's Who in Science and Engineering", and is a published author in "Beyond Earth – the Future of Humans in Space". Derek's aim is to enable the creation of a viable space tourism business, both through credible business case development, and through ensuring that the necessary supporting infrastructure is put in place.

Dr. Jay C. Buckey, Jr.

Dr. Jay C. Buckey, Jr., a former astronaut, is a Professor of Medicine at Dartmouth Medical School and an adjunct professor at Dartmouth's Thayer School of Engineering. He's an expert in space physiology and medicine and is the author of *Space Physiology*, published by Oxford University Press in 2006.

Dr. Buckey flew in space as a payload specialist astronaut on the STS-90 Neurolab mission in 1998, where he completed 256 orbits of the Earth and logged 6.3 million miles. After the mission, he co-edited *The Neurolab Spacelab Mission*, which presented and explained Neurolab's results. He also served as an alternate payload specialist astronaut for Spacelab Life Sciences 2 in 1993. Dr. Buckey has been involved in the design and development of flight hardware that flew on Spacelab missions. His current work at Dartmouth focuses on research and technology development to solve the biomedical problems of spaceflight. He is the team lead of the Technology Development Team for the National Space Biomedical Research Institute.

In addition to his NASA work, Dr. Buckey has served as a flight surgeon in the U.S. Air Force Reserve, and has flown in F-16, F-4, T-38, B-52 and AWACS aircraft. He is a senior medical examiner for the FAA. He is a member of the Association of Space Explorers, the Aerospace Medical Association, the Association for Gravitational and Space Biology, and the Explorers Club. He serves on the editorial board of the journal *Aviation, Space and Environmental Medicine*.

Jonathan B. Clark M.D., M.P.H.

Dr. Jonathan B. Clark is the National Space Biomedical Research Institute (NSBRI) Space Medicine Liaison at Baylor College of Medicine. He is a member of the Spacecraft Survival Integrated Investigation Team at NASA Johnson Space Center (JSC). Dr. Clark serves on the Board of Directors of Xtreme Space, Inc. and is Team Leader for Safety and Survivability for Orbital Outfitters Inc., medical advisor for Space Diver and Excalibur Almaz LLC, and is a consultant for Disney World Corporation. His interests are in neurologic effects in extreme environments and crew survival in space.

Dr. Clark worked as a Space Shuttle Crew Surgeon on six shuttle missions and was Chief of the Medical Operations Branch and an FAA Senior Aviation Medical Examiner at the NASA JSC Flight Medicine Clinic. Dr. Clark served 26 years on active duty with the U.S. Navy and qualified as a Naval Flight Officer, Naval Flight Surgeon and Navy Diver and U.S. Army parachutist and Special Forces Military Freefall parachutist. He flew as a DOD Space Shuttle Support Flight Surgeon for 2 space shuttle flights and flew combat medical evacuation missions in Operation Desert Storm with the U.S. Marine Corps. Prior to joining NASA in 1997, he was Head of the Spatial Orientation Systems Department at the Naval Aerospace Medical Research Laboratory in Pensacola, Fla., Head of the Aeromedical Department at the Marine Aviation Weapons and Tactics Squadron One in Yuma, Ariz., and Head of the Neurology Division and Hyperbaric Medicine at the Naval Aerospace Medical Institute.

Dr. Clark is a Fellow of the Aerospace Medical Association and the American College of Preventive Medicine. He has an academic appointment as Clinical Assistant Professor in the Department of Preventive Medicine and Community Health at the University of Texas Medical Branch in Galveston, Texas. Dr. Clark is President of the Space Medicine and a reviewer for the journal *Aviation Space and Environmental Medicine* and served on the editorial board for the publication.

He received his bachelor's degree from Texas A&M University in College Station, Texas, his medical degree from the Uniformed Services University of the Health Sciences in Bethesda, Md., and his master's degree in public health from the University of Alabama in Birmingham. He completed his internship and residency at Bethesda Naval Hospital and is a board certified diplomate of the American Board of Psychiatry and Neurology and the American Board of Preventive Medicine.

Doug Griffith

Doug studied aerospace engineering at the University of Texas at Austin, receiving his Bachelors of Science degree in 1984. Upon graduation, Doug joined the United States Marine Corps and began training to become a Naval Aviator. After completing training in the T-34C Turbomenter and TH-57 JetRanger, Doug earned his wings and reported to Camp Pendleton, California to fly AH-1W SuperCobra attack helicopters.

For five years, Doug served with Marine Light Attack Helicopter Squadron (HMLA) 369, participating in deployments to Okinawa, Korea and the Philippines before going to Southwest Asia for Operations Desert Shield and Desert Storm in 1990-91. There, Doug flew numerous combat missions in support of the Marines' advance into Kuwait City, and earned the Distinguished Flying Cross, several Air Medals, and the Navy Commendation Medal. Doug's squadron was awarded the title Marine Helicopter Squadron of the Year for 1991 as a result of its actions during the Gulf War.

Doug left the active duty Marine Corps in 1992 to begin his legal education and career, but continued to fly AH-1Ws as a reservist until 2003. During his time in the reserves, Doug was the investigator-in-charge of two major aircraft accidents, and developed a multimedia lecture series on aviation fratricide. He also worked part-time for Rockwell International Corporation during its design of an upgraded cockpit and weapons control system for the AH-1W.

By the end of his military flying career, Doug had reached the rank of Lieutenant Colonel, had amassed more than 2,500 mishap-free flight hours, and had obtained numerous instructor designations. He is now the Commanding Officer of a Los Angeles-based Marine Corps Reserve Mobilization Training Unit.

Doug received his Juris Doctor in 1996 from Loyola Law School (Dean's List, St. Thomas More Law Honor Society). Before starting his own firm catering to aviation and spaceflight companies, Doug spent more than four years at the international law firm Paul, Hastings,

Janofsky & Walker LLP. As part of the firm's aviation practice group, Doug engaged in a broad-based commercial litigation practice emphasizing sophisticated contract and regulatory disputes encompassing real property transactions, operating agreements, labor and employment matters, construction projects, trade secrets and airport noise/access issues.

Doug holds an FAA pilot license, valid for rotorcraft at the commercial level and airplanes at the private level. He serves on the Board of Directors of Angel Flight West, a charitable network of volunteer pilots who provide their aircraft and services free of charge to financially needy persons needing transportation to far-away medical facilities. Doug is a frequent lecturer under the Federal Aviation Administration's aviation safety program. As a passionate advocate of the personal spaceflight industry, he has spoken on the topic of liability and risk management for spaceflight companies, and is a member of the Space Frontier Foundation and the National Space Society.

James M. Vanderploeg, MD MPH

Dr. Vanderploeg has over 25 years of experience in aerospace medicine with a career spanning both medical operational support for space flight as well as the practice of civilian aviation medicine. He currently works with Wyle Laboratories in providing services as the Chief Medical Officer for Virgin Galactic and as the Program Manager for the Occupational Medicine and Occupational Health contract at the Johnson Space Center. Dr. Vanderploeg is a Fellow and Past President of the Aerospace Medical Association, an FAA Senior Aviation Medical Examiner, and is Board Certified by the American Board of Preventive Medicine in both Aerospace Medicine and Occupational Medicine.

Dr. Vanderploeg's NASA career included serving as Crew Surgeon or Deputy Crew Surgeon for several Shuttle missions during the early years of the Space Shuttle program. He was the Chief of the Medical Operations Branch of the Medical Sciences Division at the Johnson Space Center before being appointed as the first director of the Space Biomedical Research Institute.

As the interest in commercial human space flight has evolved, Dr. Vanderploeg has been active in several projects to develop medical criteria for commercial space tourists and crew members. He currently is the Chief Medical Officer and chairs the medical advisory panel for Virgin Galactic.

Jeffrey R. Davis, MD, MS

Jeffrey R. Davis, MD, MS is a Professor of Clinical Preventive Medicine in the Department of Preventive Medicine and Community Health at UTMB. Under an Intergovernmental Personnel Act (IPA) agreement with NASA, he serves as Director, Space Life Sciences, NASA Johnson Space Center. His NASA responsibilities include leading the Space Life Sciences Directorate. The Directorate work provides the research and technology development required for exploration as well as all biomedical support to space flight operations of the Space Shuttle and International Space Station. The technical disciplines in the directorate

include space medicine; biomedical research into the physiological changes induced by human exposure to reduced gravity; development of countermeasures to protect human health during space flight; environmental monitoring including radiation; and habitability and human factors. Dr. Davis also coordinates the National Space Biomedical Research Institute Steering Group which reviews plans for human research and technology work.

He received his B.S. degree in Biology from Stanford University and M.D. degree from the University of California at San Diego. He subsequently did residency training in internal medicine and aerospace medicine, and is certified by the American Board of Preventive Medicine. Past positions include Corporate Medical Director, American Airlines, and Chief, Medical Operations NASA. His national board participation has included service as the chair of the American Board of Preventive Medicine; chair of the Residency Review Committee for Preventive Medicine; and president of the Aerospace Medical Association. Dr. Davis currently serves as an elected member of the executive committee of the American Board of Medical Specialties. Dr. Davis is the co-editor of the text "Fundamentals of Aerospace Medicine", May 2002. Additional publications are available on request.

Richard T. Jennings, M.D.

Dr. Jennings attended Oklahoma State University from 1967-1970 and graduated from the University of Oklahoma School of Medicine in 1974. He completed residency in obstetrics and gynecology at the University of Oklahoma Tulsa Medical College and practiced obstetrics and gynecology in Stillwater, OK while also serving on the teaching staff at the University of Oklahoma, Tulsa Medical College. After practicing ob/gyn for eight years, he completed a second residency in aerospace medicine at Wright State University, Dayton, OH. He is certified by the American Board of Preventive Medicine in Aerospace Medicine and American Board of Obstetrics and Gynecology.

Following the AM residency, he began work in 1987 as a NASA-JSC flight surgeon and ob/gyn consultant and served as the Chief of the Flight Medicine Clinic and Chief of Medical Operations-Space Shuttle. During this time, he was the crew surgeon or deputy crew surgeon on 15 Shuttle missions and provided direct mission support to 45 Shuttle flights. In 1995, he transitioned to the University of Texas Medical Branch in Galveston with appointments in Preventive Medicine and Community Health, Ob/Gyn, and Family Medicine. He currently serves as residency director of the UTMB/NASA-JSC aerospace medicine residency program, director of the UTMB Aviation Medicine Center, and director, Clinical Preventive Medicine. He provides astronaut gynecological care, selection examinations, and consultation services at the Flight Medicine Clinic at NASA-JSC. In addition, he coordinates the Wyle Laboratories/UTMB physicians that work at the Gagarin Cosmonaut Training Center in Star City, Russia, Johnson Space Center, and International Artificial Gravity project on the UTMB campus. He serves as a consultant in commercial spaceflight and is the lead flight surgeon for Space Adventures. He served as the crew surgeon for Dr. Greg Olsen's International Space Station flight that originated and landed in Kazakhstan and is currently assigned to the mission of Charles Simonyi.

Melchor J. Antuñano, M.D., M.S.

Dr. Antuñano was born in Mexico City and is a graduate of the National Autonomous University of Mexico School of Medicine. He completed the Residency Program in Aerospace Medicine at Wright State University in Dayton, Ohio. He was awarded a post-doctoral research associateship by the U.S. National Research Council of the National Academy of Sciences at the USAF School of Aerospace Medicine in San Antonio, Texas.

Dr. Antuñano is currently the Director of the U.S. Federal Aviation Administration (FAA) Civil Aerospace Medical Institute (CAMI) in Oklahoma City. He provides executive direction and is responsible for the administration of FAA Office of Aerospace Medicine's programs in Medical Certification, Medical Education, Medical Research, Human Factors Research, and Occupational Health Services. Dr. Antuñano is credited with 406 professional presentations and invited lectures at national and international conferences in aerospace medicine in 27 countries, and with 49 scientific publications covering a variety of aerospace medicine topics. He is Fellow and Past-President of the U.S. Aerospace Medical Association, Past-President of the Space Medicine Branch, Past-President of the Iberoamerican Association of Aerospace Medicine, member and past-selector of the International Academy of Aviation and Space Medicine, member of the International Academy of Astronautics, Honorary Member of the Greek Aerospace Medical Association, Honorary Member of the Colombian Society of Aviation Medicine, Honorary Member of the Slovenian Aerospace Medical Association, Honorary Member of the Mexican Society of Aviation Medicine, and a member of many other national and international professional societies in aerospace medicine. Dr. Antuñano has received 61 awards and recognitions for his academic, administrative, and research achievements.

Mr. Chris Faranetta

Following the end of the Cold War, Mr. Faranetta helped forge early joint U.S./Russian space efforts while serving as International Liaison to the Space Studies Institute in Princeton N.J. To support and foster further U.S./Russian space ventures prior to the establishment of the Russian Aviation and Space Agency, Mr. Faranetta established and co-managed the American office for Rocket Space Corporation Energia, the prime contractor for the Russian segment of the International Space Station. Following his position with Energia, Mr. Faranetta worked with emerging companies to formulate and identify new markets for advanced space technologies. His love for the development of new and advanced commercial space markets drew him to Space Adventures, where he is currently serving as Vice President, Orbital Space Flight. Space Adventures, Ltd., the world's leading space tourism company, offers a wide range of space experiences, from zero-gravity and Edge of Space flights, cosmonaut training and space flight qualification programs, to actual flights into space. Headquartered in Arlington, VA, and with an office in Moscow, Russia, Space Adventures is the only company to successfully launch private individuals to the International Space Station.