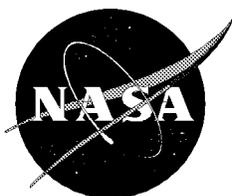


NASA/SP—2000-7011/SUPPL496
JANUARY 2000

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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Typical Report Citation and Abstract

- ❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA; Mar. 1996; 130p; In English
Contract(s)/Grant(s): RTOP 505-68-70-04
- ❹ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❺ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❻ Author
- ❼ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
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AEROSPACE MEDICINE AND BIOLOGY

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JANUARY 2000

51

LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.

20000004310 Ames Lab., IA USA

Automation and integration of multiplexed on-line sample preparation with capillary electrophoresis for DNA sequencing
Tan, H., Ames Lab., USA; Mar. 31, 1999; 165p; In English

Report No.(s): DE99-003354; IS-T-1851; No Copyright; Avail: Department of Energy Information Bridge, Hardcopy

The purpose of this research is to develop a multiplexed sample processing system in conjunction with multiplexed capillary electrophoresis for high-throughput DNA sequencing. The concept from DNA template to called bases was first demonstrated with a manually operated single capillary system. Later, an automated microfluidic system with 8 channels based on the same principle was successfully constructed. The instrument automatically processes 8 templates through reaction, purification, denaturation, pre-concentration, injection, separation and detection in a parallel fashion. A multiplexed freeze/thaw switching principle and a distribution network were implemented to manage flow direction and sample transportation. Dye-labeled terminator cycle-sequencing reactions are performed in an 8-capillary array in a hot air thermal cycler. Subsequently, the sequencing ladders are directly loaded into a corresponding size-exclusion chromatographic column operated at (approximately) 60 C for purification. On-line denaturation and stacking injection for capillary electrophoresis is simultaneously accomplished at a cross assembly set at (approximately) 70 C. Not only the separation capillary array but also the reaction capillary array and purification columns can be regenerated after every run. DNA sequencing data from this system allow base calling up to 460 bases with accuracy of 98%.

NTIS

Multiplexing; On-Line Systems; Samples; Electrophoresis; Deoxyribonucleic Acid; Sequencing

20000004363 Kyushu Univ., Inst. of Advanced Material Study, Kasuga, Japan

A New Method for Measuring Viability of Deformed Cells

Takamatsu, Hiroshi, California Univ., USA; The Reports of Institute of Advanced Material Study, Kyushu University; 1999; ISSN 0914-3793; Volume 13, No. 1, pp. 21-24; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A new experimental procedure has been developed to measure the viability of isolated cells deformed by two parallel plates which simulate ice crystals under freezing of biological material. The viability of deformed cell is evaluated in situ with trypan blue dye exclusion assay. The change in the viability with the gap size between two plates is obtained for the prostate cancer cell line ND-1 (20 microns in the mean diameter) at about 23 C. The viability decreases steeply with decreasing the gap size at about 6 microns that is 30% of original cell diameter and about 50% of cells are destroyed. If uniform expansion of cell membrane is assumed, this critical expansion corresponds to the 50% increase in the surface area.

Author

Viability; Deformation; Cell Membranes (Biology); Cells (Biology)

20000004495 Santa Fe Inst., NM USA

Autonomous Agents: The Origins and Co-Evolution of Reproducing Molecular Systems Final Report

Kauffman, Stuart, Santa Fe Inst., USA; [1999]; 3p; In English

Contract(s)/Grant(s): NAG2-1091; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The central aim of this award concerned an investigation into, and adequate formulation of, the concept of an "autonomous agent." If we consider a bacterium swimming upstream in a glucose gradient, we are willing to say of the bacterium that it is going to get food. That is, we are willing, and do, describe the bacterium as acting on its own behalf in an environment. All free living cells are, in this sense, autonomous agents. But the bacterium is "just" a set of molecules. We define an autonomous agent as a physical system able to act on its own behalf in an environment, then ask, "What must a physical system be to be an autonomous agent?" The tentative definition for a molecular autonomous agent is that it must be self-reproducing and carry out at least one thermodynamic work cycle. The work carried out in this grant involved, among other features, the development of a detailed model of a molecular autonomous agent, and study of the kinetics of this system. In particular, a molecular autonomous agent must, by the above tentative definition, not only reproduce, but must carry out at least one work cycle. I took, as a simple example of a self-reproducing molecular system, the single-stranded DNA hexamer 3'CCGCGG5' which can line up and ligate its two complementary trimers, 5'CCG3' and 5'CGG3'. But the two ligated trimers constitute the same molecular sequence in the 3' to 5' direction as the initial hexamer, hence this system is autocatalytic. On the other hand the above system is not yet an autonomous agent. At the minimum, autonomous agents, as I have defined them, are a new class of chemical reaction network. At a maximum, they may constitute a proper definition of life itself.

Derived from text

Autonomy; Cells (Biology); Deoxyribonucleic Acid; Adaptive Control; Reproduction (Biology)

2000004830 Alabama Univ., Dept. of Biological Sciences, Huntsville, AL USA

Beta-Adrenergic Receptor Gene Expression in Bovine Skeletal Muscle Cells in Culture

Bridge, Kristin Y., Alabama Univ., USA; Smith, Charles K., II, Lilly Research Labs., USA; Young, Ronald B., Alabama Univ., USA; [1998]; 1p; In English; Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Beta-adrenergic receptors ((beta)AR) are abundant in fetal, neonatal and adult skeletal muscles of cattle; however, only minimal levels of functional (beta)AR were detected in multinucleated muscle cell cultures prepared from 90- to 150-d fetal bovine skeletal muscle. Two other lines of evidence were consistent with low levels of (beta)AR expression in bovine muscle cultures. First, treating the cells with 10(exp -6)M isoproterenol for up to 20 min did not increase intracellular cAMP concentration. Second, neither the quantity of myosin heavy chain (MHC) nor its apparent synthesis rate were changed by treating the cells for 3 d with 10(exp -7) or 10(exp -6)M isoproterenol. Despite these results, the mRNA for the (beta2)AR could be detected in muscle cultures by polymerase chain reaction (PCR) and on slot blots. Thus, the (beta2)AR mRNA was expressed, but functional receptors could not be detected. Glucocorticoids are known to activate expression of (beta)AR genes in several tissues, and the effect of dexamethasone on (beta)AR gene expression in bovine multinucleated muscle cell cultures was evaluated. The intracellular concentration of cAMP following treatment with isoproterenol was elevated approximately 10-fold by dexamethasone, and the population of functional receptors was elevated by approximately 30%. The effect of dexamethasone on muscle protein synthesis and accumulation was analyzed after pretreating the cells with dexamethasone for 24 h, followed by treatment with both dexamethasone and 10(exp -6)M isoproterenol for an additional 48 h. Both the quantity of MHC and the apparent synthesis rate of MHC were stimulated by 10 to 35%. These effects appear to be due to post-transcriptional events, since the quantity of (beta2)AR receptor mRNA on slot blots was not increased by treatment with dexamethasone. Results of this study emphasize the importance of verifying that muscle cells contain functional (beta)AR when they are employed to study the effects of (beta)AR agonists on muscle protein metabolism.

Author

Adrenergics; Chemoreceptors; Gene Expression; Culture Techniques; Sympathetic Nervous System; Muscles

2000005010 NASA Ames Research Center, Moffett Field, CA USA

Avian Blood-Vessel Formation in Space *Final Report*

Lelkes, Peter I., NASA Ames Research Center, USA; [1999]; 4p; In English

Contract(s)/Grant(s): NAG2-1007; NRA-93-OLMSA-06; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Based on previous studies, we hypothesized that the developmental anomalies observed in the past might be related to or caused by delayed or improper vascular development. The objective of our research is to test the hypothesis that exposure to microgravity during space flight cause delayed or improper vascular development during embryogenesis. The effects of microgravity on the time course and extent of avian blood-vessel formation are assessed using two models, one for angiogenesis and one for vasculogenesis. The methodological approach is dictated by the constraints of the tissue preservation method used in space. Thus, both in the chorioallantoic membrane (CAM) and in the adrenal, we will evaluate microscopically the vascular architecture and immunostain endothelial cells with specific antibodies (anti- vWF and QH1). The extent of ECM protein deposi-

tion will be assessed by immunohistochemistry and correlated with the degree of vascularization, using computer-based image analysis. Also, the cellular source for ECM proteins will be assessed by in situ hybridization.

Derived from text

Blood Vessels; Microgravity; Formation; Anomalies; Cardiovascular System; Image Analysis

2000005099 NASA Ames Research Center, Moffett Field, CA USA

Launch Conditions Might Affect the Formation of Blood Vessel in the Quail Chorioallantoic Membrane

Henry, M. K., Marquette Univ., USA; Unsworth, B. R., Marquette Univ., USA; Sychev, B. R., Institute for Biomedical Problems, Russia; Guryeva, T. S., Institute for Biomedical Problems, Russia; Dadasheva, O. A., Institute for Biomedical Problems, Russia; Piert, S. J., NASA Ames Research Center, USA; Lagel, K. E., NASA Ames Research Center, USA; Dubrovin, L. C., NASA Ames Research Center, USA; Jahns, G. C., NASA Ames Research Center, USA; Boda, K., Institute of Experimental Veterinary Medicine; Sabo, V., Slovak Academy of Sciences; Samet, M. M., Slovak Academy of Sciences; Lelkes, P. I., Sinai Samaritan Medical Center, USA; *Folia Veterinaria*; 1998; Volume 42, Supplementum, pp. S25-S31; In English

Contract(s)/Grant(s): NAG2-1007; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

AS 2 part of the first joint USA-Russian MIR/Shuttle program, fertilized quail eggs were flown on the MIR 18 mission. Post-flight examination indicated impaired survival of both the embryos in space and also of control embryos exposed to vibrational and g-forces simulating the conditions experienced during the launch of Progress 227. We hypothesized that excess mechanical forces and/or other conditions during the launch might cause abnormal development of the blood supply in the chorioallantoic membrane (CAM) leading to the impaired survival of the embryos. The CAM, a highly vascularized extraembryonic organ, provides for the oxygen exchange across the egg shell and is thus pivotal for proper embryonic development. To test our hypothesis, we compared angiogenesis in CAMS of eggs which were either exposed to the vibration and g-force profile simulating the conditions at launch of Progress 227 (synchronous controls), or kept under routine conditions in a laboratory incubator (laboratory controls). At various time points during incubation, the eggs were fixed in paraformaldehyde for subsequent dissection. At the time of dissection, the CAM was carefully lifted from the egg shell and examined as whole mounts by bright-field and fluorescent microscopy. The development of the vasculature (angiogenesis) was assessed from the density of blood vessels per viewing field and evaluated by computer aided image analysis. We observed a significant decrease in blood-vessel density in the synchronous controls versus "normal" laboratory controls beginning from day 10 of incubation. The decrease in vascular density was restricted to the smallest vessels only, suggesting that conditions during the launch and/or during the subsequent incubation of the eggs may affect the normal progress of angiogenesis in the CAM. Abnormal angiogenesis in the CAM might contribute to the impaired survival of the embryos observed in synchronous controls as well as in space.

Author

Acceleration (Physics); Abnormalities; Blood Vessels; Blood Volume; Image Analysis; Launching; Microgravity

2000010518 Woods Hole Oceanographic Inst., Dept. of Marine Chemistry and Geochemistry, MA USA

Controls on Bioavailability of Phosphorus in the Coastal Ocean: A Coupled Geochemical and Enzymatic Approach *Final Report, 1 Jun 1995 - 31 May 1998*

Ruttenberg, Kathleen C.; Nov. 08, 1999; 4p; In English

Contract(s)/Grant(s): N00014-95-1-0478

Report No.(s): AD-A370459; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The primary goal of this study was to determine whether phosphate limitation of phytoplankton occurs in the coastal ocean. Three cruises on the Eel River Shelf, northern California were completed in spring, summer 1996 and winter 1997 from which hydrographic and nutrient inventory data from 3 to 5 shore-perpendicular transects were collected. These geochemical data were coupled with enzymatic assay data for Alkaline Phosphatase (APase), an inducible enzyme indicative of phosphate limitation, to evaluate the importance and spatial distribution of phosphate limitation. Nutrient-nutrient plots (e.g.; DIN versus DIP) indicate a shift from N-limitation in spring to P-limitation in summer. Those stations which exhibit lowest DIP in summer also have high APase activities, suggesting that the algal populations at these sites were phosphate limited. These findings indicate that the prevailing dogma of ubiquitous nitrogen (N) limitation of biological productivity in the coastal ocean is overly simplistic. A high degree of spatial variability in surface-water chl-a, dissolved nutrient concentrations, and APase was observed in spring and summer, illustrating the patchy nature of coastal phytoplankton blooms and the importance of high-density sampling grids to effectively characterize the overall biomass and nutrient limitation conditions of such system.

DTIC

Coastal Water; Phytoplankton; Phosphates; Geochemistry; Enzyme Activity; Phosphorus

20000011036 Star Mountain, Inc., Alexandria, VA USA

Effects of Operating Practices on Commercial Driver Alertness Final Report

O'Neill, Timothy R., Star Mountain, Inc., USA; Krueger, Gerald P., Star Mountain, Inc., USA; VanHemel, Susan B., Star Mountain, Inc., USA; McGowan, Adam L., Star Mountain, Inc., USA; Sep. 1999; 166p; In English; Sponsored in part by the American Trucking Associations Foundation, Alexandria, VA

Contract(s)/Grant(s): FHWA-MC-99-140

Report No.(s): PB2000-100799; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy

This report summarizes the results of a one-year effort to establish the interaction between operating practices in the trucking industry and driver performance, particularly with respect to safety and fatigue. Principal topics were: Loading and unloading activities as they influence the likelihood and magnitude of general driver fatigue. Driver rest and recovery as it pertains to re-starting the cumulative weekly hours-on-duty clock. Length of duty period (extend driving): In this study, simulator driving performance was measured using a 14 hours on/10 hours off schedule, with schedule breaks during the 14 hour duty cycle. This study used simulator technology, which permitted safe operation in an environment that included planned safety challenges and precise measurement of driver response. The study drew the following conclusions; (1) The effects of loading and unloading were mixed. Immediately after a morning loading/unloading session, drivers' performance in crash-likely circumstances improved. Late-day loading/unloading sessions produced ambiguous results; (2) Drivers recovered baseline performance within 24 hours of the end of a driving week, and should be fit to resume duty after 36 hours; (3) a schedule of 14 hours on duty/10 hours off duty for 5-day week did not appear to produce cumulative fatigue; (4) Incidental results worthy of further study are discussed.

NTIS

Alertness; Human Factors Engineering; Fatigue (Biology); Trucks; Computerized Simulation

20000011093 National Defence Research Establishment, Div. of Human Sciences, Linköping, Sweden

Testing Models for Estimating Muscular Strength Proevning av Skattningsmodeller foer Muskelprovet

Wenemark, R.; Aven, A.; Sep. 1998; 28p; In Swedish

Report No.(s): PB2000-100956; FOA-R-98-00822-720-SE; No Copyright; Avail: National Technical Information Service (NTIS), Hardcopy

This document describes two models (Model 1 and 2) for estimating muscular strength capacity. The purpose of using a model is that draftees can be estimated when they can not accomplish the muscular strength test. by using a model the estimation of a draftee will also be equal all over the country. The two models are based on the draftees' weight, practicing/competing at action sports and estimation of their muscular strength compared to their classmates. Those three variables create the two suggested models. The two models are estimating almost the same number of draftees' correctly, as if they had done the muscular strength capacity test. by using Model 1 79% of the draftees' were estimated correctly and 80% by using Model 2. The draftees' also had to be estimated if they belonged to one of the two groups 'HIGH or 'LOW' The suggested distribution was 70%-30%. The distribution of Model 1 was 80%-20% and of Model 2, 72%-28%. The outcome of the analyses is that Model 2 better full-fill desired criterias and is therefore recommended.

NTIS

Muscular Strength; Output

20000011278 Osaka Univ., Faculty of Engineering, Osaka, Japan

Defocus-Image Modulation Processing as Applied to Observation of Unstained Biological Specimen

Sato, Makoto, Osaka Univ., Japan; Ando, Toshiyuki, Osaka Univ., Japan; Takai, Yoshizo, Osaka Univ., Japan; Shimizu, Ryuichi, Osaka Univ., Japan; Technology Reports of the Osaka University; Oct. 15, 1999; ISSN 0030-6177; Volume 49, No. 2350, pp. 105-110; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Defocus-image modulation processing in transmission electron microscopy has been applied to observe an unstained biological specimen (*Pseudomonas aeruginosa* flagellar filament). A special microgrid with stripe-shape small holes was made as a supporting film, and the flagellar filaments which were bridged over the holes were observed without disturbance from the contrast of the supporting film. The processing successfully allows us to observe a spherical aberration-free phase image of the unstained flagellar filament with high contrast at in-focus condition. Some experimental conditions required for the observation of biological specimens are discussed.

Author

Defocusing; Phase Modulation; Image Processing; Image Analysis; Imaging Techniques; Image Reconstruction; Specimens

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.

2000000228 Tohoku Univ., Research Inst. of Electrical Communication, Sendai, Japan

An adaptive control for total artificial heart

Tanaka, Akira, Tohoku Univ., Japan; The Record of Electrical and Communication Engineering Conversazione, Tohoku University; August 1998; ISSN 0385-7719; Volume 67, No. 1, pp. 10-13; In Japanese; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

To control the total artificial heart (TAH) on the basis of the autonomic nervous system information, a new control algorithm has been proposed in which the cardiac output is controlled so as to be dependent on the peripheral vascular resistance. The cardiovascular system with TAH has been modelled as a low order DARMA model with time-varying parameters. On the basis of the model, an adaptive controller has been designed and evaluated by digital simulation and acute animal experiments.

Author

Adaptive Control; Heart; Autonomic Nervous System; Cardiovascular System

2000000379 Tohoku Univ., Research Inst. of Electrical Communication, Sendai, Japan

A Study on Musculotendon-skeleton Model at the Elbow Joint for FES Simulator

Nozawa, Tsuneyuki, Tohoku Univ., Japan; The Record of Electrical and Communication Engineering Conversazione, Tohoku University; August 1998; ISSN 0385-7719; Volume 67, No. 1, pp. 336-337; In Japanese; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Stimulus data based on EMG signals from normals are useful to restore paralyzed motor functions by FES. However, adjustment of stimulus data is required for each muscle. The musculotendon-skeleton model is used in the FES simulator which estimates FES induced motions of patients. This study aims to make musculotendon-skeleton model for estimating whole body motion developed by FES. For this purpose, it is important to consider the geometry of bones and the fact the musculotendons are surrounded by other tissues. Simulation results agreed approximately with experimental results after introducing musculotendon guide.

Author

Musculoskeletal System; Models; Elbow (Anatomy); Simulators; Bones

2000000380 Tohoku Univ., Research Inst. of Electrical Communication, Sendai, Japan

A Basic Study on Extraction of Sensory Information from Peripheral Nerve Trunk

Nakatani, Hironori, Tohoku Univ., Japan; The Record of Electrical and Communication Engineering Conversazione, Tohoku University; August 1998; ISSN 0385-7719; Volume 67, No. 1, pp. 334-335; In Japanese; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Recordings of peripheral nerve activity were made in order to extract sensory information. It is very difficult to record a single-unit activity directly because a nerve fiber is too fine to place electrodes on. Shapes of recorded action potentials from a receptor unit are considered to depend on the axonal diameter and the distance between the axon and the recording electrodes. Multivariate analysis was used to associate waveforms of action potentials with mechanical stimuli. It was found that there is a possibility of extracting sensory information from multi-unit activity based on the shape of action potential waveforms.

Author

Information Retrieval; Multivariate Statistical Analysis; Nerves; Sensory Feedback

2000000382 Tohoku Univ., Research Inst. of Electrical Communication, Sendai, Japan

A Study on an Evaluation Method of Muscle Fatigue During FES

Miura, Naoto, Tohoku Univ., Japan; The Record of Electrical and Communication Engineering Conversazione, Tohoku University; August 1998; ISSN 0385-7719; Volume 67, No. 1, pp. 330-331; In Japanese; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper presents a method of evaluating muscle fatigue with M-wave for Functional Electrical Stimulation (FES). Recent studies of evaluating muscle fatigue with M-wave have reported only overall variation of muscle condition during FES. This study

proposes the use of additional pulse for evaluation of muscle fatigue. The additional pulses was found to be effective for resulting change in M-wave and for obtaining detailed variation of muscle condition.

Author

Evaluation; Technology Assessment; Muscles; Fatigue (Biology)

2000004476 Stanford Univ., Stanford, CA USA

Do Capacitively Coupled Electric Fields Accelerate Tibial Stress Fracture Healing Annual Report, 15 Sep. 1998 - 14 Sep. 1999

Marcus, Robert; Oct. 1999; 7p; In English

Contract(s)/Grant(s): DAMD17-98-1-8519

Report No.(s): AD-A369829; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

An average of three months rest is generally recommended for resolution of tibial stress fractures. Such an extended absence from athletic or military training reduces the ability to perform optimally and the likelihood of successful return to activity upon recovery. Electric field stimulation has been shown to accelerate bone healing. While there is reason to believe that this effect will extend to the healing of stress fractures, no rigorous investigations of this application have been performed. We are collecting data in order to compare recovery times from tibial stress fracture in male and female subjects treated with either active or placebo-control electric field stimulation. There is an associated need to establish a cost effective, reliable method of diagnostic imaging for tibial stress fractures. Four forms of diagnostic imaging (radiographs, bone scan, MRI and CT) are performed on each subject. The films will be evaluated according to the ability of each to identify tibial stress fractures and predict time to healing. Establishment of a stress fracture severity grading system for each imaging technique will facilitate predictions of recovery times with and without electric field stimulation according to degree of injury. We have collected data from seven subjects in Year 1, however, due to the nature of the study design, we are unable to report findings until the conclusion of the investigation when the devices will be unblinded. Further, to maximize intra-evaluator reliability, reading and grading of all films should occur simultaneously, thus no imaging evaluation will occur until data collection is complete.

DTIC

Electric Fields; Healing; Fractures (Materials); Fracturing; Stress (Physiology); Tibia; Physiological Acceleration; Aerospace Medicine

2000005005 NASA Ames Research Center, Moffett Field, CA USA

The Effects of Orbital Spaceflight on Human Osteoblastic Cell Physiology and Gene Expression Final Report

Turner, R. T., NASA Ames Research Center, USA; [1999]; 16p; In English

Contract(s)/Grant(s): NAG2-896; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of the proposed study is to establish whether changes in gravitational loading have a direct effect on osteoblasts to regulate TGF- β expression. The effects of spaceflight and reloading on TGF- β mRNA and peptide levels will be studied in a newly developed line of immortalized human fetal osteoblasts (HFOB) transfected with an SV-40 temperature dependent mutant to generate proliferating, undifferentiated hFOB cells at 33-34 C and a non-proliferating, differentiated HFOB cells at 37-39'C. Unlike previous cell culture models, HFOB cells have unlimited proliferative capacity yet can be precisely regulated to differentiate into mature cells which express mature osteoblast function. If isolated osteoblasts respond to changes in mechanical loading in a manner similar to their response in animals, the cell system could provide a powerful model to investigate the signal transduction pathway for gravitational loading.

Derived from text

Biochemistry; Bone Demineralization; Cells (Biology); Genetics; Immobilization; Musculoskeletal System; Orthopedics; Weightlessness

2000007081 Japan Society of Aerospace and Environmental Medicine, Tokyo, Japan

Japanese Journal of Aerospace and Environmental Medicine, Volume 36

Mano, Tadaaki, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Ando, Hideki, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Koga, Kazuo, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Ohira, Yoshinobu, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Sugeno, Junichi, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Hirayanagi, Kaname, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Mori, Sigeo, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Satake,

Hirota, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Taya, Yasushi, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Kakimoto, Yukiko, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; March 1999; ISSN 0387-0723; 68p; In English; In Japanese; See also 20000007082 through 20000007082; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Content include the following: Cerebral blood flow response to thirty-minute head down measure with single photon emission computer tomography. History of aviation medicine and its role. The role of aviation medicine its contribution to the new global age of aviation.

CASI

Aerospace Medicine; Brain Circulation; Blood Flow

20000007082 Jikei Univ., Div. of Aerospace Medicine, Tokyo, Japan

Cerebral Blood Flow Response to Thirty-Minute Head Down Tilt Measured with Single Photon Emission Computed Tomography

Koike, Yu, Jikei Univ., Japan; Sudoh, Masamichi, Jikei Univ., Japan; Chiba, Yasuhiro, Kanagawa Rehabilitation Center, Japan; Yamamoto, Isao, Yokohama City Univ., Japan; Japanese Journal of Aerospace and Environmental Medicine; March 1999; Volume 36, No. 1, pp. 1-7; In English; See also 20000007081; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This experiment was performed to study the effect of 6 deg. head down tilt (HDT) for 30 minutes on whole brain mean cerebral blood flow (mCBF) using single photon emission Computed tomography (SPECT). 99m-Techneium hexamethyl-propylamine oxime (Tc-99m HMPAO) or 99m-Techneium ethyl cistenate dimer (Tc-99m ECD) were used as tracer radioisotopes. Out of nine subjects participated in the experiment, upright position was chosen as the control of HDT in 5 subjects and Tc-99m HMPAO was used as tracer radioisotope. to measure mean cerebral blood flow (mCBF), Patlak Plot analysis was used. In the other 4 subjects, supine position was chosen as the control of HDT, and Tc -99m ECD was used as tracer radioisotope. to measure mCBF, the subtraction technique was used. The mCBFs of both conditions were compared. Significant decrease of mCBF was observed in the former experiment with the control of upright position, but mCBF did not change significantly in the latter experiment with the control of supine position. The decrease of mCBF was suggested in the condition of HDT for 30 minutes, but the position of the control should be taken into consideration for the more precise comparison of both conditions. It might have been appropriate to choose passive upright position as the control of HDT. Further studies are necessary to investigate whether there might be chronological changes of CBF on long term basis.

Author

Blood Flow; Brain Circulation; Head Down Tilt

20000007176 Institute for Human Factors TNO, Soesterberg, Netherlands

Hypothermia During Training of the Marines: Prevention and Treatment *Final Report Onderkoeling Tijdens Oefeningen van Mariniers: Preventie en Maatregelen*

Daanen, H. A. M., Institute for Human Factors TNO, Netherlands; May 31, 1999; 18p; In Dutch

Contract(s)/Grant(s): A99/KM/310; TNO Proj. 789.2

Report No.(s): TD99-0045; TM-99-A039; Copyright; Avail: Issuing Activity, Hardcopy

November 25 1997 a Mariner died of hypothermia after a map and compass training in a cold wet environment. The TNO Human Factors Research Institute was asked to draft recommendations concerning prevention and treatment of hypothermia related to training of Marines. During the training a combination of physical exercise and intermittent cold water and cold windy air exposure occurred. This combination leads to fast body cooling: the skin is relatively warm due to the exercise and the heat transfer to the environment is high. Also, evaporation of water from the clothing results in strong cooling. The continuing negative heat balance leads to a decrease in core temperature. Strong shivering is the result. At even lower core temperatures the subject becomes disoriented and confused. Generally, the core temperature has dropped below 35 C. It is recommended to stop the training when the core temperature has dropped below 35 C. This can be determined by a simple thermometer in the sublingual pocket. It is important the Marines are trained to recognize the symptoms of hypothermia and emit an emergency signal in time. Heavy sanctions on not fulfilling the training task may lead to unwanted postponement of the necessary actions. It is recommended to draft a safety plan, that can be used for risk assessment prior to the training. The risk for hypothermia can be determined globally by available methods. The safety plan should indicate which aids should be available during the training. It should be considered to increase the cold susceptibility of the Marines by repeated cold water immersions prior to the training. When hypothermia is diagnosed, further cooling should be prevented. Then, the consciousness state of the victim should be determined. For conscious people warm drinks are effective to decrease hypothermia. Unconscious victims should be manipulated carefully and brought to

the nearest hospital. Protocols are available that are drafted by experts and indicate the best treatment according to education level of the care taker and available aids.

Author

Hypothermia; Physical Exercise; Risk; Prevention; Human Factors Engineering; Education

20000010337 Naval Health Research Center, Toxicology Detachment, Wright-Patterson AFB, OH USA

A New Perspective for Identifying Potential Cardiac Sensitizers Interim Report, Oct. 1998 - Oct. 1999

Smith, E.; Nakayama, T.; Herderick, E.; Powers, J.; Briggs, G.; Oct. 1999; 26p; In English

Report No.(s): AD-A370055; TOXDET-99-06; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cardiac sensitization is the sensitization of the heart to circulating catecholamines after exposure to an exogenous chemical, such that sudden alarm or exercise may precipitate a cardiac arrest. The purpose of this investigation is to develop a predictive mathematical model that can identify cardiac sensitizers. The dog and the swine were used as surrogates for the human. Physiologic and electrocardiographic measurements were taken during the control period and after each dose of ouabain, a digitalis glycoside known to provoke ventricular arrhythmia. Logistic regression was used to develop the model by converting binary data into a function (curve/equation) that can estimate of the probability of a particular result, in this case experiencing a cardiac arrhythmia. Five parameters were significant predictors of arrhythmia in dog (HR, PQ, QT, Paos and dP/dt(sub max)), and three were significant in the swine (PQ, QT and dP/dt(sub max)). The study demonstrates that several mathematical models can be constructed to predict the onset of ouabain induced arrhythmia, in both the dog and the swine, and that there are similarities in the two animal models. Efforts to reduce the number of parameters to a single term showed colinearity among simple pair wise combinations. Since the QT interval was significant in both species, it appears to be the most promising of all the parameters for predicting cardiac sensitization.

DTIC

Heart; Cardiology; Electrocardiography; Physiology; Swine; Dogs

20000010631 Civil Aeromedical Inst., Oklahoma City, OK USA

Prevalence of Chlorpheniramine in Aviation Accident Pilot Fatalities Final Report, 1991-1996

Soper, John W., Civil Aeromedical Inst., USA; Chaturvedi, Arvind K., Civil Aeromedical Inst., USA; Canfield, Dennis V., Civil Aeromedical Inst., USA; December 1999; 10p; In English

Contract(s)/Grant(s): AM-B-98-TOX-202

Report No.(s): DOT/FAA/AM-99/29; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Chlorpheniramine, a popular nonprescription antihistaminic, is known to cause drowsiness. This side effect has a potential to impair performance and to be a factor in accidents. Therefore, this study was conducted to establish the prevalence of this drug in pilot fatalities of aviation accidents. During fatal aircraft accident investigations, postmortem samples collected from the pilots at autopsy are submitted to the Civil Aeromedical Institute for toxicological evaluation, and the findings are maintained in a database. Those data were examined for the presence of chlorpheniramine in the fatalities, which occurred during a 6-year (1991-1996) period. It was determined that there were 47 (2.2%) accidents involving chlorpheniramine. In 16 of these cases, only chlorpheniramine was found, with the mean concentrations of 109 ng/ml (n = 4) in blood and 1412 ng/g (n = 12) in liver. Other drugs were also present in the remaining 31 cases, wherein the mean chlorpheniramine concentrations were 93 ng/ml (n = 18) in blood and 747 ng/g (n = 12) in liver. Ninety-five percent of all the quantitative blood values were at or above the therapeutic (10 ng/ml) level, giving a 100 ng/ml (n = 21) blood mean level. The drug's mean concentration in the liver of all the cases was 1080 ng/g (n = 24). The average chlorpheniramine blood value was approximately 10 times higher than its therapeutic value. The presence of other drugs did not appear to significantly alter the blood level of chlorpheniramine, but no such correlation could be established with the hepatic value. The approximate 10-fold increase in the liver concentration, as compared with the blood value, was consistent with the general trend of the distribution of drugs in the hepatic compartment. However, the contribution of postmortem redistribution of the drug to alter its concentration cannot be entirely ruled out. The findings from this study suggest that chlorpheniramine was present in some aviation fatalities at levels higher than therapeutic perimortem levels.

Derived from text

Aircraft Accident Investigation; Aerospace Medicine; Antihistaminics; Death; Pilot Performance

20000010755 Naval Health Research Center, San Diego, CA USA

The Effect of Vitamin Supplementation on Oxidative Stress During Strenuous Cold Weather Training at Moderate Altitude Final Report, Jul 1998-May 1999

Roberts, Donald E.; Askew, Eldon W.; Chao, Wei-Hsun; Wood, Steven M.; Reading, James E.; Feb. 24, 1999; 31p; In English; Prepared in collaboration with Bureau of Medicine and Surgery, Washington, D.C.

Report No.(s): AD-A370186; NHRC-99-6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study quantified the effect of alpha-tocopherol, ascorbic acid, and Beta-carotene, singly and in combination, on oxidative stress (OS) during training at moderate altitude. OS was quantified by indirect measures of lipid peroxidation and DNA alteration. The efficacy of the vitamins was assessed as reduced urinary, blood, and breath indices of lipid peroxidation. Seventy-five Marines were assigned to 1 of 5 groups for a double-blind, 14-day study. The groups took, daily: (1) 500 mg ascorbic acid; (2) 400 IU alpha-tocopherol; (3) 20,000 U Beta-carotene; (4) 500 mg ascorbic acid, 400 U alpha-tocopherol, 20,000 U Beta-carotene, 100 microg selenium, and 30 mg zinc; or (5) 1,000 mg oyster shell calcium (placebo). OS indicators included plasma lipid peroxides and oxygen radical absorption capacity, urine malondialdehyde and 8-hydroxy-deoxy-guanosine, and breath pentane. Samples were collected at sea level, Day 0 at 6,700 ft, Days 6 and 12 at 9,200 ft, and Day 14 at 6,700 ft. All measures generally reflected increased OS. All groups showed increased OS, indicated by breath pentane; however, the mixture resulted in a significantly smaller increase. Individual antioxidants were relatively ineffective in reducing the indicators of OS. Other measures indicated OS was increased but did not differentiate as did breath pentane.

DTIC

Deoxyribonucleic Acid; Oxygen; Tocopherol; Ascorbic Acid; Carotene

20000011224 Utah Univ., Dept. of Bioengineering, Salt Lake City, UT USA

Modeling of Cardiovascular Response to Weightlessness Final Report, 1 Jan. 1995 - 31 Dec. 1998

Sharp, M. Keith, Utah Univ., USA; 1999; 7p; In English

Contract(s)/Grant(s): NAGW-4338; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

It was the hypothesis of this Project that the simple lack of hydrostatic pressure in microgravity generates several purely physical reactions that underlie and may explain, in part, the cardiovascular response to weightlessness. For instance, hydrostatic pressure within the ventricles of the heart may improve cardiac performance by promoting expansion of ventricular volume during diastole. The lack of hydrostatic pressure in microgravity might, therefore, reduce diastolic filling and cardiac performance. The change in transmural pressure is possible due to the difference in hydrostatic pressure gradients between the blood inside the ventricle and the lung tissue surrounding the ventricle due to their different densities. On the other hand, hydrostatic pressure within the vasculature may reduce cardiac inlet pressures because of the typical location of the heart above the hydrostatic indifference level (the level at which pressure remains constant throughout changes in gravity). Additional physical responses of the body to changing gravitational conditions may influence cardiovascular performance. For instance, fluid shifts from the lower body to the thorax in microgravity may serve to increase central venous pressure (CVP) and boost cardiac output (CO). The concurrent release of gravitational force on the rib cage may tend to increase chest girth and decrease pericardial pressure, augmenting ventricular filling. The lack of gravity on pulmonary tissue may allow an upward shifting of lung mass, causing a further decrease in pericardial pressure and increased CO. Additional effects include diuresis early in the flight, interstitial fluid shifts, gradual spinal extension and movement of abdominal mass, and redistribution of circulatory impedance because of venous distention in the upper body and the collapse of veins in the lower body. In this project, the cardiovascular responses to changes in intraventricular hydrostatic pressure, in intravascular hydrostatic pressure and, to a limited extent, in extravascular and pericardial hydrostatic pressure were investigated. A complete hydraulic model of the cardiovascular system was built and flown aboard the NASA KC-135 and a computer model was developed and tested in simulated microgravity. Results obtained with these models have confirmed that a simple lack of hydrostatic pressure within an artificial ventricle causes a decrease in stroke volume. When combined with the acute increase in ventricular pressure associated with the elimination of hydrostatic pressure within the vasculature and the resultant cephalad fluid shift with the models in the upright position, however, stroke volume increased in the models. Imposition of a decreased pericardial pressure in the computer model and in a simplified hydraulic model increased stroke volume. Physiologic regional fluid shifting was also demonstrated by the models. The unifying parameter characterizing of cardiac response was diastolic ventricular transmural pressure (DVDELTA_P). The elimination of intraventricular hydrostatic pressure in O-G decreased DVDELTA_P stroke volume, while the elimination of intravascular hydrostatic pressure increased DVDELTA_P and stroke volume in the upright posture, but reduced DVDELTA_P and stroke volume in the launch posture. The release of gravity

on the chest wall and its associated influence on intrathoracic pressure, simulated by a drop in extraventricular pressure⁴, increased DVDELTA and stroke volume.

Author

Weightlessness; Cardiovascular System; Computerized Simulation; Biodynamics; Biomedical Data; Aerospace Medicine; Hydrostatic Pressure; Bionics

53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

2000000400 Tohoku Univ., Research Inst. of Electrical Communication, Sendai, Japan

A Study of Figure-Ground Separation of Figures Composed of Gabor Patches

Nakajima, Hidekazu, Tohoku Univ., Japan; The Record of Electrical and Communication Engineering Conversation, Tohoku University; August 1998; ISSN 0385-7719; Volume 67, No. 1, pp. 288-289; In Japanese; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

It is great important for visual information processing how human beings separate figures and ground. In order to psychophysically clarify this phenomenon, a figure composed of Gabor patches have been frequently used because it has specified spatial frequency. Field et.al. proposed that the continuity between adjacent patches is essentially important for the separation. In addition to the local continuity condition, Kovacs and Julesz have found an effect of closure on figure-ground separation, while they have also explained the closure effect by the continuity of the figure, In this study, however, we have found a remarkable effect of closure on the separation even when a figure including discontinuity was presented. We will discuss this new effect on figure-ground separation.

Author

Visual Perception; Human Performance

20000004380 Washington Univ., Dept. of Psychiatry, Saint Louis, MO USA

Multi-Dimensional Characterizations of Operator State: A Validation of Oculomotor Metrics Final Report

Sirevaag, Erik J., Washington Univ., USA; Rohrbaugh, John W., Washington Univ., USA; Stern, John A., Washington Univ., USA; Vedeniapin, Andrei B., Washington Univ., USA; Pakingham, Kevin D., Washington Univ., USA; LaJonchere, Clara M., Washington Univ., USA; Noember 1999; 36p; In English

Contract(s)/Grant(s): DTFA-94-6-015

Report No.(s): DOT/FAA/AM-99/28; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Relationships between overt behavioral measures such as Reaction Time (RT) and response accuracy (percent correct, A') and psychophysiological indices of oculomotor, electroencephalographic (EEG), and cardiovascular activity were delineated within the context of a 50 min continuous performance task. Subjects maintained comparable mean performance levels across all task segments. However, variability in response speed and accuracy increased with Time-On-Task. The increased variability was associated with longer blink durations, decreased post-stimulus blink latencies, decreased anticipatory and reactive saccade velocities and amplitudes, and fewer and later reactive saccades. While blinks were inhibited prior to all stimuli, the post-stimulus period of inhibition was longest following imperative stimuli. Target stimuli were also associated with more efficient anticipatory eye-movements. In the absence of a blink, RTs were substantially delayed. When blinks were present, very short latency blinks were associated with more variable RTs and increased errors. If blink latencies were late, RTs were late as well. Trials containing especially long duration blinks were associated with decreases in performance accuracy. Target stimuli followed by reactive saccades were responded to more slowly and with less accuracy than when effective anticipate eye-movements preceded stimulus onset. Furthermore, the larger the amplitude of the reactive saccade, the greater the increase in RT. Abstracting peripheral information (recheck saccades) also incurred a cost in terms of increased RT -- and the slower the velocity of the recheck saccade, the greater the impact upon RT. These electrooculographic effects were accompanied by systematic changes in EEG and cardiovascular responses and exploratory multi-variate modeling indicated the degree to which both within - as well as between-subject performance variability could be accounted for by various combinations of the psychophysiological measures.

Author

Electroencephalography; Cardiovascular System; Oculomotor Nerves; Human Factors Engineering; Operator Performance; Mathematical Models; Evoked Response (Psychophysiology)

20000011599 Old Dominion Univ., Dept. of Psychology, Norfolk, VA USA
Preliminary Analysis of Photoreading *Final Report, 15 May - 30 Sep. 1999*
McNamara, Danielle S., Old Dominion Univ., USA; January 2000; 28p; In English
Contract(s)/Grant(s): NAG2-1319
Report No.(s): ODURF-193021; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this project was to provide a preliminary analysis of a reading strategy called PhotoReading. PhotoReading is a technique developed by Paul Scheele that claims to increase reading rate to 25,000 words per minute (Scheele, 1993). PhotoReading itself involves entering a "relaxed state" and looking at, but not reading, each page of a text for a brief moment (about 1 to 2 seconds). While this technique has received attention in the popular press, there had been no objective examinations of the technique's validity. To examine the effectiveness of PhotoReading, the principal investigator (i.e., trainee) participated in a PhotoReading workshop to learn the technique. Parallel versions of two standardized and three experimenter-created reading comprehension tests were administered to the trainee and an expert user of the PhotoReading technique to compare the use of normal reading strategies and the PhotoReading technique by both readers. The results for all measures yielded no benefits of using the PhotoReading technique. The extremely rapid reading rates claimed by PhotoReaders were not observed; indeed, the reading rates were generally comparable to those for normal reading. Moreover, the PhotoReading expert generally showed an increase in reading time when using the PhotoReading technique in comparison to when using normal reading strategies to process text. This increase in reading time when PhotoReading was accompanied by a decrease in text comprehension.

Author

Reading; Texts; Words (Language); Increasing; Rates (Per Time); Time Measurement

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also 16 Space Transportation and 52 Aerospace Medicine..

20000000251 NASA Marshall Space Flight Center, Huntsville, AL USA

The Use of Human Factors Simulation to Conserve Operations Expense

Hamilton, George S., NASA Marshall Space Flight Center, USA; Dischinger, H. Charles, Jr., NASA Marshall Space Flight Center, USA; Wu, Hsin-I., Texas A&M Univ., USA; 1999; 6p; In English; Simulation, 6-7 Oct. 1999, Huntsville, AL, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In preparation for on-orbit operations, NASA performs experiments aboard a KC-135 which performs parabolic maneuvers, resulting in short periods of microgravity. While considerably less expensive than space operations, the use of this aircraft is costly. Simulation of tasks to be performed during the flight can allow the participants to optimize hardware configuration and crew interaction prior to flight. This presentation will demonstrate the utility of such simulation. The experiment simulated is the fluid dynamics of epoxy components which may be used in a patch kit in the event of meteoroid damage to the International Space Station. Improved configuration and operational efficiencies were reflected in early and increased data collection.

Author

Human Factors Engineering; Computerized Simulation; Computer Animation; C-135 Aircraft

20000000260 Navy Experimental Diving Unit, Panama City, FL USA

Evaluation of Emergency Evacuation Hyperbaric Stretchers (EEHS)

Latson, G. W., Navy Experimental Diving Unit, USA; Zinszer, M. A., Navy Experimental Diving Unit, USA; Sep. 1999; 65p; In English

Report No.(s): AD-A369830; NEDU-TR-5-99; NAVSEA-TA-97-022; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The U.S. Navy has identified a need for portable and collapsible one man hyperbaric chambers, called Emergency Evacuation Hyperbaric Stretchers (EEHS), which could be used as a means of transporting divers or submarine rescues suffering from Decompression Sickness (DCS) or Arterial Gas Embolism (AGE) to a recompression chamber for treatment. As part of a comprehensive evaluation of two candidate Systems (SOS Hyperlite and GSE Flexible Hyperbaric), NAVSEA 00C tasked NEDU to conduct non-developmental operational evaluations of the two systems, including manned and unmanned operational tests of function and safety. This report contains results of these tests. It is concluded that the SOS Hyperlite was suitable for the mission outlined. The GSE Flexible Hyperbaric, of the size and configuration tested, is not suited to the mission described. The combination of size, weight, and lack of safety features raises significant concern for use as a system that might be moved with an occupant

under pressure. The report also contains additional information on the medical considerations for use of the EEHS, recommended improvements and accessories, and a review of available information.

DTIC

Stretchers; Hyperbaric Chambers; Navy; Diving (Underwater)

20000002801 National Inst. for Occupational Safety and Health, Div. of Education and Information, Cincinnati, OH USA

NIOSH Publications on Video Display Terminals, Third Edition

Sep. 1999; 144p; In English

Report No.(s): PB2000-100207; DHHS/PUB/HIOSH-99-135; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This publication is a compendium of NIOSH publications and reports on video display terminals (VDTs). This publication is divided into two parts: Part I consists of full or partial text of selected NIOSH documents on video display terminals. Part II contains a comprehensive bibliography of NIOSH documents on video display terminals. It is divided into two sections: (A) NIOSH-authored documents (which include numbered publications, testimony, journal articles, health hazard evaluations, and miscellaneous reports) and (B) NIOSH-funded documents (which include grant and contract reports). Each document citation includes the title and year of publication and bibliographic or ordering information.

NTIS

Data Processing Terminals; Video Data; Display Devices; Glare

20000004291 NASA Langley Research Center, Hampton, VA USA

Investigating Interruptions: Implications for Flightdeck Performance

Latorella, Kara A., NASA Langley Research Center, USA; Oct. 1999; 309p; In English

Contract(s)/Grant(s): NGT-50992; RTOP 522-14-11-03

Report No.(s): NASA/TM-1999-209707; NAS 1.15:209707; L-17910; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

A fundamental aspect of multiple task management is attending to new stimuli and integrating associated task requirements into an ongoing task set; this is "interruption management" (IM). Anecdotal evidence and field studies indicate the frequency and consequences of interruptions, however experimental investigations of mechanisms influencing IM are scarce. Interruptions on commercial flightdecks are numerous, of various forms, and have been cited as contributing factors in many aviation incident and accident reports. This research grounds an experimental investigation of flightdeck interruptions in a proposed IM stage model. This model organizes basic research, identifies influencing mechanisms, and suggests appropriate dependent measures for IM. Fourteen airline pilots participated in a flightdeck simulation experiment to investigate the general effects of performing an interrupting task and interrupted procedure, and the effects of specific task factors: (1) modality; (2) embeddedness, or goal-level, of an interruption; (3) strength of association, or coupling-strength, between interrupted tasks; (4) semantic similarity; and (5) environmental stress. General effects of interruptions were extremely robust. All individual task factors significantly affected interruption management, except "similarity." Results extend the Interruption Management model, and are interpreted for their implications for interrupted flightdeck performance and intervention strategies for mitigating their effects on the flightdeck.

Author

Interruption; Airline Operations; Environment Effects

20000005091 Stanford Univ., Dept. of Mechanical Engineering, Stanford, CA USA

Modeling and Testing of Lightweight Mars Space Suit on Devon Island Final Report

Crawford, Sekou S., Stanford Univ., USA; Jun. 09, 1999; 28p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In order for manned missions to Mars to be successful, a thorough investigation into new and existing planetary spacesuits designs must be carried out. Development of a suitable EVA suit will be a significant technological challenge. A primary concern is the excessive weight of existing planetary spacesuits. Mars has approximately 1/3 of the Earth's gravitational pull. Therefore, heavy suits will significantly hamper effective EVA operations. A new design proposed by research groups from Stanford University and Berkeley uses semi-permeable membranes as a passive thermal control system. This design replaces the bulky air-conditioning systems in more traditional spacesuit designs. This novel idea is only possible due to the unique Martian atmosphere and the normal way in which the human body regulates its own temperature via sweat. The suit has been shown to effectively control the body temperature on Mars using a heat-balance model that simulates astronaut and suit for various exploration scenarios. A similar model is used to explore the suit's ability to control body temperature in the Arctic on Earth. A strategy is explored in which the Stanford spacesuit design can be simulated and tested at the Devon Island Arctic Research Station. Assuming that the model

provides adequate results, ways in which this promising new design can be successfully implemented in future missions to Mars will be discussed.

Author

Temperature Control; Space Suits; Mars Missions; Manned Space Flight; Human Body; Extravehicular Activity; Air Conditioning Equipment

2000005092 Stanford Univ., Dept. of Civil and Environmental Engineering, Stanford, CA USA

A Practical Approach to Creating a Bioregenerative Life Support System for Mars Habitat: Stanford Mission to Mars '99 Project

Glenn, Christopher, Stanford Univ., USA; June 1999; 16p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One of the many challenges that must be met before a manned mission to Mars can occur is the design of a life support system for the Mars habitat. This life support system must keep a crew of six alive and healthy for about 500 days on the Martian surface, where they will essentially be out of the range where they could receive help from Earth. This life support system must not only support the crew physiologically by providing potable water, air and food, but also psychologically. In the stressful environment of Mars, a life support system that fails to produce aesthetically pleasing consumables will only add unnecessary stress. This paper covers my research into life support systems for a Mars habitat for the past two quarters. I will present a practical method for developing a life support system that will eventually reach self-sufficiency by utilizing a plant-based greenhouse network and in situ resource generation. This task is not as hard as it may seem and does not require us to have all the answers right now. Self-sufficiency does not mean recycling every molecule of supply from earth. Instead it means learning to harvest resources on Mars such as sunlight, water vapor and carbon dioxide to supplement a highly efficient recycling and greenhouse system. In addition, just as we did not attempt to make a moon landing on the first Apollo flight, we need not attempt to create a self-sufficient life support system on the very first Mars mission. Instead, early missions will be an opportunity to develop and test these technologies and pave the way for later mission to eliminate the requirement for a lifeline to Earth.

Author

Life Support Systems; Design Analysis; Potable Water; Manned Mars Missions; Consumables (Spacecraft); Regeneration (Engineering)

2000005111 National Inst. of Standards and Technology, Gaithersburg, MD USA

Development of an Apparatus for Measuring the Thermal Performance of Fire Fighters' Protective Clothing

Lawson, J. R.; Twilley, W. H.; Oct. 1999; 62p; In English

Report No.(s): PB2000-100422; NISTIR-6400; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This report describes a test apparatus and investigates a method for measuring the thermal performance of fire fighters' protective clothing. The test method measures temperature through the various layers that make up a fire fighter's thermal protective garment. Temperature measurements are made at the surface of the outer shell, at locations between fabric or moisture barrier layers inside the protective clothing system, and at the thermal liner surface where the fire fighter's clothing or body would be in contact with the garment. When plotted, these temperature measurements show a detailed picture of how a protective clothing system performs when exposed to a given thermal environment. The apparatus may be used to expose protective clothing specimens to a wide range of heat flux conditions. The test apparatus may be used for investigating the effects of moisture in protective clothing systems. In addition, this test apparatus and the measurement methods allow for specimens to be studied for a time period ranging from several seconds to more than 30 minutes.

NTIS

Temperature Measurement; Protective Clothing; Temperature Effects; Fire Fighting

2000010361 Defence Science and Technology Organisation, Information Technology Div., Canberra Australia

Flammability Properties of Selected Fabrics and Associated Ensembles and Laminates for use in Chemical and Biological Protective Clothing

Robinson, D. J.; Egglestone, G. T.; Feb. 1999; 23p; In English

Report No.(s): AD-A366970; DSTO-TR-0810; DODA-AR-010-902; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Due to the level of heat stress imparted by the in-service Chemical and Biological (CB) Mk IV overgarment a new lightweight CB combat suit has been developed. This has subsequently led to a requirement to develop a CB flying suit. The major prerequisite for the CB flying suit is that it must not ignite or support combustion while still providing adequate CB protection. This report details the evaluation of a range of alternate textile fabrics for use in developing a CB combat suit that is suitable both as a flying

suit for aircrew and as a specialized item for ground troops. Bench scale flammability testing of the in-service Mk IV overgarment, the CB combat suit and various ensembles and laminates was undertaken. The relationship between these results and the physical properties of the fabrics is outlined.

DTIC

Flammability; Protective Clothing; Laminates; Fabrics; Flight Clothing

20000010807 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Relationship of Protective Mask Seal Pressure to Fit Factor and Head Harness Strap Stretch *Final Report*

Cohen, Kathryn S.; Sep. 1999; 111p; In English

Contract(s)/Grant(s): Proj-1L161110274A

Report No.(s): AD-A370293; ARL-TR-2070; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Currently, protective mask seals are evaluated indirectly by measuring fit factor (FF), a ratio of the concentration of particles outside versus the concentration of particles inside the mask. This report describes an alternate process for evaluating mask seals by measuring seal pressure distribution. The goal was to develop a relationship between FF and seal pressure for evaluating seal performance, and relationships between FF and strap stretch and between seal pressure and strap stretch for determining proper strap adjustment. Pressure was measured using a thin film flexible sensor placed at 11 locations around the seal of an M40 mask on a headform. Corresponding FF was measured using a protective mask fit tester. Stretch in each of the six head harness straps was measured manually using a caliper and gauge length markers on the strap. Measurements were made for three degrees of strap tightness over a total of 22 trials.

DTIC

Protection; Masks; Protective Clothing

20000010906 Armstrong Lab., Human Resources Directorate, Brooks AFB, TX USA

Task Difficulty Measurement by the USA Air Force Occupational Measurement Program *Interim Report, Jan. 1993-Jun. 1995*

Boyce, Lisa A.; Gould, R. B.; Sep. 1999; 111p; In English

Contract(s)/Grant(s): Proj-1123

Report No.(s): AD-A370602; AL/HR-TR-1996-0151; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Task difficulty (TD) data, routinely collected by Occupational Survey Program, assist policy makers in establishing minimum aptitude requirements, determining appropriate grade and training requirements, modifying classification structures, and developing promotion tests. Task difficulty is a generic term used to describe measures of task performance and task learning difficulty. Extensive research conducted during the past 30 years indicated that task difficulty should be defined in terms of task learning difficulty to have reliability, clarity, and utility. Research was needed to identify the error resulting from current procedures, as well as to develop collection procedures which emphasize the learning aspect of IT. Data were collected from 103 Air Traffic Control (ATC) Senior Noncommissioned Officers using three task factor booklets: TD, task learning difficulty (TLD), and task performance difficulty (TPD). Efforts to determine the reliability, correlation, and validity of the three measures resulted in few significant differences between the data collection methods. TLD appeared to be more reliable due to respondent's consistency and producing fewer divergent raters. TLD data had the greatest correlation to TPD data, perhaps due to the strong learning and performance relationship of ATC tasks. A task level review supports that each survey method measured its projected aspect of difficulty, however the criteria were inadequate and could not substantiate the observations statistically. While further research is necessary, implementation of a TLD survey format would improve the reliability of task difficulty data collection.

DTIC

Task Complexity; Armed Forces (USA); Military Operations; Quality Control; Hypotheses

20000010934 Fluor Daniel Hanford, Inc., Richland, WA USA

Light Duty Utility Arm computer software configuration management plan

Philipp, B. L., Fluor Daniel Hanford, Inc., USA; Sep. 14, 1998; 32p; In English

Report No.(s): DE99-050763; HNF-2924; No Copyright; Avail: Department of Energy Information Bridge, Hardcopy

This plan describes the configuration management for the Light Duty Utility Arm robotic manipulation arm control software. It identifies the requirement, associated documents, and the software control methodology. The Light Duty Utility Arm (LDUA) System is a multi-axis robotic manipulator arm and deployment vehicle, used to perform surveillance and characterization opera-

tions in support of remediation of defense nuclear wastes currently stored in the Hanford Underground Storage Tanks (USTs) through the available 30.5 cm (12 in.) risers. This plan describes the configuration management of the LDUA software.

NTIS

Configuration Management; Robot Arms; Management Planning; Numerical Control

20000011094 National Defence Research Establishment, FOA Program, Stockholm, Sweden

Man-Systems-Integration Annual Report, 1998 Aersrapport 1998 foer FoT -Omraedet; Maenniska- Systeminteraktion
Sandstroem, L.; Jan. 1999; 36p; In Swedish

Report No.(s): PB2000-100961; FOA-R-99-00994-706-SE; No Copyright; Avail: National Technical Information Service (NTIS), Hardcopy

Experimental studies concerning improving tactical situation awareness in combat aircraft through color coding showed that pilots preferred chromatic codes, and in complex backgrounds, lower reaction times for polychrome color were demonstrated. In studying Pilot Mental WorkLoad in simulated missions, a significant relationship was found between eye fixation rate and heart rate, making it possible to combine heartrate, blink rate and fixation rate into an index of mental workload. In a project where the objectives are to give decision making support to the pilot through sensor integration and sensor administration and by use of modern Temporal Display techniques several substudies have been pursued. Algorithms for estimating optimal timing of maneuvers in BVR-fights have been demonstrated, specifications of a Temporal Situation Awareness project have been presented among other activities. In a project in cooperation with DERA/UK Cognitive Cockpit design for the next generation of fighter aircraft is studied.

NTIS

Systems Integration; Human-Computer Interface; Human Factors Engineering

20000011176 Institute for Human Factors TNO, Soesterberg, Netherlands

Head Slaved Displays in a Driving Simulator Hoofdvollgende displays in een rijnsimulator

Padmos, P., Institute for Human Factors TNO, Netherlands; Jul. 29, 1999; 30p; In English

Contract(s)/Grant(s): B98/053; TNO Proj. 730.3

Report No.(s): TD99-0328; TM-99-B008; Copyright; Avail: Issuing Activity, Hardcopy

Head slaved displays are displays with limited instantaneous field of view, in which through using head motion signals in the image generator the image remains stationary with respect to the head movements. This enables seeing large out-world fields. A special kind of head slaved display is the Head Mounted Display (HMD), which is used often in Virtual Reality. Using head slaved displays in simulators may yield considerable savings in costs and space, compared to the usual large projection screen. In our driving simulator it was studied how various head slaved displays influence driving performance and subjective difficulty. The driving task consisted of following a straight road of 200 m, followed by halting at a marking before a crossing. Then the car merged in a gap in a left or right approaching traffic stream. The following display conditions were compared: 1) Wide projection screen; 2) Head mounted mask with limited instantaneous field of view (= simulation of perfect HMD); 3) Head slaved projected window with four discrete positions; 4) Continuously head slaved window; 5) HMD in see-through mode, enabling visibility of vehicle references like steer, hood and window stiles mixed in the out-world image; 6) HMD without vehicle references; and 7) HMD with vehicle references generated in the out-world image. The simulator collected data on the driving behaviour. Subjects' comments on difficulty and problems were taken. The most important conclusions and recommendations are: A HMD has negative effects on driving performance and comfort. The limited field of view is not the cause of the worse HMD performance; probably, the most important causes for this are its large weight and the considerable image delay. A continuously head slaved window is a good alternative for projection on a large screen. If a HMD is used it is recommended to apply vehicle references in the generated out-world image. It is recommended to study effects of stereo vision on nearby aspects of driving performance in a simulator. It is important to improve the steering model of the current simulator. Proper subject training is important for these type of experiments.

Author

Head Movement; Helmet Mounted Displays; Human Factors Engineering; Human-Computer Interface; Motion Simulation

20000011515 Research Inst. of National Defence, Div. of Human Sciences, Linkoeping, Sweden

Effect of a Modified Abdominal Bladder of the Anti-G Suit-97 on Transdiaphragmal Pressure and the Position of the Diaphragm Effekt av Modifierad Bukblasa till 'Anti-G Draekt 97' pa Transdiafragmalt Tryck och Diafragmaposition

Eiken, O.; Groenkvis, M.; Bergsten, E.; Oernhagen, H.; Gustafsson, P.; Nov. 1998; 22p; In Swedish

Report No.(s): PB2000-100957; FOA-R-98-00813-720-SE; No Copyright; Avail: National Technical Information Service (NTIS), Hardcopy

To improve the G-protection properties of the anti-G suit-97, the inner (abdominal) surface of its abdominal bladder has been expanded. The aim of the present study was to investigate if such modified abdominal bladder improves transmission of pressure from bladder to the abdomen, and hence induces a more cranial displacement of the diaphragm, without compromising comfort. Eight healthy males participated, The anti-G suit with the modified abdominal bladder (Mod) was compared with the standard anti-G suite (Std) at 1 G in three conditions: (1) With safety pressure (0.4kPa) in the airways and the counter-pressure jerkin and zero pressure in the anti-G suit. (2) 4kPa in the airways/jerkin and 12 kPa in the suit. (3) 4 kPa in the airways/jerkin and 24 kPa in the suit. Esophageal and gastric pressures were measured during tidal breathing and during controlled muscular straining maneuvers. Also, in three of the subjects the position of the diaphragm was measured by means of X-ray under conditions corresponding to (2) above. The modified abdominal bladder did not induce discomfort. Mod increased the transdiaphragmal pressure gradient during tidal breathing at pressures in the anti-G suit and airways/jerkin of 24 and 4kPa, respectively condition (3). However, the increase in pressure gradient was small and may consequently be of little significance with regards to the anti-G properties of the suit. Results from the X-ray experiment did not suggest that Mod had any significant effect on diaphragm position.

NTIS

Abdomen; Antigravity; Bladder

2000011529 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA

Human Error Mitigation in Future Operations Control Centers

Ahlstrom, Vicki; MacMillan, Jean; Tenney, Yvette J.; Pew, Richard W.; Cranston, Robert L.; Jun. 1999; 46p; In English
Report No.(s): AD-A368140; DOT/FAA/CT-TN99/14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report documents a human error mitigation study conducted at the William J. Hughes Technical Center Research Development & Human Factors Laboratory. The study examined potential causes of human errors in future Airway Facilities (AF) operations control centers (OCCs). The participants consisted of nine specialists having expertise in current AF operations and knowledge of human error tendencies. The participants explored four operational scenarios, identified potential sources of error, and recommended specific solutions. A research team extracted common themes from participant responses to each of the four scenarios and identified general sources of potential error. They made specific recommendations for mitigating error in future OCC facilities.

DTIC

Human Factors Engineering; Error Analysis; Man Machine Systems; Air Traffic Control

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EXO BIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see 52 Aerospace medicine; on animals and plants see 51 Life Sciences. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science.

2000004902 Search for Extraterrestrial Intelligence Inst., Mountain View, CA USA

"Application of Tunable Diode Laser Spectrometry to Isotopic Studies for Exobiology" Final Report, 1 Oct. 1955 - 30 Sep. 1999

Sauke, Todd B., Search for Extraterrestrial Intelligence Inst., USA; [1999]; 2p; In English

Contract(s)/Grant(s): NCC2-929; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Computer-controlled electrically-activated valves for rapid gas-handling have been incorporated into the Stable Isotope Laser Spectrometer (SILS) which now permits rapid filling and evacuating of the sample and reference gas cells, Experimental protocols have been developed to take advantage of the fast gas handling capabilities of the instrument and to achieve increased accuracy which results from reduced instrumental drift during rapid isotopic ratio measurements. Using these protocols' accuracies of 0.5 del (0.05%) have been achieved in measurements of $^{13}\text{C}/^{12}\text{C}$ in carbon dioxide. Using the small stable isotope laser spectrometer developed in a related PIDDP project of the Co-I, protocols for acquisition of rapid sequential calibration spectra were developed which resulted in 0.5 del accuracy also being achieved in this less complex instrument. An initial version of software for automatic characterization of tunable diode lasers has been developed and diodes have been characterized in order to establish their spectral output properties. A new state-of-the-art high operating temperature (200 K) mid infrared diode laser was purchased (through NASA procurement) and characterized. A thermo-electrically cooled mid infrared tunable diode laser system for use with high temperature operation lasers was developed. In addition to isotopic ratio measurements of carbon and oxygen, measurements of a third biologically important element ($^{15}\text{N}/^{14}\text{N}$ in N_2O gas) have been achieved to a preliminary accuracy of

about 0.2%. Transfer of the basic SILS technology to the commercial sector is proceeding under an unfunded Space Act Agreement between NASA and SpiraMed, a medical diagnostic instrument company. Two patents have been issued. Foreign patents based on these two US patents have been applied for and are expected to be issued. A preliminary design was developed for a thermo-electrically cooled SILS instruments for application to planetary space flight exploration missions.

Derived from text

Tunable Lasers; Laser Spectrometers; Isotopes; Research; Exobiology; Semiconductor Lasers

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