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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

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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;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ 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.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
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9. Subject Terms

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 463)

APRIL 20, 1998

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LIFE SCIENCES (GENERAL)

19980017991 Oregon State Univ., Coll. of Oceanic and Atmospheric Sciences, Corvallis, OR USA

Grazing-Activated Production of Dimethyl Sulfide (DMS) by two clones of *Emiliana huxleyi*

Wolfe, Gordon V., Oregon State Univ., USA; Steinke, Michael, Bremen Univ., Germany; *Limnology and Oceanography*; Sep. 1996; Volume 41, No. 6, pp. 1151-1160; In English

Contract(s)/Grant(s): NAGw-3737; CEC Proj. 930326

Report No.(s): NASA/CR-96-207169; NAS 1.26:207169; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Emiliana huxleyi clones CCMP 370 and CCMP 373 produced similar amounts of dimethylsulfoniopropionate (DMSP) during axenic exponential growth, averaging 109 mM internal DMSP. Both clones had detectable DMSP lyase activity, as measured by production of dimethyl sulfide (DMS) during in vitro assays of crude cell preparations, but activities and conditions differed considerably between clones. Clone 373 had high activity; clone 370 had low activity and required chloride. For both strains, enzyme activity per cell was constant during exponential growth, but little DMS was produced by healthy cells. Rather, DMS production was activated when cells were subjected to physical or chemical stresses that caused cell lysis. We propose that DMSP lyase and DMSP are segregated within these cells and re-action only under conditions that result in cell stress or damage. Such activation occurs during microzooplankton grazing. When these clones were grazed by the dinoflagellate *Oxyrrhis marina*, DMS was produced; ungrazed cells, as well as those exposed to grazer exudates and associated bacteria, generated no DMS. Grazing of clone 373 produced much more DMS than grazing of clone 370, consistent with their relative in vitro DMSP lyase activities. DMS was only generated when cells were actually being grazed, indicating that ingested cells were responsible for the DMS formation. We suggest that even low levels of grazing can greatly accelerate DMS production.

Author

Dimethyl Compounds; DMSP Satellites; Grazing; Sulfides; Bacteria; Enzyme Activity

19980018000 Oregon State Univ., Coll. of Oceanic and Atmospheric Sciences, Corvallis, OR USA

Release and Consumption of DMSP from *Emiliana Huxleyi* during grazing by *Oxyrrhis Marina*

Wolfe, Gordon V., Oregon State Univ., USA; Sherr, Evelyn B., Oregon State Univ., USA; Sherr, Barry F., Oregon State Univ., USA; *Marine Ecology Progress Series*; Aug. 11, 1994; Volume 111, pp. 111-119; In English

Contract(s)/Grant(s): NAGw-3737

Report No.(s): NASA/CR-94-207167; NAS 1.26:207167; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Degradation and release to solution of intracellular dimethylsulfoniopropionate (DMSP) from *Emiliana huxleyi* 370 was observed during grazing by the heterotrophic dinoflagellate *Oxyrrhis marina* in 24 h bottle incubations. Between 30 and 70% of the lost algal DMSP was metabolized by the grazers without production of dimethylsulfide (DMS) when grazer densities were 150 to 450/ml. The rest was released to solution and about 30% was converted to DMS by bacteria associated with the grazer culture. These experiments demonstrate that grazing by herbivorous protists may be an important sink for DMSP in marine waters, removing a potential source of DMS. Microzooplankton grazing may also indirectly increase the production of DMS by transferring algal DMSP to the dissolved pool, making it available for bacterial metabolism.

Author

Grazing; Degradation; DMSP Satellites; Protozoa; Bacteria

19980018073 Baylor Coll. of Medicine, Dept. of Medicine, Houston, TX USA

Regulation of Blood Volume During Spaceflight *Final Report*

Alfrey, Clarence P., Baylor Coll. of Medicine, USA; 1997; 45p; In English

Contract(s)/Grant(s): NAG2-500

Report No.(s): NASA/CR-97-206684; NAS 1.26:206684; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effects of spaceflight on erythropoiesis and blood volume in the rat were studied during the 14-day NASA Spacelab Life Sciences 2 (SLS-2) Shuttle mission. Measurements included red blood cell mass (RBCM), plasma volume (PV), iron utilization and iron utilization in response to an injection of erythropoietin. Red blood cell (RBC) survival, splenic sequestration and erythrocyte morphology were also evaluated. At landing, the RBCM adjusted for body weight was significantly lower in the flight animals than in the ground controls. While the PV was also decreased, the change was not statistically significant. Incorporation of iron into circulating RBCs was normal when measured after five days of spaceflight and the rat responded normally to the single in-flight injection of erythropoietin. No change in RBC morphology could be attributed to spaceflight. A normal survival was found for the RBC population that was represented by Cr-51 labeled RBCs. These results demonstrate that rats, like humans, return from spaceflight with a decreased RBCM and total blood volume.

Author

Blood Volume; Space Flight; Blood Cells; Physiological Effects; Microgravity

19980018114 Indiana Univ., Research and Sponsored Programs, Indianapolis, IN USA

Cell Kinetic and Histomorphometric Analysis of Microgravitational Osteopenia: Pare.03B Final Report

Garetto, Lawrence P., Indiana Univ., USA; Roberts, W. Eugene, Indiana Univ., USA; Jan. 26, 1998; 15p; In English

Contract(s)/Grant(s): NAG2-756

Report No.(s): NASA/CR-1998-207003; NAS 1.26:207003; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Previous methods of identifying cells undergoing DNA synthesis (S-phase) utilized H-3 Thymidine (3HT) autoradiography. 5-Bromo-2'-deoxyuridine (BrdU) immunohistochemistry is a nonradioactive alternative method. This experiment compared the two methods using the nuclear volume model for osteoblast histogenesis in two different embedding media. Twenty Sprague-Dawley rats were used, with half receiving 3HT (1 micro g Ci/g) and the other half BrdU (50 micro g/g). Condyles were embedded (one side in paraffin, the other in plastic) and S-phase nuclei were identified using either autoradiography or immunohistochemistry. The fractional distribution of preosteoblast cell types and the percentage of labeled cells (within each cell fraction and label index) were calculated and expressed as mean \pm standard error. Chi-Square analysis showed only a minor difference in the fractional distribution of cell types. However, there were significant differences (p less than 0.05) by ANOVA, in the nuclear labeling of specific cell types. With the exception of the less-differentiated A+A' cells, more BrdU label was consistently detected in paraffin than in plastic-embedded sections. In general, more nuclei were labeled with 3H-thymidine than with BrdU in both types of embedding media. Labeling index data (labeled cells/total cells sampled \times 100) indicated that BrdU in paraffin, but not plastic gave the same results as 3HT in either embedding method. Thus, we conclude that the two labeling methods do not yield the same results for the nuclear volume model and that embedding media is an important factor when using BrdU. As a result of this work, 3HT was chosen for used in the PARE.03 flight experiment.

Derived from text

Microgravity; Cells (Biology); Deoxyribonucleic Acid; Experimentation

19980018278 Slovak Academy of Sciences, Bratislava, Czechoslovakia

The 8th Bratislava Symposium on Saccharides: Programme and Abstracts

Sep. 1997; 118p; In English; 8th; Bratislava Symposium on Saccharides, 1-5 Sep. 1997, Smolenice, Slovenia

Report No.(s): AD-A331777; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche; Abstracts Only; Abstracts Only

Partial Contents: (1) Protein carbohydrate interactions as studied by NMR experiments; (2) Ionic polysaccharides: Experiments, theory and structural information; (3) Spectroscopic studies of dynamics and structure in oligo- and polysaccharides; (4) A study on the interaction of D- and L-poly(Lysine) enantiomers with potassium pectate; (5) Pyridine - an useful reagent in chemical ionization mass spectrometry of carbohydrate derivatives; (6) New aspects of glycoside bond formation; (7) C-glycoside construction from anionic C-glycosyl donors: Sugar mimics for sugar receptors; (8) Anomeric radicals, carbenes and nitrenes in monosaccharide chemistry; (9) Synthesis of arylalkyl and indolylmethyl glucosinolates: A new approach; and (10) The role of carbohydrates in today's commercial world.

DTIC

Conferences; Sugars; Abstracts; Experimentation; Spectroscopy; Atomic Structure

19980018284 Michigan Technological Univ., Houghton, MI USA

Diatom Attachment at Aquatic Interfaces: Molecular Interactions, Mechanisms, and Physiology of Adhesion Final Report, 1 Dec. 1994 - 30 Nov. 1996

Gretz, Michael R., Michigan Technological Univ., USA; Hoagland, Kyle D., Nebraska Univ., USA; Nov. 26, 1997; 5p; In English

Contract(s)/Grant(s): N00014-94-I-0273

Report No.(s): AD-A332718; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We have answered fundamental questions regarding the mechanisms of attachment and the nature of the biocomposite adhesives utilized by the marine biofouling diatom *Achnanthes longipes* and the freshwater *Cymbella cistula*. During the course of this grant we have: (1) delineated the sequence of events involved in attachment of the organisms to a variety of surfaces; (2) discovered that initial adhesion is mediated by different methods/polymers on hydrophilic surfaces vs. those more hydrophobic and that bacterial 'preconditioning' has variable effects on adhesion; (3) developed methodology for mass culture of fouling diatoms and isolation of adhesive components; (4) characterized the 'proteoglycan' bioadhesives using monosaccharide and methylation analysis, NMR and other analytical techniques; (5) localized specific carbohydrate moieties of the adhesive with lectins and produced monoclonal antibodies against the adhesives and applied them as probes of structure/function of the adhesives; (6) determined that adhesion is disrupted at several levels by dichlorobenzonitrile (DCB) and related specific inhibitors of plant extracellular polysaccharide synthesis; (7) ascertained that DCB and other potential anti-fouling chemicals act intracellularly on an 18 KD membrane associated protein and that DCB doped polyimide surfaces do not inhibit adhesion; (8) discovered that adhesive structures are not assembled in the presence of high concentrations of iodide and that bromide is a limiting requirement for adhesion; and (9) created an expression library to screen for a 50 kD polypeptide from the adhesive and a peroxidase involved in crosslinking the adhesive.

DTIC

Molecular Interactions; Adhesion; Physiology; Carbohydrates; Molecular Structure

19980018334 Tennessee Univ., Knoxville, TN USA

Effects of Shifts in Cell Surface Properties on Adhesion and Activity in Engineered Bioluminescent Bacteria in Biofilms
Final Report, 1 Jul. 1994 - 30 Jun. 1997

White, David C., Tennessee Univ., USA; Sep. 30, 1997; 10p; In English

Contract(s)/Grant(s): N00014-94-I-0765

Report No.(s): AD-A331624; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Shifts in the membrane composition of two strains of *Pseudomonas putida* (solvent sensitive strain MW! 200 and solvent tolerant strain Idaho) were studied following exposure to solvent (*o*-xylene). Responses to solvent were examined in terms of phospholipid and fatty acid content (increasing in strain Idaho, and decreasing in strain MW1200), and synthesis and composition of lipopolysaccharide (again increasing in strain Idaho and decreasing in strain MW1200). Possibly due to the alteration in LPS structure, stable biofilms of strain Idaho formed more quickly in the presence of solvent than was observed in the absence of solvent. Also, changes in the biosynthesis rate of the phospholipids in the two strains were measured. Both strains exhibited an increase in biosynthesis rate in the presence of *o*-xylene with the greatest increase in strain Idaho. The increased rate of biosynthesis is highly beneficial to the Idaho cells enabling rapid repair of membrane damage and, therefore an increased solvent tolerance with up to on 100 fold decrease in permeability to solvent. Although a *nah-lux* construction was made and stressfully inserted onto the strain Idaho chromosome, the transformant produced light under all conditions. Consequently, it was not usable for attachment response studies following changes in the bulk phase composition.

DTIC

Adhesion; Bacteria; Construction; Damage; Deformation; Exposure; Maintenance; Membrane Structures; Membranes

19980018500 Delaware Univ., Dept. of Chemical Engineering, Newark, DE USA

Van der Waals Interactions Involving Proteins

Roth, Charles M., Delaware Univ., USA; Neal, Brian L., Delaware Univ., USA; Lenhoff, Abraham M., Delaware Univ., USA; Biophysical Journal; Feb. 1996; ISSN 0006-3495; Volume 70, pp. 977-987; In English

Contract(s)/Grant(s): NAG8-1038; NSF CTS-91-11604; NSF BCS-92-10401

Report No.(s): NASA/CR-96-207387; NAS 1.26:207387; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Van der Waals (dispersion) forces contribute to interactions of proteins with other molecules or with surfaces, but because of the structural complexity of protein molecules, the magnitude of these effects is usually estimated based on idealized models of the molecular geometry, e.g., spheres or spheroids. The calculations reported here seek to account for both the geometric irregularity of protein molecules and the material properties of the interacting media. Whereas the latter are found to fall in the generally accepted range, the molecular shape is shown to cause the magnitudes of the interactions to differ significantly from those calculated using idealized models, with important consequences. First, the roughness of the molecular surface leads to much lower average interaction energies for both protein-protein and protein-surface cases relative to calculations in which the protein molecule is approximated as a sphere. These results indicate that a form of steric stabilization may be an important effect in protein solutions. Underlying this behavior is appreciable orientational dependence, one reflection of which is that molecules of complementary shape are found to exhibit very strong attractive dispersion interactions. Although this has been widely discussed previously in

the context of molecular recognition processes, the broader implications of these phenomena may also be important at larger molecular separations, e.g., in the dynamics of aggregation, precipitation, and crystal growth.

Author

Van Der Waals Forces; Proteins; Dispersions

19980018501 NASA Ames Research Center, Moffett Field, CA USA

Glucose Infusion into Exercising Dogs after Confinement: Rectal and Active Muscle Temperatures

Greenleaf, J. E., NASA Ames Research Center, USA; Kruk, B., Polish Academy of Sciences, Poland; Nazar, K., Polish Academy of Sciences, Poland; Falecka-Wieczorek, I., Polish Academy of Sciences, Poland; Kaciuba-Uscilko, H., Polish Academy of Sciences, Poland; Aviation, Space, and Environmental Medicine; Dec. 1995; Volume 66, No. 12, pp. 1169-1174; In English

Contract(s)/Grant(s): RTOP 199-18-12-07

Report No.(s): NASA/CR-95-207202; NAS 1.26:207202; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

Intravenous glucose infusion into ambulatory dogs results in attenuation of exercise-induced increase of both rectal and thigh muscle temperatures. That glucose (Glu) infusion attenuates excessive increase in body temperature from restricted activity during confinement deconditioning. Intravenous glucose infusion attenuates the rise in exercise core temperature in deconditioned dogs by a yet undefined mechanism.

Author

Aerospace Medicine; Glucose; Intravenous Procedures; Body Temperature

19980018614 Geological Survey, Reston, VA USA

Biological Resources Division Geospatial Technology Strategic Plan 1997 - 2000

DERchia, F., Geological Survey, USA; DERchia, T., Editor, Geological Survey, USA; Getter, J., Geological Survey, USA; McNiff, M., Geological Survey, USA; Stitt, S., Geological Survey, USA; White, B., Geological Survey, USA; Nov. 1997; 42p; In English Report No.(s): AD-A334123; USGS/BRD/ITR-1997-0003; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Geospatial Technology Strategic Plan addresses the use and applications of geospatial technology in the Biological Resources Division of the U.S. Geological Survey. The Strategic Plan lays the foundation for a long-term strategy to develop standards and protocols and to share and transfer technology within the Biological Resources Division and with other U.S. Geological Survey Divisions. The form for coordination is the Geospatial Technology Coordinating Group, comprised of representatives from Biological Resources Centers and Programs. The goals, strategies, and objectives included in this document will serve 55 the guiding policy for geospatial technology activities in the Biological Resources Division of the U.S. Geological Survey. The primary responsibilities of the Geospatial Technology Coordinating Group, Biological Resources Division Headquarters, Regional Offices, Science and Technology Centers, and Programs are clearly defined.

DTIC

Geological Surveys; Policies; Technologies; Biotechnology; Research and Development

19980018823 Society of Environmental Toxicology and Chemistry, Pensacola, FL USA

Environmental Toxicology and Chemistry: An International Journal, Volume 15

Ward, C. H., Editor, Rice Univ., USA; Nov. 1996; ISSN 0730-7268; 55p; In English

Report No.(s): AD-A332986; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Environmental Toxicology and Chemistry, the official journal of the Society of Environmental Toxicology and Chemistry (SETAC), is dedicated to furthering scientific knowledge and disseminating information on environmental toxicology and chemistry including the application of these sciences to hazard/risk assessment. The journal provides a forum for professionals in academia, industry, government, and other segments of society involved in the use, protection, and management of the environment for the enhancement of ecological health and human welfare. Environmental Toxicology and Chemistry is divided into three sections, each with its own editors: environmental chemistry, environmental toxicology, and hazard/risk assessment. Interdisciplinary in scope, the journal includes integrative studies involving components of classical toxicology; physiology; biology; microbiology; organic, environmental and analytical chemistry; anatomy; genetics; environmental engineering; geology; ecology; soil, water and atmospheric sciences; and economics. Through peer-reviewed research papers, short communications, and review articles, Environmental Toxicology and Chemistry reports concepts and the results of experimental and analytical studies that can be used for the development of ecologically acceptable practices and principles.

DTIC

Environmental Chemistry; Toxicology; Environmental Engineering; Ecology; Microbiology; Information Dissemination; Atmospheric Chemistry; Atmospheric Physics

19980018941 Naval Research Lab., Microbiologically Influenced Corrosion Section, Stennis Space Center, MS USA

General Techniques for SEM Observation

Lavoie, Dennis, Naval Research Lab., USA; Ray, Ricky, Naval Research Lab., USA; Little, Brenda, Naval Research Lab., USA; Jan. 1997; 26p; In English

Report No.(s): AD-A333615; NRL/BA/7333-95-0006; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This minimization procedure is only necessary for samples that must be viewed in the hydrated state without prior drying. A more direct installation sequence may be used for initially dry samples. For some samples, it may be important to avoid dehydration, but the presence of additional water is not a problem. In such cases it is recommended that the sample be covered in excess water before using the optimized installation sequence.

DTIC

Dehydration; Scanning Electron Microscopy; Observation; Optimization

19980019292 Monterey Bay Aquarium Research Inst., Moss Landing, CA USA

The Onset of the 1997-1998 El Nino and its Impact on the Phytoplankton Community of the Central Equatorial Pacific Final Report

Chavez, F. P., Monterey Bay Aquarium Research Inst., USA; Strutton, P. G., Monterey Bay Aquarium Research Inst., USA; McPhaden, M. J., National Oceanic and Atmospheric Administration, USA; 1996; 15p; In English; Original contains color illustrations; Supported in part by the David and Lucile Packard Foundation

Contract(s)/Grant(s): NASS-97134; NOAA-NA-56GP0202; NAG5-3130

Report No.(s): NASA/CR-1998-206767; NAS 1.26:206767; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Using physical and bio-optical data from moorings in the central equatorial Pacific, the perturbations to phytoplankton biomass and productivity associated with the onset of the 1997-98 El Nino event were investigated. The data presented depict the physical progression of El Nino onset, from reversal of the trade winds in the western equatorial Pacific, through eastward propagation of equatorially trapped Kelvin waves and advection of waters from the nutrient-poor western equatorial warm pool. The physical perturbations led to fluctuations in phytoplankton biomass, quantum yield of fluorescence and a 50% reduction in primary productivity.

Author

El Nino; Phytoplankton; Perturbation; Biomass; Advection

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19980018490 Georgia Univ., Athens, GA USA

Membrane Transport: Cellular Probe of Heat Stroke Final Report, 2 Aug. 1993 - 1 Aug. 1997

Willis, John S., Georgia Univ., USA; Sep. 1997; 66p; In English

Contract(s)/Grant(s): DAMD17-93-J-3031

Report No.(s): AD-A331554; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In vitro effects of temperature on permeation of Na⁺ and K⁺ were explored in red cells of guinea pig to evaluate the Energy Depletion Hypothesis of heatstroke. Prior to Midterm Report it was found that large changes in cell Na⁺ and K⁺ do not occur at 410C and 450C, that increase in pump activity matches elevated Na⁺ permeation at 410C and that steep rise in K-Cl cotransport at 410C and 450C accounts for most increase in passive K⁺ permeation. Since Midterm Report this large temperature effect on K-Cl cotransport has been shown to operate indirectly through regulation of the carrier, most probably the phosphates that activates it. Increased net loss of K⁺ through this pathway protects the cell from swelling at 410C and 450C. In vitro this loss is balanced by uptake of K⁺ through the Na-K pump, but if pumps are limited in vivo, it could account for hyperthermic hyperkalemia. Cell acidification (and swelling) causes an enormous increase in Na⁺ uptake at 410C and 450C through an unknown amiloride sensitive pathway. This devastating rise in Na permeation could, if general, meet the primary condition for cell failure postulated by the Energy Depletion Hypothesis.

DTIC

Acidity; Axioms; Erythrocytes; Heat Stroke; Hypotheses; Membranes; Permeating; Phosphates

19980018625 Weizmann Inst. of Science, Rehovot, Israel

Treatment of Retinal Injuries by Low-Energy Laser: Models of Neurodegeneration in Retinal Injuries and Treatment by Low Energy Laser

Schwartz, Michal, Weizmann Inst. of Science, Israel; Oct. 1997; 18p; In English

Contract(s)/Grant(s): DAMD17-96-I-6004

Report No.(s): AD-A334113; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have demonstrated in previous studies that low energy laser reduces injury-induced deficits caused by acute partial injury of the rat optic nerve. The results of in-depth analysis suggest that the laser effect in this model is of a neuroprotective nature. We have devoted the time lapsed since approval of funding of the present study to characterization of the optic nerve partial lesion model, in an attempt to determine whether the progressive degeneration which occurs subsequently to the primary insult and continues in the absence of any external insult, is of a self-perpetuating nature, and whether such progressive degeneration follows any topographical pattern and whether any such pattern might be a reflection of the severity of the primary injury itself. By clarify the above points, we may turn our model into an ideal model for studying the neuroprotection of the optic nerve and retinal ganglion cells from injurious conditions.

DTIC

Lasers; Cells (Biology); Retina; Injuries; Nervous System

19980018854 Johns Hopkins Univ., Laurel, MD USA

Corneal Damage from Infrared Radiation Annual Report, 1 Nov. 1996 - 31 Oct. 1997

McCally, Russel L., Johns Hopkins Univ., USA; Dec. 1997; 24p; In English

Contract(s)/Grant(s): DAMD17-96-C-6005

Report No.(s): AD-A334135; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes our research during the past year on the interaction of 80 ns pulses of infrared radiation produced by a CO₂-TEA laser with the cornea. Epithelial damage thresholds were determined for sequences of 1, 2, 8, 32, 128, and 1024 pulses at 10 Hz and for sequences of 1, 2, 8, 32, 128, and 1024 pulses at 16 Hz. Threshold damage is correlated by a power law of the form $ED_{th} = CN^{-\alpha}$ in which ED_{th} is the threshold energy density and N is the number of pulses in the sequence. Temperature calculations reveal that the maximum temperature increase on the beam axis 10 micron beneath the anterior tear surface resulting from the different threshold exposures is essentially constant. This result is consistent with a critical peak temperature damage model and suggests that, at least for the multiple-pulse exposures, the damage mechanism may be predominately thermal. Damage threshold measurements on corneas maintained at 21 C indicated that the damage mechanism is indeed predominately thermal.

DTIC

Cornea; Infrared Radiation; Damage; TEA Lasers; Carbon Dioxide Lasers; Sequencing

19980018856 Arizona Univ., Tucson, AZ USA

Immunotoxicology of Exposure to JP-8 Jet Fuel Final Report

Harris, David, Arizona Univ., USA; Dec. 1997; 13p; In English

Contract(s)/Grant(s): F49620-96-I-0075; AF Proj. 2312

Report No.(s): AD-A332846; AFOSR-97-0701TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Chronic jet fuel exposure could be detrimental to Air Force personnel, by not only adversely affecting their work performance but also by predisposing these individuals to increased incidences of infectious disease, cancer and autoimmune dysfunctions. Chronic exposure to jet fuel has been shown to adversely affect human liver function, to cause emotional dysfunction, to cause abnormal electroencephalograms, to cause shortened attention spans, and to decrease sensorimotor speed. Currently, there are no standards for personnel exposure to jet fuels of any kind, let alone JP-8 jet fuel. Kerosene based petroleum distillates have been associated with hepatic, renal, neurologic and pulmonary toxicity in animals models and human occupational exposures. The U.S. Department of Labor, Bureau of Labor statistics estimates that over 1.3 million workers were exposed to jet fuels in 1992. Thus, jet fuel exposure may not only have serious consequences for USAF personnel, but also may have potential harmful effects upon a significant number of civilian workers. Short-term (7 day) JP-8 jet fuel exposure causes lung injury as evidenced by increased pulmonary resistance, a decrease in bronchoalveolar lavage concentrations of substance P, increased wet lung/body weight ratio, and increased alveolar permeability. Long-term exposures, although demonstrating evidence of lung recovery, results in injury to secondary organs such as liver, kidneys and spleen.

DTIC

JP-8 Jet Fuel; Jet Engine Fuels; Toxicology; Immunity; Human Performance; Armed Forces (USA)

19980018944 Armstrong Lab., Brooks AFB, TX USA

Autonomic Functions Associated with Blood Pressure Regulation and Orthostatic Performance in Women *Final Report*

Convertino, Victor A., Armstrong Lab., USA; Aug. 1997; 54p; In English

Report No.(s): AD-A332260; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Functions of baroreflex control of heart rate and vascular resistance, adrenoreceptor responsiveness, indices of baseline vagal and sympathetic tone, plasma volume, and venous compliance were compared in men and women to test the hypothesis that greater orthostatic intolerance in women would be associated with impairment of specific mechanisms of blood pressure regulation. Heart rate (HR), stroke volume (SV), cardiac output (Q), mean arterial blood pressure (MAP), forearm (FVR) and leg (LVR) vascular resistance, catecholamines (NE), and changes in leg volume (%LV) were measured during various protocols of lower body negative pressure (LBNP), carotid stimulation, and infusions of adrenoreceptor agonists in 10 females and 10 males matched for age and fitness. LBNP tolerance for women (797 +/- 63 mmHg.min) was 35% lower (P=0.0017) than for men. At presyncope, SV, Q, MAP and %LV were lower (P<0.05) in females compared to males while HR, FVR, and TPR were similar in both groups. Lower LBNP tolerance in females was associated with impairment of the heart rate response to carotid baroreceptor stimulation, lower baseline cardiac vagal activity, greater decline in Q and SV induced by LBNP, increased Beta1-adrenoreceptor responsiveness, greater vasoconstriction under equal LBNP, lower levels of NE at presyncope, and lower blood volume. Results support the hypothesis that women have significant deficiencies in mechanisms that underlie blood pressure regulation under orthostatic challenge. These findings should be considered in selection and training of women for military combat, especially in combat missions requiring high-G aerial maneuvers.

DTIC

Females; Blood Pressure; Cardiovascular System; Chemoreceptors; Physiological Responses; Heart Rate; Cardiac Output

19980018968 Civil Aeromedical Inst., Oklahoma City, OK USA

Selection of an Internal Standard for Postmortem Ethanol Analysis *Final Report*

Canfield, Dennis V., Civil Aeromedical Inst., USA; Smith, Moraine D., Civil Aeromedical Inst., USA; Adam, Heather J., Civil Aeromedical Inst., USA; Houston, Eric R., Civil Aeromedical Inst., USA; Feb. 1998; 14p; In English

Report No.(s): DOT/FAA/AM-98/5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One mission of the Civil Aeromedical Institute is to determine the concentrations of alcohol in postmortem specimens related to aviation accidents. This requires the ability to identify and quantitate a wide range of alcohols that are produced in postmortem specimens. A headspace gas chromatographic procedure utilizing n-propanol as an internal standard had been used in the past. However, n-propanol has been found in postmortem specimens, making n-propanol an unsuitable specimen for an internal standard in the analysis of postmortem specimens. This study evaluated 3 potential replacement internal standards for postmortem ethanol analysis. A mixture of alcohols commonly found in postmortem specimens was prepared and tested using headspace gas chromatography. Solutions were prepared using the test mix and the new internal standards. Data were collected on the resolution and reproducibility of the proposed new internal standards with the test mix. Postmortem cases collected over the past 8 years were reviewed for the presence of specific volatile compounds. Baseline resolution from the test mix was not obtained with propionaldehyde, while propionic acid methyl ester exhibited degradation over time. T-butanol was found to give baseline resolution from all volatile compounds commonly found in antimortem and postmortem specimens. No t-butanol was found in 2880 fatal pilots analyzed over the past 8 years for the presence of volatiles. T-butanol is a better internal standard for the analysis of alcohols in postmortem specimens than propionaldehyde, n-propanol, and propionic acid methyl ester, and is not produced in postmortem specimens.

Author

Aircraft Accidents; Alcohols; Ethyl Alcohol; Gas Chromatography; Butanes; Pilots (Personnel)

19980018977 South Carolina Univ., Dept. of Physiology, Columbia, SC USA

Effect of an Airplane Cabin Water Spray System on Human Thermal Behavior: A Theoretical Study Using a 25-Node Model of Thermoregulation *Final Report*

Wolf, M. B., South Carolina Univ., USA; Garner, Robert P., Civil Aeromedical Inst., USA; Feb. 1998; 26p; In English

Report No.(s): DOT/FAA/AM-98/4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study was conducted to assess the effect of an aircraft cabin water spray system on thermoregulatory responses of passengers after being wetted by the spray system. A mathematical model was developed that could adequately describe experimentally determined transient changes in metabolic rate (MR), and core and skin temperatures of human beings exposed to water-immersion conditions (0 to 28 C). The model was the basic 25-node description of Stolwijk and Hardy as modified to apply to a male with medium fat content. The MR increase induced by shivering was described by 3 components sensitive to 1) time-rate of change of skin temperature, 2) the product of changes in skin and head-core temperatures and 3) the product of skin temperature change

and the time-rate of change of head-core temperature. The model was also able to closely predict the changes in MR and skin temperatures induced by exposure to cold air. However, the predictions of rectal temperature changes were in the opposite direction to the experimental data for this case. The model was modified to describe the effects of spraying individuals with water on their heads, arms and torsos to simulate the action of a cabin water spray system activated by a fire in an airplane. The model predicted that an individual, after being sprayed and exiting into a cold and windy environment, would encounter only a minor increase in thermal stress compared to the dry state. We conclude that mathematical simulation is an effective method of predicting thermal behavior of humans under a variety of cold conditions.

Author

Body Temperature; Human Behavior; Mathematical Models; Physiological Responses; Spraying; Computerized Simulation; Thermal Stresses; Skin Temperature (Biology)

19980018998 NASA Ames Research Center, Moffett Field, CA USA

Noninvasive Determination of Bone Mechanical Properties Using Vibration Response: A Refined Model and Validation in vivo

Roberts, S. G., Stanford Univ., USA; Hutchinson, T. M., NASA Ames Research Center, USA; Arnaud, S. B., NASA Ames Research Center, USA; Kiratli, B. J, Veterans Administration Hospital, USA; Steele, C. R., Stanford Univ., USA; *Journal of Biomechanics*; 1996; ISSN 0021-9290; Volume 29, No. 1, pp. 91-98; In English

Contract(s)/Grant(s): RTOP 199-26-12-02; RTOP 106-30-43-04

Report No.(s): NASA/CR-95-207219; NAS 1.26:207219; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

Accurate non-invasive mechanical measurement of long bones is made difficult by the masking effect of surrounding soft tissues. Mechanical response tissue analysis (MRTA) offers a method for separating the effects of the soft tissue and bone; however, a direct validation has been lacking. A theoretical analysis of wave propagation through the compressed tissue revealed a strong mass effect dependent on the relative accelerations of the probe and bone. The previous mathematical model of the bone and overlying tissue system was reconfigured to incorporate the theoretical finding. This newer model (six-parameter) was used to interpret results using MRTA to determine bone cross-sectional bending stiffness, EI(sub MRTA). The relationship between EI(sub MRTA) and theoretical EI values for padded aluminum rods was $R(\text{sup } 2) = 0.999$. A biological validation followed using monkey tibias. Each bone was tested in vivo with the MRTA instrument. Postmortem, the same tibias were excised and tested to failure in three-point bending to determine EI(sub 3-PT) and maximum load. Diaphyseal bone mineral density (BMD) measurements were also made. The relationship between EI(sub 3-PT) and in vivo EI(sub MRTA) using the six-parameter model is strong ($R(\text{sup } 2) = 0.947$) and better than that using the older model ($R(\text{sup } 2) = 0.645$). EI(sub MRTA) and BMD are also highly correlated ($R(\text{sup } 2) = 0.853$). MRTA measurements in vivo and BMD ex vivo are both good predictors of scaled maximum strength ($R(\text{sup } 2) = 0.915$ and $R(\text{sup } 2) = 0.894$, respectively). This is the first biological validation of a non-invasive mechanical measurement of bone by comparison to actual values. The MRTA technique has potential clinical value for assessing long-bone mechanical properties.

Author

Loads (Forces); Mathematical Models; Mechanical Measurement; Mechanical Properties; Vibration; Wave Propagation; Tibia; Bone Mineral Content

19980019137 Naval Health Research Center, San Diego, CA USA

Longitudinal Trends and Gender Differences in Physical Fitness and Lifestyle Factors in Career U.S. Navy Personnel Interim Report, 1983-1994

Trent, L. K., Naval Health Research Center, USA; Hurtado, S. L., Naval Health Research Center, USA; May 1997; 23p; In English Contract(s)/Grant(s): Proj. M0096

Report No.(s): AD-A328021; NHRC-97-13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study examines long-term health and physical readiness trends in the U.S. Navy. Lifestyle questionnaires were mailed to all participants from baseline studies between 1983 and 1989 who were still on active duty in 1994. Commands provided body composition and Physical Readiness Test (PRT) scores for the participants. Two longitudinal cohorts were created an 8-year sample (N = 640) with matched data from 1986, 1989, and 1994; and an 11-year sample (N = 1,576), with data from 1983 and 1994. Analyses of both cohorts revealed significant improvements in physical fitness, exercise, lean body mass, dietary habits, and sleep, as well as significant decreases in tobacco and alcohol use and job stress. However, hypertension rates, percent body fat, and body mass index showed significant increases over time. Women's scores were significantly better than men's on a number of factors.

Overall, these findings suggest that the Navy's health promotion efforts have had a significant positive impact on the health and fitness of career Navy personnel.

DTIC

Physical Fitness; Trends; Physiological Responses; Health; Armed Forces (USA)

19980019154 Naval Health Research Center, San Diego, CA USA

Thermoregulatory Consequences of Upper Body Versus Lower Body Exercise *Final Report*

Canine, M. K., Naval Health Research Center, USA; Bothorel, B., Naval Health Research Center, USA; Habib, C. M., Naval Health Research Center, USA; Trone, D. W., Naval Health Research Center, USA; Vurbeff, G. K., Naval Health Research Center, USA; May 12, 1997; 27p; In English

Report No.(s): AD-A328063; NHRC-97-17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study was to examine the effects of exercise mode on heat strain when cooling was provided by liquid-based microclimate cooling. Eight males exercised 20 min every half hour for a total of 120 min in a hot environment (49 deg C, 20% relative humidity) while dressed in a chemical protective overgarment. Subjects completed the following four tests: upper body exercise (UBE) with no cooling (NC), UBE with cooling (C), lower body exercise (LBE) with NC, and LBE with C. Work rates were selected to elicit an oxygen uptake of 1.2 L/min. Heart rate (HR), rectal temperature (T sub re), and whole body sweat rate (SR) were measured as heat strain indicators. Heat strain indices were similar between UBE and UBE when no cooling was provided. When cooling was provided, SR and T sub re were similar between exercise modes, but HR was significantly higher during UBE-C (109 +/- 19 beats/min) than during UBE-C (96 +/- 10 beats/min). Heat transfer to the cooling system was greater during IBIS than during UBE, possibly due to the lower efficiency in performance of LBE. Thus, whole body heat transfer under these conditions may be related to metabolic heat production rather than to region of muscular activity.

DTIC

Thermoregulation; High Temperature Environments; Physiological Tests; Physical Exercise; Physiological Responses

53

BEHAVIORAL SCIENCES

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

19980018178 Alphatech, Inc., Burlington, MA USA

Development of a Search and Rescue Simulation to Study the Effects of Prolonged Isolation on Team Decision Making *Final Report*

Entin, Elliot E., Alphatech, Inc., USA; Kerrigan, Caroline, Alphatech, Inc., USA; Serfaty, Daniel, APTIMA, Inc., USA; Young, Philip, APTIMA, Inc., USA; Feb. 1998; 52p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS2-14388

Report No.(s): NASA/CR-1998-207175; NAS 1.26:207175; TR-853; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The goals of this project were to identify and investigate aspects of team and individual decision-making and risk-taking behaviors hypothesized to be most affected by prolonged isolation. A key premise driving our research approach is that effects of stressors that impact individual and team cognitive processes in an isolated, confined, and hazardous environment will be projected onto the performance of a simulation task. To elicit and investigate these team behaviors we developed a search and rescue task concept as a scenario domain that would be relevant for isolated crews. We modified the Distributed Dynamic Decision-making (DDD) simulator, a platform that has been extensively used for empirical research in team processes and taskwork performance, to portray the features of a search and rescue scenario and present the task components incorporated into that scenario. The resulting software is called DD-Search and Rescue (Version 1.0). To support the use of the DDD-Search and Rescue simulator in isolated experiment settings, we wrote a player's manual for teaching team members to operate the simulator and play the scenario. We then developed a research design and experiment plan that would allow quantitative measures of individual and team decision making skills using the DDD-Search and Rescue simulator as the experiment platform. A description of these activities and the associated materials that were produced under this contract are contained in this report.

Author

Rescue Operations; Decision Making; Human Performance; Isolation; Confinement; Simulation; Teams

19980018969 Boston Univ., Boston, MA USA

Context-Sensitive Visual Processing: Segmentation and Grouping, Visual Search, and 3-D Surface Perception

Mingolla, Ennio, Boston Univ., USA; Sep. 1997; 10p; In English

Contract(s)/Grant(s): N00014-94-I-0597

Report No.(s): AD-A332832; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Psychophysical experiments in visual search, texture segregation, motion segmentation, lightness perception on 3-D surfaces, and the perception of heading have been designed, executed, and analyzed. Data from these experiments and others has been used to refine parameter selection for the Boundary Contour System model of early human vision and its application to image processing. Mingolla has obtained a security clearance and consulted with Dr. Allen Waxman's group at MIT Lincoln Laboratory on night vision and image processing. Mingolla continues to work in modeling (neural architectures for brightness perception, illusory contours, figure/ground segmentation, search for targets in clutter, motion perception) and image processing (segmentation or enhancement of SAR and LADAR imagery).

DTIC

Image Processing; Motion Perception; Optical Radar; Synthetic Aperture Radar; Laser Range Finders; Brightness; Radar Imagery

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19980018040 Advisory Group for Aerospace Research and Development, Aerospace Medical Panel, Neuilly-Sur-Seine, France
3-D Surface Anthropometry: Review of Technologies *L'Anthropometrie de Surface en Trois Dimensions: Examen des Technologies*

Dec. 1997; 192p; In English

Report No.(s): AGARD-AR-329; ISBN 92-836-1069-5; Copyright Waived; Avail: CASI; A09, Hardcopy; A02, Microfiche

This document, in seven chapters, describes the dramatic changes taking place in the field of anthropometry due to advances in 3-D imaging technology. Chapter I explains how 3-D technology can overcome many of the limitations of traditional anthropometry; Chapter II discusses applications for 3-D anthropometry; Chapter III compares traditional and 3-D data collection methods; Chapter IV discusses ways to display 3-D images for users of the data; Chapter V addresses database management issues; Chapter VI explains how the latest user interface design techniques can help users of 3-D data; and Chapter VII examines 3-D data standardization issues and provides a list of current standards for 3-D data.

Author

Anthropometry; Three Dimensional Models; Technologies; Reviewing; Data Acquisition; Data Management; Telecommunication

19980018083 NERAC, Inc., Tolland, CT USA

Head Up Displays. (Latest citations from the Aerospace Database)

Jan. 1996; In English; Page count unavailable.

Report No.(s): PB96-859111; Copyright Waived; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning the design, fabrication, and applications of head up displays (HUDs). Applications include military aircraft, helicopters, space shuttle, and commercial aircraft. Functions of the display include instrument approach, target tracking, and navigation. The head up display provides for an integrated avionics system with the pilot in the loop. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Head-Up Displays

19980018098 Naval Postgraduate School, Monterey, CA USA

Instantaneous Axis of Rotation for Continuous Human Knee Motion

Parks, Steven, Naval Postgraduate School, USA; Jun. 1997; 128p; In English

Report No.(s): AD-A333396; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Previous studies of human knee motion are based on finite rotation data collected using large rotation steps varying from 5 to 30 degrees. In some cases this rotation data is used to develop axes of rotation for the joint. For such analysis, the rotation axis developed may be significantly different from the joint's instantaneous axis of rotation because, in general, the axis of rotation developed using finite rotation steps only closely approximates the true instantaneous axis of rotation if the step size is small. For the current study, a device has been developed to record high frequency (15 Hz) rotation and translation data of the femur and tibia during knee flexion. Kinematic constraint equations have been developed to analyze the six degree of freedom rotation and translation data to obtain an accurate approximation to the instantaneous axis of rotation. Four cadaveric knees were analyzed with all ligaments intact. Motion characteristics common to all knees were identified. The most obvious characteristic, internal tibial rotation, was related to the initial varus/valgus orientation of each knee. The anterior cruciate ligaments (ACL) of these same knees were subsequently severed, the knees were measured, and the motion analyzed. Differences in the motion characteristics of each knee were detected after the ACL was cut.

DTIC

Axes of Rotation; Degrees of Freedom; High Frequencies; Kinematic Equations; Translating

19980018184 Missouri Univ., Rolla, MO USA

Asynchronous Distance Learning Technology: The Instructors' View

Evans, Earl A., Missouri Univ., USA; Dec. 24, 1997; 112p; In English

Report No.(s): AD-A333521; AFIT-97-151; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Advances in communications, computer technology and human computer interfaces have enabled concurrent advances in Web based education. A number of case studies concerning applications of Web based education for both distance learning and on campus programs have been published. Primarily, these studies have focused on individual assessments of the Web based technologies. In addition, these published studies have generally highlighted the successes while little discussion about failed attempts has been presented in the literature. In contrast, this thesis provides a broad based assessment of applied Web technology for higher education. This research was conducted via a survey completed by twenty five university and college faculty from seventeen four year institutions. The survey instrument was composed of two parts. Part I gathered information about the course characteristics; equipment required, software, course title and credit hours. Part 2 of the survey included eleven categories of web based course delivery tools, such as chatrooms and digitized lectures. Course instructors were asked for the frequency of application of the particular tool and their perceptions of importance, efficiency of use, and instructor satisfaction for each tool. The general findings of the study as well as the statistically significant interaction effects between course characteristics are presented. The study found that electronic mail and on line information sources were the most important course delivery tools used by the survey participants. Highly favorable ratings were given to digitized lectures as well.

DTIC

Computer Systems Design; Human-Computer Interface; Information Systems; Technology Assessment

19980018187 Army Research Inst. of Environmental Medicine, Natick, MA USA

Effects of a Specifically Designed Physical Conditioning Program on the Load Carriage and Lifting Performance of Female Soldiers

Harman, Everett, Army Research Inst. of Environmental Medicine, USA; Frykman, Peter, Army Research Inst. of Environmental Medicine, USA; Palmer, Christopher, Army Research Inst. of Environmental Medicine, USA; Lammi, Eric, Army Research Inst. of Environmental Medicine, USA; Reynolds, Katy, Army Research Inst. of Environmental Medicine, USA; Nov. 1997; 112p; In English

Report No.(s): AD-A333437; T98-1; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Forty-six women were studied to determine whether their ability to perform 'very heavy' Army jobs could be improved by a specially designed 24-week physical training program administered within normal Army time constraints; 32 subjects remained for the entire testing and training program. The training program proved effective. The weight of boxes the women could lift to three different heights improved between 30% and 47%. After training, the average box-weight the women could lift onto a truck was 118 pounds, 81% of the Army male value. The number of 40-pound boxes the women could lift onto a truck in 10 minutes increased from 106 to 140. The number of 40-pound boxes that could be lifted off the ground, carried 25 feet and placed onto a truck increased from 53 to 62. Vertical jump and standing long jump distance increased 20% and 15% respectively. The speed at which a 75 pound backpack could be carried over a 2-mile mixed-terrain course increased from 3.4 to 4.4 miles per hour. Before the training, only 24% of the women could qualify for 'very heavy' Army jobs; after the training, 78% could qualify. Body composition improved as well.

DTIC

Tasks; Education; Females; Height

19980018194 Army Research Lab., Aberdeen Proving Ground, MD USA

Investigation of Female Load Carrying Performance Final Report, 23 Jan. - 31 Dec. 1995

Harper, William H., Army Research Lab., USA; Knapik, Joseph, Army Research Lab., USA; dePontbriand, Rene, Army Research Lab., USA; Jan. 1996; 120p; In English

Contract(s)/Grant(s): MIPR-95MM5589

Report No.(s): AD-A332962; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This study examined the relative load-carrying ability of men and women. Nineteen male and fifteen female soldiers (medical specialists who had just completed advanced individual training) carried loads of 18, 27, and 36 kg during an individual maximal effort 10-km road march. March times, heart rates, and subjective exertion ratings were collected every 2.5 km along the road march course and at the finish. Before and after the march, maximum vertical jump, grenade throw distance, and pain, soreness and discomfort of various body locations were assessed and a post-march questionnaire about equipment was completed. The major findings were that the average march rates for both male and female soldiers in all load conditions were faster than the rates published in Field Manual 21-18 (U.S. Army, 1990). This suggests that the test subjects were within the published zone of acceptable foot march performance. Men completed the marches an average of 21% faster than the women. Women reported more problems with the shoulder straps, fit of the pistol belts, and the fit and stability of the rucksack. Women also reported greater pain, soreness, and discomfort in the back regions than men did after carrying the heaviest load. This suggests that at least a portion of the gender differences in march rate may be explained by the equipment problems reported by the women, and equipment redesigned specifically for the female population may reduce the magnitude of the difference. Increasing load masses resulted in slower march times, more perceived exertion, and reports of greater pain, soreness, and discomfort regardless of gender. The maximal effort march itself (regardless of gender or load) results in slight decrements in grenade throw distance.

DTIC

Females; Physical Work; Armed Forces (USA); Physiological Tests

19980018292 Crew Systems Consultants, San Marcos, TX USA

Helmet-Mounted Display Design Guide

Newman, Richard L., Crew Systems Consultants, USA; Greeley, Kevin W., Crew Systems Consultants, USA; Nov. 03, 1997; 406p; In English

Contract(s)/Grant(s): NAS2-14131

Report No.(s): AD-A331767; NASA/CR-97-206824; NAS 1.26:206824; TR-97-11; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

Helmet Mounted Displays (HMDs) present flight, navigation, and weapon information in the pilot's line of sight. The HMD was developed to allow the pilot to retain aircraft and weapon information while looking off boresight. This document reviews current state of the art in HMDs and presents a design guide for the HMD engineer in identifying several critical HMD issues: symbol stabilization, inadequate definitions, undefined symbol drive laws, helmet considerations, and Field of View (FOV) vs. resolution tradeoff requirements. In particular, display latency is a key issue for HMDs. In addition to requiring further experimental studies, it impacts the definition and control law issues. Symbol stabilization is also critical. In the case of the Apache helicopter, the lack of compensation for pilot head motion creates excessive workload during hovering and Nap of the Earth (NOE) flight. This translates into excessive training requirements. There is no agreed upon set of definitions or descriptions for how HMD symbols are driven to compensate for pilot head motion. A set of definitions is proposed to address this. There are several specific areas where simulation and flight experiments are needed: development of hover and NOE symbologies which compensate for pilot head movement; display latency and sampling, and the tradeoff between FOV, sensor resolution and symbology.

DTIC

Helmet Mounted Displays; Design Analysis; Product Development; Flight Simulation

19980018586 Naval Postgraduate School, Monterey, CA USA

A Computer Simulation Study of a Single Rigid Body Dynamic Model for Biped Postural Control

Bediz, Mechmet, Naval Postgraduate School, USA; Mar. 1997; 183p; In English

Report No.(s): AD-A331492; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Existing kinematics models for humans cannot simulate movement beyond geometric constraints. On the other hand, complex dynamics models are computationally expensive for real time computer graphics applications in Virtual Environments(VE). To be able to create a more realistic, real time, and computationally efficient human model, a simple dynamic model needs to be developed. The approach taken in this thesis was to develop a single rigid body dynamic human model with massless legs. Instead of a Lagrangian model, which complicates the calculations exponentially as the complexity of the system increases, the Newton-Euler method was chosen to derive system differential equations. Linear state feedback was used for postural control. As part of

this research, a previous realistic looking human model is further developed. The major conclusion of this thesis is that a single rigid body dynamic model can be used for simulation of postural control. The simulation results contained in this thesis show that such a modeling technique could be used to cause a detailed kinematic representation of a human figure to move in a smooth and realistic way without resorting to complexity of a multi-link dynamic model.

DTIC

Computer Graphics; Computerized Simulation; Differential Equations; Real Time Operation; Rigid Structures; Lagrangian Function

19980018602 Georgia Tech Research Inst., Electronic Systems Lab., Atlanta, GA USA

Design of an ITS-Level Advanced Traffic Management System: A Human Factors Perspective

Mitta, D. A., Georgia Tech Research Inst., USA; Kelly, M. J., Georgia Tech Research Inst., USA; Folds, D. J., Georgia Tech Research Inst., USA; Jul. 1996; 159p; In English

Contract(s)/Grant(s): DTFH61-92-C-00094

Report No.(s): PB96-192307; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The report documents an approach for designing an Advanced Traffic Management System (ATMS) for a human factors perspective. In designing the ATMS from a human factors perspective, a user-centered top-down system analysis was conducted. Methodologies employed in conducting this analysis, procedures for implementing such methodologies, and analysis results are reported. System objectives and performance requirements for the ATMS, as well as ATMS functionality, are derived. Human operator issues (assignment of operator roles to ATMS functions, specification of operator performance requirements, and identification of operator tasks) are also addressed. Results of the operator task analysis supported the preparation of a human factors specification for the ATMS.

NTIS

Human Factors Engineering; Highways; Transportation; Management Systems; Traffic

19980018790 Army Aeromedical Research Lab., Fort Rucker, AL USA

U.S. Army Aviation Life Support Equipment Retrieval Program: Head and Neck Injury Among Night Vision Goggle Users in Rotary-Wing Mishaps Final Report

Shannon, Samuel G., Army Aeromedical Research Lab., USA; Mason, Kevin T., Army Aeromedical Research Lab., USA; Oct. 1997; 13p; In English

Report No.(s): AD-A332850; USAARL-98-02; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The relationship between night vision goggle (NVG) use in the U.S. Army and head/neck injury risk is unknown. A 10-year retrospective study of traumatic head/neck injuries among U.S. Army aircrew members wearing NVGs in rotary-wing mishaps was conducted by review of U.S. Army Safety Center and U.S. Army Aviation Epidemiology Data Register records. Among 704 cockpit aircrew members, 403 (57.2 percent) suffered some degree of injury during the mishap. Among the 403 injured crewmembers, 250 (62.0 percent) had head and/or neck injuries. A disproportionate number of cockpit aircrew members in nonsurvivable mishaps had head and/or neck injuries (87.0 percent) compared to those in survivable mishaps (19 percent). Crewmembers wearing NVGs had a significantly increased risk for head and/or neck, head only, and neck only injury. When stratified by type of NVG, and based on logistic regression models that included aircraft type (UH-60 versus other) and survivability as covariates, crewmembers wearing the AN/PVS-5 carried the burden of this injury risk (RR=2.01, CI95=1.58, 2.57). For crewmembers wearing the aviator's night vision imaging system (ANVIS), the risk of head and/or neck, head only, or neck only injury was not statistically greater than crewmembers not wearing NVGs (RR=1.22, CI95=0.94, 1.58). Aircrew wearing the older AN/PVS-5 were at increased risk for head/neck injury during a rotary-wing mishap, while ANVIS users with the ANVIS break-away feature were not at increased risk for head/neck injury.

DTIC

Night Vision; Injuries; Head (Anatomy); Goggles; Risk; Epidemiology; Life Support Systems; Imaging Techniques; Aerospace Medicine

19980018817 Istituto Superiore di Sanita, Rome, Italy

Spatial-Temporal Parameters of Gait

Giacomozzi, C., Istituto Superiore di Sanita, Italy; Macellari, V., Istituto Superiore di Sanita, Italy; Saggini, R., Istituto Superiore di Sanita, Italy; Dec. 1995; 62p; In English

Report No.(s): PB96-166806; ISTISAN-SR-95-36; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The aim of the work was to obtain reference data as independent as possible of the characteristics of the healthy subjects that constitute the reference group, e.g. sex, age, anthropometric characteristics. The authors are aware (Grieve, 1969) that it is not enough to find the normal range of a parameter, but it is essential to determine whether and how different parameters (i.e. stride, velocity, gait cycle and swing phase) occur in normal combination. Therefore, a statistical methodology was followed to identify statistical multiple linear regression models that were then applied to the bulk of data in order to find out these parameter combinations, and the existing relationships between the measured parameters and the anthropometric characteristics. The paper reports all the results obtained for the subjects, grouped for sex and age. They constitute a preliminary reference data base of normal spatial and temporal parameters of gait.

NTIS

Physiological Responses; Walking; Sex; Age Factor

19980018846 Office of Naval Research, Washington, DC USA

Interruption of People in Human-Computer Interaction: A General Unifying Definition of Human Interruption and Taxonomy Topical Report

McFarlane, Daniel C., Office of Naval Research, USA; Dec. 31, 1997; 98p; In English

Report No.(s): AD-A333587; NRL-FR-5510-97-9870; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

User-interruption in human-computer interaction (HCI) is an increasingly important problem. Many of the useful advances in intelligent and multitasking computer systems have the significant side effect of greatly increasing user-interruption. This previously innocuous HCI problem has become critical to the successful function of many kinds of modern computer systems. Unfortunately, no HCI design guidelines exist for solving this problem. In fact, theoretical tools do not yet exist for investigating the HCI problem of user-interruption in a comprehensive and generalizable way. This report asserts that a single unifying definition of user-interruption and the accompanying practical taxonomy would be useful theoretical tools for driving effective investigation of this crucial HCI problem. These theoretical tools are constructed here. A comprehensive analysis is conducted through the existing literature. Theoretical constructs from several relevant but diverse fields are identified and discussed. A unifying definition of user-interruption is synthesized. This new definition is supported with an array of postulates, assertions, and a taxonomy of human interruption to facilitate its practical application.

DTIC

Human-Computer Interface; Interruption; Computers; Computer Systems Performance

19980019132 Institute for Human Factors TNO, Soesterberg, Netherlands

Conceptual Lay-out of the Staff Room of the Air Defence and Command Frigate Interim Report Conceptuele Indeling van de Stafkamer van het Luchtverdedigings en Commando Fregat

Post, W. M., Institute for Human Factors TNO, Netherlands; Punte, P. A. J., Institute for Human Factors TNO, Netherlands; Jun. 26, 1997; 26p; In Dutch

Contract(s)/Grant(s): A95/KM/352

Report No.(s): TD97-0220; TM-97-A045; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 De Soesterburg, Netherlands), Hardcopy, Microfiche

As part of the design process of the Air Defence and Command Frigate of the Royal Netherlands Navy, TNO Human Factors Research Institute advised about the conceptual lay-out of the staff room. Proceeding from a scenario, function, and link analysis, a predefined manning, and the spatial constraints, an ergonomic well-thought out design concept has been established. This concept has three parts. One table is designated for monitoring, assessing, planning, deciding, and directing and controlling current and non-current operations. A separate meeting table and a large screen display support long-term planning, briefing, and intensive staff work during battle. A third table is intended for performing METOC, general planning tasks and is additionally required for intensive staff work during battle. A summary of the anticipated conduct of staff- operations is enclosed.

Author

Human Factors Engineering; Display Devices; Functional Analysis; Functions (Mathematics); Planning

Subject Term Index

A

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