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# **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;
- 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
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
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# AEROSPACE MEDICINE AND BIOLOGY

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*A Continuing Bibliography (Suppl. 452)*

NOVEMBER 17, 1997

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## LIFE SCIENCES (GENERAL)

**19970031196** Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD USA  
**Predictive Binding Parameters for DNA-DNA Association within a Fluid Stream** *Final Report, Nov. 1993 - 1994*

Wood, Sheila J., Edgewood Research Development and Engineering Center, USA; Jul. 1997; 27p; In English

Contract(s)/Grant(s): DA Proj. 101-61102-BH-67

Report No.(s): AD-A328050; ERDEC-TR-425; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The ability to predict the rates of association of DNA to DNA have been used previously for those reactions occurring in a test tube. This study shows the ability to predict the binding rate of DNA to DNA within a fluid stream. The primary ligand was an oligonucleotide 20 basepairs attached to the dextran matrix in BIAcore(trademark). Efficiency of hybridization of this ligand to a secondary ligand of 40 basepairs (containing 20 complementary) was assessed. Association was predictable, based on ssDNA remaining at equilibrium, using second order rate kinetics. Changes in concentration encompassing one order of magnitude had little to no effect on the efficiency of hybridization.

DTIC

*Deoxyribonucleic Acid; Ligands; Fluid Flow; Body Fluids*

**19970031269** Edgewood Research Development and Engineering Center, Research and Technology Directorate, Aberdeen Proving Ground, MD USA

**Preliminary Results on the Temporal and Spacial Distribution of Environmental Airborne Bioaerosols** *Final Report, Dec. 1995 - Dec. 1996*

Carlile, D. L., Edgewood Research Development and Engineering Center, USA; Birenzvige, A., Edgewood Research Development and Engineering Center, USA; Wick, C. H., Edgewood Research Development and Engineering Center, USA; Cork, S. J. K., Geo-Centers, Inc., USA; May 1997; 19p; In English

Contract(s)/Grant(s): DA Proj. 101-61384-A7-1A

Report No.(s): AD-A327826; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The increased civilization pressure has given new emphasis to the need to characterize and understand the environmental impact of human activities. One area that has not received much attention is the anthropogenic contribution to airborne biological particles (bioaerosols). This issue is of particular importance when tracking the travel of disease-causing microbes and for the study of the impact of human activity on natural ecology. Human activities contributing to this loading include waste water treatment, processing abattoirs, agricultural activities, composting, municipal landfill, bioengineering plants, urban activities, etc. We are in the process of monitoring the background concentration, flux, and types of ambient outdoor background bacteria (and other microorganisms) in the atmosphere as a function of location, time of day, season, and weather patterns. This report will present some preliminary data collected at the Edgewood Area, Aberdeen Proving Ground, MD.

DTIC

*Bioengineering; Water Treatment; Waste Water; Microorganisms; Ecology; Air Pollution; Aerosols; Environment Effects*

**19970031307** Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD USA

**Serial Probe Recognition as an Environmental Enrichment Device for Nonhuman Primates**

Copeland, T. L., Army Medical Research Inst. of Chemical Defense, USA; Jun. 1997; 23p; In English

Contract(s)/Grant(s): DA Proj. 3M4-63807-A-993

Report No.(s): AD-A328077; USAMRICD-TR-97-02; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the present study, a Serial Probe Recognition (SPR) task was evaluated as an environmental enrichment device for nonhuman primates. Twenty-one rhesus monkeys were assigned to two experimental groups, one group male (n=15) and one group female (n=6). Urinary cortisol levels, which correlate positively with stress, were measured to determine the effectiveness SPR as an environmental enrichment device, with baseline measurements taken before the onset of the task, and experimental measurements taken during SPR training. Results showed that cortisol levels were significantly higher during the SPR condition than during the baseline condition.

DTIC

*Females; Primates; Urology; Monkeys*

**19970031310** W/L Associates Ltd., Frederick, MD USA

**Second World Congress for Electricity and Magnetism in Biology and Medicine: Abstract Book**

Aug. 1997; 347p; In English, 8-13 Jun. 1997, Bologna, Italy

Report No.(s): AD-A328028; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche; Abstracts Only; Abstracts Only

The Second World Congress Technical Program Committee developed a balanced, forward-looking program to represent the interest of the four organizing scientific societies. Four major tracks (physical, biological, medical sciences and technology) are presenting all parts of the program. Over 650 abstracts from 27 countries were reviewed, and those accepted are contained in the publication. The program consisted of Plenary lectures, minisymposiums, and contributed poster reports.

DTIC

*Magnetic Properties; Medical Science; Biotechnology*

**19970031327** Washington State Univ., Pullman, WA USA

**Calcium/Calmodulin-Mediated Gravitropic Response to Plants Final Report**

Poovaiah, B. W., Washington State Univ., USA; 1996; 2p; In English

Contract(s)/Grant(s): NAGw-3807; NAG10-0061

Report No.(s): NASA-CR-204307; NAS 1.26:204307; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We have cloned and characterized eight calmodulin isoforms and identified one isoform (PCM-1) that is highly responsive to changes in the environment. A transgene approach was taken to study the consequences of altered expression of PCM-1 on plant growth and development. Transgenic potato plants were produced carrying sense and antisense constructs of PCM-1 fused to the CaMV 35S promoter. Transgenic sense plants showing a moderate increase in PCM-1 mRNA exhibited strong apical dominance, produced elongated tubers, and were taller than the controls (Patent No. 5,498,533, 1996). Interestingly, the plants expressing the highest level of PCM-1 mRNA did not form underground tubers; instead, these transgenic plants produced aerial tubers when allowed to grow for longer periods. The formation of aerial tubers in these transgenic sense plants is an indication that the inhibitory effect of light on tuberization has been altered. Transgenic plants were also produced carrying sense and antisense constructs of PCM-1 fused to an inducible patatin promoter. The antisense plants grew similar to the control plants in the initial stages of growth. However, in the later stages of growth when the patatin promoter became active, growth was reduced and the plants exhibited leaf burns. The control plants grown under identical conditions did not show leaf burns, suggesting an altered response of transgenic plants to the environmental conditions. To further study the role of PCM-1 in signal transduction, transgenic potato plants carrying the PCM-1 promoter fused to the GUS reporter gene were produced. GUS expression was found to be developmentally regulated and signal-responsive, indicating a positive correlation between the expression of PCM-1 and GUS mRNAs. These results suggest that the 5' flanking region of PCM-1 controls developmental and signal-induced expression. We have also expressed PCM-1 and PCM-6 isoforms in *E. coli* and purified the proteins. These proteins showed different mobility patterns on SDS-PAGE which can be recognized by western analysis.

Derived from text

*Calcium; Calmodulin; Gravitropism; Plants (Botany)*

**19970031335** ManTech Environmental Technology, Inc., Dayton, OH USA

**Acute toxicity evaluation of a new noncorrosive decontamination solution Final Report, Sep.1996 - Feb. 1997**

Wolfe, Robin E., ManTech Environmental Technology, Inc., USA; Ellis, David H., ManTech Environmental Technology, Inc., USA; Feldman, Marcia L., Geo-Center, Inc., USA; Leahy, Harry F., Geo-Center, Inc., USA; Jul. 1997; 25p; In English

Contract(s)/Grant(s): F41624-96-C-9010; AF Proj. 7757

Report No.(s): AD-A328038; AL/OE-TR-1997-0070; NMRI-97-34; Rept-4300-9405; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Navy requested evaluation of a new noncorrosive chemical warfare decontamination solution (NDS) designed for removal of toxic chemicals from equipment. This investigation contained three experiments: acute oral limit test, acute dermal limit test,

and acute inhalation limit test. Oral gavage with 5 g NDS/kg resulted in 100% mortality of male and female F-344 rats. Clinical signs included whole body tremors and chromodacryorrhea. Treatment at lower oral concentrations of NDS resulted in the determination of an LD50 at 0.78 g/kg. All male and female NZW rabbits died after dermal treatment with 2 g NDS/kg. Signs of toxicity prior to death included whole body tremors and excessive salivation. Dermal treatment at lower doses of NDS resulted in the determination of a dermal LD50 of 0.36 g/kg. Inhalation exposure of male and female rats to near the limit test concentration (4.4 mg/L) also resulted in 100% mortality. The 4-h LC50 for NDS aerosol was determined to be 1.36 mg/L. The 100% fatality associated with the higher levels of exposure for all routes of exposure, coupled with a lack of significant gross or histologic lesions, suggests that deaths were not necessarily due to corrosive action. Additional studies would be required to explain the cause(s) of mortality following administration of NDS.

DTIC

*Toxicity; Decontamination; Solutions; Physiological Tests; Physiological Responses*

**19970031354** Woods Hole Oceanographic Inst., MA USA

**A Molecular Approach to Questions in the Phylogeny of Planktonic Sarcodines**

Zettler, Linda Angela Amaral, Woods Hole Oceanographic Inst., USA; Sep. 1996; 199p; In English; Sponsored in part by Scurlock Foundation and Woods Hole Coastal Research Center

Contract(s)/Grant(s): NSF OCE-93-14533

Report No.(s): AD-A327746; MIT/WHOI-97-08; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

The relationships of the Acantharea and the Polycystinea (order Spumellarida) to other protists were investigated using phylogenetic analyses of small-subunit ribosomal RNA (SSU rRNA) genes. These two classes are included in the superclass Actinopoda based on specialized pseudopodia called axopods. SSU rRNA-based phylogenies do not support the common ancestry of the Acantharea and the Polycystinea, implying that the superclass Actinopoda is artificial and should be discarded. All analyses supported the monophyly of the Acantharea and the separate monophyly of the Polycystinea. The origin of the sequences was confirmed by in situ hybridizations. The SSU rRNA-based method was also useful in fine-scaled comparisons. Sequence comparisons for the solitary spumellarian *Thalassicolla nucleata* from the Sargasso Sea and the Pacific Ocean indicate there may be different species which are morphologically identical or that there may be allelic variation in a given individual. Analyses between the solitary *T. nucleata* and seven colonial spumellaria indicate that the colonial spumellaria may not be monophyletic. The results from examination of branching patterns within three of the four orders of the Acantharea placed the symphyacanthid *Haliommatidium* sp. branching among the Arracanthida, indicating that the Symphyacanthida are not monophyletic as defined by morphology-based systematics.

DTIC

*Ribonucleic Acids; Protozoa; Plankton; Morphology*

**19970031391** Marine Mammal Commission, Washington, DC USA

**The Marine Mammal Commission, Calendar Year 1996 Annual Report, 1996**

Jan. 1997; 262p; In English

Report No.(s): PB97-142889; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Topics discussed include the following: Introduction; Species of Special Concern; Marine Mammal-Fisheries Interactions; International Aspects of Marine Mammal Protection and Conservation; Activities Related to Marine Mammals in the Arctic; Marine Mammal Stranding and Die-Offs; Effects of Pollution on Marine Mammals; Outer Continental Shelf Oil and Gas Exploration and Development; Research and Studies Program; Permits and Authorizations to Take Marine Mammals; Marine Mammals in Captivity; Appendix A: Marine Commission Recommendations in 1996; Appendix B: Reports of Commission-Sponsored Activities Available from the National Technical Information Service; and Appendix C: Selected Literature Published Elsewhere Resulting from Commission-Sponsored Activities.

NTIS

*Marine Mammals; Fisheries; Wildlife; Man Environment Interactions; Ecosystems; Endangered Species; Conservation*

**19970031396** Air Force Academy, Dept. of Biology, CO USA

**Mutagenic Effect on Alternating Current Magnetic Fields**

Obringer, John W., Air Force Academy, USA; Kelchner, Brian, Air Force Academy, USA; Horne, Brandon, Air Force Academy, USA; Aug. 1997; 28p; In English

Report No.(s): AD-A328264; USAFA-TR-97-5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Electromagnetic Fields (EMF) such as those produced by power lines have become a growing source of concern to the general public. Many epidemiological studies have linked EMF to carcinogenesis implying an underlying genetic phenomenon mediated

by EMF. EMF can be subdivided into either electric fields (E-field) or magnetic fields (B-fields). Our research used a reverse mutagenesis bacteriophage T4D model to quantitatively study the effects of E-fields on a molecular genetic level. Statistical analysis of the data indicated that there was no significant difference ( $p$  greater than 0.05) in the mutagenic rate of phages grown in the presence of A/C E-fields compared to the controls except at a field strength of 1053 V/M ( $p = 0.04$ ). This result is not consistent with the other values tested and at this time we are at a loss to explain what appears to be a decrease in background spontaneous reversion rate in the phage T4 mutant.

DTIC

*Alternating Current; Electromagnetic Fields; Mutagens; Genetics; Power Lines; Carcinogens; Bacteriophages; Epidemiology*

**19970031410** Miami Univ., FL USA

**Physiological Ecology of Dimethylsulfoniopropionate(DMSP) and Dimethylsulfide (DMS) Production by Phytoplankton Final Report**

Mar. 30, 1997; 3p; In English

Contract(s)/Grant(s): NAGw-3765; NAGw-5111; NAGw-4786

Report No.(s): NASA-CR-204282; NAS 1.26:204282; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The main objectives of the previously funded work were: (1) to determine the rates of DMSP and DMS production as a function of phytoplankton growth rate, (2) to determine the light dependence (quantity and quality) of DMSP and DMS production by phytoplankton, and (3) to study intraspecific differences in DMSP and DMS production by phytoplankton.

Author

*Physiology; Ecology; Dimethyl Compounds; Dimethylhydrazines*

**19970031469** Chicago Univ., Chicago, IL USA

**Characterization of Light and Nitrogen Regulated Gene Expression Pathways in Marine Diatoms Final Report, 1 Apr. 1991 - 31 Mar. 1992**

Smith, G. Jason, Chicago Univ., USA; Apr. 1992; 4p; In English

Contract(s)/Grant(s): N00014-91-J-1864

Report No.(s): AD-A328090; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This report summarizes the results of ONR funded research focused on characterization of the genes and gene products for several biosynthetic and structural proteins found in marine diatoms with the goal to utilize molecular probes generated from these studies to monitor molecular events regulating the production dynamics of marine phytoplankton. The diatom *Skeletonema Costatum*, an ubiquitous coastal species was selected as a model system. The polymerase chain reaction utilizing consensus oligonucleotide primers to conserved amino acid domains was employed and used to isolate genomic and cDNA fragments corresponding to the sequences encoding the nitrogen assimilatory enzymes nitrate reductase (NR) and glutamine synthetase (GS) and the structural proteins actin and the fucoxanthin chlorophyll a/c protein (FCP).

DTIC

*Gene Expression; Proteins; Marine Environments; Nitrogen*

**19970031472** Georgia Univ., Dept. of Marine Science, Athens, GA USA

**Bacterial Degradation of Cellulosic Waste at Sea Final Report, Apr. 1995 - Feb. 1997**

Moran, Mary Ann, Georgia Univ., USA; Ye, Wen-Ying, Georgia Univ., USA; Binder, Brian J., Georgia Univ., USA; Feb. 1997; 32p; In English

Contract(s)/Grant(s): N00014-95-I-0570

Report No.(s): AD-A327756; Rept-10-21-RR100-209; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Information on the biological fate of cellulosic material in the ocean and the cellulolytic abilities of oceanic bacteria is important for predicting the fate of waste paper particles released from ships and the time required for complete decomposition. Measures of bacterial respiration were used to estimate rates and kinetics of cellulose particle degradation by marine bacterioplankton over a range of environmental conditions typical of selected locations and depths in the ocean. Decomposition of cellulose slurries followed first order degradation kinetics, with decay constants ranging from  $-0.004/d$  at 280C to  $-0.0004/d$  at 40C (half lives of 173 to 1733 days).  $Q(10)$  values for cellulose decomposition averaged 1.85 for temperatures between 80C and 280C. Inorganic nutrient concentrations were less important than temperature in determining rates of degradation. Decomposition rates were also not affected by the size of the paper particles for size classes ranging from 2 mm to 150 micro-m. Oceanic bacterial - communities

were found to degrade cellulose at rates approximately 10-fold lower than bacteria from in coastal seawater, possibly reflecting differences in the abundance of natural cellulosic substrates between the two environments.

DTIC

*Degradation; Bacteria; Cellulose; Marine Biology; Waste Disposal; Oceanography; Plankton; Decomposition; Hydrolysis*

**19970031735** Tulane Univ., Dept. of Neurobiology, Covington, LA USA

**Phenotype and Age Differences in Blood Gas Characteristics, Electrolytes, Hemoglobin, Plasma Glucose and Cortisol in Female Squirrel Monkeys**

Brizzee, K. R., Tulane Univ., USA; Ordy, J. M., Tulane Univ., USA; Dunlap, W. P., Tulane Univ., USA; Kendrick, R., Tulane Univ., USA; Wengenack, T. M., Tulane Univ., USA; Laboratory Animal Science; Apr. 1988; Volume 38, No. 2, pp. 200-202; In English

Contract(s)/Grant(s): NAG2-101; NIH-RR00164

Report No.(s): NASA-CR-203681; NAS 1.26:203681; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche

Due to its small size, lower cost, tractable nature, successful breeding in captivity and its status near the middle of the primate phylogenetic scale, the squirrel monkey has become an attractive primate model for basic and biomedical research. Although the squirrel monkey now is being used more extensively in many laboratories with diverse interests, only fragmentary reports have been published regarding basic physiological characteristics, or baseline blood reference values of different phenotypes, particularly blood gases, hematology and serum chemical constituents. It is becoming recognized increasingly that these baseline blood reference values are important not only in the care and maintenance of the squirrel monkey, but are critical for assessing normal physiological status, as well as the effects of various experimental treatments. The purpose of this study was to compare differences in blood gases, electrolytes, hematology, blood glucose and cortisol among young and old Bolivian (Roman type) and Colombian (Gothic type) phenotypes of the squirrel monkey.

Author (revised)

*Blood; Monkeys; Electrolytes; Hemoglobin; Glucose; Females; Squirrels*

**19970031736** Tulane Univ., Dept. of Psychology, New Orleans, LA USA

**Motion-Induced Alterations in 2-Deoxyglucose Uptake in Brainstem Nuclei of Squirrel Monkeys: Autoradiographic and Liquid Scintillation Studies**

Brizzee, K. R., Tulane Univ., USA; Dunlap, W. P., Tulane Univ., USA; Brain, Behavior and Evolution; 1983; Volume 23, pp. 14-25; In English

Contract(s)/Grant(s): NAG2-101; NIH-RR00164

Report No.(s): NASA-CR-203700; NAS 1.26:203700; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Each of 8 young adult female squirrel monkeys were injected via a femoral vein cannula with 167 microCi/100 g body weight of 2-(1,2-H-3)-deoxy-D-glucose (2-DG) (New England Nuclear, 37.3 Ci/mmol) in 0.5 ml sterile saline. 4 additional female squirrel monkeys were injected in the same manner with 100 microCi/100 g body weight of the (H-3)-2-DG. 2 h after this initial injection the original 8 animals were injected with 16.7 microCi/100 g body weight of 2-(C-14)-deoxy-D-glucose (51.3 mCi/mmol) in 0.5 ml sterile saline. The 4 additional animals were injected with 25 microCi/100 g body weight of the (C-16)-2-DG. Half of the animals at each dose level were restrained in the upright position with Velcro straps and a nontraumatic moulded plastic head holder on a modified animal restraint board (Withrow and Devine, 1972) with the head in the sagittal plane but tilted forward about 20 deg. They were then subjected to horizontal rotary motion at 25 rpm together with a vertical movement of 6 inches at 0.5 Hz for 1 h in a lighted room. The other half of the animals at each dose were restrained in the same manner and maintained in a quiescent state. At the end of this period each animal was anesthetized with ketamine, and the brain was quickly dissected out and frozen in isopentane cooled to -60 C with dry ice. Transverse cryostat sections (-15 C) of the brainstem were cut alternately at 200 and 20 microns from the nucleus gracilis caudally through the superior vestibular nucleus rostrally. Micropunch samples of the individual vestibular nuclei, and other brainstem nuclei and areas were obtained from the 200-microns sections with a modification of the method of Eik-Nes and Brizzee with a small stainless steel punch measuring 850  $\mu$ m in diameter. The frozen punch samples were prepared for liquid scintillation counting (Beckman LS7500 system). Differential (H-3) and (C-14) counts (cpm) were made employing external standards. The 20-microns sections were prepared for <sup>14</sup>C autoradiography by standard methods employing Kodak SB-5 X-ray film. The (C-14) autoradiographs from the motion-stimulated animals revealed a selectively high uptake of 2-DG in all of the vestibular nuclei, the lateral cuneate nucleus and the lateral reticular nucleus as compared with the corresponding structures in the control animals. The area postrema and nucleus of the solitary tract also exhibited somewhat higher grain density in motion-stimulated as compared with control subjects. The inferior olive showed a heavy 2-DG uptake in nearly all subjects but the brain density appeared somewhat higher in motion-stimulated animals. Data from the liquid scintillation

counts revealed that the C-14/H-3 ratio (cpm) was significantly higher ( $p$  less than 0.05) in the medial and inferior vestibular nuclei and nucleus cuneatus in motion-stimulated than in control animals. Values for the other vestibular nuclei and dorsal reticular formation (region of the vomiting center), and nucleus of the solitary tract were high but did not attain the level of statistical significance.

Author

*Monkeys; Brain; Statistical Analysis; Females; Curium Isotopes; Injection; Investigation*

**19970031741** Florida Univ., Dept. of Physiology, Gainesville, FL USA

**Peripheral Conversion of L-5-Hydroxytryptophan to Serotonin Induces Drinking in Rats**

Kikta, Dianne C., Florida Univ., USA; Threatte, Rose M., Florida Univ., USA; Barney, Christopher C., Florida Univ., USA; Fregly, Melvin J., Florida Univ., USA; Greenleaf, John E., Florida Univ., USA; *Pharmacology Biochemistry & Behavior*; 1981; ISSN 0091-3057; Volume 14, pp. 889-893; In English

Contract(s)/Grant(s): NCA2-OR204-101; NIH-AM-07164-04; NIH-HL-05890-01

Report No.(s): NASA-CR-203785; NAS 1.26:203785; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Female rats administered serotonin (0.25 to 4.0 mg/kg, s.c.) showed a dose-dependent increase in water intake. The dipsogenic response was nearly maximal when 2 mg/kg was administered s.c. and plateaued by 2 hr after treatment. 1-5-Hydroxytryptophan (5-HTP), the precursor of serotonin, is also a potent dipsogen which induces drinking by way of the renin-angiotensin system. The possibility that the dipsogenic activity of 5-HTP is dependent on decarboxylation to serotonin was the objective of these studies. Either benserazide (30 mg/kg, s.c.), a central and peripheral decarboxylase inhibitor, or carbidopa (6.5 mg/kg, s.c.), a peripheral decarboxylase inhibitor, was administered 15 min prior to the dipsogen. Both decarboxylase inhibitors attenuated the dipsogenic response to 5-HTP (25 mg/kg, s.c.) but not to serotonin (2 mg/kg, s.c.). The peripheral serotonergic receptor antagonist, methysergide (3 mg/kg, i.p.), blocked the dipsogenic responses to both 5-HTP (25 mg/kg, s.c.) and serotonin (2 mg/kg, s.c.). There was no interaction between 5-HTP (18 mg/kg, s.c.) and serotonin (1 mg/kg, s.c.) when administered simultaneously with respect to their dipsogenic effects. Thus, the drinking response accompanying administration of 5-HTP occurs following peripheral conversion to serotonin which, in turn, activates peripheral serotonergic receptors. The mechanism(s) by which activation of peripheral serotonergic receptors increases water intake is not known, but appears to involve release of renin from the kidney.

Author

*Serotonin; Drinking; Rats; Vasoconstrictor Drugs*

**19970031756** NASA Ames Research Center, Moffett Field, CA USA

**Changes in Body Temperatures During Prolonged Physical Exercise and their Influence on Muscle Metabolism in Dogs**

Kozlowski, S., Polish Academy of Sciences, Poland; Kaciuba-Uscilko, H., Polish Academy of Sciences, Poland; Nazar, K., Polish Academy of Sciences, Poland; Brzezinska, Z., Polish Academy of Sciences, Poland; Kruk, B., Polish Academy of Sciences, Poland; Greenleaf, J. E., NASA Ames Research Center, USA; *Scripta Medica*; 1984; Volume 57, No. 5, pp. 289-294; In English Report No.(s): NASA-TM-112439; NAS 1.15:112439; PAS Proj. - 10.4; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Increasing body temperature during physical work is one of the important factors limiting endurance performance. The mechanism of this effect is not fully understood. It is known, however, that exercise-hyperthermia considerably alters circulatory and respiratory responses to exercise; it may also impair some regulatory functions of the brain, and affect motivation to continue the work. There are some data demonstrating that high temperatures, but within physiological limits, lower phosphorylative efficiency of mitochondria in skeletal muscle in vitro (Brooks et al., 1971) and in vivo increase the glycolytic rate in muscle during isometric contractions (Edwards et al., 1972). Previous results from this laboratory (Kozlowski et al., 1983, unpublished data) provided evidence that prevention of hyperthermia during prolonged exercise in dogs increases work endurance, slows down glycogen depletion in working muscles and causes an increase in blood lactate concentration. This suggested that exercise-induced hyperthermia might reduce working ability by its effect on muscle metabolism. The aim of this work was to study the effect of external cooling during exercise on changes in body temperatures, heart and respiratory frequencies as well as on some indices of muscle metabolism in dogs.

Author

*Body Temperature; Physical Exercise; Physical Work; Metabolism; Muscles; Dogs*

19970031757 Polish Academy of Sciences, Dept. of Applied Physiology, Warsaw, Poland

**Progressive Enhancement of Body Temperature Responses to Consecutive Exercise-Bouts of the Same Intensity in Dogs**

Kaciuba-Uscilko, Hanna, Polish Academy of Sciences, Poland; Kruk, Barbara, Polish Academy of Sciences, Poland; Nazar, Krystyna, Polish Academy of Sciences, Poland; Greenleaf, John E., Polish Academy of Sciences, Poland; Kozłowski, Stanislaw, Polish Academy of Sciences, Poland; ACTA Physiology Pol.; 1985; Volume 36, No. 3, pp. 165-173; In English

Contract(s)/Grant(s): PAS Proj. 10.4

Report No.(s): NASA-TM-112440; NAS 1.15:112440; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Progressive enhancement of body temperature responses to consecutive exercise-bouts of the same intensity in dogs. Changes in rectal ( $T_{\text{re}}$ ) muscle ( $T_{\text{m}}$ ), and hypothalamic ( $T_{\text{hy}}$ ) temperatures, plasma osmolality, and some intermediary metabolic variables were examined in dogs performing four successive exercise-bouts of the same intensity. During the rest-intervals separating the exercise-bouts body temperatures returned to initial levels and water losses were replaced.  $T_{\text{m}}$  and  $T_{\text{re}}$  responses to consecutive exercise-bouts were progressively increasing. Similar tendency was found in  $T_{\text{hy}}$  changes. Cardiac and respiratory frequencies attained the same level in all four exercise-bouts, while blood lactate and FFA concentrations were increasing and blood glucose level was decreasing progressively. No changes in plasma osmolality was noted. Exercise-induced increases in  $T_{\text{m}}$  correlated positively with plasma FFA concentration ( $r=0.68$ ). Body temperature responses to exercise were reduced by beta-adrenergic blockage. It is concluded that the enhancement of the thermal responses to consecutive exercise-bouts can be related to the metabolic action of catecholamines.

Author (revised)

*Body Temperature; Physical Exercise; Dogs; Exercise Physiology*

19970031794 Armed Forces Radiobiology Research Inst., Bethesda, MD USA

**Altered Thyroid Axis Function in Lewis Rats with Genetically Defective Hypothalamic CRH/VP Neurosecretory Cells**

Whitnall, Mark H., Armed Forces Radiobiology Research Inst., USA; Smallridge, Robert C., Armed Forces Radiobiology Research Inst., USA; Aug. 1997; 14p; In English

Report No.(s): AD-A328836; AFFRI-SP97-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Lewis rats display a hyporesponsive hypothalamo-pituitary-adrenocortical (HPA) axis, overproduction of cytokines, and susceptibility to inflammatory disease. The Lewis corticotropin-releasing hormone (CRH) neurosecretory system contains normal numbers of vasopressin (VP) deficient axon varicosities but abnormally sparse vasopressin-containing varicosities in the external zone of the median eminence, compared to the normoresponsive Sprague Dawley (SD), Wistar, and Fischer 344 strains. Since vasopressin may act as a thyrotropin-releasing factor, we hypothesized that thyroid axis responsivity may be altered in Lewis rats.  $T_{\text{sub }3}$ ,  $T_{\text{sub }4}$ , and the thyroid-stimulating hormone (TSH) were measured by radioimmunoassay, and free  $T_{\text{sub }4}$  by equilibrium dialysis in adult male Lewis and SD rats. Exposure to cold (5 C) for 1 h induced significant increases in  $T_{\text{sub }3}$ ,  $T_{\text{sub }4}$ , and TSH levels in Lewis rats but not in SD rats. Ninety min of insulin-induced hypoglycemia (1 IU/kg, ip) caused a significant  $T_{\text{sub }3}$  increase in Lewis rats and a significant  $T_{\text{sub }4}$  increase in SD rats. Two h after intraponeal administration of lipopolysaccharide (LPS; (0.25 or 0.75 mg/kg)),  $T_{\text{sub }4}$  levels fell significantly in Lewis rats but not in SD rats. TSH decreases were significant in Lewis rats after 0.75 mg/kg LPS and in SD rats after 0.25 mg/kg. Baseline hormone levels were generally higher in Lewis rats; the differences were significant for  $T_{\text{sub }3}$  and  $T_{\text{sub }4}$  in the insulin experiments and for  $T_{\text{sub }3}$ ,  $T_{\text{sub }4}$ , and free  $T_{\text{sub }4}$  in the LPS experiments. The data suggest that reduced inhibition from the adrenocortical axis in Lewis rats leads to hyperresponsivity of the thyroid axis to cold and greater LPS-induced decreases in  $T_{\text{sub }4}$  levels, probably due to an exaggerated inhibitory cytokine response.

DTIC

*Hypothalamus; Thyroid Gland; Rats; Hypoglycemia; Pituitary Hormones; Radioimmunoassay; Nervous System*

19970031859 Texas Univ. Health Science Center, Div. of Otorhinolaryngology, San Antonio, TX USA

**Function of Molluscan Statocysts**

Wiederhold, Michael L., Texas Univ. Health Science Center, USA; Sheridan, Christine E., Texas Univ. Health Science Center, USA; Smith, Nancy K. R., Texas Univ. Health Science Center, USA; Evolution, and Modern Aspects of Biomineralization in Plants and Animals; 1990, pp. 393-408; In English

Contract(s)/Grant(s): NAG2-442

Report No.(s): NASA-CR-204875; NAS 1.26:204875; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The gravity sensors of most molluscs are spherical organs called statocysts. The wall of the sphere contains mechanosensory cells whose sensory cilia project into the lumen of the cyst. The lumen is filled with fluid and dense 'stones', the statoconia or statoliths, which sink under the influence of gravity to load and stimulate receptor cells which are at the bottom. The composition of the statoconia is known in only a few species. Data presented here suggest that they are aragonite in Aplysia. The statoconia

of *Aplysia californica* are shown to be calcified about a lamellar arrangement of membranes. Similar lamellar membrane arrangements are seen within the receptor cells, and their possible role in the formation of the statoconia is discussed. Scanning electron micrographs of unfixed statoconia reveal plate-like crystallization on their surface. Elemental analysis shows a relatively high strontium content. This is of interest in light of the recent report (Bidwell et al., 1986) that strontium is required in the culture medium of several laboratory-reared molluscs before statoconia develop.

Author

*Chemical Analysis; Mollusks; Culture Techniques; Organs*

**19970031925** Georgia Univ., Dept. of Biochemistry and Molecular Biology, Athens, GA USA

**Metabolic and Enzymological Studies of Sulfur-Dependent Marine Hyperthermophiles Final Report, Jun. 1993 - May 1996**

Adams, Michael W., Georgia Univ., USA; Sep. 1996; 9p; In English

Contract(s)/Grant(s): N00014-90-J-1894

Report No.(s): AD-A328613; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The results from this study have provided the first insights into how hyperthermophilic organisms obtain energy from the metabolism of C and N compounds, and how this can be achieved at high temperatures. These organisms have unusual pathways based on the rarely-used element tungsten (W), which is present in the novel enzymes AOR, FOR and GAPOR. W is seldom used in biological systems, the analogous element, molybdenum (Mo), is virtually ubiquitous. We propose that W is much more suited to catalyze low potential reactions (such as those catalyzed by GAPOR, AOR and FOR) at extreme temperatures, and that such reactions could not be catalyzed by Mo-containing enzymes. We have cloned and sequenced the first genes for any W-protein, and the first genes for hyperthermophilic oxidoreductases. In addition, a new pathway for peptide metabolism as been proposed, again involving new types of enzyme, such as VOR, IOR and ACS. We also provided the first definitive model for the evolution of mesophilic oxidoreductases from hyperthermophilic enzymes, and the first crystal structure for a hyperthermophilic enzyme (AOR) was obtained, providing the first insights in to protein stability at extreme temperatures.

DTIC

*Metabolism; Stability; Mesophiles; Thermopiles*

**19970031964** Connecticut Univ., Health Center, Farmington, CT USA

**The Optical Patch Clamp Stage 2: Non-Linear Optics as a Probe of Membrane Potential in Living Cells Final Report, 1 Jan. 1995 - 30 Jun. 1997**

Loew, Leslie M., Connecticut Univ., USA; Aug. 05, 1997; 41p; In English

Contract(s)/Grant(s): N00014-95-I-0151

Report No.(s): AD-A328780; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of new dyes with superior binding and second harmonic generation (SHG) efficiencies have been synthesized. These dyes are all based on the aminonaphthyl-ethenyl-pyridinium chromophore used in our earlier studies of fluorescent potentiometric dyes. We have calibrated the potential-dependent response of the SHG signal on a model membrane system and found the response to be several times more sensitive than the fluorescence signal used most commonly for voltage-sensitive dyes. The utility of the SHG signal for following the membrane potential changes in a system of excitable cells, the visual system of the housefly *Musca domestica* has been established. This is a particularly appropriate application of the method since the infrared probing light is not absorbed by the photoreceptor cells. A significant enhancement of the SHG signal when the dyes are absorbed to colloidal silver has been demonstrated, suggesting that this approach might be applied to probing the electrical activity of single molecules on a cell surface. Finally, we have obtained the first SHG microscopic images, demonstrating the utility of SHG as a new modality for non-destructive selective contrast in 3D microscopy of living cells.

DTIC

*Photoreceptors; Microscopy; Membranes; Harmonic Generations; Fluorescence; Electric Potential; Chromophores*

**19970032018** Texas Univ., Graduate School of Biomedical Science, San Antonio, TX USA

**Vitamin D3 Analogues with Low Vitamin D Receptor Binding Affinity Regulate Chondrocyte Proliferation, Proteoglycan Synthesis, and Protein Kinase C Activity**

Greising, Daniel M., Texas Univ., USA; Sep. 1996; 69p; In English

Report No.(s): AD-A327924; AFIT-97-091; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The purpose of the study was to determine the genomic and nongenomic mechanism of action of various analogues of vitamin D on resting zone (RC) and growth zone (GC) rat costochondral chondrocyte differentiation and proliferation in vitro. This study

is intended to provide insight into how modifications of the A-ring and other structural modifications of vitamin D molecule affect the biological activity of these secosteroids.

DTIC

*Vitamins; Activity (Biology); Crystal Growth; Rats*

**19970033074**

**Effect of pulsed electric fields on biological cells: Experiments and applications**

Schoenbach, Karl H., Old Dominion Univ, USA; Peterkin, Frank E.; Alden, Raymond W., III; Beebe, Stephen J.; IEEE Transactions on Plasma Science; April 1997; ISSN 0093-3813; 25, 2, pp. 284-292; In English; Copyright; Avail: Issuing Activity

The effect of pulsed electric fields with amplitudes in the range of 100 V/cm-100 kV/cm on bacteria and aquatic nuisance species has been explored. The pulse duration was so short that heating of the biological matter could be neglected. The electrical energy required for lysing of bacteria, or stunning of aquatic species, decreases when the pulse duration is reduced. For lysing of *Escherichia coli*, this tendency has been proven to hold for pulsewidths as short as 60 ns. For macroorganisms, however, it was found that for pulsewidths of less than 5  $\mu$ s, the tendency is reversed: the energy required to affect the macroorganisms increases again. This minimum in energy, or maximum in efficiency, respectively, can be understood by taking the time required for electrical charging of the cell membrane into account. Applications of the pulsed electric field technique (PEFT) are in biofouling prevention, debacterialization of liquids, and in the field of medicine. A series of field tests on biofouling prevention in a cooling system with untreated water as coolant has demonstrated the economic feasibility of the electro-technology.

Author (EI)

*Bacteria; Contamination; Electric Fields; Membranes*

**19970033791**

**Two-parameter model for three types of nuclepore filtration of leukocytes**

Shao, Jinyu, China-Japan Friendship Hospital, China; Yan, Zongyi; Zhuang, Fengyuan; Sun, Ruijuan; Applied Mathematics and Mechanics (English Edition); March 1997; ISSN 0253-4827; 18, 3, pp. 251-258; In English; Copyright; Avail: Issuing Activity

Micropore filtration of leukocytes is one of the main methods for evaluating leukocytes' deformability. A biofluid mechanical model was proposed for three cases: (1) filtration under gravity; (2) constant pressure filtration; (3) constant flow rate filtration. In previous models, constant blood cell resistance was assumed. In this paper, when evaluating the filter resistance to leukocytes, not only the effect of the change in the driving pressure but also the difference in the deformability of individual leukocytes were taken into consideration. Moreover, based on Moessmer's experimental results, a probability distribution function for the transit time of polymorphonuclear cells (PMNs) through the filter was assumed. Finally, numerical curves were obtained for the above three types of filtration and the comparison between the theoretical and experimental results of PMNs for case (1) turns out to be satisfactory. The two parameters in the model, A and B represent leukocytes' deformability under low and high pressures respectively.

Author (revised by EI)

*Blood; Hemodynamics; Rheology*

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**AEROSPACE MEDICINE**

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

**19970031170** Armstrong Lab., Brooks AFB, TX USA

**Female Acceleration Tolerance Enhancement Final Report, 15 Dec. 1995 - 31 Mar. 1997**

Dooley, James W., Armstrong Lab., USA; May 1997; 22p; In English

Report No.(s): AD-A328419; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two major policy decisions dramatically impacted requirements to accommodate women into combat aircraft. On 28 April 1993, the Secretary of Defense directed the services to open assignments in combat aircraft to women. This decision greatly expanded the number and types of aircraft that women could fly. Prior to this decision, female pilots and other female aircrew were restricted by directive to aircraft that did not directly engage in combat. The second significant decision impacting the woman pilot was a requirement that the new joint services aircraft for pilot training, the Joint Primary Aircraft Training System (JPATS), be designed to accommodate 80% of US women (1). These size requirements were also adopted for the F-22 Advanced Tactical Fighter. Current military combat, trainer, and support type aircraft are generally designed to accommodate pilots who are 64 to 77 inches in stature with a sitting height of 34 to 40 inches. When applied to the aircraft cockpit, ejection seat and crew-mounted

life support equipment, this design criteria allows approximately 90% of US males to meet size requirements, while only 40% of US females are tall enough to meet the requirements (3,9). The expansion to the size envelope to accommodate 80% of US females will significantly increase the number of women who qualify for flying training. These two decisions - allowing women to fly combat aircraft and greatly increasing the aircrew size and stature ranges that the aircraft will need to accommodate - present a unique challenge to aircraft and life support equipment development, particularly the development of G-protective equipment and evaluations of female acceleration tolerances.

DTIC

*Acceleration Tolerance; Females; Military Aircraft*

**19970031188** Walter Reed Army Medical Center, Washington, DC USA

**Muscle Activity and Fatigue during Push-ups Performed by Women: An Electromyographic and Videographic Analysis of Fifteen Muscles** *Final Report, 5 Dec. 1994 - 31 Dec. 1995*

Robinson, Michael D., Walter Reed Army Medical Center, USA; Apr. 1996; 62p; In English  
Report No.(s): AD-A328281; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This study sought to determine the primary muscles used by women during pushups and to establish differences in muscle firing patterns and utilization between elite and marginal performers Design: Cohort Analytic Study assessing differences in muscle activity and utilization during pushups between two groups of women at differing levels of ability. Participants : Sixty three women scoring in elite or marginal categories were enrolled. Main Outcome Measure: Video and intramuscular EMG recordings of 15 muscles were made of maximal isometric contractions and five consecutive pushups.

DTIC

*Muscles; Females; Activity (Biology); Exercise Physiology; Physical Fitness; Muscular Function*

**19970031249** Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA

**Skin-Color Modeling and Adaptation**

Yang, Jie, Carnegie-Mellon Univ., USA; Lu, Weier, Carnegie-Mellon Univ., USA; Waibel, Alex, Carnegie-Mellon Univ., USA; May 1997; 27p; In English

Contract(s)/Grant(s): N00014-93-I-0806

Report No.(s): AD-A327881; CMU-CS-97-146; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report studies a statistical skin-color model and its adaptation. By quantitative analysis and goodness-of fit test we reveal that (1) skin-color differences among people can be reduced by intensity normalization and (2) under a certain lighting condition a skin-color distribution can be characterized by a multivariate normal distribution in the normalized color space. We then propose an adaptive model to characterize human skin-color distributions for locating human faces under different lighting conditions. The parameters of the model are adapted by a linear combination of the known parameters. The maximum likelihood criterion has been used to obtain the optimal estimation of the coefficients. The model has been successfully applied to a real-time face tracker and other applications.

DTIC

*Skin (Anatomy); Normal Density Functions; Goodness of Fit; Coefficients; Color*

**19970031270** Jarvis Christian Coll., Hawkins, TX USA

**Retrieval of Water Channels by Endocytosis in Renal Epithelia** *Annual Report, 5 Jun. 1996 - 4 Jun. 1997*

Mia, Abdul J., Jarvis Christian Coll., USA; Yorio, Thomas, Jarvis Christian Coll., USA; Jul. 1997; 97p; In English

Contract(s)/Grant(s): DAMD17-95-C-5086

Report No.(s): AD-A327822; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Understanding the specific mechanisms involved in the regulation of water balance by the kidney will provide information needed to design preventive measures for dealing with potential adverse conditions that may result in water deprivation and decreased renal responsiveness to vasopressin. The present study is designed to determine the cellular mechanisms involved in reduced fluid reabsorption and membrane reorganization following the removal of the actions of ADH.

DTIC

*Water Balance; Kidneys; Cytology*

**19970031293** Texas Univ., Galveston, TX USA

**Repletion of Zinc and Iron Deficiencies Improves Cognition of Premenopausal Women** *Annual Report, 22 Sep. 1995 - 21 Sep. 1996*

Sandstead, Harold H., Texas Univ., USA; Oct. 1996; 121p; In English

Report No.(s): AD-A328324; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This project investigates the relationship of zinc and iron nutrition to human neuropsychological function.

DTIC

*Psychology; Neurology; Females*

**19970031304** Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD USA

**Skin Absorption Pharmacology of Topical Skin Protectant ICD No. 2289** *Final Report*

Kurt, E. M., Army Medical Research Inst. of Chemical Defense, USA; Braue, E. H., Jr., Army Medical Research Inst. of Chemical Defense, USA; Jun. 1997; 18p; In English

Contract(s)/Grant(s): DA Proj. 3M4-63807-D-993

Report No.(s): AD-A328152; USAMRICD-TR-97-03; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Attenuated Total Reflectance (ATR) Fourier Transform-Infrared (FTIR) spectroscopy was used to determine the effectiveness of washing Topical Skin Protectant (TSP) ICD No. 2289 from the skin of male euthymic hairless guinea pigs 24 hours after TSP application. In one case a foam tipped cotton swab, soap, and water were used to scrub the TSP from the guinea pig skin. In another case, a more abrasive wash cloth was used, in place of a foam tipped swab, to scrub the TSP from the guinea pig skin. ATR-FTIR spectra of the guinea pig skin after both washings showed that the TSP is not completely removed from the guinea pig skin. ATR-FTIR spectra of the tape strips acquired of the same area after the washings showed that the depth of penetration does not exceed the stratum corneum.

DTIC

*Skin (Anatomy); Infrared Spectroscopy; Infrared Spectra; Pharmacology*

**19970031305** Massachusetts Inst. of Tech., Cambridge, MA USA

**Metabolic Response to Food Restriction in Military-Eligible Women, With a Gender Comparison** *Annual Report, 15 Sep. 1995 - 14 Sep. 1996*

Young, Vernon R., Massachusetts Inst. of Tech., USA; Oct. 1996; 17p; In English

Contract(s)/Grant(s): DAMD17-95-2-5014

Report No.(s): AD-A328137; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two major series of investigations will be undertaken to explore the metabolic responses of women, who meet military standards of body-weight and percent body-fat to the nutritional stressors of food restriction. A comparison of their responses will be made with those occurring in men, who also meet the standards established by the military. The first series (Series 1) will be devoted to the temporal (Progressive) changes in lipid, carbohydrate and protein metabolism that occur during a short-term (3 day) fasting period. A proposed sixteen women and eight men will participate in this study.

DTIC

*Females; Lipid Metabolism; Carbohydrate Metabolism; Physiological Responses; Protein Metabolism*

**19970031306** Kentucky Univ., Lexington, KY USA

**Perimetric Mapping of Hyperacuity: Effects of Retinal Laser Scars** *Final Report, 25 May 1995 - 24 May 1997*

Schmeisser, Elmar T., Kentucky Univ., USA; Jun. 1997; 45p; In English

Contract(s)/Grant(s): DAMD17-95-C-5038

Report No.(s): AD-A328135; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effects of specific graded retinal laser lesions on both vernier acuity and local luminance perimetry were measured by electrophysiological means. Seven *Cynomolgus fasciculata* received minimal spot laser exposures 6 years previously from a q-switched Nd-YAG laser (1064 nm) at energies up to and including contained subretinal hemorrhages in both the parafovea and the fovea. High contrast vernier acuity targets were presented at high luminance levels to anesthetized primates. Visual evoked potentials were recorded by conventional means. A significant decrease of the pattern response signal/noise, and a relative loss of vernier signal was seen in the lesioned eyes. Animals with the more severe lesions have degraded small pattern responses and

no recordable vernier response. Lesser apparent losses produced less effect. Finally, a map of each retina was produced by flickering small patches on the stimulus display and recording the retinal signal. The multifocal (perimetric) electroretinogram was recorded from specialized contact lenses. Relative response losses of no more than 25% were seen at sites corresponding to the more severe foveal lesions.

DTIC

*Evoked Response (Psychophysiology); Signal to Noise Ratios; Spatial Distribution; YAG Lasers; Bioelectric Potential*

**19970031315** Kansas State Univ., Dept. of Psychology, Manhattan, KS USA

**The Effects of Cognitive Hardiness on Stress, Health, Performance, and Cardiovascular/Neuroendocrine Function**

Drummond, Johathan T., Kansas State Univ., USA; Aug. 01, 1997; 347p; In English

Report No.(s): AD-A327997; AFIT-97-097; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

Cognitive hardiness is a psychological construct of stress resiliency which has been postulated to moderate stress-illness and stress-performance relationships. Hardiness has also been thought to exert main effects on health and performance outcomes. In Study 1, relationships between hardiness, perceived stress, depression, and academic performance were investigated. Hardiness was found to be positively predictive of academic performance; the effect was partially mediated by course load. Hardiness was also revealed to moderate the stress-depression relationship. The negative relationship between stress and academic performance was mediated by depression. A model explaining 30% of the variance in academic performance is presented and discussed. Study 2 was an extensive exploratory effort that investigated the relationships between hardiness, stress, performance, illness/injury, appraisal processes, and physiological reactivity to a realistic stressor in 23 helicopter pilots. Main and moderating effects for hardiness were demonstrated in stress-performance and stress-illness relationships and outcomes. Hardiness was predictive of challenge appraisals, cortisol baselines and reactivity, and performance. Mediated relationships are discussed. Relations between cortisol reactivity and performance suggest profound and disturbing adverse impact on work-related cognitive function. Higher order curvilinear relationships between hardiness, cortisol reactivity, challenge appraisals, and performance were revealed. Implications, future research initiatives, and appropriate research designs are discussed.

DTIC

*Cardiovascular System; Stress (Psychology); Steroids; Physiology; Neurophysiology; Helicopters*

**19970031329** NASA Kennedy Space Center, Cocoa Beach, FL USA

**Carotid-Cardiac Baroreflex: Relation with Orthostatic Hypotension Following Simulated Microgravity and Implications for Development of Countermeasures**

Convertino, Victor A., NASA Kennedy Space Center, USA; Acta Astronautica; 1991; ISSN 0094-5765; Volume 23, pp. 9-17; In English

Report No.(s): NASA-TM-112818; NAS 1.15:112818; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In a series of studies, we have examined the effects of exposure to simulated microgravity, varying states of vascular volume, and acute exercise on the function of the carotid-cardiac baroreflex in man. In the first study, exposure to simulated microgravity (6 deg headdown bedrest) reduced the sensitivity and buffer capacity of the vagal baroreceptor-cardiac reflex mechanisms and this impaired baroreflex function was associated with orthostatic hypotension. Since the reduction in plasma volume during BR was not correlated with impaired baroreflex function, a second study was conducted which demonstrated that the carotid-cardiac baroreflex response was not affected by either acute hypovolemia or hypervolemia. These results suggest that acute fluid replacement prior to reentry may not reverse impaired baroreflex function associated with postflight hypotension. In a third study, we demonstrated that one bout of maximal exercise increased baroreflex sensitivity and buffer capacity through 24 h post-exercise. These baroreflex changes were opposite to those observed following BR. Taken together, these data suggest that the contributions of reduced blood volume and impaired carotid-cardiac baroreflex function to orthostatic hypotension following exposure to microgravity are probably separate and additive; maximal exercise in addition to fluid replacement may provide an acute effective countermeasure against postflight hypotension.

Author

*Cardiac Output; Cardiovascular System; Hypotension; Microgravity; Countermeasures*

**19970031341** Armstrong Lab., Wright-Patterson AFB, OH USA

**Relationship Between Neck Strength, Anthropometric Parameters, and Gender with Head Motion under Impact Acceleration Final Report, 23 Jan. - 30 Sep. 1995**

Morris, Charles E., Armstrong Lab., USA; Apr. 1996; 21p; In English

Contract(s)/Grant(s): MIPR-95MM5582

Report No.(s): AD-A328169; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With the opening of the fighter cockpit to women, it is imperative to expand the current database of responses of females to high impact acceleration environments. Since women tend to have less upper-body strength than men, it was hypothesized that they may not be able to brace their heads as effectively against the loads which occur during impact and escape. The objective of the current experimental effort was to examine the ability of subjects of both sexes to brace against an impact acceleration of -6.5 Gx or -4.0 Gy, and to attempt to identify a correlation between such ability, static strength measurements, anthropometric measurements, or any combination thereof. The isometric strength measurements correlated well with anthropomorphic measurement, but none of these proved useful in predicting the head displacement. However, a strong relationship was found for both sexes between neck force exerted just before impact and head motion in the Gx study. A weaker correlation was noted for the Gy impacts for males. It is therefore useful to estimate female resistance to impact by measuring static neck strength. In order to predict male impact resistance, the neck strength must be measured under impact conditions where the subject is highly motivated.

DTIC

*Anthropometry; Neck (Anatomy); Impact Acceleration; Head Movement; Physiological Responses*

**19970031351** Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD USA

**Detection of Cholera Toxin by Optical Methods: A Mechanism-Based Approach to the Generic Detection of Protein Toxins Final Report, Mar. - Sep. 1996**

Young, Ronald J., Edgewood Research Development and Engineering Center, USA; Hsu, Fu-Lien, Edgewood Research Development and Engineering Center, USA; Apr. 1997; 19p; In English

Contract(s)/Grant(s): DA Proj. 101-61101-A-91-A

Report No.(s): AD-A327736; ERDEC-TR-373; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Methods to monitor the ADP-ribosyltransferase activity of cholera toxin fragment A were investigated. Ultraviolet spectroscopy was a suitable technique when the acceptor molecule contained a chromophore. Toxin catalyzed ADP-ribosylation of acceptor molecules, which do not contain a chromophore but do contain an amino group, can be monitored by labeling the acceptor molecule with a fluorescent probe after its ADP-ribosylation. The sensitive technique of fluorescence spectroscopy can be employed to monitor the action of cholera toxin without regards to the substituents on the acceptor molecule by use of epsilon NAD, the fluorescent analogue of NAD.

DTIC

*Ultraviolet Spectroscopy; Spectroscopy; Fragments; Fluorescence; Acceptor Materials*

**19970031369** California Univ., San Diego, La Jolla, CA USA

**Mechanism of Botulinum Toxin a Neurotoxicity: Channel Formation and Protein Phosphorylation Final Report, 30 Apr. i 1993 - 31 Jan. 1997**

Montal, Mauricio, California Univ., San Diego, USA; Mar. 1997; 40p; In English

Contract(s)/Grant(s): DAMD17-93-C-3100

Report No.(s): AD-A328168; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A unique contribution of this program is the discovery of potentiation of botulinum neurotoxin (BoTX) A protease activity by tyrosine phosphorylation. This key finding underscores the requirement to screen for potential blockers using the pharmacologically relevant target, namely tyrosine phosphorylated neurotoxin, presumably the biologically active form within the cells. A most exciting outcome is the ability to design peptides that selectively block neurotransmitter release. The proteolytic products of the BoTX activity have proved to be instrumental in providing clues about the secretory vesicle fusion process. These peptides are suitable mimics of the neurotoxin itself, displaying effective inhibitory activity on transmitter release by inhibiting vesicle docking and thereby disabling the fusion machinery. Peptides designed along these principles may find clinical application as BoTX substitutes in the treatment or management of disorders associated with involuntary muscle spasms. A major finding is the identification of an ion channel-forming motif in BoTXA heavy chain. The ion channel activity of BoTX may be abrogated by identifying effective open channel blockers, lending credence to the concept that open channel blockers may be a single class of drugs effective against all BoTXs isoforms. The potency of such agents may, in principle, be augmented by combining active compounds against both the protease and channel activities of the neurotoxin which are considered necessary for its neurotoxicity.

DTIC

*Nervous System; Clostridium Botulinum; Phosphorylation; Tyrosine; Protease*

**19970031529** Lois Joy Galler Foundation for Hemolytic Uremic Syndrome, Inc., Melville, NY USA

**Third International Symposium of Shiga Toxin (Verocytotoxin): Producing Escherichia Coli Infections (VTEC 1997) Final Report**

O'Brien, Alison, Lois Joy Galler Foundation for Hemolytic Uremic Syndrome, Inc., USA; Oct. 1997; 179p; In English, 22-26 Jun. 1996, Baltimore, MD, USA

Contract(s)/Grant(s): DAMD17-96-I-630S

Report No.(s): AD-A328167; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

During the decade between VTEC '87, held in Toronto, and this 3rd symposium in Baltimore, there has been an explosive growth of knowledge about Shiga Toxin (Verocytotoxin) producing Escherichia coli (VTEC). At the same time there has been a worrisome increase in the incidence and impact of infections due to these organisms throughout the world. The major recent outbreaks in Japan, Germany and the western USA are cases in point. A lot of work remains to be done to control, manage and ultimately prevent the human suffering associated with this emerging infectious disease. The VTEC Symposium series was designed to provide a multidisciplinary forum for exchanging information, disseminating new knowledge, and highlighting state-of-the-art scientific advances in this rapidly evolving field. This core element of the Symposium remains intact in VTEC '97 as does the striving to achieve synthesis between art, science, humanity and good fellowship, a mission for the Symposium that became so firmly entrenched during the outstanding VTEC '94 meeting in Bergamo. I wish to acknowledge the Co-chairmen of VTEC '97, Mr. Robert C. Galler without whose drive, dedication, and leadership, VTEC '97 would not have got off the ground, and Dr. James B. Kaper who has been committed to providing delegates with the best hospitality his home town of Baltimore can offer. In addition, Jim and Dr. Alison O'Brien have put together an outstanding Scientific Program.

DTIC

*Conferences; Infectious Diseases; Escherichia; Toxins and Antitoxins*

**19970031548** Texas Univ. Health Science Center, Houston, TX USA

**Back Pain and Endurance Training of Back Muscles: Justification for Further Study in Helicopter Pilots**

Ladner, Timothy J., Texas Univ. Health Science Center, USA; May 29, 1997; 39p; In English

Report No.(s): AD-A325683; AFIT-97-047; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study is to review the literature systematically to determine if available published evidence is sufficient to recommend endurance training of back musculature as a preventive measure for helicopter back pain. Based on this review further studies will be recommended to evaluate the effectiveness of back musculature training in helicopter back pain.

DTIC

*Helicopters; Pilot Performance; Physiological Effects; Muscles*

**19970031742** NASA Ames Research Center, Moffett Field, CA USA

**Dehydration-Induced Drinking: Peripheral and Central Aspects**

Greenleaf, John E., NASA Ames Research Center, USA; Fregly, Melvin J., Florida Univ., USA; Federation Proceedings; Jul. 1982; ISSN 0014-9446; Volume 41, No. 9, pp. 2507-2508; In English; 65th; Federation of American Societies for Experimental Biology, 16 Apr. 1981, Atlanta, GA, USA; Sponsored by American Physiological Society, USA

Report No.(s): NASA-TM-112378; NAS 1.15:112378; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The physiological mechanism that induces water intake in mammals is incompletely understood. At least six distinct stimuli have been used experimentally for this purpose: 1) hypertonic saline; 2) beta-adrenergic agonists, especially isoproterenol; 3) the octapeptide, angiotensin II; 4) polyethylene glycol; 5) parasympathomimetic agents; and 6) dehydration. The diversity of these stimuli and the differences in their responsiveness from different routes of administration suggest the difficulty in ascribing the induction of water intake to a single physiological mechanism. Indeed, with such a basic function as drinking, there is likely more than one underlying mechanism.

Derived from text

*Dehydration; Drinking; Mammals; Physiology; Glycols*

**19970031762** NASA Ames Research Center, Moffett Field, CA USA

**Heat Stress Field Study**

Spaul, W. A., Naval and Marine Corps Reserve Center, USA; Greenleaf, J. E., NASA Ames Research Center, USA; U.S. Navy Medicine; Mar. 1984; Volume 75, pp. 25-33; In English

Report No.(s): NASA-TM-112438; NAS 1.15:112438; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Every summer the Marine Corps sends several thousand reservists to its Air Ground Combat Center, Twenty-nine Palms, CA, for 2 weeks of training. This article presents results from three separate field exercises in which data were collected on environmental conditions. It also discusses epidemiology of the Heat-Related Casualty (HRC) and non-HRC populations and includes a compilation of anecdotal data from the field hospital staffs. The purposes of these investigations were to identify high-risk individuals and the activities that may contribute to increased casualty rates, to suggest procedures for prevention, and to increase the efficiency of remedial treatment with the ultimate goal of eliminating HRC.

Author

*Heat Tolerance; Stress (Physiology); Stress (Psychology); Education; Epidemiology; Investigation*

**19970031763** NASA Ames Research Center, Moffett Field, CA USA

**The Disappearance of the Acid Mucopolysaccharide Coating in Blood Vessels Exposed to Oxygen, Radiation and in Old Age and Possible Implications**

Philpott, Delbert E., NASA Ames Research Center, USA; Takahashi, Akira, NASA Ames Research Center, USA; Turnbull, Charles, NASA Ames Research Center, USA; 1973; 2p; In English; 31st; Electron Microscopy Soc. Amer., 1973, New Orleans, LA, USA

Report No.(s): NASA-TM-112781; NAS 1.15:112781; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The blood vessels are known to be involved in radiation pathology, both the fragility and permeability being altered. Delayed radiation response has been shown to involve a loss of the blood supply to necrotic areas. Since the structure of the MucoPolySaccharide (MPS) coating on the luminal wall is heparin-like in nature and heparin has known anti-coagulant properties, the observed increase in clotting in older persons suggests possible alteration of the acid MPS coating. Rats were treated in several ways to examine the effect of various factors on the MPS coating. Young rats were whole-body irradiated with 2400r X-rays and sacrificed 24 and 48 hours later. Another group of rats were exposed to 100% oxygen at one atmosphere for periods up to 72 hours. A third group of rats 2 years old or more were examined for the effects of age. The animals were perfused with 7% glutaraldehyde, followed by Luft's method of staining with ruthenium red. The heart and trachea were embedded in Epon/Araldite, sectioned and viewed, unstained, at 40KV using a 20 micron objective aperture. Both the irradiated rats and those exposed to 100% oxygen lost the MPS blood vessel coating. The blood vessels were edematous and the pinocytotic vesicles had increased in size. The older rats showed a decrease in the MPS coating with increasing age. Otherwise their capillaries were generally normal in appearance. Radiation and oxygen depolymerize mucopolysaccharides. The sulfate and carboxyl groups in the acid mucopolysaccharides bind calcium and calcium binding is the origin of anti-coagulant properties of the acid mucopolysaccharide. The loss of a MPS endothelial coating in the lumen through depolymerization, or the loss of the cells ability to produce the MPS coating would have certain implications in regard to blood flow. The loss of such a barrier between the blood and the endothelial membrane suggests surface contact with the blood elements and an increased chance of coagulation, when other conditions are just right. For example, blood stasis in a denuded area might bring about a clot. Vascular edema is reported to be associated with delayed radionecrosis and fibrin threads have been reported in necrotic areas. Depolymerization of the MPS would increase the number of molecules present and increase the osmotic pressure. The consequences of such depolymerization by oxygen and radiation offer one explanation for the observed edema and the loss of the MPS coating. This in turn offers an explanation for loss of blood flow in areas where delayed radiation effects occur. Although the older rats which lacked MPS coatings did not have edematous vessels, loss of MPS may still be an age related factor and occur as a result of loss of production rather than depolymerization of this coating material.

Derived from text

*Acids; Blood Vessels; Exposure; Oxygen; Radiation Effects; Carbohydrates*

**19970031820** Department of Defense, Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense programs, Washington, DC USA

**Department of Defense Report on Search for Human Radiation Experiment Records, 1944 - 1994, Volume 1**

Jun. 1997; 588p; In English

Report No.(s): AD-A328642; No Copyright; Avail: CASI; A25, Hardcopy; A06, Microfiche

The intent of this publication is to inform the public about the Department of Defense (DoD) involvement in ionizing radiation experiments, studies or projects with human subjects which occurred from 1944 to 1994. This information is part of DoD's extensive effort in support of President William J. Clinton's openness in government initiatives that began in January 1994. In the spirit of openness, this book includes a wide range of records retrieved by the DoD. EO 12891 defined Human Radiation Experiments as: (1) Experiments on individuals involving intentional exposure to ionizing radiation. This category does not include common and routine clinical practices, such as established diagnosis and treatment methods involving incidental exposures to ionizing radiation. (2) Experiments involving intentional environmental releases of radiation that were designed to test human health effects to ionizing radiation, or were designed to test the extent of human exposure to ionizing radiation.

DTIC

*Radiation Dosage; Ionizing Radiation; Radiation Effects; Human Beings*

**19970031821** Department of Defense, Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Programs, Washington, DC USA

**Department of Defense Report on Search for Human Radiation Experiment Records, 1944 - 1994, Volume 2**

Jun. 1997; 60p; In English

Report No.(s): AD-A328641; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Report on Search for Human Radiation Experiment Records documents the Department of Defense involvement in ionizing radiation research with human subjects that occurred between 1944 to 1994. Volume 1 provided the most complete information available at the time it was prepared. Little information was available for some projects that occurred between 1944 and 1974. Volume 2 provides the information that has been found for many of these projects. The Department of Defense is committed to openness in government and will continue to make relevant information available to the public.

DTIC

*Ionizing Radiation; Radiation Effects*

**19970031860** California Univ., Orthopaedic Research Lab., Davis, CA USA

**Mathematical Model for the Mineralization of Bone**

Martin, Bruce, California Univ., USA; Journal of Orthopaedic Research; 1994; Volume 12, No. 3, pp. 375-383; In English

Contract(s)/Grant(s): NAG2-649

Report No.(s): NASA-CR-204904; NAS 1.26:204904; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

A mathematical model is presented for the transport and precipitation of mineral in refilling osteons. One goal of this model was to explain calcification 'halos,' in which the bone near the haversian canal is more highly mineralized than the more peripheral lamellae, which have been mineralizing longer. It was assumed that the precipitation rate of mineral is proportional to the difference between the local concentration of calcium ions and an equilibrium concentration and that the transport of ions is by either diffusion or some other concentration gradient-dependent process. Transport of ions was assumed to be slowed by the accumulation of mineral in the matrix along the transport path. The model also mimics bone apposition, slowing of apposition during refilling, and mineralization lag time. It was found that simple diffusion cannot account for the transport of calcium ions into mineralizing bone, because the diffusion coefficient is two orders of magnitude too low. If a more rapid concentration gradient-driven means of transport exists, the model demonstrates that osteonal geometry and variable rate of refilling work together to produce calcification halos, as well as the primary and secondary calcification effect reported in the literature.

Author

*Mathematical Models; Bones; Minerals*

**19970031868** Texas Univ., Applied Research Labs., Austin, TX USA

**Control of Acoustic Cavitation with Application to Lithotripsy**

Bailey, Michael R., Texas Univ., USA; Mar. 03, 1997; 221p; In English

Contract(s)/Grant(s): N00014-89-J-1109

Report No.(s): AD-A327393; ARL-TR-97-1; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Control of acoustic cavitation (sound-induced bubble activity) is the subject of this dissertation. Application is to clinical lithotripsy where cavitation contributes to kidney stone comminution and tissue damage. An electrical spark at the near focus of an underwater ellipsoidal reflector was the acoustical source, as in the Dornier HM3 lithotripter. Experiments were done with rigid reflectors, pressure-release reflectors, and pairs of reflectors sharing a common focus and a controlled delay between sparks. Since a bubble hit by a single shock pulse can grow profoundly and then collapse violently, our hypothesis was that a second pulse timed

to arrive during the collapse phase would intensify the ultimate collapse. Experiments and numerical calculations confirmed the hypothesis. Pitted by bubble collapses, aluminum foil placed along the reflector axis recorded the spatial cavitation field. Tempered collapse was also discovered; a sufficiently short delay between two pulses or a change in order of the positive and negative phases of a single pulse stifled bubble growth. Early collapse was detected acoustically. Computations of bubble radius and collapse pressure reinforced the observations.

DTIC

*Acoustic Measurement; Calculi; Cavitation Flow; Kidney Diseases*

**19970031921** Massachusetts Univ. Medical Center, Worcester, MA USA

**Studies of Altered Response to Infection Induced by Severe Injury Final Report, 14 Apr. 1992 - 2 Jun. 1997**

Miller–Graziano, Carol L., Massachusetts Univ. Medical Center, USA; Jul. 1997; 123p; In English

Contract(s)/Grant(s): DAMD17-92-C-2033

Report No.(s): AD-A328889; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Multiple organ dysfunction syndrome (MODS) is most frequent area of late eat in trauma patients and a particular problem for combat casualties where conflict conditions may not allow early evacuation to ICU units of extensive treatment. Consequently, delineating mechanisms for ameliorating posttrauma immunosuppression and overproduction of inflammatory cytokines is a major priority. Only the trauma patient subset with both MOe and T cell dysfunctions develop MODS. This patient subsets' MOe are producing large quantities of deregulated and aberrant TNF(sub alpha), indicated by increased TNF(sub alpha) mRNA stability, failure to shed neutralizing TNF, insensitivity to PGE(sub 2) and TGF(sub beta) downregulation, as well as predominant production of cell associated or mTNF(sub alpha). These aberrant post-injury MOe's ability to activate T cells is also decreased by loss of their IL-12 production and both helper 1 and helper 2 T lymphocyte responses are concomitantly depressed. Dysfunctional T cells fail to appropriately activate or regulate inflammatory MOe allowing exaggerated inflammatory monokines to cause MODS. Aberrant MOe function is detectable as an increase of MOe TNFR (failure to shed the TNFR) and surface expression of mTNF(sub alpha). Aberrant T lymphocyte activity is also rapidly indicated by depressed CD28 and CD3 expression and concomitant upregulation of CD11b expression. Rapid flow cytometric identification of altered MOe and T cell surface receptor/ligand combinations might serve as an easily implementable technique for screening combat casualties. This contract's data have implicated a combination of T lymphocyte and MOe dysfunctions as responsible for the development of MODS. Both a possible means of rapidly identifying combat casualties at risk of MODS and suggestions of future interventive therapy have been developed as a result of this contract.

DTIC

*Signs and Symptoms; Infectious Diseases; Casualties; Injuries; Organs; Patients*

**19970031928** Minnesota Univ., Brain Science Center, Minneapolis, MN USA

**Neural Modeling of Motor Cortex and Spinal Cord Final Report, 1 Oct. 1993 - 31 Mar. 1997**

Georgopoulos, Apostolos P., Minnesota Univ., USA; Aug. 20, 1997; 40p; In English

Contract(s)/Grant(s): N00014-94-I-0033

Report No.(s): AD-A328753; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We developed physiologically relevant, neural networks to model time-varying neuronal population operations in the motor cortex and spinal cord, dealing with movements in space. We also developed a model of the interactions between these two networks dealing with generating time-varying motoneuronal outputs for movements in space. The novelty of our approach consisted in (1) the realistic nature of the elements in our networks, (2) the massive and asymmetric interconnectivity among network elements, (3) the physiologically relevant design of the networks, including the communication by spike trains among network elements and rules of connectivity based on experimental findings, (4) the dynamical behavior of the networks, and (5) the time-varying performance of the networks. Finally, we were able to reliably decode and transform the neuronal ensemble activity recorded in behaving animals for controlling an simulated arm. This demonstration suggests that the use of biologically inspired neural networks to transform raw cortical signals into the motor output of a multijoint artificial limb is both feasible and practical time-varying performance of the networks.

DTIC

*Neural Nets; Spinal Cord; Neurons; Cerebral Cortex; Models; Neurophysiology*

**19970032026** Institute for Human Factors TNO, Soesterberg, Netherlands

**Thermal Modelling of Individual Characteristics Interim Report Modelling van de individuele thermische reactie**

Havenith, G., Institute for Human Factors TNO, Netherlands; Jun. 25, 1997; 50p; In English

Contract(s)/Grant(s): DSTO-B97-044

Report No.(s): AD-A327397; TNO-TM-97-B007; TDCK-TD97-0219; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

One of the major gaps in the prediction of heat stress response is the limited implementation of individual characteristics in prediction models. Without this individualization, the evaluation of the resultant average group response prediction necessitates the use of very conservative limit values for body temperature increase. This is caused by the wide range of responses observed within a group. The present study aimed at the implementation of individual characteristics in a heat stress prediction model (THDYN), in order to investigate whether this would indeed result in a more precise prediction with less variance between predicted and observed responses. For this purpose, the relevant parameters related to anthropometric characteristics (body surface area  $A_{sub 0}$ , body tissue conductance, body heat capacity), sweating and skin blood flow control (training and acclimation) were introduced in the model. The parameters were derived from literature. Next, data sets which were not used for the parameter estimation were used for a validation of the model changes. It was found that the individualized model indeed provided an improved prediction. The size of the improvement varied with the climate and the work type however. The best predictions for body heat storage were observed for fixed work loads in a warm humid and in a hot dry climate and for work loads relative to the individual maximum in a warm humid climate (Explained variance 27-53%). For relative work loads in a cool and in a hot dry climate the models predictive capacity for individuals was not significantly improved (less than 10%).

DTIC

*Prototypes; Mathematical Models; Human Body; Temperature Ratio; Thermal Stresses*

**19970032084** Krug Life Sciences, Inc., San Antonio, TX USA

**Grating Visual Acuity Following Hemorrhagic Foveal Lesions, Mar. 1989 - Mar. 1992**

Rhodes, James W., Krug Life Sciences, Inc., USA; Garcia, Paul V., Krug Life Sciences, Inc., USA; Lasers and Light in Ophthalmology; Apr. 1996; Volume 7, No. 4, pp. 153-165; In English

Contract(s)/Grant(s): F33615-88-C-0631; AF Proj. 7757

Report No.(s): AD-A328748; AL-JA-1992-0063; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Grating visual acuity was measured in three cases of experimentally produced foveal, hemorrhagic vitreous lesions in rhesus monkeys. A dual-Purkinje-image (DPI) eye-tracker and a modified laser photocoagulator were used to target the laser exposure while the subject was engaged in an operantly trained grating detection task. Each subject received one exposure in the right eye from a Q-switched Nd:glass laser. The resulting vitreous hemorrhage emanated from a disk-shaped area of edema and disrupted tissue; the blood was largely confined to a single, inferiorly directed column, with only slight, diffuse mixing with the vitreous. Grating acuity in the injured eye declined immediately after the laser exposure. During the ensuing 37-day assessment period, acuity returned to the pre-exposure range within 5 to 14 days. The size of the area of retinal injury also decreased over the assessment period, but complications of vitreous clouding and strial traction lines were noted.

DTIC

*Eye (Anatomy); Visual Acuity; Monkeys; Glass Lasers; Hemorrhages; Injuries; Gratings (Spectra)*

**19970032085** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Kalman Filter Analysis of an Animal Head-Motion Estimation System**

Steward, Darryl L., Air Force Inst. of Tech., USA; Aug. 22, 1997; 58p; In English

Report No.(s): AD-A328745; AFIT/CI-97-109; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Head motion is a parameter that scientists at NASA Ames Research Center are interested in observing during flight experiments. The purpose of determining head motion is to understand the physiological effects of the flight environment upon Rhesus monkeys. Previously, the engineers at Ames Research Center used angular rate sensors to develop head motion velocity (HMV) systems. Although advantages exist for using angular rate sensors to determine head motion, several disadvantages have prompted the engineers at Ames Research Center to investigate new methodology for designing HMV systems. One method employed to avoid the problems associated with using angular rate sensors uses an accelerometer configuration. However, accelerometers are noisy and contain both deterministic and stochastic errors. Hence, this thesis explores using the Kalman filter as a covariance anal-

ysis tool to minimize the accelerometer errors and develop an animal head-motion estimation system. Furthermore, the results of several experiments show that an accurate depiction of head motion is obtainable.

DTIC

*Kalman Filters; Physiological Effects; Stochastic Processes; Monkeys; Accelerometers; Flight Stress (Biology); Head Movement; Angular Velocity*

**19970034406**

**SQUID based remanence measurements of immunoassays**

Koetitz, R., Physikalisch Technische Bundesanstalt, Germany; Matz, H.; Trahms, L.; Koch, H.; Weitschies, W.; Rheinlaender, T.; Semmler, W.; Bunte, T.; IEEE Transactions on Applied Superconductivity; June 1997; ISSN 1051-8223; 7, 2, pt. 3, pp. 3678-3681; In English; Copyright; Avail: Issuing Activity

The use of fine magnetic particles as labels for antibodies and the measurement of their remanent magnetization for the preparation of immunoassays is presented. Antibodies were coupled with magnetic nanoparticles and samples were prepared by reaction of the magnetically labeled antibodies with their solid phase adsorbed antigen. After exposing the samples to a field of some mT a dc-SQUID system measures the remanent sample magnetization in the absence of an external field. The combination of high moment labels and SQUIDS yields ultrasensitive immunoassays with a wide range of detectable analyte concentrations. In contrast to most standard techniques in our method the detected magnetic signal is specific only for bound reaction partners, thus eliminating the need for separation of unbound components.

Author (EI)

*Bioassay; Magnetic Measurement; Magnetization; Remanence; Squid (Detectors)*

53

**BEHAVIORAL SCIENCES**

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

**19970031187** Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA

**Learning in a Synthetic Environment: The Effect of Visual Display, Presence, and Simulator Sickness Final Report, Apr. 1995 - Jan. 1996**

Johnson, David M., Army Research Inst. for the Behavioral and Social Sciences, USA; Feb. 1997; 79p; In English

Contract(s)/Grant(s): DA Proj. 2O2-62785-A-791

Report No.(s): AD-A328285; ARI-TR-1057; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Soldiers explored a synthetic representation of an Army heliport under three visual display conditions: (1) wide field of view (FOV) helmet mounted display, (2) narrow FOV helmet mounted display, and (3) stationary, wide screen display. Pretest and post-test measures of spatial knowledge were recorded. Measures of presence in the virtual environment were recorded. Measures of simulator sickness were administered upon exit from the virtual environment and 24 hours later. Overall, soldiers acquired a significant amount of spatial knowledge from the synthetic representation. When transferred to the actual Army heliport, soldiers were able to navigate around the location with near zero errors. There was no effect of visual display on any measures of spatial knowledge. Also, there was no effect of visual display on reported presence or simulator sickness. Simulator sickness was significantly reduced after 24 hours away from the virtual environment. Presence did not correlate with spatial knowledge. Simulator sickness correlated negatively with spatial knowledge. Presence and simulator sickness were negatively correlated.

DTIC

*Helmet Mounted Displays; Flight Simulators; Computerized Simulation; Human Factors Engineering; Visual Perception; Virtual Reality; Visual Acuity; Heliports; Flight Simulation*

**19970031197** Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

**The Rotated Diagonal Factors (RDF) Approach: A Substitute for MANOVA When Analyzing Multi-Task and Multi-Criterion Data**

Wherry, Robert J., Jr., Naval Air Warfare Center, USA; Forster, Estrella M., Naval Air Warfare Center, USA; Morrison, Jeffery, Naval Air Warfare Center, USA; Apr. 10, 1997; 95p; In English

Report No.(s): AD-A328049; NAWCADWAR--96-36-TR; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In the study examined, subjects (Ss) were required to perform a continuous two-dimensional tracking task whose criteria included RMS Error in both dimensions as well as the number of times the Ss manipulated the control stick in either dimension. Occasionally, one of two other discrete tasks (i.e., a tactical assessment task and a communications task) occurred. Performance

on the discrete tasks included accuracy of responses as well as response time for both correct and incorrect responses. Over a period of time, this provided potential data about percent of correct, incorrect, and missed responses as well as median times for both correct and incorrect responses. Thus, several criteria were available for each of the three tasks. The tracking data analyzed in this study were limited to only those data which occurred during and immediately after the occurrence of either type of discrete task. This approach was taken because, in the absence of a second actual task, the tracking task was the only one which Ss had to actively perform, although Ss were responsible for monitoring if a new target had appeared which required their assessment.

DTIC

*Human Factors Engineering; Analysis of Variance; Multivariate Statistical Analysis; Root-Mean-Square Errors; Human Performance*

**19970031218** Armstrong Lab., Aerospace Medicine Directorate, Brooks AFB, TX USA

**The Development of the Sustained Operations Assessment Profile (SOAP) Interim Report, Aug. 1996 - Jul. 1997**

Retzlaff, Paul D., Armstrong Lab., USA; King, Raymond E., Armstrong Lab., USA; Marsh, Royden W., Armstrong Lab., USA; French, Jonathan, Armstrong Lab., USA; Jul. 1997; 32p; In English

Report No.(s): AD-A328506; AL/AO-TR-1997-0094; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This work describes the development of a new psychological test to assess fatigue in military and civilian personnel engaged in sustained operations. The Sustained Operations Assessment Profile (SOAP) was developed through the integration of clinical experience, psychometric methods, and empirical analysis. Using a sample of 84 subjects, a thorough test development plan was accomplished. The 10 scales cover three broad areas of functioning including cognitive, effective, and arousal dimensions. The scales have normative data and are demonstrated to be reliable and valid. Further validation work is suggested to improve the test.

DTIC

*Psychological Tests; Psychometrics; Fatigue (Biology); Military Psychology; Armed Forces (USA)*

**19970031226** Illinois Univ., Beckman Inst., Urbana, IL USA

**Functional MR Studies of Cognitive Processing Final Report, 1 Sep. 1993 - 28 Aug. 1996**

Kramer, Arthur F., Illinois Univ., USA; Jan. 1997; 2p; In English

Report No.(s): AD-A328436; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The funds received from this Augmentation Award for Science and Engineering Research Training (AASERT) provided for the support of several graduate and undergraduate students at the University of Illinois. These students were involved in a number of studies (see list of published papers below) which entailed the development of paradigms and the conduct of experiments to examine the psychological and neurophysiological mechanisms which underlie different aspects of visual selective attention. Research skills which the students acquired during the course of training included behavioral experimentation, mathematical modeling of psychological and neurophysiological phenomena, the use of event-related brain potentials, and the collection of functional magnetic resonance data as subjects performed different attentional tasks. Indeed, after a number of years of struggling with a failed magnet in the Beckman Institute at the University of Illinois we now have an agreement in place with a local hospital (Cane Clinic) to use their 1.5 Telsa GE Sigma on evenings and weekends to collect psychological data. The support that we received from ONR through the ASSERT award was instrumental in providing the experience we needed to be able to take advantage of this.

DTIC

*Neurophysiology; Psychology; Cognition*

**19970031284** Army Aeromedical Research Lab., Aircrew Health and Performance Div., Fort Rucker, AL USA

**Evaluation of the Spatial Disorientation Sortie in Training Aviators Final Report**

Braithwaite, Malcolm, Army Aeromedical Research Lab., USA; Alvarez, Eduardo, Army Aeromedical Research Lab., USA; Cashwell, Kenneth, Army Aeromedical Research Lab., USA; Collins, Clarence, Army Aeromedical Research Lab., USA; Estrada, Arthur, Army Aeromedical Research Lab., USA; Jun. 1997; 69p; In English

Contract(s)/Grant(s): DA Proj. 3M1-6278-A-879

Report No.(s): AD-A328235; USAARL-97-22; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Following didactic instruction, most aircrew are able to experience some of the disorientating illusions and limitations of the orientation senses in a variety of ground-based devices. In order to reinforce instruction in spatial disorientation (SD) within the environment in which they operate, British Army Air Corps helicopter pilots also receive an airborne demonstration of the limitations of their orientation senses. The objective of this assessment was to determine whether the SD demonstration sortie would be an effective adjunct in training aircrew in SD in the U.S. Army. This paper describes the sortie and records the results of the assessment. Forty-five aviators and training personnel experienced the sortie and provided their opinion in questionnaires. The

following conclusions were made: The maneuvers performed in the SD demonstration sortie, and the sortie overall, were extremely effective at demonstrating the limitations of the orientation senses; the SD sortie attracted a significantly higher rating in its effectiveness to train aviators in SD than all the currently available methods; the introduction of the sortie into the initial flight training syllabus would be a distinct enhancement to the SD training of aviators and associated personnel; and the introduction of the sortie into the refresher training in field units also would be an advantage. Recommendations to support these conclusions are made.

DTIC

*Flight Crews; Flight Training; Disorientation; Helicopters; Sensory Perception*

**19970031336** Naval Aerospace Medical Research Lab., Pensacola, FL USA

**Performance-Based Occupational Strength Testing for Candidate Navy Pilots/Naval Flight Officers** *Final Report, 15 Nov. 1994 - 30 Sep. 1996*

Meyer, Lloyd G., Naval Aerospace Medical Research Lab., USA; Oct. 1996; 43p; In English

Contract(s)/Grant(s): MIPR-95MM5509

Report No.(s): AD-A328221; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Secretary of Defense has directed the military services to allow women to fly aircraft engaged in combat missions. The current inventory of naval aircraft was physically designed to accommodate a majority of the male population. Anthropometric standards from 1964 are regularly used for selection, but muscular strength standards for aviation do not exist. This work was done to aid the Navy in safely opening the anthropometric accommodation range for aviation by determining gender-neutral strength requirements for all applicants. The objectives of this study were to: (1) identify strength-critical tasks in naval aircraft, (2) develop data bases on current strength and anthropometric measurements of male and female aviation candidates, (3) develop gender-neutral strength standards to construct an aviation strength screening device, and (4) develop a physical strength enhancement program to assist individuals to meet or exceed the strength standards. Significant differences between male and female aviation candidates in upper or lower body strength and body measurements were found. Upon completion of this work, the strength screening device and aviation physical training program will be delivered to the Commanding Officer, Naval Aviation Schools Command.

DTIC

*Combat; Females; Anthropometry; Physical Fitness; Fighter Aircraft*

**19970031348** Michigan Univ., Ann Arbor, MI USA

**Precis to a Practical Unified Theory of Cognition and Action: Some Lessons from EPIC Computational Models of Human Multiple-Task Performance** *Interim Report, 1 Jan. 1992 - 1 Jun. 1997*

Meyer, David E., Michigan Univ., USA; Kieras, David E., Michigan Univ., USA; Jun. 01, 1997; 70p; In English

Contract(s)/Grant(s): N00014-92-J-1173

Report No.(s): AD-A327743; TR-97-ONR-EPIC-8; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Experimental psychology, cognitive science, and human factors engineering have progressed sufficiently far that a practical unified theory of cognition and action is now foreseeable. Such a theory soon may yield useful quantitative predictions about rapid human multiple task performance in applied settings. Toward this end, an Executive-Process/Interactive-Control (EPIC) architecture has been formulated with components whose assumed properties emulate fundamental perceptual, cognitive, and motor processes. On the basis of EPIC, a theorist may construct detailed computational models that characterize multiple task performance under both laboratory and real world conditions. For example, EPIC computational models provide good accounts of response latencies and accuracies from the psychological refractory period procedure, aircraft cockpit operation, and human computer interaction. As a result, major commonalities in performance across various task domains have been discovered, and efficacious principles for designing person machine interfaces have been identified. The substantive and methodological lessons learned from these advances constitute an instructive precis to further utilitarian theoretical unification.

DTIC

*Human-Computer Interface; Human Factors Engineering; Flight Operations; Mathematical Models; Cockpits*

**19970031412** NASA Ames Research Center, Moffett Field, CA USA

**Prolonged Fixation Studies for Spaceflight**

Corbett, Robert, NASA Ames Research Center, USA; Philpott, Delbert E., NASA Ames Research Center, USA; Black, Sam, NASA Ames Research Center, USA; Ann. Proc. Electron Microscopy Soc. Amer.; 1973; 2p; In English; 31st; Electron Microscopy Soc. Amer., 1973, New Orleans, LA, USA

Report No.(s): NASA-TM-112789; NAS 1.15:112789; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Observation of subtle or early signs of change in spaceflight induced alterations on living systems require precise methods of sampling. In-flight analysis would be preferable but constraints of time, equipment, personnel and cost dictate the necessity for prolonged storage before retrieval. Because of this, various tissues have been stored in fixatives and combinations of fixatives and observed at various time intervals. High pressure and the effect of buffer alone have also been tried. Of the various tissues embedded, muscle, cartilage and liver, liver has been the most extensively studied because it contains large numbers of organelles common to all tissues. The fixatives tested were 2% paraformaldehyde, 6% glutaraldehyde, 3% glutaraldehyde with 1% paraformaldehyde, and each of the previous three plus 0.05% DinitrodiFluorobenzene (DFF). These were all buffered with s-collidine and contained 0.25% 0.1 M CaCl<sub>2</sub>. Each of the six basic solutions was made 1%, 5% and 10% sucrose, resulting in 18 different fixatives. Tissues were removed and observed at various periods up to 1 year. The best fixative was the combination of 3% glutaraldehyde, 1% paraformaldehyde and 0.05% DFF in 5% sucrose followed by 1% osmium tetroxide prior to dehydration and embedding. Combinations of fixatives appeared to offer the best answer since no one fixative completely fixes an entire tissue. During storage several changes took place in the less favorable fixing solutions. There was generally a decrease in definition of the structures of the tissue especially in the cristae of the mitochondria and the rough and smooth endoplasmic reticulum. The tissue was often expanded in the 1% sucrose and shrunken in the 10% sucrose solutions. Some of the glycogen granules appeared to leach out or change and membrane pools formed and enlarged. The high pressure preservation, 10 kilobars, for three days preserved the membranes but not the microtubules. Our hope was that the high pressure would inactivate the enzymes thereby preserving the tissue, but preservation was not satisfactory. Control liver kept in buffer for three days before fixation remained quite well preserved. The osmotic pressure of the buffer was carefully adjusted to be isotonic. The ribosomes were retained and easily seen in the nucleus and cytoplasm perhaps because general cytoplasmic leaching caused them to stand out.

Author (revised)

*Space Flight; In-Flight Monitoring; Muscles; Cartilage; Liver; Sampling*

**19970031562** Wright State Univ., Psychology Dept., Dayton, OH USA

**Perception and Control of Locomotion Final Report, Aug. 1993 - Aug. 1996**

Flach, John M., Wright State Univ., USA; Oct. 31, 1996; 23p; In English

Contract(s)/Grant(s): F49620-93-I-0560; AF Proj. 3484

Report No.(s): AD-A325535; WSU-662480; AFOSR-TR-97-0145; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This work has focused on perception and control of low altitude flight. The key independent variables were speed of forward motion and optical texture. Results showed an interaction between texture and speed.

DTIC

*Low Altitude; Collision Avoidance; Flight Control; Pilot Performance; Motion Perception*

**19970031749** NASA Ames Research Center, Moffett Field, CA USA

**Improving Digital Halftones by Exploiting Visual System Properties**

Mulligan, Jeffrey B., NASA Ames Research Center, USA; Conference Record on Signals, Systems & Computers; Nov. 03, 1993, pp. 961-965; In English; 27th; Signals, Systems and Computers, 1-3 Nov. 1993, Pacific Grove, CA, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): RTOP 505-64-53; RTOP 506-59-65

Report No.(s): NASA-CR-204376; NAS 1.26:204376; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The visibility of quantization noise in digital halftones can be predicted from psychological data on spatial and temporal contrast sensitivity. Simple models of the visual system can be incorporated into halftoning algorithms to minimize the visibility of the resulting artifacts. Filter-based algorithms may be customized to match the error filter to human contrast sensitivity under known viewing conditions. The relative insensitivity of the visual system to high frequency chromatic modulation allows visible luminance noise to be reduced at the expense of additional (but invisible!) chromatic noise. The techniques are easily extended to three dimensions for displays which can be modulated in time such as CRT's and flat panel displays.

Author

*Improvement; Display Devices; Digital Electronics; Optical Properties*

**19970031791** Armstrong Lab., Aerospace Medicine Directorate, Brooks AFB, TX USA

**Female and Male Air Force Student Pilots: Attitudes toward Mixed-Gender Squadrons, Career Issues, and Combat Flying Interim Report, Aug. 1996 - Jul. 1997**

McGlohn, Suzanne, Armstrong Lab., USA; Callister, Joseph D., Armstrong Lab., USA; King, Raymond E., Armstrong Lab., USA; Retzlaff, Paul D., Armstrong Lab., USA; Jul. 1997; 15p; In English

Report No.(s): AD-A328912; AL/AO-TR-1997-0096; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Air Force officers beginning pilot training were surveyed regarding their opinions and attitudes toward their flying and military careers. Differences between women and men were found in long term goals, opinions regarding mixed-gender squadrons, POW concerns, and combat attitudes. of particular interest are the facts that a large percentage of men believe that work situations will be worsened by the inclusion of women and that a large percentage of women believe flying in combat should be optional. Background: The integration of women into military aviation roles has largely been dictated by administrative action. The U. S. Army Aviation Flight Program was opened to women in 1973 (Voge and King, 1996), the U. S. Air Force began training women to be pilots and navigators in 1976 (Jones, 1983), and the U. S. Navy began training women to be naval flight officers in 1979 (Baisden, 1992). In 1993, many of the restrictions on women flying combat missions have also been lifted (U. S. Government Printing Office, 1992). These changes have occurred mostly for socio-political reasons, and many questions regarding the impact of these changes have not been answered.

DTIC

*Aircraft Pilots; Combat; Navigators; Navy; Pilot Training*

**19970031800** Armstrong Lab., Aerospace Medicine Directorate, Brooks AFB, TX USA

**The Armstrong Laboratory Aviation Personality Survey (ALAPS): Norming and Cross-Validation *Interim Report, Aug. 1996 - Jul. 1997***

Retzlaff, Paul D., Armstrong Lab., USA; Callister, Joseph D., Armstrong Lab., USA; King, Raymond E., Armstrong Lab., USA; Jul. 1997; 38p; In English

Report No.(s): AD-A328913; AL/AO-TR-1997-0099; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Armstrong Laboratory Aviation Personality Survey (ALAPS) was developed to better psychologically assess aircrew. The 15 scales cover personality, psychopathology, and crew interaction styles. This work provides additional psychometric data in support of its use. A sample of over 1000 male and female student pilots provide thorough norming, additional evidence of reliability, and further construct validity.

DTIC

*Psychometrics; Students; Surveys; Flight Crews*

**19970031819** Human Resources Research Organization, Alexandria, VA USA

**Report on the Expanded Methodology for Development of Structured Simulation-Based Training Programs *Final Report, Jan. 1995 - May 1996***

Campbell, Charlotte H., Human Resources Research Organization, USA; Deter, Daniel E., Human Resources Research Organization, USA; Quinkert, Kathleen A., Army Research Inst. for the Behavioral and Social Sciences, USA; Jun. 1997; 37p; In English Contract(s)/Grant(s): DASW01-94-D-0011; DA Proj. 2O2-62785-A-791

Report No.(s): AD-A328671; HUMRRO-FR-WATSD-97-09; ARI-RR-1710; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) and the Force 21 Training Program have sponsored the development of a structured simulation-based training program for selected staffs of conventional mounted brigades. The development effort, entitled the Combined Arms Operations at Brigade Level Realistically Achieved Through Simulation (and known as COBRAS) resulted in construction of training support packages (TSPs) for large-scale exercises and for small-group vignettes. Development of the scenario and all TSP materials followed the guidance found in the Methodology for the Development of Structured Simulation-Based Training, published by ARI in 1995. This report documents an expanded methodology, based on experience in the COBRAS program. The expansion is contained in the Guide for Development of Structured Simulation-Based Training. The Guide contains additional examples and warnings, and more in-depth coverage of TSP construction and formative evaluations. This report discusses the activities in the methodology.

DTIC

*Computerized Simulation; Education*

**19970031857** NASA Ames Research Center, Moffett Field, CA USA

**Multiple Concurrent Visual-Motor Mappings: Implications for Models of Adaptation**

Cunningham, H. A., NASA Ames Research Center, USA; Welch, Robert B., NASA Ames Research Center, USA; Journal of Experimental Psychology: Human Perception and Performance; Jan. 06, 1994; ISSN 0096-1523; Volume 20, No. 5, pp. 987-999; In English; 31st; Psychonomic Society, 1990, New Orleans, LA, Ventura, CA, USA, USA

Contract(s)/Grant(s): RTOP 199-16-12-34

Report No.(s): NASA-TM-112672; NAS 1.15:112672; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Previous research on adaptation to visual-motor rearrangement suggests that the central nervous system represents accurately only 1 visual-motor mapping at a time. This idea was examined in 3 experiments where subjects tracked a moving target under repeated alternations between 2 initially interfering mappings (the 'normal' mapping characteristic of computer input devices and a 108° rotation of the normal mapping). Alternation between the 2 mappings led to significant reduction in error under the rotated mapping and significant reduction in the adaptation aftereffect ordinarily caused by switching between mappings. Color as a discriminative cue, interference versus decay in adaptation aftereffect, and intermanual transfer were also examined. The results reveal a capacity for multiple concurrent visual-motor mappings, possibly controlled by a parametric process near the motor output stage of processing.

Author

*Central Nervous System; Concurrent Processing; Adaptation; Head Movement*

**19970031962** Military Academy, Center for Leadership and Organizations Research, West Point, NY USA

**Estimating Personality Constructs from Archival Data Final Report, Jan. 1996 - Feb. 1997**

Evans, Kenneth L., Military Academy, USA; Apr. 1997; 106p; In English

Contract(s)/Grant(s): DA Proj. A791

Report No.(s): AD-A328816; ARI-TR-1063; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

As part of a leadership research program at the U.S. Military Academy involving cadets in the Class of 1998, this report examined the viability of using archival data on prior cadets to estimate a variety of personality constructs among current cadets. Two sets of archival personality data on prior cadet classes were obtained. The first involved a short form administration of the ABLE inventory to cadets in the Class of 1994. The second involved the administration of the NEO Personality Inventory to the Class of 1996. Scores on the 12 scales contained in these inventories were used as archival criteria. Archival predictors were then sought from other and questionnaire items administered to cadets at the same point in time as the original inventories. For each scale, a different 20-item pool of predictors was developed from the archival items having the strongest zero order correlations with that scale. A series of multiple regression analyses was then used to predict scores on each scale. An average R<sup>2</sup> of .39 per scale was obtained after cross validation. Both the original scales and their analogs tended to manifest similar relationships with two external criteria examined, leadership performance and attrition.

DTIC

*Personality; Leadership*

**19970032081** Armstrong Lab., Human Resources Directorate, Brooks AFB, TX USA

**Guidelines for Conducting Interviews Final Report, May 1995 - May 1997**

Watson, Thomas W., Armstrong Lab., USA; Jun. 1997; 85p; In English

Contract(s)/Grant(s): AF Proj. 1123

Report No.(s): AD-A328769; AL/HR-TR-1997-0043; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report provides practical guidance for anyone, inside or outside the Air Force, interested in conducting interviews, especially for general data gathering and evaluation purposes. The report begins with a discussion of the advantages and disadvantages of interviews relative to survey or naturalistic observation and the skills and characteristics interviewers should possess. Then, interview ethics are discussed from free speech and privacy perspectives with emphasis upon the need for ensuring voluntary participation and maintaining confidentiality. Following this, discussion focuses on preparing for and conducting interviews. Issues such as sampling, selecting the type of interview, interview protocol development, and what to do to prepare for and conduct suc-

cessful interviews are discussed. This includes practical suggestions on how to write questions, how to develop probes, and how to clarify understanding of what is being said. Finally, techniques for analyzing and reporting results are presented.

DTIC

*Surveys; Ethics*

**19970032086** Delaware Univ., Newark, DE USA

**Brain Mechanisms Underlying Individual Differences in Reaction to Stress: An Animal Model Final Report**

Siegel, Jerome, Delaware Univ., USA; Aug. 10, 1997; 4p; In English

Contract(s)/Grant(s): DAALO3-88-K-0043

Report No.(s): AD-A328741; ARO-25521.7-LS; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Humans who are high risk takers and high sensation seekers show increasing amplitudes (augmenting) of the P1-N1 components of the visual evoked potential (VEP) increasing intensities of light flash, whereas low risk takers show VEP reducing. We developed an animal model of this important dimension of behavior in which we reported that cats and rats who display high levels of exploration, activity, aggression, and risk taking show VEP augmenting as do their human counterparts; similarly cats and rats that are low sensation seekers are VEP reducers. Our published papers describe a number of neurophysiological characteristics associated with VEP augmenting and reducing and thus high and low sensation seekers. We also demonstrated, in our rat model, that augmenting/reducing and the sensation seeking trait have a heritable basis.

DTIC

*Brain; Physiological Responses; Stress (Physiology); Neurophysiology; Models*

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### MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

**19970031165** Naval Health Research Center, San Diego, CA USA

**Effect of Anti-Exposure Suits on Body Temperatures during Shipboard Flooding Activities**

Hagan, R. D., Geo-Centers, Inc., USA; Bernhard, R. D., Geo-Centers, Inc., USA; Cohen, B. S., Naval Health Research Center, USA; Hodgdon, J. A., Naval Health Research Center, USA; May 1997; 23p; In English

Report No.(s): AD-A327981; NHRC-97-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of the present investigation was to evaluate the effectiveness of the whole-body Naval Clothing and Textile Research Facility experimental-immersion suit (NAVCLCLO) in maintaining normal body temperatures in naval personnel performing simulated flooding repair activities in cold water. Preliminary evaluations were also conducted on subjects wearing the Marine Corps (MARCOR) experimental-immersion suit, and MultiFabs Survival (MULFAB) suit. These were compared with subjects wearing NAVCLCLO and those wearing coveralls, cotton T-shirt, shorts, and socks which represented the control (CON) condition.

DTIC

*Body Temperature; Suits; Cold Water*

**19970031191** Naval Health Research Center, San Diego, CA USA

**The Effects of Wearing a Disposable Eye/Respiratory Protection (DERP) Mask in Environmental Extremes Final Report, Mar. - Oct. 1996**

Cohen, Barry S., Naval Health Research Center, USA; Feith, Steven J., Naval Health Research Center, USA; Prusaczyk, W. K., Naval Health Research Center, USA; Dec. 02, 1996; 30p; In English

Contract(s)/Grant(s): AF Proj. 6515

Report No.(s): AD-A327982; NHRC-97-9; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this study was to evaluate three prototype DERP masks under consideration for use by the U.S. Air Force. The evaluation included measurement of CO<sub>2</sub> levels and breathing resistance inside these masks. Additionally, the thermal, physiological, and psychological effects of wearing the three masks during rest and exercise were measured during two 2-hr scenarios, once each under two different environmental conditions (heat and cold).

DTIC

*Masks; Protective Clothing; Respiration; Eye Protection; Carbon Dioxide; Chemical Warfare*

**19970031203** Army Research Lab., Aberdeen Proving Ground, MD USA

**Resolution Versus Field of View Trade-off for Monocular Night Vision Goggle Simulators *Final Report***

CuQlock-Knopp, V. Grayson, Army Research Lab., USA; Sipes, Dawn E., Johns Hopkins Univ., USA; Torgerson, Warren, Johns Hopkins Univ., USA; Bender, Edward, Army Communications-Electronics Command, USA; Merritt, John O., Interactive Technologies, USA; Jun. 1997; 68p; In English

Contract(s)/Grant(s): DA Proj. 1L1-61102-B7-4A

Report No.(s): AD-A327778; ARL-TR-1424; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A field experiment was conducted to gain insight into the trade-offs between field of view (FOV) and resolution, with reference to the off-road mobility and target-detection capability of personnel using night vision goggles. Daytime simulators of night vision goggles were developed to represent all combinations of three levels of resolution (equivalent to 20/40, 20/80, and 20/120 Snellen acuities) and three FOVs (40 deg, 60 deg, and 80 deg). One product of the experiment was the formulation of a function that could be used to estimate human performance in traversing off-road terrain on foot. This trade-off function allows for the estimation of performance associated with any combination of resolution and FOV within the tested range. Another result was the identification of a significant interaction between FOV and resolution; for mobility errors, the effect of changes in resolution on performance increased as FOV decreased. For all dependent measures (errors, time, ratings, and targets), decreasing FOV had the most impact at the lowest level of resolution.

DTIC

*Field of View; Night Vision; Simulators; Resolution; Snellen Tests; Goggles; Monocular Vision; Target Acquisition*

**19970031300** Army Aeromedical Research Lab., Aircrew Health and Performance Div., Fort Rucker, AL USA

**A Helicopter Simulator Assessment of Pilot Head Movement during Various Phases of Flight *Final Report***

Braithwaite, Malcolm G., Army Aeromedical Research Lab., USA; Alvarez, Eduardo A., Army Aeromedical Research Lab., USA; Jones, Heber D., Army Aeromedical Research Lab., USA; Higdon, Alford A., Army Aeromedical Research Lab., USA; Groh, Shannon L., Army Aeromedical Research Lab., USA; Beal, Kathleen G., Wright State Univ., USA; Estrada, Arthur, Hughes Technical Center, USA; Jul. 1997; 65p; In English

Contract(s)/Grant(s): DA Proj. 3M1-62787-A-879

Report No.(s): AD-A328240; USAARL-97-26; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The opto-kinetic cervico reflex (OKCR) is a recently hypothesized visually driven reflex that serves to stabilize the image of the external horizon on the retina during high performance aircraft roll maneuvers. Although anecdotally reported as occurring, head tilt during helicopter flight has not been formally studied. Such research is required to determine the full impact and significance it may have on a rotary-wing aviator's flying performance. The aim of this study was to investigate the relationship between horizon position and perception of orientation, and thus generate vital information to assess whether this reflex plays an important role in spatial disorientation. Twenty volunteer pilots participated in a UH-60 flight simulator study to examine the effects of this reflex. The results confirm that the OKCR occurs during simulated helicopter flight, both with and without night vision goggles. As with previous studies, head roll increased during flight under visual meteorological conditions in relation to increasing aircraft roll angle up to a maximum sustainable level and then remained constant. Head roll did not occur during flight under instrument meteorological conditions. Various aspects that impact rotary-wing operations are discussed, and recommendations made for future research.

DTIC

*Aircraft Pilots; Flight Instruments; Flight Simulators; Helicopters; Head Movement; Goggles; Flight Simulation; Flight Conditions; Night Vision*

**19970031309** Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA

**Modeling Body Joint Loads during Equipment Decontamination Operations *Final Report***

McMahon, Richard W., Army Research Lab., USA; Shams, Tariq, General Engineering and Systems Analysis Co., Inc., USA; Jul. 1997; 99p; In English

Contract(s)/Grant(s): Da Proj. 1L1-62716-AH-70

Report No.(s): AD-A328065; ARL-TR-1332; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The General Engineering and Systems Analysis Company (GESAC), Inc., under contract with the Human Research and Engineering Directorate of the U.S. Army Research Laboratory (ARL), (contract number DAAL01-94-P-0906) estimated body joint loading using a computer simulation program called DYNAMAN(copyright). This work was performed in support of the U.S. Army Chemical and Biological Defense Command (CBDCOM) modular decontamination system (MDS) development program. The objective of this effort was to model the loading imposed by each of five different scrub brush systems on various human body joints and compare the resulting force and torque values. of primary interest was information concerning how electric motor place-

ment affected joint loading and how the joint loads of the powered brush systems compared with those of the manual brush. The results of this modeling effort identified several limitations with the current model, identified several key aspects of power scrub brush design and operator interface, and were used to aid in the selection of brush designs for continued development.

DTIC

*Decontamination; Computerized Simulation; Brushes; Human Body; Loads (Forces); Joints (Anatomy)*

**19970031318** Institute for Human Factors TNO, Soesterberg, Netherlands

**Absolute Accuracy of the Cyberware WB4 Whole Body Scanner** *Interim Report, Mar. - Apr. 1996*

Daanen, Hein, Institute for Human Factors TNO, Netherlands; Brunsman, Matt, Sytronics, Inc., USA; Taylor, Stacie, Sytronics, Inc., USA; Feb. 1997; 34p; In English

Contract(s)/Grant(s): F41624-93-C-6001; AF Proj. 7184

Report No.(s): AD-A327818; AL/CF-TR-1997-0046; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes a study of the accuracy of the Cyberware WB4 whole-body scanner. CARD Lab researchers made multiple scans of a calibration object designed to simulate human body size and shape. Researchers then pinpointed landmarks on the scans using Integrate, a software package developed at the CARD Lab to manage and manipulate scan data. Dimensions in the scans were then compared to the actual size of the calibration object. Researchers concluded that the scans and the actual object were very comparable, that no systematic distortion occurred, and that errors caused by the scan landmarking process could be solved with enhancements to Integrate.

DTIC

*Image Processing; Man Machine Systems; Data Bases; Software Engineering; Computer Aided Design; Human Body; Scanners; Applications Programs (Computers)*

**19970031322** Logicon Technical Services, Inc., Dayton, OH USA

**Operator Workload in the F-15E: A Comparison of TAWL and Micro Saint Computer Simulations** *Interim Report, Apr. 1995 - Dec. 1996*

See, Judi E., Logicon Technical Services, Inc., USA; Vidulich, Michael A., Wright Lab., USA; Jan. 1997; 46p; In English

Contract(s)/Grant(s): F41624-94-C-6007; AF Proj. 7184

Report No.(s): AD-A327807; AL/CF-TR-1997-0017; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The mental workload experienced by the crewmember occupying the back seat of the F-15E during a target acquisition mission was simulated via two computer modeling tools: Task Analysis/Workload (TAWL) and the microcomputer version of Systems Analysis of Integrated Networks of Tasks (Micro Saint). The primary objectives were to evaluate the similarity of the two modeling tools and compare their relative ease of use. The scenario consisted of a ten-task target acquisition mission whose goal was to detect and destroy a Scud missile target. Output from the two models was highly similar in terms of overall patterns of workload throughout the mission. In both instances, workload was greatest during the last two minutes of the mission when final decision regarding target presence and location and weapon release needed - to be made. Estimates of overall and peak workload from each model were also indistinguishable. The one area in which the models differed was in the component workload estimates obtained for four of the ten functions during the mission. The Micro Saint estimates were consistently somewhat higher than those provided by TAWL, an outcome largely attributable to the differential manner in which the transition periods between tasks are handled by the two models. In sum, the two modeling tools yielded similar results in an overall or gross level, but differed on a fine-grained level, indicating that Micro Saint is much more versatile and flexible than TAWL.

DTIC

*Computerized Simulation; Workloads (Psychophysiology); F-15 Aircraft; Human Factors Engineering; Mental Performance; Target Acquisition; Crews; Missiles*

**19970031323** Edgewood Research Development and Engineering Center, Research and Technology Directorate, Aberdeen Proving Ground, MD USA

**Use of the Performance Assessment Battery to Determine Mask Wearability** *Final Report, May - Jul. 1996*

Caretti, David M., Edgewood Research Development and Engineering Center, USA; Jun. 1997; 19p; In English

Contract(s)/Grant(s): DA Proj. 101-61101-A-91A

Report No.(s): AD-A327805; ERDEC-TR-417; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this investigation was to evaluate the ability of the Performance Assessment Battery (PAB) to determine mask wearability. The PAB was customized to assess the psychological domains that most influence subjective comfort including a profile of mood state and measurements of sustained attention and reaction time. This PAB battery was administered before, during, and after 60 min of treadmill walking at a moderate intensity. Subjects completed three experimental conditions of mask

wear; no mask, wear of the U.S. Army M40 respirator with a standard C2 filter canister, and wear of the M40 with a C2 canister that had its airflow resistance cut in half. These test conditions were selected to enable us to evaluate the ability of the chosen PAB tasks to assess wearability of respirators with significantly different breathing resistances. Results showed that response accuracy, speed, and throughput (responses/min) were analogous between conditions, suggesting that mask acceptability, as measured by the PAB, was similar between the three mask wear conditions. Factors related to exercise intensity and differences in mask inspiratory resistances suggest that additional research may be needed before the value of the PAB as a tool for assessing mask acceptability by wearers can be determined.

DTIC

*Electric Batteries; Protective Clothing; Wear; Respirators; Masks; Physical Exercise*

**19970031374** Naval Research Lab., Materials Chemistry Branch, Washington, DC USA

**Control of Lead in Drinking Water**

Brady, Robert F., Jr., Naval Research Lab., USA; Adkins, James D., Naval Research Lab., USA; Jul. 11, 1997; 112p; In English Report No.(s): AD-A327758; NRL/MR/6120--97-7957; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report describes the installation of an NRL-developed epoxy lining in the drinking water distribution system in three buildings. Water was sampled before and after installation of the lining; the sampling data was interpreted after several confounding factors were identified and allowed. Improper installation of the lining in one of the buildings led to its premature failure, and this was documented and analyzed. The lining is shown to be effective in preventing leaching of lead into drinking water. This technology is recommended as a routine method for excluding lead from drinking water distribution systems in buildings, and guidance for use in establishing contracts to install the lining is provided.

DTIC

*Water; Epoxy Compounds; Linings; Leaching; Water Quality; Water Treatment*

**19970031671** Army Aeromedical Research Lab., Fort Rucker, AL USA

**Mass Requirements for Helicopter Aircrew Helmets**

McEntire, B. Joseph, Army Aeromedical Research Lab., USA; Shanahan, Dennis F., Army Aeromedical Research Lab., USA; Aug. 25, 1997; 7p; In English

Report No.(s): AD-A328597; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Helicopter aircrew helmets are becoming more sophisticated with increased mission requirements. This increase results in additional mass being supported on the aircrew's head. Ultimately, there is a limit to how much mass can be supported by the aircrew without increasing the fatigue rates and neck injury risk in accidents. This paper reviews the past mass property requirements of Army helicopter helmets. Current requirements for the RAH-66 Comanche helmet are also detailed with the rationale for their derivation.

DTIC

*Helicopters; Flight Crews; Helmets*

**19970031746** NASA Ames Research Center, Moffett Field, CA USA

**The CELSS Antarctic Analog Project: An Advanced Life Support Testbed at the Amundsen-Scott South Pole Station, Antarctica**

Straight, Christian L., Bionetics Corp., USA; Bubenheim, David L., NASA Ames Research Center, USA; Bates, Maynard E., Bionetics Corp., USA; Flynn, Michael T., NASA Ames Research Center, USA; Life Support & Biosphere Science; 1994; ISSN 1069-9422; Volume 1, No. 1, pp. 52-60; In English

Report No.(s): NASA-CR-204218; NAS 1.26:204218; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

CELSS Antarctic Analog Project (CAAP) represents a logical solution to the multiple objectives of both the NASA and the National Science Foundation (NSF). CAAP will result in direct transfer of proven technologies and systems, proven under the most rigorous of conditions, to the NSF and to society at large. This project goes beyond, as it must, the generally accepted scope of CELSS and life support systems including the issues of power generation, human dynamics, community systems, and training. CAAP provides a vivid and starkly realistic testbed of Controlled Ecological Life Support System (CELSS) and life support systems and methods. CAAP will also be critical in the development and validation of performance parameters for future advanced life support systems.

Author

*Life Support Systems; Closed Ecological Systems; Antarctic Regions; Technologies*

**19970031938** Aeronautical Systems Div., Wright-Patterson AFB, OH USA

**An Evaluation of the C-17A Forward Loadmaster Station Interface *Final Report, 1 Jun. - 31 Dec. 1996***

Anesgart, Martin N., Aeronautical Systems Div., USA; Jan. 1997; 48p; In English

Report No.(s): AD-A328628; ASC-TR-97-5004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

C-17 Human Factors conducted an evaluation of the C-17A Forward Loadmaster Station (FLS) Interface in the Loadmaster Simulator at Altus AFB, OK from 28 July to 1 August 1996. by executing five training scenarios containing malfunctions, ten airdrop certified loadmasters provided information on the quality of the Station interface through rating panels, annunciators and switches on six point scales of adequacy and through responding to questions involving 'Situation Awareness' (SA). Although the loadmasters generally viewed their interaction with the FLS as adequate, a repeated measures analysis on a composite of ratings and SA supported the contention that as the number and complexity of task elements increased, the ability of the FLS to aid the loadmaster in performance of the mission decreased. A follow-on ranking procedure of the average ratings demonstrated that the FLS did not give clear and full information for all phases of airdrop. Uncertainty was the primary factor contributing to a potential, serious diminishment of the loadmaster's capacity to respond in anomalous situations. Suggestions for improvements included decluttering of displays and simplification of switch actuation sequences.

DTIC

*Human Factors Engineering; C-17 Aircraft; Airdrops; Malfunctions; Flight Simulation*

**19970031947** CHI Systems, Inc., Lower Gwynedd, PA USA

**SH-60R Operator Machine Interface Enhancement (SHOMIE) *Monthly Report, 1 Jun. - 31 Jul. 1997***

Glenn, Floyd, CHI Systems, Inc., USA; Aug. 14, 1997; 4p; In English

Contract(s)/Grant(s): N00421-97-C-1133

Report No.(s): AD-A328544; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A systematic approach, designated SH-60R Operator Machine Interface Enhancement (SHOMIE), is proposed for developing decision aid enhancements to the SENSO and ATO crew stations of the SH-60R aircraft which is currently under development by the Navy. The methodology begins with determination of functional performance requirements via a technique based primarily, but not exclusively, on cognitive task analysis. Cognitive performance limitations are determined both analytically and empirically and then used to derive functional requirements for decision aid concepts to overcome the identified limitations. Relevant software and algorithmic techniques for realizing the desired functionality are then derived from an evaluation of viable candidates obtained from a taxonomic analysis of aiding technologies. Finally, the decision aid concepts are specified as structured architectural designs which are then implemented as software prototypes. The Phase 1 effort will focus primarily on the SENSO crewstation because the SENSO's tasks are expected to be changed more radically than the ATO's with the introduction of new sensor information processing software. Also to restrict the scope of the effort to a manageable level and still assure operational relevance, we propose to focus on the domain of acoustic search and localization in littoral ASW missions. CHI Systems has worked extensively in this domain, having developed a variety of ASW decision aids, training tools, cognitive task analyses, and testbeds, all of which will greatly facilitate the development of the decision aids to be formulated by the SHOMIE methodology.

DTIC

*Algorithms; Decision Making; Functional Design Specifications; Mental Performance; Augmentation; Crew Workstations; Data Processing*

**19970032025** Molecular Geodesics, Inc., Cambridge, MA USA

**Biomimetic Materials for Pathogen Neutralization *Quarterly Report, 9 Jan. - 14 Jul. 1997***

Mikos, Anthony, Rice Univ., USA; Burns, Michael, Rice Univ., USA; Ingber, Donald, Molecular Geodesics, Inc., USA; Ezzell, Robert, Science, Math and Engineering, Inc., USA; Jul. 15, 1997; 19p; In English

Contract(s)/Grant(s): MDA972-97-C-0010; DARPA Order E905

Report No.(s): AD-A327399; MGITR9701; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this contract is to develop artificial 'smart' materials that may be used in protective bioskins, face masks, and venting systems for conventional battledress overgarments to capture and neutralize biological threat agents and chemical toxins before they enter into the body. The technical approach involves the development of computer-assisted design & manufacturing (CAD/CAM) and polymer chemistry fabrication technologies for the production of synthetic 'biomimetic' materials that exhibit the mechanical responsiveness and biochemical processing capabilities of living cells and tissues. We also will develop a novel optical fiber technology for delivery of germicidal UV radiation within the interstices of the material. Since the initiation of funding, our CAD/CAM team has focused on designing and fabricating geodesic scaffolds using a variety of rapid prototyping techniques. We have successfully mastered multiple CAD software programs and have used this approach in conjunction with rapid prototyping technologies (stereolithography and selective laser sintering) to design and manufacture epoxy, acrylic, and nylon

scaffolds with defined microstructure and strut sizes as small as 250 microns in diameter. Mechanical testing confirmed that our first rigid geodesic scaffold was 25 times more flexible than a solid block of equal size and shape made from the same material. We also have begun to use computerized engineering analysis to mechanically test potential structural configurations (e.g., hinges, different geometries) on the computer prior to fabrication. In addition, prototypes of geodesic scaffold 'cassettes' have been produced for future use in aerosol studies with biological warfare agents. Our Polymer Chemistry group has synthesized its first porous hydrogels and characterized their porosity, water binding capacities, and microstructure.

**DTIC**

*Biochemistry; Computer Aided Design; Computer Aided Manufacturing; Masks; Protective Clothing; Polymer Chemistry; Optical Fibers; Fabrication; Epoxy Resins; Chemical Warfare*

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