

NASA/SP—1998-7011/SUPPL481  
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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)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

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# AEROSPACE MEDICINE AND BIOLOGY

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*A Continuing Bibliography (Suppl. 481)*

DECEMBER 28, 1998

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## LIFE SCIENCES (GENERAL)

**19980237014** NASA Lewis Research Center, Cleveland, OH USA

### **Chemical Gas Sensors for Aeronautic and Space Applications 2**

Hunter, G. W., NASA Lewis Research Center, USA; Chen, L. Y., NASA Lewis Research Center, USA; Neudeck, P. G., NASA Lewis Research Center, USA; Knight, D., Cortez 3 Service Corp., USA; Liu, C. C., Case Western Reserve Univ., USA; Wu, Q. H., Case Western Reserve Univ., USA; Zhou, H. J., Case Western Reserve Univ., USA; Makel, D., Makel Engineering, Inc., USA; Liu, M., Georgia Inst. of Tech., USA; Rauch, W. A., Georgia Inst. of Tech., USA; Oct. 1998; 16p; In English; Sensor Expo, 19-21 May 1998, San Jose, CA, USA; Sponsored by Sensors Magazine, USA

Contract(s)/Grant(s): RTOP 242-20-00

Report No.(s): NASA/TM-1998-208504; NAS 1.15:208504; E-11309; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Aeronautic and Space applications require the development of chemical sensors with capabilities beyond those of commercially available sensors. Areas of most interest include launch vehicle safety monitoring emission monitoring and fire detection. This paper discusses the needs of aeronautic and space applications and the point-contact sensor technology being developed to address these needs. The development of these sensor is based on progress two types of technology: 1) Micro-machining and micro-fabrication technology to fabricate miniaturized sensors. 2) The development of high temperature semiconductors, especially silicon carbide. Sensor development for each application involves its own challenges in the fields of materials science and fabrication technology. The number of dual-use commercial applications of this micro-fabricated gas sensor technology make this area of sensor development a field of significant interest.

Author

*Silicon Carbides; Semiconductors (Materials); Miniaturization; Launch Vehicles; High Temperature Environments; Gas Detectors; Exhaust Gases; Exhaust Emission; Detection*

**19980237271** NASA Marshall Space Flight Center, Huntsville, AL USA

### **Evidence for Microfossils in the Murchison Meteorite**

Hoover, Richard B., NASA Marshall Space Flight Center, USA; Nature; [1997]; ISSN 0028-0836; 6p; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Evidence for the existence of possible microfossils in-situ in the Murchison meteorite has been obtained by investigations carried out with the Environmental Scanning Electron Microscope (ESEM). A diverse population of coccoid, filamentous, and "mushroom" shaped bodies have been discovered by examining uncoated, freshly broken, pieces of the meteorite. Energy Dispersive Spectroscopy (EDS) x-ray analysis reveals a high carbon concentration within the "mushroom" forms. Optical microscopy images show these bodies are black in color and resemble the Murchison rock. Their x-ray spectral signature exhibits characteristics of the overlying elemental signature of the Murchison matrix. These biological-like microstructures have not been identifiable with known terrestrial microorganisms, and recent terrestrial contamination is not considered the probable source. It is suggested that microorganisms may have contaminated the Murchison parent body as a result of microbial laden debris thrown off Earth, Mars (or some other body where microbial life already existed) by impact ejection mechanisms. The forms found in the meteorite are interpreted to represent the lithified remains (microfossils) of microbiological entities that were present on the Murchison meteorite before it fell to Earth in 1969.

Author

*Microorganisms; Fossils; Murchison Meteorite; Scanning Electron Microscopy; Spectral Signatures; Microbiology; X Ray Analysis*

**19980237340** NASA Marshall Space Flight Center, Huntsville, AL USA

**Phosphate Biomineralization of Cambrian Microorganisms**

McKay, David S., NASA Johnson Space Center, USA; Rozanov, Alexei Yu., Russian Academy of Natural Sciences, Russia; Hoover, Richard B., NASA Marshall Space Flight Center, USA; Westall, Frances, NASA Johnson Space Center, USA; 1998; 8p; In English; Optical Science, Engineering and Instrumentation, 9 Jun. 1998, Bellingham, WA, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

As part of a long term study of biological markers (biomarkers), we are documenting a variety of features which reflect the previous presence of living organisms. As we study meteorites and samples returned from Mars, our main clue to recognizing possible microbial material may be the presence of biomarkers rather than the organisms themselves. One class of biomarkers consists of biominerals which have either been precipitated directly by microorganisms, or whose precipitation has been influenced by the organisms. Such microbe-mediated mineral formation may include important clues to the size, shape, and environment of the microorganisms. The process of fossilization or mineralization can cause major changes in morphologies and textures of the original organisms. The study of fossilized terrestrial organisms can help provide insight into the interpretation of mineral biomarkers. This paper describes the results of investigations of microfossils in Cambrian phosphate-rich rocks (phosphorites) that were found in Khubsugul, Northern Mongolia.

Author

*Microorganisms; Fossils; Meteorites; Organisms; Phosphates*

**19980237466** California Univ., Computer Science Dept., Los Angeles, CA USA

**Propagation of Electrical Excitation in a Ring of Cardiac Cells: A Computer Simulation Study**

Kogan, B. Y., California Univ., USA; Karplus, W. J., California Univ., USA; Karpoukhin, M. G., California Univ., USA; Roizen, I. M., California Univ., USA; Chudin, E., California Univ., USA; Qu, Z., California Univ., USA; Simulation Modelling in Bioengineering; 1996; 13p; In English

Contract(s)/Grant(s): NCC2-374; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The propagation of electrical excitation in a ring of cells described by the Noble, Beeler-Reuter (BR), Luo-Rudy I (LR I), and third-order simplified (TOS) mathematical models is studied using computer simulation. For each of the models it is shown that after transition from steady-state circulation to quasi-periodicity achieved by shortening the ring length (RL), the action potential duration (APD) restitution curve becomes a double-valued function and is located below the original (that of an isolated cell) APD restitution curve. The distributions of APD and diastolic interval (DI) along a ring for the entire range of RL corresponding to quasi-periodic oscillations remain periodic with the period slightly different from two RLs. The 'S' shape of the original APD restitution curve determines the appearance of the second steady-state circulation region for short RLs. For all the models and the wide variety of their original APD restitution curves, no transition from quasi-periodicity to chaos was observed.

Author

*Computerized Simulation; Chaos; Mathematical Models*

**19980237697** Genometrix, Inc., The Woodlands, TX USA

**An Advanced Approach to Simultaneous Monitoring of Multiple Bacteria in Space Final Report**

Eggers, M., Genometrix, Inc., USA; Mar. 1998; 30p; In English

Contract(s)/Grant(s): NAS5-97183

Report No.(s): NASA/CR-1998-206889; NAS 1.26:206889; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The utility of a novel microarray-based microbial analyzer was demonstrated by the rapid detection, imaging, and identification of a mixture of microorganisms found in a waste water sample from the Lunar-Mars Life Support Test Project through the synergistic combination of: (1) judicious RNA probe selection via algorithms developed by University of Houston scientists; (2) tuned surface chemistries developed by Baylor College of Medicine scientists to facilitate hybridization of rRNA targets to DNA probes under very low salt conditions, thereby minimizing secondary structure; and (3) integration of the microarray printing and detection/imaging instrumentation by Genometrix to complete the quantitative analysis of microorganism mixtures.

Derived from text

*Microorganisms; Waste Water; Life Support Systems; Ribonucleic Acids; Deoxyribonucleic Acid*

**19980237901** NASA Ames Research Center, Moffett Field, CA USA

**Life and Microgravity Sciences Spacelab Mission: Human Research Pilot Study**

Arnaud, Sara B., Editor, NASA Ames Research Center, USA; Walker, Karen R., Editor, Walker and Associates, USA; Hargens, Alan, Editor, NASA Ames Research Center, USA; Apr. 1996; 56p; In English

Contract(s)/Grant(s): RTOP 106-30-32; RTOP 199-97-62-13; RTOP 199-97-62-16



Report No.(s): NASA-TM-110395; A-960597; NAS 1.15:110395; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Life Sciences, Microgravity Science and Spacelab Mission contains a number of human experiments directed toward identifying the functional, metabolic and neurological characteristics of muscle weakness and atrophy during space flight. To ensure the successful completion of the flight experiments, a ground-based pilot study, designed to mimic the flight protocols as closely as possible, was carried out in the head-down tilt bed rest model. This report records the rationales, procedures, preliminary results and estimated value of the pilot study, the first of its kind, for 12 of the 13 planned experiments in human research. The bed rest study was conducted in the Human Research Facility at Ames Research Center from July 11 - August 28, 1995. Eight healthy male volunteers performed the experiments before, during and after 17 days bed rest. The immediate purposes of this simulation were to integrate the experiments, provide data in a large enough sample for publication of results, enable investigators to review individual experiments in the framework of a multi-disciplinary study and relay the experience of the pilot study to the mission specialists prior to launch.

Author

*Bed Rest; Musculoskeletal System; Physiological Responses; Head Down Tilt; Space Environment Simulation; Atrophy; Muscles*

**19980237981** Indiana Univ., Indianapolis, IN USA

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

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

Contract(s)/Grant(s): NAG2-756; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

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

Author

*Cells (Biology); Autoradiography; Bone Demineralization; Microgravity; Nuclear Models; Deoxyribonucleic Acid*

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### AEROSPACE MEDICINE

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

**19980236995** Brown Univ., Dept. of Pathology, Providence, RI USA

**Tissue Engineering Skeletal and Cardiac Muscle Organs with Mechanical Forces**

Vandenburgh, Herman H., Brown Univ., USA; Engineering in Medicine and Biology; 1997; 26p; In English; Sponsored in part by Miriam Foundation; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Tissue engineering is a new discipline for the in vitro construction of organs such as the pancreas, liver, skin, cartilage, bone, muscle, and blood vessels where the primary goal is to replace the function of a deficient organ. As an alternative to the transplantation of whole organs, which are in critically short supply, tissue engineers will isolate and expand differentiated cells in tissue culture into a complex organ-like structure which can function properly when implanted in vivo. By definition, an organ is a multi-layered structure made up of at least two primary cell types, muscle, nerve, epithelium, and/or connective tissue. Therefore tissue engineering will require the proper interactions of a mixture of cell types in the correct ratios and interconnections, and will be dependent on developing new tissue culture techniques for growing multiple cell types in three dimensions.

Derived from text

*Tissues (Biology); Blood Vessels; Heart; Epithelium; Culture Techniques; Connective Tissue; Pancreas; Liver; Bones*

**19980237079** Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia

**Physical Work and Cognitive Function During Acute Heat Exposure before and after Heat Acclimation**

Patterson, Mark J., Defence Science and Technology Organisation, Australia; Taylor, Nigel A., Defence Science and Technology Organisation, Australia; Amos, Denys, Defence Science and Technology Organisation, Australia; Jun. 1998; 44p; In English  
Report No.(s): AD-A352863; DSTO-TR-0683; DODA-ARO-010-569; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Eight physically active males, without a history of heat acclimation were studied during heat exposure for 22 consecutive days. Physiological adaptation and cognitive function were evaluated during heat stress tests. Four cognitive function tests were administered at intervals during the study. These tests involved assessment of perceptual function, spatial orientation, temporal orientation and vigilance. The observations show that heat acclimation improves the capacity to perform physical work in the heat. However, neither unfamiliar nor habitual heat strain appear to induce attentional disturbances, temporal or spatial disorientation, or altered visual perception, as quantified within this experimental design. While these data indicate that cognitive function is not affected by heat, it is possible that the cognitive function tests used were not sufficiently sensitive to quantify heat-induced impairment. It is also possible that changes may only appear in more complex cognitive tasks.

DTIC

*Acclimatization; Spatial Distribution; Exposure; Heat Tolerance; Physiological Responses; Heat Acclimatization; Temperature Effects; Mental Performance*

**19980237309** Rothe Development, Inc., San Antonio, TX USA

**Effect of G-Suit Protection on Carotid-Cardiac Baroreflex Function Final Report**

Convertino, Victor A., Rothe Development, Inc., USA; Reister, Craig A., Rothe Development, Inc., USA; Sep. 1998; 18p; In English

Contract(s)/Grant(s): AF Proj-2300

Report No.(s): AD-A353566; AFRL-HE-BR-TP-1998-0074; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To test the hypothesis that 0-suit inflation could increase cardiac chronotropic responses to baroreceptor stimulation and enhance baroreflex buffering of blood pressure, the carotid-cardiac baroreflex response of 12 subjects was measured across two levels of lower body negative pressure (LBNP = 0 and 50 mm Hg) and two levels of 0-suit inflation (0 and 50 mm Hg) in random order. Carotid-cardiac baroreflex stimulation was delivered via a silastic neck pressure cuff and responsiveness quantified by determination of the maximum slope of the stimulus-response function between R-R intervals (ms) and their respective carotid distending pressures (mm Hg). Mean  $\pm$  SE baseline control baroreflex responsiveness was  $3.8 \pm 0.4$  ms/mm Hg. LBNP reduced the baroreflex response to  $2.7 \pm 0.4$  ms/mmHg ( $P$  less than 0.05), but 0-suit inflation, both with and without LBNP, restored the baroreflex response to  $4.4 \pm 0.7$  and  $4.3 \pm 0.6$  ms/mmHg, respectively. These results suggest that, in addition to increased venous return and elevated peripheral resistance, 0-suit inflation may provide protection against the debilitating effects of blood distribution to the lower extremities during 0 acceleration by increasing cardiovascular responsiveness to carotid baroreceptor stimulation.

DTIC

*Blood Pressure; Hypotheses; Carotid Sinus Body; Arteries; Baroreceptors*

**19980237317** Brown Univ., Dept. of Pathology, Providence, RI USA

**Methods for the Organogenesis of Skeletal Muscle in Tissue Culture**

Vandenburgh, Herman, Brown Univ., USA; Shansky, Janet, Brown Univ., USA; DeTatto, Michael, Brown Univ., USA; Chromiak, Joseph, Brown Univ., USA; Methods in Tissue Engineering; 1997; 18p; In English

Contract(s)/Grant(s): NAGw-4674; NAG2-914; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Skeletal muscle structure is regulated by many factors, including nutrition, hormones, electrical activity, and tension. The muscle cells are subjected to both passive and active mechanical forces at all stages of development and these forces play important but poorly understood roles in regulating muscle organogenesis and growth. For example, during embryogenesis, the rapidly growing skeleton places large passive mechanical forces on the attached muscle tissue. These forces not only help to organize the proliferating mononucleated myoblasts into the oriented, multinucleated myofibers of a functional muscle but also tightly couple the growth rate of muscle to that of bone. Postnatally, the actively contracting, innervated muscle fibers are subjected to different patterns of active and passive tensions which regulate longitudinal and cross sectional myofiber growth. These mechanically-induced organogenic processes have been difficult to study under normal tissue culture conditions, resulting in the development of numerous methods and specialized equipment to simulate the in vivo mechanical environment. These techniques have led to the "engineering" of bioartificial muscles (organoids) which display many of the characteristics of in vivo muscle including parallel arrays of postmitotic fibers organized into fascicle-like structures with tendon-like ends. They are contractile, express adult

isoforms of contractile proteins, perform directed work, and can be maintained in culture for long periods. The in vivo-like characteristics and durability of these muscle organoids make them useful for long term in vitro studies on mechanotransduction mechanisms and on muscle atrophy induced by decreased tension. In this report, we described a simple method for generating muscle organoids from either primary embryonic avian or neonatal rodent myoblasts.

Derived from text

*Bones; Cells (Biology); Culture Techniques; Embryology; Musculoskeletal System*

**19980237351** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Reduction of Invalid Assessments During Cycle Ergometry Testing**

Pritt, Wayne M., Air Force Inst. of Tech., USA; Sep. 09, 1998; 43p; In English

Report No.(s): AD-A353145; AFIT-98-060; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This investigation will measure the magnitude of the reduction in cycle ergometry invalid test results manifested by a change in the definition of steady-state heart rate from 3 beats per minute to 5 or 6 beats per minute. It will further assess the possible impact of such a change on the ability of the CET to accurately predict aerobic capacity.

DTIC

*Ergometers; Biology*

**19980237750** Georgetown Univ., Medical Center, Washington, DC USA

**Dysregulation of the Stress Response in the Persian Gulf Syndrome Annual Report, 6 May 1997 - 5 May 1998**

Jun. 1998; 14p; In English

Contract(s)/Grant(s): DAMD17-96-1-6042

Report No.(s): AD-A353771; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In 1990 and 1991, the U.S. deployed approximately 700,000 troops to the Persian Gulf to liberate Kuwait from Iraqi occupation. Fortunately, there were relatively few combat and non-combat related injuries and diseases during this conflict in comparison with previous military campaigns, and most veterans of this conflict who did develop illness had diagnosable and treatable conditions. However, the symptoms of approximately 20% of those with symptoms have not been explained, and this constellation of symptoms occurring in this setting has been termed the Persian Gulf Syndrome (PGS).

DTIC

*Diseases; Signs and Symptoms; Sickneses*

**19980237770** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Core Temperature and Energy Expenditure During the Crucible Exercise at Marine Corps Recruit Depot, Parris Island**

Castellani, John W.; Hoyt, Reed W.; Young, Andrew J.; DeLany, James P.; Gonzalez, Richard R.; Sep. 1998; 28p; In English

Report No.(s): AD-A354030; USARIEM-T98-26; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In January and February, 1998, fifty Marine Recruits (thirty men, twenty women) were studied during the Crucible, a 54 hour training exercise which culminates Marine Corps Recruit Basic Training. The purpose of this study was to measure body core temperature and energy expenditure during the Crucible to: 1) assess the risk of hypothermia and 2) determine if ration restrictions should be eased. Core temperature was measured with a lightweight (3 oz) Body Core Temperature Monitor (BCTM) and an FDA-approved ingestible temperature sensor. Energy expenditure was measured using the doubly labeled water (D2180) technique. Energy intake was estimated by collecting Meal Ready to Eat (MRE) ration wrappers saved by each volunteer during the exercise. Weather data were obtained from portable stations. Results: 1) mean maximum core temperature was 38.51 C (range, 38.15-39.14 C); 2) mean minimum core temperature was 35.97 C (range, 35.28-36.64 C); 3) mean energy expenditure (kcal) over 54-h was 13,790 plus or minus 410 (6128 kcal/day) and 10,635 plus or minus 315 (4727 kcal/day) for the men and women, respectively; 4) mean energy intake for 54-h was 3,200 and 2,600 kcals for the men and women, respectively; 5) mean air temperature was 10.8 C (range, 3.6-18.8 C) in January and 13.8 C (range, 6.3-21.4 C) in February. In conclusion, mean core temperature did not fall to hypothermic levels (<35.5C) and the energy deficit was approximately 10,100 kcal in the men and 7,700 kcal in the women.

DTIC

*Temperature Sensors; Body Temperature; Physical Exercise; Cores; Crucibles*

**19980237931** Naval Postgraduate School, Monterey, CA USA

**The Effects of Sopite Syndrome on Self-Paced Airsickness Desensitization Program**

Flaherty, Michelle A.; Sep. 1998; 78p; In English

Report No.(s): AD-A354296; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The U. S. Navy implemented the Self-Paced Airsickness Desensitization (SPAD) program in 1989 for aviation students whose incidence of airsickness was not easily resolved. Some participants may have also experienced symptoms that are not typically recognized as motion sickness, including prolonged drowsiness and/or mood changes. These effects are part of a poorly understood response to motion termed "Sopite Syndrome." This thesis explores the effects of Sopite Syndrome on student aviators diagnosed with motion sickness. Sixty SPAD program participants completed a survey comprised of scales, which estimate motion sickness, drowsiness, fatigue, and sleep disturbances during SPAD treatment days. Results indicate: (1) symptoms consistent of Sopite Syndrome were reported by 45% of the participants and (2) the presence of Sopite Syndrome in a SPAD participant was not an accurate predictor for successful treatment and return to flight status.

DTIC

*Signs and Symptoms; Motion Sickness; Aircraft Pilots*

**19980237938** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**A Comparison of 8-Hour versus 12-Hour Shifts on Performance, Health and Safety in a USAF Aircraft Maintenance Squadron**

Scott, Kelly J.; Sep. 1998; 63p; In English

Report No.(s): AD-A354347; AFIT/GLM/LAL/98S-11; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This study examined the effects of converting a large USAF aircraft maintenance squadron from an 8-hour shift system to a 12-hour shift system. In 1996, the squadron converted its 24-hour operations from three 8-hour work shifts, to two 12-hour work shifts with compressed work weeks. The squadron maintained 12-hour shifts for 19 consecutive months. A comparison was made of organizational performance, worker health and safety measures before, during and after 12-hour shift implementation. Findings indicated that changing from 8- to 12-hour shifts resulted in a slight increase in aircraft Mission Capability rates. However, this benefit appears to have come at the expense of worker health, as evidenced by a ten-fold increase in worker sick-call visits to the base hospital. Additionally, the squadron expended a higher proportion of direct labor hours in support of the flying schedule. There were no significant differences in any other aircraft reliability, maintenance repair or deferred maintenance indicators. On- and off-duty accident rates were also examined. There were no significant differences noted between mean 8- and 12-hour shift accident rates. The decision to implement 12-hour shifts is one that must be made with careful consideration of the costs and benefits identified in this study.

DTIC

*Aircraft Maintenance; Operator Performance; Health; Schedules*

**19980237951** Defence and Civil Inst. of Environmental Medicine, Toronto, Ontario Canada

**Shivering Capacity and Prediction of Survival Time *Final Report***

Tikuiss, Peter; Apr. 1998; 15p; In English

Report No.(s): AD-A353706; DCIEM-98TM-45; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The accuracy of prediction models of survival time for cold exposure depends heavily on the estimation of shivering capacity which is poorly understood. The purpose of this study was to measure shivering endurance which was hypothesized to diminish through pre-exposure exercise. Thirteen healthy and fit males participated in an experiment designed to test their shivering response following 5 h of high intensity mixed exercise during which only water was consumed. Following exercise for the fatigue trial or beginning in a fresh state for the control trial, and instrumentation for physiological monitoring (rectal and skin temperatures, metabolic rate, heat loss, heart rate, EMG), subjects assumed a seated position in a 10 C air environment wearing shorts, t-shirt, rainhat, and neoprene boots and gloves. After 30 min, the subjects were showered continuously with cold water on their backs accompanied by a 6 per km per h wind for up to 4 h. Three subjects lasted the complete duration for both trials. While shivering fatigue was not observed, there were vast differences in the shivering response of the subjects which, in addition to body fatness, influenced duration. The results also indicate an over-reliance on glycogen stores for shivering in the present prediction model based on the subject's utilization of fat during shivering in the fatigue trial.

DTIC

*Shivering; Predictions; Physiology; Cold Tolerance; Endurance*

## BEHAVIORAL SCIENCES

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

**19980237472** Anacapa Sciences, Inc., Santa Barbara, CA USA

**Combat Mission Training Research at the 58th Special Operations Wing: A Summary Final Report, Sep. 1995 - Jun. 1997**

Spiker, V. A., Anacapa Sciences, Inc., USA; Nullmeyer, Robert T., Anacapa Sciences, Inc., USA; Tourville, Steven J., Anacapa Sciences, Inc., USA; Silverman, Denise R., Anacapa Sciences, Inc., USA; Jul. 1998; 58p; In English

Contract(s)/Grant(s): F41624-95-C-5011; AF Proj. 1123

Report No.(s): AD-A353096; AL/HR-TR-1997-0182; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report summarizes three empirical studies conducted at Kirtland Air Force Base during 1995-1997. The first study examined the relationship between crew resource management (CRM) processes and mission performance for MC-130P Combat Shadow crews who were receiving annual simulator refresher training. Using independent assessments of process and performance, a strong, positive correlation ( $r=.86$ ) was observed between CRM effectiveness at the crew-level and their performance during a simulated tactical mission. A strong association between the quality of a crew's mission planning activities and subsequent mission performance ( $r=.60$ ) was also observed. A second study investigated human factors characteristics of an aerial gunner/scanner simulator (AGSS) recently installed at the 58th Special Operations Wing. The AGSS is a virtual reality (VR) training device that uses a CRT-based, helmet-mounted display and a three degree-of-freedom motion base to train rotary-wing gunners and scanners. A usability assessment by 11 aerial gunner instructors showed that while the device's VR properties have enormous training potential, the device's human factors aspects need improvement, including the CRTs, head tracker, fitting procedures, and cables. A third study explored the impact of networked simulation on combat mission training. Ninety-nine crewmembers participating in nine networked training exercises were surveyed following training in which MH-53J, MH-60G, TH-53A, and MC-130P weapon system trainers were linked. Survey results strongly support the value of networked training in such areas as multiship tactics, aerial refueling operations, formation flight, situation awareness, and mission team coordination. Areas in need of improvement include establishing training objectives, incorporating emergency procedures into the scenario, and leveling the task demands across crew positions and weapon systems.

DTIC

*Computerized Simulation; Flight Crews; Training Devices; Research; Numerical Analysis; Resources Management; Human Performance; Human Factors Engineering*

**19980237915** Ergocenter, Tver, Russia

**Psychophysiological Substantiation of the Mode of Piloted Aircraft's Spatial Attitude Information Presentation on a Helmet-Mounted Display in Complex Aircraft's Spatial Altitude Identification and Its Leveling Final Report**

Shlayen, P. Y.; Jan. 1998; 69p; In English

Contract(s)/Grant(s): F6170897W0031

Report No.(s): AD-A353934; SPC-97-4008; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report results from a contract tasking Ergocenter as follows: The contractor will (1) Formulate the theoretical concepts of human spatial orientation in flight and psychophysiological principles of helmet mounted display (HMD) design for representation of aircraft spatial attitude position and determine the factors that increase and decrease the efficiency of a HMD as a spatial orientation indicator; (2) Study the psychophysiological particularities of visual perception while using the various versions of a HMD; and (3) Substantiate on a basis of analysis of performed investigations the recommendation on the scope and form of presentation to a flyer the basic information about spatial attitude position of a steered aircraft for HMD visor during unusual attitude recognition and its recovery to flat and level flight.

DTIC

*Psychophysiology; Attitude (Inclination); Helmet Mounted Displays; Spatial Distribution; Aircraft*

**19980237942** Morehouse School of Medicine, Atlanta, GA USA

**Brain in Space: A Teacher's Guide with Activities for Neuroscience**

Sullivan, Walter W., Jr., Morehouse School of Medicine, USA; 1998; 186p; In English

Contract(s)/Grant(s): NCC2-936

Report No.(s): PB98-173636; NASA-EG-1998-03-118-HQ; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The lessons and activities in this guide will engage your students in the excitement of space life science investigations after the Neurolab Spacelab mission. It is the authors' goal that the information in this guide will inspire both you and your students to become interested and active participants in this space mission. Few experiences can compare with the excitement and thrill

of watching a Shuttle launch. This guide provides an opportunity for you and your students to go one step further by conducting the experiments on Earth that are relevant to the research conducted in space.

NTIS

*Brain; Space Missions; Neurology*

## 54

### MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

**19980237086** Sanders Associates, Inc., VentureStar Reusable Launch Vehicle Program, Nashua, NH USA

**RLV Vehicle Health Management System Modeling and Simulation: Reducing Program Costs and Increasing Mission Success**

Wangu, Srimal, Sanders Associates, Inc., USA; May 15, 1998; 10p; In English; RLV, 29 Jun. 1998, Cocoa Beach, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NCC8-115; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Sanders, a Lockheed Martin Company, is leading the development and integration of the Vehicle Health Management (VHM) system for Lockheed Martin's VentureStar Reusable Launch Vehicle. The primary objective of this effort is to provide an automated health status and decision-making system for the vehicle. A detailed simulation of the VHM system on RLV is currently being developed using the Foresight Design and Modeling Tool. The simulation will consist of models of key components of the RLV VHM system. An effective detailed system simulation will allow for system and design engineering, as well as program management teams, to accurately and efficiently evaluate system designs, analyze the behavior of current systems, and predict the feasibility of making smooth and cost-efficient transitions from older technologies to newer ones. This methodology will reduce program costs, decrease total program life-cycle time, and ultimately increase mission success.

Author

*Reusable Launch Vehicles; Management Systems; Cost Reduction; Project Management*

**19980237253** NASA Marshall Space Flight Center, Huntsville, AL USA

**Applying Human Factors in Payload Display Design**

Dunn, Mariea C., NASA Marshall Space Flight Center, USA; Hutchinson, Sonya L., NASA Marshall Space Flight Center, USA; 1998; 5p; In English, 28-30 Sep. 1998, Anaheim, CA, USA; Sponsored by Society of Automotive Engineers, Inc., USA

Report No.(s): Rept-98WAC-16; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The payload display design process is intended to assist in designing visual computer interfaces that appropriately support astronauts' interaction with payload displays that fly on missions and yet provide the needed results for the scientists. Standardization of displays will minimize training cost and time while maximizing display usability. This paper proposes a framework for developing displays that integrates human factors design techniques at each step. The fundamental principles upon which the framework is based encompass traditional aspects of human computer interface design, systems design, and human performance.

Author

*Human Factors Engineering; Systems Engineering; Payloads; Human-Computer Interface; Computer Design*

**19980237261** Virginia Univ., Dept. of Chemical Engineering, Charlottesville, VA USA

**Effects of Humidity Swings on Adsorption Columns for Air Revitalization: Modeling and Experiments Final Report, 16 Jan. 1994 - 15 Jan. 1997**

LeVan, M. Douglas, Virginia Univ., USA; Finn, John E., NASA Ames Research Center, USA; 1997; 13p; In English

Contract(s)/Grant(s): NCC2-5024; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this research was to develop a dynamic model which can predict the effect of humidity swings on activated carbon adsorption beds used to remove trace contaminants from the atmosphere in spacecraft. Specifically, the model was to be incorporated into a computer simulation to predict contaminant concentrations exiting the bed as a function of time after a humidity swing occurs. Predicted breakthrough curves were to be compared to experimentally measured results. In all respects the research was successful. The two major aspects of this research were the mathematical model and the experiments. Experiments were conducted by Mr. Appel using a fixed-bed apparatus at NASA-Ames Research Center during the summers of 1994 and 1995 and during the first 8 months of 1996. Mr. Appel conducted most of his mathematical modeling work at the University of Virginia. The simulation code was used to predict breakthrough curves using adsorption equilibrium correlations developed previously by

M. D. LeVan's research group at the University of Virginia. These predictions were compared with the experimental measurements, and this led to improvements in both the simulation code and the apparatus.

Author

*Meteorology; Atmospheric Density; Climatology; Humidity; Atmospheric Moisture; Meteorological Parameters; Moisture Content; Vapor Pressure; Water Vapor; Trace Contaminants; Air Purification*

**19980237296** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Report on the Evaluation of Two Prototype Chemical Protective Clothing Garments**

Santee, W. R., Army Research Inst. of Environmental Medicine, USA; Blanchard, L. A., Army Research Inst. of Environmental Medicine, USA; Gonzalez, J. A., Army Research Inst. of Environmental Medicine, USA; MacLeod, D. W., Army Research Inst. of Environmental Medicine, USA; Aug. 1998; 33p; In English

Report No.(s): AD-A353652; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The study evaluated the heat strain experienced by seven soldiers exposed to heat stress while exercising in prototype and issue chemical protective (CP) garments in Mission Oriented Protective Posture (MOPP-1). The control garments were the issue Chemical Protective Undergarment (CPU) and Marine Saratoga Overgarment (CPO). The prototype (X) garments were light-weight CPO and CPUs. Testing consisted of 100 min exposures to thermoneutral (20C, 50% RH), desert (49C, 20% RH) and tropic (35C, 75% RH) environments while walking at 1.34 m-s<sup>-1</sup> (3 mph). Data included rectal temperatures and total endurance times (ET). In descending order of performance, the results indicate a joint ranking of the two overgarments, then the prototype undergarment (CPU-X) and, finally, the issue undergarment (CPU-C). One significant difference between the two overgarments indicated an advantage for the prototype (CPO-X), whereas other observations indicated that the issue overgarment (CPO-C) was a more "wearable" garment. The issue undergarment (CPU-C) was significantly different (worse) than the two overgarments. In fewer cases (49C), the prototype undergarment (CPU-X) did significantly worse than the overgarments. Between the two undergarments, all significant differences indicated that the prototype (CPU-X) would induce less thermal strain than the issue (CPU-C) undergarment.

DTIC

*Prototypes; Protective Clothing; Heat Tolerance; Posture; Garments; Stresses*

**19980237435** Conrad Technologies, Inc., Paoli, PA USA

**Manikin Test and Calibration System, Phase 1**

DeCleene, Donald F., Conrad Technologies, Inc., USA; Oslon, Mitchell B., Conrad Technologies, Inc., USA; Ploszay, James R., Conrad Technologies, Inc., USA; Jun. 02, 1997; 128p; In English

Contract(s)/Grant(s): N62269-96-C-0028

Report No.(s): AD-A353514; CTI961001; NAWCADPAX-97-256-TR; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The objective of this project is to develop a test fixture to facilitate dynamic testing and system-level calibrations of an anthropomorphic manikin vertebral column and head complex. The calibration fixture is necessary to evaluate and improve the predictive consistency of the systems-level biofidelic performance of a test manikin under conditions of loadings that are encountered in ejection and crash environments. An optimal design arrangement to meet the calibration requirements is provided by this Phase I report. The fixture design provides controlled, accurate and repeatable excitations to produce consistent and reliable calibrations. Additionally, the fixture design provides the versatility to conduct short duration dynamic tests of aircrew interaction with various seating and restraint systems designed for ejection or crash conditions. The fixture design incorporates computer interface for input of test parameters and a pneumatic and hydraulic drive system to provide programming of the acceleration profile. The dynamic system provides significantly improved calibration over the current static techniques. This dynamic calibration capability is essential to obtain manikin test results that are repeatable and allow the comparison of one set of test results with another. Improved manikin calibration is particularly important for the reliable evaluation of life support equipment.

DTIC

*Computers; Calibrating; Dynamic Tests; Mechanical Drives*

**19980237884** Air Force Inst. of Tech., School of Logistics and Acquisition Management, Wright-Patterson AFB, OH USA

**Technology Acceptance: A Fusion of Human-Computer Interaction and Management Information Systems Constructs**

Sep. 1998; 66p; In English

Report No.(s): AD-A354244; AFIT/GIS/LAS/98S-3; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In recent years, information technology has advanced at a pace that few would have anticipated. It has been estimated that the computing power of the modem desktop computer has been increasing at the rate of 1000% per decade. In combination with

the development of personal computers, the advent of networks and the world wide web provide unprecedented access to information and computing power. However, the problem of developing useful user interfaces remains a problem. In many military and commercial settings, the increased computing power offered by current information technology remains unexploited because of user interfaces that are difficult to use. This thesis reports on the examination of constructs related to user acceptance of information systems from two disciplines, human-computer interaction (HCI) and management information systems (MIS). More specifically, research was conducted to evaluate the possibility of overlap between the two divergent fields. The Technology Acceptance Model (TAM) from MIS research was examined in light of the HCI constructs of efficiency, effectiveness, and satisfaction. of interest was the impact of efficiency, effectiveness, and satisfaction on the formulation of user perceptions of ease of use. The empirical data suggests that satisfaction plays a major role in the formulation of user perceptions ( $p < 0.01$ ).

DTIC

*Human-Computer Interface; Management Information Systems*



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