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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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This issue of *Aerospace Medicine and Biology, A Continuing Bibliography with Indexes* (NASA SP-7011) lists 31 reports, articles, and other documents recently announced in the NASA STI Database.

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

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Typical Report Citation and Abstract

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

Key

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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 431)

JANUARY 27, 1997

51
LIFE SCIENCES (GENERAL)

19970001726 Marshall Univ., Huntington, WV USA
Interaction of Light and Ethylene on Stem Gravitropism ***Final Report***
Harrison, Marcia A., Marshall Univ., USA; Oct. 06, 1996; 76p; In English
Contract(s)/Grant(s): NAGw-3859; MURC Proj. 111-92-0046-00
Report No.(s): NASA-CR-202421; NAS 1.26:202421; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The major objective of this study was to evaluate light-regulated ethylene production during gravitropic bending in etiolated pea stems. Previous investigations indicated that ethylene production increases after gravistimulation and is associated with the later (counter-reactive) phase of bending. Additionally, changes in the counter-reaction and locus of curvature during gravitropism are greatly influenced by red light and ethylene production. Ethylene production may be regulated by the levels of available precursor (1-aminocyclopropane-l-carboxylic acid, ACC) via its synthesis, conjugation to malonyl-ACC or glutamyl-ACC, or oxidation to ethylene. The regulation of ethylene production by quantifying ACC and conjugated ACC levels in gravistimulated pea stemswas examined. Also measured was the changes in protein and enzyme activity associated with gravitropic curvature by electrophoretic and spectrophotometric techniques. An image analysis system was used to visualize and quantify enzymatic activity and transcriptional products in gravistimulated and red-light treated etiolated pea stem tissues.
Author
Electrophoresis; Enzyme Activity; Ethylene; Gravitropism; Proteins; Carboxylic Acids

19970001731 Wisconsin Univ., Biodynamics Lab., Madison, WI USA
An Evaluation of Collagen Metabolism in Non-Human Primates Associated with the Bion Space Program-Markers of Urinary Collagen Turnover and Muscle Tissue Collagen Types ***Progress Report***
Vailas, Arthur C., Wisconsin Univ., USA; Oct. 07, 1996; 26p; In English
Contract(s)/Grant(s): NAG2-769
Report No.(s): NASA-CR-202429; NAS 1.26:202429; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this paper was to study the residual effects in a growing animal during recovery from a micro-gravity environment and to examine the effects of caging upon the growth and maturation of the tibia and humerus in order for recommendations to be made in the implementation of suitable housing modules for future spaceflight research.
Derived from text
Urology; Tibia; Primates; Muscles; Microgravity; Metabolism; Humerus; Growth

19970001749 Society of Automotive Engineers, Inc., Warrendale, PA USA
Development of an Intermediate-Scale Aerobic Bioreactor to Regenerate Nutrients from Inedible Crop Residues
Finger, Barry W., Bionetics Corp., USA; Strayer, Richard F., Bionetics Corp., USA; 1994; ISSN 0148-7191; 12p; In English; 24th; 5th; Environmental Systems, 20-23 Jun. 1994, Friedrichshafen, Friedrichshafen, Germany, Germany
Contract(s)/Grant(s): NAG2-435
Report No.(s): NASA-CR-202467; NAS 1.26:202467; SAE-TP-941501; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Three Intermediate-Scale Aerobic Bioreactors were designed, fabricated, and operated. They utilized mixed microbial communities to bio-degrade plant residues. The continuously stirred tank reactors operated at a working volume of 8 L, and the average oxygen mass transfer coefficient, k(sub L)a, was 0.01 s(exp -1). Mixing time was 35 s. An experiment using inedible wheat residues, a replenishment rate of 0.125/day, and a solids loading rate of 20 gdw/day yielded a 48% reduction in biomass. Bioreactor

effluent was successfully used to regenerate a wheat hydroponic nutrient solution. Over 80% of available potassium, calcium, and other minerals were recovered and recycled in the 76-day wheat growth experiment.
Author
Bioreactors; Aerobes; Biomass Energy Production; Biomass; Nutrients; Minerals; Biodegradation

19970001750 National Aeronautics and Space Administration. Ames Research Center, Life Science Div., Moffett Field, CA USA
Stimulation of Myofibrillar Protein Synthesis in Hindlimb Suspended Rats by Resistance Exercise and Growth Hormone
Linderman, Jon K., National Aeronautics and Space Administration. Ames Research Center, USA; Whittall, Justen B., National Aeronautics and Space Administration. Ames Research Center, USA; Gosselink, Kristin L., National Aeronautics and Space Administration. Ames Research Center, USA; Wang, Tommy J., National Aeronautics and Space Administration. Ames Research Center, USA; Mukku, Venkat R., Genentech, Inc., USA; Booth, Frank W., Texas Univ., USA; Grindeland, Richard E., National Aeronautics and Space Administration. Ames Research Center, USA; Life Sciences; 1995; Volume 57, No. 8, pp. 755-762; In English
Contract(s)/Grant(s): RTOP 199-26-12-09
Report No.(s): NASA-CR-202481; NAS 1.26:202481; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of this study was to determine the ability of a single bout of resistance exercise alone or in combination with recombinant human growth hormone (rhGH) to stimulate myofibrillar protein synthesis (Ks) in hindlimb suspended (HLS) adult female rats. Plantar flexor muscles were stimulated with resistance exercise, consisting of 10 repetitions of ladder climbing on a 1 m grid (85 deg.), carrying an additional 50% of their body weight attached to their tails. Saline or rhGH (1 mg/kg) was administered 30’ prior to exercise, and Ks was determined with a constant infusion of H-3-Leucine at 15’, 60’, 180’, and 360’ following exercise. Three days of HLS depressed Ks is approx. equal to 65% and 30-40% in the soleus and gastrocnemius muscles, respectively (p is less than or equal to 0.05). Exercise increased soleus Ks in saline-treated rats 149% 60’ following exercise (p less than or equal to 0.05), decaying to that of non-exercised animals during the next 5 hours. Relative to suspended, non-exercised rats rhGH + exercise increased soleus Ks 84%, 108%, and 72% at 15’, 60’ and 360’ following exercise (p is less than or equal to 0.05). Gastrocnemius Ks was not significantly increased by exercise or the combination of rhGH and exercise up to 360’ post-exercise. Results from this study indicate that resistance exercise stimulated Ks 60’ post-exercise in the soleus of HLS rats, with no apparent effect of rhGH to enhance or prolong exercise-induced stimulation. Results suggests that exercise frequency may be important to maintenance of the slow-twitch soleus during non-weightbearing, but that the ability of resistance exercise to maintain myofibrillar protein content in the gastrocnemius of hindlimb suspended rats cannot be explained by acute stimulation of synthesis.
Author
Proteins; Protein Synthesis; Pituitary Hormones; Muscles; Flexors; Body Weight

19970001820 NASA Ames Research Center, Moffett Field, CA USA
Summary of Research: Study of Substrates in Microgravity
Bingham, Gail E., Utah State Univ., USA; Yendler, Boris S., Lockheed Martin Corp., USA; Kliss, Mark, NASA Ames Research Center, USA; [1996]; 23p; In English
Contract(s)/Grant(s): NCC2-5039
Report No.(s): NASA-CR-202572; NAS 1.26:202572; SDL/96-032; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An upcoming series of joint US-Russian plant experiments will use the granular Substrate Nutrient Delivery System (NDS) equipment developed by Russian and Bulgarian scientists for the Mir Space Station’s Svet greenhouse. The purpose of this study was to develop a better understanding of granular substrate water relations and to provide the ability to document water distribution in the Svet NDS during the space experiments. to this end, we conducted a study to expanded our understanding of substrate water behavior in granular substrates in microgravity. This report documents the results of our experiments with the Svet substrate water content sensor, explains the results observed in the Svet NDS during the 1990 Greenhouse experiment; describes the development of a miniature version of the Svet type (heat pulse) sensor that has been used to measure the distribution of water content inside the Svet NDS in space, and documents the calibration of these sensors and measurements conducted in both ground and space experiments,
Author
Microgravity Applications; Moisture Content; Spaceborne Experiments; Substrates; Greenhouses; Nutrients; Crop Growth

19970001821 NASA Johnson Space Center, Houston, TX USA

Effect of Gravity on the Mammalian Cell Deformation

Hung, R. J., Alabama Univ., USA; Tsao, Y., Krug Life Sciences, Inc., USA; Gonda, Steven, NASA Johnson Space Center, USA; 1995; 12p; In English; Life Sciences and Space Medicine Conference, 3-5 Apr. 1995, Houston, TX, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): KLS-P.O.-70511

Report No.(s): NASA-CR-202586; NAS 1.26:202586; AIAA Paper 95-1052; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

The effect of human cell immersed in culture liquid under a micro-gravity environment has been investigated. The study is based on the numerical simulation of the configuration of human cell affected by the time dependent variation of gravity acceleration ranging from 10(exp -3) to 2 g(sub o) (g(sub o) = 9.81 m/s(exp 2)) in 15 seconds. Both the free floating cell and the cell contacted to the upper and lower inclined walls imposed by the time-dependent reduced gravity acceleration are considered in this study. The results show that the cell configuration changes from spherical to horizontally elongated ellipsoid for both the free floating cell and the cell sitting on the lower inclined wall while the cell configuration varies from spherical to vertically elongated ellipsoid for the cell hanging to the upper inclined wall when the gravity acceleration increases. Experimental observations, carried out of human cells exposed to the variation of gravity levels, show that the results of experimental observations agree exactly with the theoretical model computation described in this paper. These results sre significant for humans exposed to the micro-gravity environment.

Author

Microgravity; Gravitational Effects; Cells (Biology); Culture Techniques; Deformation; Ellipsoids; Floating; Mammals

19970001926 Utah Univ., School of Medicine; Radiobiology Div., Salt Lake City, UT USA

Prostaglandin E2 Prevents Ovariectomy-Induced Cancellous Bone Loss in Rats

Ke, Hua Zhu, Utah Univ., USA; Li, Mei, Utah Univ., USA; Jee, Webster S. S., Utah Univ., USA; Bone and Mineral; 1992; ISSN 0169-6009; Volume 19, pp. 45 - 62; In English

Contract(s)/Grant(s): NAG2-435; AR-38346; DE-AC02-76EV-00119; DE-FG02-89ER-60764

Report No.(s): NASA-CR-202468; NAS 1.26:202468; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

The object of this study was to determine whether prostaglandin E2, (PGE2) can prevent ovariectomy induced cancellous bone loss. Thirty-five 3-month-old female Sprague-Dawley rats were divided into two groups. The rats in the first group were ovariectomized (OVX) while the others received sham operation (sham-OVX). The OVX group was further divided into three treatment groups. The daily doses for the three groups were 0,1 and 6 mg PGE2/kg for 90 days. Bone histomorphometric analyses were performed on double-fluorescent-labeled undecalcified proximal tibial metaphysis (PTM). We confirmed that OVX induces massive cancellous bone loss (-80%) and a higher bone turnover (+143%). The new findings from the present study demonstrate that bone loss due to ovarian hormone deficiency can be prevented by a low-dose (1 mg) daily administration of PGE2. Furthermore, a higher-dose (6 mg) daily administration of PGE2 not only prevents bone loss but also adds extra bone to the proximal tibial metaphyses. PGE, at the 1-mg dose level significantly increased trabecular bone area, trabecular width, trabecular node density, density of node to node, ratio of node to free end, and thus significantly decreased trabecular separation from OVX controls. At this dose level, these same parameters did not differ significantly from sham-OVX controls. However, at the 6-mg dose level PGE2, there were significant increases in trabecular bone area, trabecular width, trabecular node density, density of node to node, and ratio of node to free end, while there was significant decrease in trabecular separation from both OVX and sham-operated controls. The changes in indices of trabecular bone microanatomical structure indicated that PGE2 prevented bone loss as well as the disconnection of existing trabeculae. In summary, PGE2, administration to OVX rats decreased bone turnover and increased bone formation parameters resulting in a positive bone balance that prevented bone loss (in both lower and higher doses) and added extra bone to metaphyses of OVX rats (in higher dose). These findings support the strategy of the use of bone stimulation agents in the prevention of estrogen depletion bone loss (postmenopausal osteoporosis).

Author

Prostaglandins; Bone Mineral Content; Osteoporosis; Females; Bone Demineralization

19970002870

Hardness and toughness of exoskeleton material in the stone crab, Menippe mercenaria

Melnick, C. A., Univ of Florida, USA; Chen, Z.; Mecholsky, J. J. JR; Journal of Materials Research; November 1996; ISSN 0884-2914; 11, 11, pp. 2903-2907; In English; Copyright; Avail: Issuing Activity

Techniques from the field of materials science and engineering were utilized to examine the mechanical effects of dark pigment in exoskeleton material on the distal portion of stone crab, Menippe mercenaria, chelae. We made specimens from dark- and light-colored exoskeleton material to measure hardness and fracture toughness. The results from these tests showed the dark material to be much harder and tougher than light-colored material from the same crab chela. Scanning electron microscope photographs are presented to document the microstructure and level of porosity. We think that the structural difference in material properties is due to the lower level of porosity and phenolic tanning in dark material and that this tanning caused the dark color and filling of porosity. The exoskeleton structure is a laminated organic-inorganic structure which can serve as a model for self-healing structures.
Author (EI)
Biology; Fracture Strength; Hardness; Laminates

19970002930 NASA Ames Research Center, Cardivascular Research Lab, Moffett Field, CA USA
Intrapericardial denervation: Responses to water immersion in rhesus monkeys
McKeever, Kenneth H., Ohio State Univ., USA; Keil, Lanny C., Ohio State Univ., USA; Sandler, Harold, Ohio State Univ., USA; American Physiological Society; 1995, pp. R1040 - R1049; In English
Report No.(s): NASA-TM-111729; NAS 1.15:111729; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Eleven anesthetized rhesus monkeys were used to study cardiovascular, renal, and endocrine alterations associated with 120 min of head-out water immersion. Five animals underwent complete intrapericardial denervation using the Randall technique, while the remaining six monkeys served as intact controls. Each animal was chronically instrumented with an electromagnetic flow probe on the ascending aorta, a strain gauge pressure transducer implanted in the apex of the left ventricle (LV), and electrocardiogram leads anchored to the chest wall and LV. During immersion, LV end-diastolic pressure, urine flow, glomerular filtration rate, sodium excretion, and circulating atrial natriuretic peptide (ANP) each increased (P less than 0.05) for intact and denervated monkeys. There were no alterations in free water clearance in either group during immersion, yet fractional excretion of free water increased (P less than 0.05) in the intact monkeys. Plasma renin activity (PRA) decreased (P less than 0.05) during immersion in intact monkeys but not the denervated animals. Plasma vasopressin (PVP) concentration decreased (P less than 0.05) during the first 30 min of immersion in both groups but was not distinguishable from control by 60 min of immersion in denervated monkeys. These data demonstrate that complete cardiac denervation does not block the rise in plasma ANP or prevent the natriuresis associated with head-out water immersion. The suppression of PVP during the first minutes of immersion after complete cardiac denervation suggests that extracardiac sensing mechanisms associated with the induced fluid shifts may be responsible for the findings. water immersion; natriuresis; vasopressin; eardiae denervation; monkey
Author
Cardiovascular System; Endocrinology; Physiological Effects; Water Immersion

19970002953 NASA Lewis Research Center, ClevelandOH USA
NASA Life Sciences Advanced Refrigerator/Freezer Technology Assessment Results
Cairelli, James E., NASA Lewis Research Center, USA; Gaseor, Thomas, Oceaneering Space Systems, USA; Oct. 1996; 18p; In English; 26th; Environmental Systems, 8-11 Jul. 1996, Monterey, CA, USA; Sponsored by Society of Automotive Engineers, Inc., USA
Contract(s)/Grant(s): RTOP 233-03-0A; RTOP 106-41-00
Report No.(s): NASA-TM-107225; NAS 1.15:107225; E-10261; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA Lewis Research Center, through contract with Oceaneering Space Systems, is engaged in a project to develop advanced refrigerator/freezer (R/F) technologies for future Life and Biomedical Sciences space flight missions. The first phase of the project, a technology assessment recently has been completed to identify the advanced refrigerator/freezer technologies needed and best suited to meet the requirements for the five R/F classifications specified by the researchers, to rank those technologies based on benefit and risk, and to recommend those which can be developed within this project. This paper presents the basis, the methodology, and results of the R/F technology assessment, and makes recommendations for the technology areas to be developed.
Author
Technology Assessment; Refrigerators; Cooling Systems; Freezing; Spacecraft Environments; Coolers

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AEROSPACE MEDICINE

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

19970001823 National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX USA
Computer Analysis of Electromagnetic Field Exposure Hazard for Space Station Astronauts during Extravehicular Activity
Hwu, Shian U., Lockheed Engineering and Sciences Co., USA; Kelley, James S., Lockheed Engineering and Sciences Co., USA; Panneton, Robert B., National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, USA; Arndt, G. Dickey, National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, USA; 1995; 8p; In English; Life Sciences and Space Medicine, 3-5 Apr. 1995, Houston, TX, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS9-19100
Report No.(s): NASA-CR-202587; NAS 1.26:202587; AIAA Paper 95-1049; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

In order to estimate the RF radiation hazards to astronauts and electronics equipment due to various Space Station transmitters, the electric fields around the various Space Station antennas are computed using the rigorous Computational Electromagnetics (CEM) techniques. The Method of Moments (MoM) was applied to the UHF and S-band low gain antennas. The Aperture Integration (AI) method and the Geometrical Theory of Diffraction (GTD) method were used to compute the electric field intensities for the S- and Ku-band high gain antennas. As a result of this study, The regions in which the electric fields exceed the specified exposure levels for the Extravehicular Mobility Unit (EMU) electronics equipment and Extravehicular Activity (EVA) astronaut are identified for various Space Station transmitters.
Author
Astronauts; Extravehicular Activity; Hazards; Radiation Hazards; Exposure; Computerized Simulation; Electric Fields

19970001868 NASA Ames Research Center, Life Sciences Div., Moffett Field, CA USA
Factors in Daily Physical Activity Related to Calcaneal Mineral Density in Men
Hutchinson, Teresa M., NASA Ames Research Center, USA; Whalen, Robert T., NASA Ames Research Center, USA; Cleek, Tammy M., NASA Ames Research Center, USA; Vogel, John M., NASA Ames Research Center, USA; Arnaud, Sara B., NASA Ames Research Center, USA; Medicine and Science in Sports and Exercise; [1995]; ISSN 0195-9131, pp. 745 - 750; In English; 40th; American College of Sports Medicine, USA
Contract(s)/Grant(s): RTOP 199-26-12-02; RTOP 199-26-12-36
Report No.(s): NASA-CR-202485; NAS 1.26:202485; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

To determine the factors in daily physical activity that influence the mineral density of the calcaneus, we recorded walking steps and the type and duration of exercise in 43 healthy 26-to 51-yr-old men. Areal (g/sq cm) calcaneal bone mineral density (CBMD) was measured by single energy x-ray densitometry. Subjects walked a mean (+/- SD) of 7902(+/-2534) steps per day or approximately 3.9(+/-1.2) miles daily. Eight subjects reported no exercise activities. The remaining 35 subjects spent 143(2-772) (median and range) min/wk exercising. Twenty-eight men engaged in exercise activities that generate single leg peak vertical ground reaction forces (GRF(sub z)) of 2 or more body weights (high loaders, HL), and 15 reported exercise or daily activities that typically generate GRF(sub z) less than 1.5 body weights (low loaders, LL). CBMD was 12% higher in HL than LL (0.668 +/- 0.074 g/sq cm vs 0.597 +/- 0.062 g/sq cm, P less than 0.004). In the HL group, CBMD correlated to reported minutes of high load exercise (r = 0.41, P less than 0.03). CBMD was not related to the number of daily walking steps (N = 43, r = 0.03, NS). The results of this study support the concept that the dominant factor in daily physical activity relating to bone mineral density is the participation in site specific high loading activities, i.e., for the calcaneus, high calcaneal loads.
Author
Exercise Physiology; Bones; Density Measurement; Physiological Tests; Physical Exercise

19970001875 National Aeronautics and Space Administration. Ames Research Center, Life Sciences Div., Moffett Field, CA USA
Simulated Microgravity Increases Cutaneous Blood Flow in the Head and Leg of Humans
Stout, M. Shannon, National Aeronautics and Space Administration. Ames Research Center, USA; Watenpaugh, Donald E., National Aeronautics and Space Administration. Ames Research Center, USA; Breit, Gregory A., National Aeronautics and Space Administration. Ames Research Center, USA; Hargens, Alan R., National Aeronautics and Space Administration. Ames

Research Center, USA; Aviation, Space, and Environmental Medicine; Sep. 1995; Volume 66, No. 9, pp. 872 - 875; In English
Contract(s)/Grant(s): RTOP 199-14-12-04
Report No.(s): NASA-CR-202487; NAS 1.26:202487; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The cutaneous micro-circulation vasodilates during acute 6 deg. head-down tilt (HDT, simulated microgravity) relative to upright conditions, more in the lower body than in the upper body. We expected that relative magnitudes of and differences between upper and lower body cutaneous blood flow elevation would be sustained during initial acclimation to simulated microgravity. We measured cutaneous micro-vascular blood flow with laser-Doppler flowmetry at the leg (over the distal tibia) and cheek (over the zygomatic arch) of eight healthy men before, during, and after 24 h of HDT. Results were calculated as a percentage of baseline value (100% measured during pre-tilt upright sitting). Cutaneous blood flow in the cheek increased significantly to 165 +/- 37% (mean + SE, p less than 0.05) at 9-12 h HDT, then returned to near baseline values by 24 h HDT (114 +/- 29%, NSD), despite increased local arterial pressure. Microvascular flow in the leg remained significantly elevated above baseline throughout 24 h HDT (427 +/- 85% at 3 h HDT and 215 +/- 142% at 24 h HDT, p less than 0.05). During the 6-h upright sitting recovery period, cheek and leg blood flow levels returned to near pre-tilt baseline values. Because hydrostatic effects of HDT increase local arterial pressure at the carotid sinus, baroreflex-mediated withdrawal of sympathetic tone probably contributed to increased microvascular flows at the head and leg during HDT. In the leg, baroreflex effects combined with minimal stimulation of local veno-arteriolar and myogenic autoregulatory vasoconstriction to elicit relatively larger and more sustained increases in cutaneous flow during HDT. In the cheek, delayed myogenic vasoconstriction and/or humoral effects apparently compensated for flow elevation by 24 h of HDT. Therefore, localized vascular adaptations to gravity probably explain differences in acclimation of lower and upper body blood flow to HDT and actual microgravity.
Author (revised)
Blood Flow; Cardiovascular System; Microgravity Applications; Vasoconstriction; Physiological Responses; Capillary Flow; Attitude (Inclination); Arteries; Acclimatization

19970002626
Change in refractive index of a borosilicate glass fiber annealed below the glass transformation temperature
Kang, Seunggu, Kyonggi Univ, USA; Lin, Hongy; Day, Delbert E.; Journal of the American Ceramic Society; October 1996; ISSN 0002-7820; 79, 10, pp. 2633-2636; In English; Copyright; Avail: Issuing Activity

Glass fibers pulled from multihole bushings can have a slight difference in thermal history that causes a distribution in the refractive index that can be narrowed by annealing the fibers. The kinetics for the initial stage change in refractive index for fiber annealed between 300 deg and 500 C are best described by a second-order reaction with an activation energy of 120 +/- 17 kJ/mol. The improved uniformity an refractive index for annealed fibers is indicated by a decrease in the half-height width of the optical transmission versus temperature curve for glass fiber immersed in a liquid. The standard deviation in the refractive index of glass fibers with a bimodal distribution in diameter decreases from 8 x 10(sup - 4) +/- 0.0002 to 4 x 10(sup - 4) +/- 0.0002 after the fibers are annealed at 400 C for 1 h.
Author (EI)
Annealing; Borosilicate Glass; Glass Fibers; Reaction Kinetics; Refractivity

19970003224 National Taiwan Univ., Dept. of Electrical Engineering, Taipei, Taiwan, Province of China
Effects of Vascular Properties on the Impedance Spectra of Systemic Circulation
Chen, Chao-Weng, National Taiwan Univ., Taiwan, Province of China; Shau, Yio-Wha R., National Taiwan Univ., Taiwan, Province of China; Wu, Chien-Ping, National Taiwan Univ., Taiwan, Province of China; Transactions of the Chinese Institute of Engineers; Jul. 1996; Volume 19, No. 4, pp. 439-449; In English; Also announced as 19970003222; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

A viscoelastic four-tube artery micro-vessel vein model has been built using a transmission line network. Hemodynamic data from literature are used in the fluid-circuit analogic model. The predicted input impedance spectra agree reasonably well with the published measurements. Parametric analysis shows that the changes in the vascular properties in different portions of the body cause fluctuations of the maxima or minima of the impedance spectrum. In general, the changes of vascular properties in the lower body affect the first minimum, and the changes in the upper body influence the second minimum. Decreasing capacitances (i.e., increasing arterial stiffness due to aging), reducing the lumen area, or decreasing the length of blood vessels result in an increase of the impedance modulus, and the shift of the first minimum to a higher frequency, which agree well with experiments. The changes of peripheral resistances of all terminations affect the magnitude of impedance modulus maxima only. The current model

uses simple physiological data directly; it can be used to simulate the effect of pharmacologic manipulation on the impedance spectra of the patients.
Author
Impedance; Viscoelasticity; Veins; Blood Vessels; Hemodynamic Responses; Stiffness

19970003260 Armed Forces Inst. of Pathology, Washington, DC USA
Retrospective Study of HIV Infection in Human Tissues ***Annual Report, 1 Apr. 1995 - 31 Mar. 1996***
Nelson, Ann M., Armed Forces Inst. of Pathology, USA; Apr. 1996; 9p; In English
Contract(s)/Grant(s): MIPR-92MM2550
Report No.(s): AD-A314065; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The objective of this report is to seek, review, identify, and retrieve repository materials (slides, blocks, wet tissues, and information) of cases fulfilling the CDC definition of AIDS in the absence of demonstrable HIV infection.
DTIC
Infectious Diseases; Human Immunodeficiency Virus; Data Bases; Information Systems; Biological Effects

19970003261 NASA Ames Research Center, Moffett Field, CA USA
Upper Body Venous Compliance Exceeds Lower Body Venous Compliance in Humans
Watenpaugh, Donald E., NASA Ames Research Center, USA; Jul. 1996; 38p; In English
Contract(s)/Grant(s): RTOP 199-14-12-04; RTOP 199-26-12-38
Report No.(s): NASA TM-110409; A-962296; NAS 1.15:110409; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Human venous compliance hypothetically decreases from upper to lower body as a mechanism for maintenance of the hydrostatic indifference level 'headward' in the body, near the heart. This maintains cardiac filling pressure, and thus cardiac output and cerebral perfusion, during orthostasis. This project entailed four steps. First, acute whole-body tilting was employed to alter human calf and neck venous volumes. Subjects were tilted on a tilt table equipped with a footplate as follows: 90 deg, 53 deg, 30 deg, 12 deg, O deg, -6 deg, -12 deg, -6 deg, O deg, 12 deg, 30 deg, 53 deg, and 90 deg. Tilt angles were held for 30 sec each, with 10 sec transitions between angles. Neck volume increased and calf volume decreased during head-down tilting, and the opposite occurred during head-up tilt. Second, I sought to cross-validate Katkov and Chestukhin's (1980) measurements of human leg and neck venous pressures during whole-body tilting, so that those data could be used with volume data from the present study to calculate calf and neck venous compliance (compliance = (Delta)volume/(Delta)pressure). Direct measurements of venous pressures during postural chances and whole-body tilting confirmed that the local changes in venous pressures seen by Katkov and Chestukhin (1980) are valid. The present data also confirmed that gravitational changes in calf venous pressure substantially exceed those changes in upper body venous pressure. Third, the volume and pressure data above were used to find that human neck venous compliance exceeds calf venous compliance by a factor of 6, thereby upholding the primary hypothesis. Also, calf and neck venous compliance correlated significantly with each other (r(exp 2) = 0.56). Fourth, I wished to determine whether human calf muscle activation during head-up tilt reduces calf venous compliance. Findings from tilting and from supine assessments of relaxed calf venous compliance were similar, indicating that tilt-induced muscle activation is relatively unimportant. Low calf venous compliance probably results from stiffer venous, skeletal muscle, and connective tissues, and better-developed local and central neural controls of venous distensibility. This research establishes that upper-to-lower body reduction of venous compliance can explain headward positioning of the hydrostatic indifference level in humans.
Author
Blood Pressure; Posture; Positioning; Pressure Measurement; Physiological Effects; Gravitational Effects; Plethysmography; Neck (Anatomy); Calves

19970003269 Forschungszentrum Rossendorf G.m.b.H., Inst. of Bioinorganic and Radiopharmaceutical Chemistry, Rossendorf, Germany
Forschungszentrum Rossendorf, Institute of Bioinorganic and Radiopharmaceutical Chemistry ***Annual Report, 1995***
Johannes, B., Editor, Forschungszentrum Rossendorf G.m.b.H., Germany; Seifert, S., Editor, Forschungszentrum Rossendorf G.m.b.H., Germany; Feb. 1996; 192p; In English
Report No.(s): FZR-122; DE96-775172; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche; US Sales Only; US Sales Only
Research at the Institute of Bioinorganic and Radiopharmaceutical Chemistry of the Research Center Rossendorf is focused on radiotracers as molecular probes for diagnosis of disease. The research effort has two main components: - Positron Emission Tomography (PET) - technetium chemistry and radiopharmacology. The research activities of the Institute have been performed in three administratively classified groups. A PET tracer group is engaged in the chemistry and radiopharmacy of C-11 and F-18

compounds and in the setup of the PET center. A SPECT tracer group deals with the design, synthesis and chemical characterization of metal coordination compounds, primarily rhenium and technetium complexes. A biochemical group is working on SPECT and PET-relevant biochemical and biological projects. This includes the characterization and assessment of new compounds developed in the two synthetically oriented groups. The annual report presented here covers the research activities of the Institute of Bioinorganic and Radiopharmaceutical Chemistry in 1995.
DOE
Diagnosis; Synthesis (Chemistry)

19970003298 NASA Langley Research Center, Hampton,VA USA
Issues In Space Radiation Protection: Galactic Cosmic Rays
Wilson, J. W., NASA Langley Research Center, USA; Kim, M., College of William and Mary, USA; Schimmerling, W., Universities Space Research Association, USA; Badavi, F. F., Christopher Newport Coll., USA; Thibeault, S. A., NASA Langley Research Center, USA; Cucinotta, F. A., NASA Langley Research Center, USA; Shinn, J. L., NASA Langley Research Center, USA; Kiefer, R., College of William and Mary, USA; Health Physics Society; Jan. 1995; ISSN 0017-9078; Volume 68, No. 1, pp. 50-58; In English
Report No.(s): NASA-TM-111575; NAS 1.15:111575; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

When shielding from cosmic heavy ions, one is faced with limited knowledge about the physical properties and biological responses of these radiations. Herein, the current health is discussed in terms of conventional protection practice and a test biological response model. The impact of biological response on optimum materials selection for cosmic ray shielding is presented in terms of the transmission characteristics of the shield material. Although liquid hydrogen is an optimum shield material, evaluation of the effectiveness of polymeric structural materials must await improvement in our knowledge of both the biological response and the nuclear processes.
Author
Spacecraft Shielding; Radiation Protection; Galactic Cosmic Rays; Biological Effects; Radiation Hazards; Space Stations; Spacecrews

19970003315 NASA Johnson Space Center, Houston, TX USA
Renal-Stone Risk Assessment During Space Shuttle Flights
Whitson, Peggy A., NASA Johnson Space Center, USA; Pietrzyk, Robert A., Krug Life Sciences, Inc., USA; Pak, Charles Y. C., Texas Univ., USA; Journal of Urology; 1996; 27p; In English
Report No.(s): NASA-TM-111752; NAS 1.15:111752; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The metabolic and environmental factors influencing renal stone formation before, during, and after Space Shuttle flights were assessed. We established the contributing roles of dietary factors in relationship to the urinary risk factors associated with renal stone formation. 24-hr urine samples were collected prior to, during space flight, and following landing. Urinary factors associated with renal stone formation were analyzed and the relative urinary supersaturation ratios of calcium oxalate, calcium phosphate (brushite), sodium urate, struvite and uric acid were calculated. Food and fluid consumption was recorded for a 48-hr period ending with the urine collection. Urinary composition changed during flight to favor the crystallization of stone-forming salts. Factors that contributed to increased potential for stone formation during space flight were significant reductions in urinary pH and increases in urinary calcium. Urinary output and citrate, a potent inhibitor of calcium-containing stones, were slightly reduced during space flight. Dietary intakes were significantly reduced for a number of variables, including fluid, energy, protein, potassium, phosphorus and magnesium. This is the first in-flight characterization of the renal stone forming potential in astronauts. With the examination of urinary components and nutritional factors, it was possible to determine the factors that contributed to increased risk or protected from risk. In spite of the protective components, the negative contributions to renal stone risk predominated and resulted in a urinary environment that favored the supersaturation of stone-forming salts. The importance of the hypercalciuria was noted since renal excretion was high relative to the intake.
Author
Metabolism; Spaceborne Experiments; Urology; Risk

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BEHAVIORAL SCIENCES

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

19970001367 Civil Aeromedical Inst., Oklahoma City, OK USA
Flight Inspection Crew Resource Management Training Needs Analysis ***Final Report***
Bailey, Lawrence L., Civil Aeromedical Inst., USA; Shaw, Rogers V., Civil Aeromedical Inst., USA; Sep. 1996; 18p; In English
Report No.(s): DOT/FAA/AM-96/24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

On October 26, 1993, there was a fatal crash of a Federal Aviation Administration (FAA) flight inspection aircraft. During the accident investigation, the National Transportation Safety Board (NTSB) cited ineffective crew resource management (CRM) as one of the causal factors and recommended CRM training for flight inspection aircrews. As part of the FAA's response to the NTSB recommendation, a CRM training needs analysis was conducted. Cluster analytic results of the identified training needs suggested three categories affecting crew performance: (1) technical skills, (2) crew coordination skills, and (3) the organization context in which flight inspection crews perform. Implications for CRM awareness training are discussed. The purpose of this report is to document the flight inspection CRM training needs that emerged from the analyses and to recommend steps for developing a flight inspection CRM training program.
Author
Accident Investigation; Crashes; Flight Crews; Flight Training; Human Performance; Safety Management

19970001534 Los Alamos National Lab., NM USA
Measurement Issues in Assessing Employee Performance: A Generalizability Theory Approach
Stephenson, Blair O., Los Alamos National Lab., USA; 1996; 17p; In English; IPMACC (Personnel/Management Association Assessment Council), Jun. 1996, Boston, MA, USA
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): LA-UR-96-2256; CONF-9606256-1; DE96-012652; No Copyright; Avail: Issuing Activity (Department of Energy (DOE)), Microfiche

Increasingly, organizations are assessing employee performance through the use of rating instruments employed in the context of varied data collection strategies. For example, the focus may be on obtaining multiple perspectives regarding employee performance (360(degree) evaluation). From the standpoint of evaluating managers, upward assessments and 'peer to peer' evaluations are perhaps two of the more common examples of such a multiple perspective approach. Unfortunately, it is probably fair to say that the increased interest and use of such data collection strategies has not been accompanied by a corresponding interest in addressing both validity and reliability concerns that have traditionally been associated with other forms of employee assessment (e.g., testing, assessment centers, structured interviews). As a consequence, many organizations may be basing decisions upon information collected under less than ideal measurement conditions. to the extent that such conditions produce unreliable measurements, the process may be both dysfunctional to the organization and/or unfair to the individual(s) being evaluated. Conversely, the establishment of reliable and valid measurement processes may in itself support the utilization of results in pursuit of organizational goals and enhance the credibility of the measurement process (see McEvoy), who found the acceptance of subordinate ratings to be related to perceived accuracy and fairness of the measurement process). The present paper discusses a recent 'peer to peer' evaluation conducted in our organization. The intent is to focus on the design of the study and present a Generalizability Theory (GT) approach to assessing the overall quality of the data collection strategy, along with suggestions for improving future designs.
DOE
Performance Tests; Reliability; Ratings; Personnel; Evaluation

19970001567 Washington Univ., Department of Psychology, Saint Louis, MO USA
Blinks, Saccades; and Fixation Pauses During Vigilance Task Performance: 2: Gender and Time of Day ***Final Report***
Stern, John A., Washington Univ., USA; Boyer, Donna J., Washington Univ., USA; Schroeder, David J., Federal Aviation Administration, USA; Touchstone, R. M., Federal Aviation Administration, USA; Stoliarov, N., State Scientific Research Inst. for Civil Aviation, Russia; Mar. 1996; 47p; In English
Contract(s)/Grant(s): DTFA-02-91-C-91056
Report No.(s): AD-A307024; DTFA02-91-C-91056; DOT/FAA/AM-96/9; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As operators are required to spend more time monitoring computer controlled devices in future systems, it is critical to define the task and situational factors (i.e., fatigue) that may impact vigilance and performance. Aspects of the gaze system can be moni-

tored relatively unobtrusively, although we used conventional electro-oculographic techniques in this study. Can gaze control measures be used to reflect, and hopefully predict, periods of impaired attention and performance? Gaze control measures (blinks, saccades, and fixations) were recorded while subjects performed on an air traffic control simulation task. Twenty-five subjects performed the task for 3 days at 2 successive hours per day. Blinks and saccades were sampled for 5 consecutive minutes after 10, 30, 50, 70, 90, and 110 minutes of task performance. Sign ificant Time-On-Task (TOT) effects were obtained for all of the 13 variables abstracted. A number of main effects for DAY and a number of interactions involving DAY were significant. TOT effects were obtained for blink rate, blink closing duration, 50% window, blink amplitude, long closure duration blinks, eye closure frequency, blink flurry frequency, number of blinks part of flurries, saccade rate, saccade amplitude, fixation duration, long duration fixations, and performance decrements. The changes in blink frequency and other blink attributes are interpreted within a framework suggesting a breakdown of inhibitory control as a function of TOT. We believe that this TOT effect is not a tonic one, i.e., a steady decline in the ability to inhibit, but aphasic process, in that periods of poorer inhibitory control increase in frequency and duration as a function of TOT. This conceptual model is akin to one proposed by Bills (1931) dealing with performance 'blocks.'
DTIC
Human Performance; Alertness; Controllers

19970001568 Navy Personnel Research and Development Center, San Diego, CA USA
Assessment of Potential for Leadership Phase 1: Development of the Measures ***Final Report, Jun. - Dec. 1994***
Morrison, Robert F., Navy Personnel Research and Development Center, USA; Lovec, Rhonda M., Navy Personnel Research and Development Center, USA; Woods, Barbara A., Navy Personnel Research and Development Center, USA; Vickers, Ross R., Jr, Navy Personnel Research and Development Center, USA; Sep. 1995; 164p; In English
Contract(s)/Grant(s): N6804-594WRK-F001
Report No.(s): AD-A306778; NPRDC-TN-95-11; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
A technology was required to identify potential leaders from among recruits who did not have the technical knowledge required for direct entry into 'A' schools with such requirements. to potentially fulfill this need, an experimental biodata form that emphasized teenage leadership opportunities was developed and an appropriate commercially available personality measure was identified. A major consideration during the above work was to ensure that such technology provided an equal opportunity for selection into the program regardless of race. It is recommended that the two instruments described herein be submitted to a validation process so that their ability to distinguish potential leaders from non-leaders is appropriately evaluated prior to any implementation.
DTIC
Aptitude; Personnel Selection; Leadership; Personnel Management

19970001604 Institute for Human Factors TNO, Soesterberg, Netherlands
Psychosocial risks at work, measured with personnel from the Royal Military Academy ***Welzijnsrisico's bij KMA-Personeel***
vanOrden, C. Y. D., Institute for Human Factors TNO, Netherlands; Langefeld, J. J., Institute for Human Factors TNO, Netherlands; Oct. 11, 1996; 64p; In Dutch
Contract(s)/Grant(s): A96/KL/304
Report No.(s): TNO-TM-96-A041; RP-96-0181; Copyright; Avail: Issuing Activity (Organisatie voor Toegepast Natuurwetenschappelijk, The Hague, Netherlands), Hardcopy, Microfiche
Under Dutch law, all employers are obliged to carry out an inventory of psychosocial risks in the work environment. In the Dutch Army, the Checklist Man & Organization (TOMO), developed by the TNO Human Factors Research Institute, is used for this purpose. After a first evaluation in 1995, the TOMO inventory was slightly adjusted, and two response categories were added. This renewed inventory was evaluated again, with personnel of the Royal Military Academy. Ten functional groups were involved in the study, all represented by approximately ten employees. Respondents filled in the TOMO, as well as a short questionnaire on rank, experience, and contract. In this report, only the psychosocial risks that were found in the different function groups are described. Technical aspects of the inventory (reliability and validity) are reported elsewhere. In general, most psychosocial risks occur in the area of Task Demands (chapter 1 of TOMO) on Skill Discretion (chapter 4 of TOMO). It is striking that employees with a civil contract report more risks than the military personnel, and that sergeants report more risks than officers. The amount of time on the job also seems to matter. Freshmen, or very experienced employees report more risks than those who have been carrying out their jobs for a 'mediocre' period of time, causing some interpretation problems. Risks do not automatically have

to do with functions, but one should bear in mind rank, contract, and experience. In the appendix, the total TOMO inventory is included, as well as summaries of the 'risks' per function group.
Derived from text
Human Factors Engineering; Risk; Workloads (Psychophysiology); Stress (Biology); Social Factors; Law (Jurisprudence)

19970003076 College of William and Mary, Hampton, VA USA
Various Embodiments of the Non-Invasive Endoscopic Feedback for Learning of Voluntary Control of Physiological Functioning
Henriksen, Mina D., College of William and Mary, USA; Technical Reports: Langley Aerospace Research Summer Scholars; 1995; Part 1, pp. 295-298; In English; Also announced as 19970003049; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The research performed was a small portion of the patent to be submitted by Dr. Alan T. Pope entitled 'A Method of Providing Veridical Non-Invasive Endoscopic Feedback for Learning of Voluntary Control of Physiological Functioning'. The focus of this study is to incorporate the emerging technology of virtual reality with the forms of biofeedback already in existance producing a life-like, real-time model of the body's functioning without using invasive procedures, yet still producing the equivalent of a picture from an invasive endoscopic procedure in the region of interest. The portion of the project designated to me was to research and report as many possible uses for such technology as possible.
Author
Physiological Tests; Physiological Responses; Biofeedback

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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.

19970001714 Lockheed Engineering and Sciences Co., Houston, TX USA
The Design and Testing of the LSSIF Advanced Thermal Control System
Henson, Robert A., Lockheed Engineering and Sciences Co., USA; Keller, John R., Lockheed Engineering and Sciences Co., USA; 1995; 8p; In English; Life Sciences and Space Medicine Conference, 3-5 Apr. 1995, Houston, TX, USA
Report No.(s): NASA-TM-111797; NAS 1.15:111797; AIAA Paper 95-1051; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

The Life Support Systems Integration Facility (LSSIF) provides a platform to design and evaluate advanced manned space systems at NASA Johnson Space Center (JSC). The LSSIF Early Human Testing Initiative requires the integration of such subsystems to enable human occupancy of the 6 meter chamber for a 90 day closed volume test. The Advanced Thermal Control System (TCS) is an important component of the integrated system by supplying coolant to the subsystems within the chamber, such as the Air Revitalization System. The TCS incorporates an advanced high efficiency, heat pump to reject waste heat from the chamber to an external sink or 'lift' temperature that emulates a Lunar environment. The heat pump is the High Lift Heat Pump, developed by Foster-Miller, Inc., and is the main test article of the TCS. The heat pump prototype utilizes a non-CFC refrigerant in a design where the thermal requirements exceed existing terrestrial technology. These operating requirements provide a unique opportunity to design and test an advanced integrated thermal system and the associated controls. The design, control, and systems integration of the heat pump and the TCS also have terrestrial technology application. This paper addresses the design of the TCS and the heat pump, along with the control scheme to fully test the heat pump. Design approaches utilized in the LSSIF TCS are promoted for implementation in terrestrial thermal systems. The results of the preliminary thermal and fluid analyses used to develop the control of the thermal systems will also be discussed. The paper includes objectives for the 90 day human test and the test setup. Finally, conclusions will be drawn and recommendations for Earth design application are submitted.
Author
Life Support Systems; Temperature Control; Cooling Systems; Heat Pumps; Automatic Control; Design Analysis

19970001732 NASA Marshall Space Flight Center, Huntsville, AL USA
Spacecraft Cabin Air Quality Control and Its Application to Tight Buildings
Perry, J. L., NASA Marshall Space Flight Center, USA; Graf, J. C., NASA Johnson Space Center, USA; 1995; 12p; In English; Life Sciences and Space Medicine Conference, 3-5 Apr. 1995, Houston, TX, USA

Report No.(s): NASA-TM-111798; NAS 1.15:111798; AIAA Paper 95-1050; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Air quality is an important consideration not only for the external environment, but also for the indoor environment. Most people spend a majority of their lives indoors and the air that they breathe is important to their physical and emotional well being. Since most modern building designs have focused on energy efficiency, less fresh air is brought from the outside. As a result, pollutants from building materials, furniture, cleaning, and cooking have no place to go. to make matters worse, most ventilation systems do not include any means for removing pollutants from the recycled air. Unfortunately, pollution at even a small level can result in eye, throat, and lung irritation in addition to chronic headaches, nausea, and fatigue. A spacecraft cabin, which represents the worst case in tight building design, requires special consideration of air quality since any effects pollutants may have on a crewmember can potentially place a mission or other crewmembers at risk. A detailed approach has been developed by the National Aeronautics and Space Administration (NASA) to minimize cabin atmosphere pollution and provide the crew with an environment which is as free of pollutants as possible. This approach is a combination of passive and active contamination control concepts involving the evaluation and selection of materials to be used onboard the spacecraft, the establishment of air quality standards to ensure crew health, and the use of active control means onboard the spacecraft to further ensure an acceptable atmosphere. This approach has allowed NASA to prevent illness by providing crewmembers with a cabin atmosphere which contains pollutant concentrations up to 100 times lower than those specified for terrestrial indoor environments. Standard building construction, however, does not take into account the potentially harmful effects of materials used in the construction process on the health of future occupants and relies primarily on remedial rather than preventive techniques when addressing contamination. This approach results in a building that theoretically has low operating costs, but may actually have high costs associated with lost work days, increased medical claims, decreased productivity, and problem remediation. A similar approach to NASA's may be adopted by the building construction community which can tap the extensive database of material offgassing properties that has been collected to support the space program. Many materials used by NASA are commercially available and are frequently used in building construction. In addition, computer models which have been developed for assessing various methods of active contamination control can be applied to building ventilation system design and the analysis of their economics. Through using NASA' s experience, the expense associated with the current remedial approach can be avoided.

Author

Spacecraft Cabins; Air Quality; Air Pollution; Buildings; Active Control; Contamination; Technology Utilization

19970002914 Institute for Human Factors TNO, Soesterberg, Netherlands

Extrapolation of Anthropometric Data ***Extrapolatie van antropometrische gegevens***

Werkhoven, P. J., Institute for Human Factors TNO, Netherlands; Nov. 01, 1996; 35p; In Dutch

Report No.(s): TNO-TM-96-A045; Copyright; Avail: Issuing Activity (Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands), Hardcopy, Microfiche

By order of the Royal Netherlands Air Force, TNO Human Factors Research Institute has carried out a study on how to infer from available anthropometric data the expected longitudinal changes in body measures of present-day high-school graduates. Longitudinal growth is determined by repeatedly measuring the body measures of the same subjects over a long period of time and can be decomposed into two components: transversal and secondary changes. Transversal changes are the differences between body measures of different age-groups measured in a particular year (a snapshot). Secondary changes are the differences between body measures in different years for a particular age-group. Longitudinal growth of stature can be inferred with sufficient accuracy from transversal and secondary changes (direct extrapolation). Most recent transversal studies show that 19.5-year old men are approximately 1.7 cm taller than 17.5-year old men (0.4 cm for women). The secondary growth of full-grown men and women is 0.16 cm per year. From these transversal and secondary changes we infer that the stature of 17.5 year old male Dutch high-school graduates (averaged across region and race) in 1995 will increase by 2.0 cm to 182.9 cm in 1997. The body-length of 17.5-year old female high-school graduates in 1995 will increase by 0.7 cm to 170.2 cm in 1997. Transversal and secondary studies on other body measures than stature do not exist in the Netherlands. The extrapolation of body measures other than body-length, therefore, can be done only through indirect extrapolation (some body measures are approximately linearly related to body length). However, the extrapolation errors are not acceptable (for example, 5-7 cm for sitting height). However, for some body measures such as the buttock-knee length, it is justified to assume proportionality with body-height (linearity with zero off-set) resulting in a reduced extrapolation error (0.3 cm). Thus, successful direct extrapolation is limited to stature and indirect extrapolation of other body measures inevitably results in large errors. It is, therefore, of importance to actually measure transversal and secondary changes of different body measures of high-school graduates (ANTRO 1995) as well as students (full-grown) on a regular basis (e.g. every five years).

Author

Anthropometry; Age Factor; Body Size (Biology)

19970002973 NASA Kennedy Space Center, Cocoa Beach, FL USA

An Occupational Performance Test Validation Program for Fire Fighters at the Kennedy Space Center

Schonfeld, Brian R., Bionetics Corp., USA; Doerr, Donald F., NASA Kennedy Space Center, USA; Convertino, Victor A., NASA Kennedy Space Center, USA; Journal of Occupational Medicine; Jul. 1990; ISSN 0096-1736; 32, 7, pp. 638 - 643; In English
Report No.(s): NASA-TM-111725; NAS 1.15:111725; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

We evaluated performance of a modified Combat Task Test (CTT) and of standard fitness tests in 20 male subjects to assess the prediction of occupational performance standards for Kennedy Space Center fire fighters. The CTT consisted of stair-climbing, a chopping simulation, and a victim rescue simulation. Average CTT performance time was 3.61 +/- 0.25 min (SEM) and all CTT tasks required 93% to 97% maximal heart rate. by using scores from the standard fitness tests, a multiple linear regression model was fitted to each parameter: the stairclimb (r(exp 2) = .905, P less than .05), the chopping performance time (r(exp 2) = .582, P less than .05), the victim rescue time (r(exp 2) = .218, P = not significant), and the total performance time (r(exp 2) = .769, P less than .05). Treadmill time was the predominant variable, being the major predictor in two of four models. These results indicated that standardized fitness tests can predict performance on some CTT tasks and that test predictors were amenable to exercise training.
Author

Human Performance; Fire Fighting; Physical Fitness; Regression Analysis; Physiological Responses; Physiological Tests

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

19970003266 NASA Johnson Space Center, Houston, TX USA

Search for Past Life on Mars: Possible Relict Biogenic Activity in Martian Meteorite ALH84001

McKay, David S., NASA Johnson Space Center, USA; Gibson, Everett K., Jr., NASA Johnson Space Center, USA; Thomas-Keprta, Kathie L., Lockheed Martin Corp., USA; Vali, Hojatollah, McGill Univ., Canada; Romanek, Christopher S., Georgia Univ., USA; Clemett, Simon J., Stanford Univ., USA; Chillier, Xavier D. F., Stanford Univ., USA; Maechling, Claude R., Stanford Univ., USA; Zare, Richard N., Stanford Univ., USA; Science; [Aug. 1996]; 10p; In English
Contract(s)/Grant(s): RTOP 185-52-11-01
Report No.(s): NASA-TM-111753; NAS 1.15:111753; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Fresh fracture surfaces of the martian meteorite ALH84001 contain abundant polycyclic aromatic hydrocarbons (PAHs). These fresh fracture surfaces also display carbonate globules. Contamination studies suggest the PAHs are indigenous to the meteorite. High resolution scanning and transmission electron microscopy study of surface textures and internal structures of selected carbonate globules show that the globules contain fine-grained, secondary phases of single-domain magnetite and Fe-monosulfides. The carbonate globules are similar in texture and size to some terrestrial bacterially induced carbonate precipitates. Although inorganic formation is possible, formation of the globules by biogenic processes could explain many of the observed features including the PAHs. The PAHs, the carbonate globules, and their associated secondary mineral phases and textures could thus be fossil remains of a past martian biota.
Author

Meteorites; Mars (Planet); Extraterrestrial Life; Carbonates; Exobiology; Polycyclic Aromatic Hydrocarbons

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