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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

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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 466)

JUNE 1, 1998

51
LIFE SCIENCES (GENERAL)

19980038223 Pittsburgh Univ., Pittsburgh, PA USA
Development of a Novel Intravenous Membrane Oxygenator ***Final Report, 1 Jun. 1994 - 28 Sep. 1997***
Heinrich, Shelly, Pittsburgh Univ., USA; Hewitt, Todd, Pittsburgh Univ., USA; Hout, Mariah, Pittsburgh Univ., USA; Lund, Laura, Pittsburgh Univ., USA; Federspiel, William, Pittsburgh Univ., USA; Oct. 1997; 154p; In English
Contract(s)/Grant(s): DAMD17-94-C-4052
Report No.(s): AD-A337586; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The Intravenous Membrane Oxygenator (IMO) at the University of Pittsburgh is intended to provide temporary and portable respiratory support to military and civilian personnel whose lungs are acutely damaged and impaired. The current IMO device consists of several hundred hollow fiber membranes (H:FMs) manifolded to gas supply lines for O2 delivery, CO2 removal, and helium supply to a balloon integer located within the fiber bundle. Rapid pulsation of the balloon generates additional convective flow of blood across the HFMs and enhances the rate of O2 delivery and CO2 removal This report describes key progress in the following areas: 1) hollow fiber membrane evaluation; 2) IMO prototype design development; 3) in-vitro gas exchange performance and characterization of the IMO; and 4) acute and chronic animal studies. The IMO prototypes developed under this contract exchanged O2 and CO2 at rates equal to or exceeding our design target for gas transfer per fiber surface area. This target is based on attaining 50% of the normal baseline metabolic requirements for O2 supply and CO2 removal with an IMO device of 0.4 to 0.5 sq m fiber surface area. The next phase of IMO development has already begun and involves scaling-up to full-size IMO devices intended for human implantation.
DTIC
Fabrication; Oxygen; Respirators; Armed Forces; Gas Exchange

19980038264 Walter Reed Army Medical Center, Washington, DC USA
Development of Ultra Long Duration Local Anesthetic Agents in a Rat Model ***Final Report, 15 Dec. 1992 - 31 Dec. 1995***
Kline, Mark D., Walter Reed Army Medical Center, USA; Nov. 1997; 72p; In English
Contract(s)/Grant(s): MIPR-93MM3511
Report No.(s): AD-A337587; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

For decades anesthesiologists have sought an agent that would provide local anesthesia lasting for days rather than hours. The ideal ultra-long duration local anesthetic agent would affect sensory but not motor fibers, be free of local irritant effects, have a high therapeutic index, and provide analgesia for several days. No agent currently exists that meets all these criteria. Lecithin-coated microcrystal technology shows promise in improving the delivery of local anesthetics and analgesics. In this study three different agents were developed and tested in animal models to establish possible clinical efficacy.
DTIC
Clinical Medicine; Anesthesiology; Anesthetics; Rats

19980039725
Experimental and theoretical study of the response of ZrO(sub 2) oxygen sensors to simple one-reducing-gas mixtures
Brailsford, A. D., Ford Motor Co., USA; Yussouff, M.; Logothetis, E. M.; Wang, T.; Soltis, R. E.; Sensors and Actuators, B: Chemical; July 15, 1997; ISSN 0925-4005; Volume B42, no. 1, pp. 15-26; In English; Copyright; Avail: Issuing Activity

The emf of commercial automotive zirconia oxygen sensors exposed to O(sub 2)/CO/CO(sub 2)/N(sub 2) or O(sub 2)/H(sub 2)/H(sub 2)O/N(sub 2) gas mixtures was measured as a function of R' = (2P(sub O(2))P(sub CO)) or (2P(sub O(2))/P(sub H(2))) ateratures. A step-like transition from high to low emf occurs at the switch-point R'(sub s0) that is almost independent of tempera-

ture. The high emf (at say R' = 0.5) first increases and then decreases with temperature for O(sub 2)/CO/CO(sub 2)/N(sub 2) gas mixture, whereas it only decreases for O(sub 2)/H(sub 2)/H(sub 2)O/N(sub 2). These results may be analyzed using the steady state model of gas sensors. Two lumped parameters, R'(sub s) and xi, are needed in the model to compe the emf. R'(sub s) represents the theoretical switch-point and xi determines the theoretical high emf. To obtain good fit with experiment, we choose R'(sub s) close to the observed R'(sub s0) and then vary xi. The quantity xi depends upon the fundamental processes taking place on the sensor electrode; the temperature dependence of its fitted values (and hence the high emf) may be understood in terms of rate constants for adsorption, desorption and reaction.
Author (EI)
Gas Detectors; Gas Mixtures; Oxygen; Zirconium Oxides; Mathematical Models; Electrodes; Adsorption

52
AEROSPACE MEDICINE

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

19980037233 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Insulated Skin Temperature and Cardiac Frequency as Indices of Thermal Strain during Work in Hot Environments
Taylor, Nigel A. S., Wollongong Univ., Australia; Amos, Denys, Defence Science and Technology Organisation, Australia; Nov. 1997; 18p; In English
Report No.(s): DSTO-TR-0590; AR-010-381; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., P.O. Box 4331, Melbourne Victoria 3001, Australia), Hardcopy, Microfiche

The paper reviews the possibility that thermal strain may be predicted or determined from changes within certain physiological variables. Key variables include body core temperature, cardiac frequency, sweat rate and skin blood flow. The possible use of a modified skin temperature and cardiac frequency are examined as a means of predicting impending heat disfunction or quantifying thermal strain. The two most promising techniques for possible monitoring of body core temperature are those of insulated transcutaneous and zero-gradient skin temperature measurements.
Author
Temperature Measurement; Skin Temperature (Biology); Heart; Cardiac Output

19980037577 Center for Naval Analyses, Alexandria, VA USA
A Cost-Benefit Analysis of Shipboard Telemedicine ***Final Report***
Garcia, Federico E., Center for Naval Analyses, USA; Stoloff, Peter H., Center for Naval Analyses, USA; Thomason, Janet E., Center for Naval Analyses, USA; Shia, Derek S., Center for Naval Analyses, USA; Sep. 1997; 90p; In English
Contract(s)/Grant(s): N00014-91-C-0002; Navy Proj. R0148
Report No.(s): AD-A334780; CRM-97-66; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Telemedicine (TM) is an umbrella term that covers various technologies used to transmit information for health services. TM uses electronic information and communication technologies to provide and support health care when distance separates the participants. In an effort to enhance medical services at sea, the Navy is considering taking TM beyond the demonstration phase by installing the equipment on over 300 ships and fleet Marine Force units. Because this would be a significant investment, the Surgeon General has asked CNA to determine the cost-effectiveness of the technology. We conducted a cost-benefit analysis on four telemedicine modalities: telephone and fax, e-mail and internet, video-teleconferencing, and teleradiology. These TM modalities can be enhanced with various digitized diagnostic instruments. We also conducted a cost-benefit analysis on the following instruments: detmascope, ophthalmoscope, otoscope, stethoscope, endoscope, electrocardiogram and defibrillator, and ultrasound.
DTIC
Ship to Shore Communication; Ships; Telemedicine; Information Systems; Health; Surgeons

19980037583 International Society of Toxinology, Morelos, Mexico
12th World Congress on Animal, Plant and Microbial Toxins ***Final Report, 1 Jul. 1997 - 31 Dec. 1997***
Possani, Lourival D., International Society of Toxinology, Mexico; Jan. 1998; 143p; In English, 21-26 Sep. 1997, Cuernavaca, Mexico
Contract(s)/Grant(s): DAMD17-97-I-7333
Report No.(s): AD-A335319; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche; Abstracts Only; Abstracts Only

This Congress took place in Cuernavaca, Morelos, Mexico. Approximately 320 participants from 30 different countries were present. The program included seven plenary lectures, six mini-symposia, 87 oral presentations in free communications sessions

and 167 poster presentations. Only the plenary lectures and symposia will be covered here. The abstracts of the entire Congress will be printed by Toxicon, the official journal of the International Society on Toxinology (it is currently in press).
DTIC
Toxins and Antitoxins; Conferences

19980037717 Texas Univ., Galveston, TX USA
Molecular Study of Interactions Between P-Glycoprotein and Anticancer Drugs ***Final Report, 1 Aug. 1994 - 31 Jul. 1997***
Zhang, Jian-Ting, Texas Univ., USA; Aug. 1997; 20p; In English
Contract(s)/Grant(s): DAMD17-94-J-4419
Report No.(s): AD-A334403; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

P-glycoprotein is a plasma membrane protein that functions as a drug transporter and is responsible for multidrug resistance in some breast cancers. In the past one year, we have generated two site-specific antibodies and used them to determine the topologies of P-glycoprotein in multidrug resistant cancer cells. We found that P-glycoproteins in the plasma membrane of mammalian cells express at least two alternate topologies. This observation is consistent with our previous study using cell-free expression system. The more than one topology feature of P-glycoprotein may be responsible for its multifunctional nature. We have also been able to express the transmembrane domains of P-glycoprotein in bacteria. The success in this study will allow us to map the drug-binding domain in P-glycoprotein and study the drug-P-glycoprotein interactions.
DTIC
Proteins; Bacteria; Cancer; Antibodies; Mammary Glands; Cells (Biology)

19980037954 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Investigation of laser polarized xenon magnetic resonance ***Final Report, 1 Apr. 1996 - 30 Sep. 1997***
Walsworth, Ronald L., Smithsonian Astrophysical Observatory, USA; Feb. 1998; 8p; In English
Contract(s)/Grant(s): NAGw-5025
Report No.(s): NASA/CR-97-207602; NAS 1.26:207602; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Ground-based investigations of a new biomedical diagnostic technology: nuclear magnetic resonance of laser polarized noble gas are addressed. The specific research tasks discussed are: (1) Development of a large-scale noble gas polarization system; (2) biomedical investigations using laser polarized noble gas in conventional (high magnetic field) NMR systems; and (3) the development and application of a low magnetic field system for laser polarized noble gas NMR.
Derived from text
Nuclear Magnetic Resonance; Lasers; Xenon Isotopes

19980038044 Maryland Univ., College Park, MD USA
Symposium on Medical Dual-Use Technologies ***Final Report, 1 May 1995 - 31 Dec. 1995***
Declaris, Nicholas, Maryland Univ., USA; Jan. 1998; 62p; In English
Contract(s)/Grant(s): DAMD17-95-I-5042
Report No.(s): AD-A336405; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The goals of this symposium are: (1) to assess the current and future potential of a number of key technology areas of special interests to ARPA and to biomedical engineers and educators, and (2) to define the directions of future research in these interdisciplinary areas. Invited experts will summarize recent developments in their research area. Panel discussions, with audience participation, will focus on the challenges and benefits in advancing the technologies.
DTIC
ARPA Computer Network; Conferences; Engineers; Medical Services; Medical Personnel; Hybrid Propulsion

19980038154 Defence Research Establishment Suffield, Medicine Hat, Alberta Canada
Estimation of Human Toxicity From Animal Inhalation Toxicity Data: 1. Minute Volume-Body Weight Relationships Between Animals and Man
Bide, R. W., Defence Research Establishment Suffield, Canada; Armour, S. J., Defence Research Establishment Suffield, Canada; Yee, E., Defence Research Establishment Suffield, Canada; Oct. 1997; 50p; In English
Report No.(s): AD-A336351; DRES-SR-673; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The relationship between Body Weight (BW) and respiratory minute volume (Vm) was reviewed by collecting a data base from the literature of minute volume rates that encompassed species from mice at 12 g body weight to horses and a giraffe at 500 kg body weight. The data were separated into anesthetized and non-anesthetized groups and juvenile animals were removed from the non-anesthetized group. The final data set of non-anesthetized animals contained 131 studies representing 2125 animals and

18 species. The data show a power-law (allometric) relationship between the minute volume and body weight. The scaling or allometric parameters in this power-law have been estimated using a linear regression of the logarithms of the minute volume against body weight. The resulting allometric equations were; Log10Vm = -0.286+ 0.802 Log10BW or Vm = 0.518 BW0.802. From these equations a corresponding set of min ute volumes were obtained for various body weights of humans eg. 15.6 L/min for a 70 kg human. The results of the analyses were compared to similar studies in the literature. The relationship is recommended for military uses because it is derived from non-anesthetized, young adult mammals which are expected to mimic the soldier.
DTIC
Human Body; Body Weight; Toxicity; Laboratories

19980038197 University of Southern California, Los Angeles, CA USA
The Effect of a Moderate Aerobic Exercise Training Program on Ovarian Function ***Annual Report, 1 Sep. 1996 - 31 Aug. 1997***
Shames, Lisa S., University of Southern California, USA; Sep. 1997; 15p; In English
Contract(s)/Grant(s): DAMD17-96-I-6013
Report No.(s): AD-A336663; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There is substantial evidence to suggest that estrogens play a key role in the etiology of breast cancer. Both cross-sectional studies of highly trained athletes and prospective studies of high intensity exercise training programs have found a higher frequency of anovulation, lower levels of estradiol and in some cases a shortened luteal phase length with associated lower estradiol levels among these women. However, little is known about the effects of moderate intensity exercise on ovarian function. We hypothesize that the observed reduction in risk with exercise is due to altered ovarian function. We are investigating the relationship between a moderate intensity exercise training program and ovarian function. Specifically we aim: (1) to determine whether changes occur in frequency of ovulation as a result of a 6 month exercise training program, (2) to determine whether changes occur in serum E2 levels in ovulatory and anovulatory cycles in these women, and (3) to determine the luteal phase menstrual cycle lengths of these women as a result of the training program. We are collecting blood and urine specimens and questionnaire data (over a three year period) from 120 premenopausal women. We expect to have completed data and preliminary findings on 39 women by December 1997.
DTIC
Physical Exercise; Reproduction (Biology); Physiological Tests; Physiological Responses

19980038225 Virginia Univ., Dept. of Biology, Charlottesville, VA USA
Control of Circadian Behavior by Transplanted Suprachiasmatic Nuclei and by the Tau Gene ***Final Report, 1 Sep. 1994 - 31 Aug. 1997***
Menaker, Micahel, Virginia Univ., USA; Aug. 1997; 17p; In English
Contract(s)/Grant(s): F49620-94-I-0356; AF Proj. 2312
Report No.(s): AD-A337450; AFRL-SR-BL-TR-98-0166; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The mammalian retina was found to contain an independent circadian oscillator which regulates the synthesis of melatonin and has effects, through a presently unknown pathway, on the circadian rhythm of locomotor behavior in infact animals. Electrical recordings were successfully obtained from several brain regions of intact, behaving hamsters. The suprachiasmatic nucleus (SCN) expressed circadian rhythms of electrical activity with peak electrical activity during the animals' 'day' (inactive period), and low activity during the animals' night (active period). The electrical activity in the bed nucleus of the stria terminalis was in phase with that in the SCN. All other brain regions studied showed electrical rhythms with the opposite phase. The circadian mutation tau was found to affect the period and the temperature compensation mechanism of the oscillator in the cultured retina as well as the dynamics of c-fos induction in the SCN. Tau mutant hamsters were found to have significantly altered responses of their circadian rhythms to GABAergic pharmacological agents. A model system was developed (using the green iguana) with which it is possible, for the first time, to study the interaction of multiple, distributed circadian oscillators. This is the only available experimental model of human circadian dissociation.
DTIC
Circadian Rhythms; Retina; Oscillators

19980038341 Yale Univ., New Haven, CT USA
Muscle and Liver Carbohydrates: Response to Military Task Performance by Women and Men ***Annual Report, 23 Sep. 1996 - 22 Sep. 1997***
Price, Thomas B., Yale Univ., USA; Oct. 1997; 42p; In English
Contract(s)/Grant(s): DAMD17-96-C-6097

Report No.(s): AD-A337501; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During this first year we have made progress in three areas: (1) design of the exercise ergometer and development of a reliable experimental protocol, (2) validation of MRI as a viable method of measuring differential muscle recruitment in a local system (the lower leg with plantar flexion), and (3) development and implementation of a total body MR imaging protocol that enables the identification & differentiation of muscles that are recruited by our experimental protocol. In area 1 we have successfully implemented an experimental protocol that is reliable in a male population, we have not yet tested our protocol in a female population. We may need to reduce the mass of our weighted box in both populations to ensure that the female subjects can complete the task. In area 2 we demonstrated that MRI provides a viable tool to assess differential muscle recruitment patterns. In area 3 we have developed and implemented an echo planar total body MR imaging protocol that reliably measures total body muscle recruitment during our experimental protocol. We have successfully completed a study with a male subject and have been able to identify differential muscle recruitment patterns. Although we were not able to study the number of subjects that we had initially hoped to study, the experimental protocol and MR techniques are ready. With the addition of a staff member to recruit subjects, we are currently screening subjects and preparing them for studies on a weekly to bi-weekly basis.

DTIC

Liver; Muscles; Carbohydrates

19980038345 Chicago Univ., Office of Research Administration, Chicago, IL USA

Phase Shifting Effects of Light and Activity on the Human Circadian Clock ***Final Report, 1 May 1994 - 31 Oct. 1997***

VanCauter, Eve, Chicago Univ., USA; Feb. 15, 1998; 18p; In English

Contract(s)/Grant(s): F49620-94-I-0203; AF Proj. 2312

Report No.(s): AD-A337545; Rept-15522; AFRL-SR-BL-TR-98-0189; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goals of this research are to delineate basic mechanisms controlling the human circadian clock and to derive practical procedures to rapidly phase-shift human rhythms in real life situations. The focus is on the impact of the: interactions between circadian rhythmicity and sleep-wake regulation on endocrine function, metabolism, cardiovascular function, mood and cognition. The studies are designed to approximate real life conditions and examine conditions of circadian misalignment and sleep loss that are relevant to Air Force operations. This effort demonstrated that physical exercise is capable of phase-delaying human rhythms and that daytime exposure to dark may result in rapid phase-advances. We also showed that the subjective discomfort, fatigue, and decreased performance which occur following time shifts (i.e. the ”jet lag syndrome”) are associated not only with a misalignment of bodily rhythms but also with a prolonged elevation of a hormonal concentration in blood. Recent studies further indicated that partial sleep loss, whether acute or chronic, results in marked alterations of endocrine and metabolic function. These observations challenge the common belief that sleep deprivation affects mood and cognition, but not peripheral physiology, and emphasize the need to develop countermeasures to minimize decrements in both mental and physical function.

DTIC

Cardiovascular System; Circadian Rhythms; Clocks; Jet Lag

19980038360 Texas Univ., Medical Branch, Galveston, TX USA

Superoxide and Nitric Oxide Mechanisms in Traumatic Brain Injury and Hemorrhagic Hypotension ***Annual Report, 1 Dec. 1996 - 30 Nov. 1997***

DeWitt, Douglas S., Texas Univ., USA; Dec. 1997; 75p; In English

Contract(s)/Grant(s): DAMD17-97-I-7008

Report No.(s): AD-A337483; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Traumatic brain injury (TBI) reduces cerebral blood flow (CBF) and renders the brain vulnerable to secondary ischemia. Hypotension contributes to poor outcome after TBI in humans. We have prevented hypoperfusion and restored autoregulation after TBI. The goals of this project are to determine whether treatment based on our observations will prevent CBF reductions, brain edema and histological damage after TBI and hemorrhagic hypotension, and to understand the mechanisms that contribute to the efficacy of the proposed treatments. Specific Aim 1 addressed the hypothesis that impairment of cerebrovascular function will result in brain injury after TBI and hemorrhagic hypotension that would not occur after hypotension alone. Specific Aim 2 addressed the hypothesis that post-TBI cerebral hypoperfusion is caused by nitric oxide (NO)-dependent mechanisms. Specific Aim 3 addressed the hypothesis that increased production of super oxide during TBI and subsequent hypotension/resuscitation is responsible for the impaired cerebrovascular reactivity. Specific Aim 4 will address the hypothesis that small volume resuscita-

tion with hyper tonic saline will restore cerebral circulatory and systemic hemodynamics without causing the pronounced changes in brain water diffusion seen after TBI and hypotension/resuscitation with shed blood.
DTIC
Nitric Oxide; Brain Damage; Hemorrhages; Hypotension

19980038364 Wright State Univ., Dayton, OH USA
Middle Cerebral Artery Blood Flow Velocity After Exposure to Sustained +Gz ***Interim Report, Jan. 1996 - Jun. 1997***
Kovitaya, Manaswee, Wright State Univ., USA; Tripp, Lloyd D., Jr., Wright State Univ., USA; Chelette, Tamara L., Wright State Univ., USA; Jun. 1997; 39p; In English
Contract(s)/Grant(s): F41624-95-C-6014; AF Proj. 7184
Report No.(s): AD-A337565; AL/CF-TR-1997-0159; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Anecdotal information has been available for many years that G training over time increases a human's ability to tolerate G. However, little data exist to corroborate the observation. The main thrust of this study was to quantify the accumulative physiological effects of +Gz exposure on cerebral blood flow using transcranial Doppler. A total of six male and six female subjects participated in this study. The subjects experienced numerous G exposures ranging from 2.5 to 5.2 % during three days of centrifuge training. Total time at (i greater than 1 was 5.3 minutes. Changes in middle cerebral artery blood flow velocity during a squat-stand orthostatic challenge test before and after G exposures and then within seven days after each day of G exposure were observed. No significant changes in middle cerebral artery blood flow velocity were found. Further studies with more subjects, higher & levels, and more repeated & exposures of longer duration are suggested.
DTIC
Blood Flow; Brain Circulation; Blood Vessels; Arteries

19980040032
Neutron and X-ray reflectivity studies of human serum albumin adsorption onto functionalized surfaces of self-assembled monolayers
Petrash, Stanislaw, Univ. of Akron, USA; Liebmann-Vinson, Andrea; Foster, Mark D.; Lander, Lorraine M.; Brittain, William J.; Majkrzak, Charles F.; Biotechnology Progress; September-October, 1997; ISSN 8756-7938; Volume 13, no. 5, pp. 635-639; In English; Copyright; Avail: Issuing Activity

Neutron and X-ray reflectivity (NR and XR) have been widely used for the investigation of the structure of thin organic films. Here we demonstrate how these sensitive techniques may be applied to the study of protein adsorption to well-characterized self-assembled monolayers (SAMs) with different chemical functionalities. NR can be used for in situ study, while XR provides complementary information on the initial surfaces and dried layers measured in air after protein has been adsorbed. In situ measurements of adsorption of human serum albumin onto a hydrophilic NH(sub 2)-terminated monolayer clearly show the presence of a thin layer of adsorbed protein next to the SAM. Adsorption of albumin onto a hydrophobic, deuterated, CD(sub 3)-terminated SAM causes even bigger changes in the NR. Upon replacing the protein solution with protein-free buffer solution, the reflectivities from both kinds of monolayers do not change, demonstrating that the albumin adsorption is irreversible after several hours of contact with the protein solution. X-ray reflectivity measurements of dried substrates performed ex situ in air provide a lower bound estimate of the amount of protein which must be at the interface in situ. This combination of techniques provides a uniquely sensitive approach for studying changes that occur upon protein adsorption at an interface.
Author (EI)
X Rays; Proteins; Adsorption; Monomolecular Films; Neutrons; Wave Reflection

19980040042 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Insulated Skin Temperature and Cardiac Frequency as Indices of Thermal Strain during Work in Hot Environments
Taylor, Nigel A., Wollongong Univ., Australia; Amos, Denys, Defence Science and Technology Organisation, Australia; Nov. 1997; 29p; In English
Report No.(s): AD-A335194; DSTO-TR-0590; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper reviews the possibility that thermal strain may be predicted or determined from changes within certain physiological variables. Key variables include body core temperature, cardiac frequency, sweat rate and skin blood flow. The possible use of a modified skin temperature and cardiac frequency are examined as a means of predicting impending heat dysfunction or quantifying thermal strain. The two most promising techniques for possible monitoring of body core temperature are those of insulated transcutaneous and zero-gradient skin temperature measurements.
DTIC
Body Temperature; Skin Temperature (Biology); Cardiac Output; Thermal Stresses

53
BEHAVIORAL SCIENCES

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

19980037953 Klein Associates, Inc., Fairborn, OH USA
Applied Cognitive Task Analysis (ACTA) Methodology ***Final Report, Sep. 1994 - Apr. 1997***
Militello, Laura G., Klein Associates, Inc., USA; Hutton, Robert J. B., Klein Associates, Inc., USA; Pliske, Rebecca M., Klein Associates, Inc., USA; Knight, Betsy J., Klein Associates, Inc., USA; Klein, Gary, Klein Associates, Inc., USA; Nov. 1997; 193p; In English
Contract(s)/Grant(s): N66001-94-C-7034
Report No.(s): AD-A335225; NPRDC-TN-98-4; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

The impact of technology on many tasks and functions has resulted in greatly increased demands on the cognitive skills of workers. More procedural or predictable tasks are now handled by smart machines, while humans have become responsible for difficult cognitive tasks. The increase in cognitive demands placed on workers has created a need for training that targets cognitive skills. In most cases, however, the task analyses that drive training development are conducted using methodologies that focus primarily on behaviors. The training community needs tools that will allow access to experienced based cognitive skills. The primary goal of this project was to develop streamlined methods of Cognitive Task Analysis that would fill this need. We have made important progression this direction. We have developed streamlined methods of Cognitive Task Analysis. Our evaluation study indicates that the methods are usable and aid in the development of important, accurate training materials addressing cognitive issues. In addition, we have developed a CD-based stand alone instructional package, which will make the Applied Cognitive Task Analysis (ACTA) tools widely accessible. A survey of the software conducted with both Navy Instructional Systems Specialists (ISSs) and private sector Instructional Designers indicates that the software is successful in communicating the ACTA techniques.
DTIC
Technologies; Education; Tasks; Mental Performance

19980038359 Colorado Univ., Dept. of Psychology, Boulder, CO USA
On Verification of Multiplication Facts: An Investigation Using Retrospective Protocols ***Interim Report, Aug. 1995 - Aug. 1996***
Romero, Stephen, Colorado Univ., USA; Sep. 1997; 63p; In English
Contract(s)/Grant(s): MDA903-86-K-0010; B74F61102C07
Report No.(s): AD-A337482; ARI-RN-97-33; ARI-RN-97-33; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Current theories of mental multiplication elicit two questions: (1) Do the same processes underlie answer production and answer verification, and (2) Does any theory centered around a single strategy suffice to explain the underlying mechanisms for these tasks? This study involved addition of retrospective protocols to a verification task, in two experiments. The patterns of effects for reaction times (RT) and errors in both experiments were similar to Campbell's (1991) findings, suggesting that the addition of the protocols did not significantly alter the task. Analysis of the protocols provided evidence that retrieval of the correct answer from memory and then comparison to the answer given was the modal strategy reported in both experiments but was not reported for 100% of the trials. These findings imply that the same processes that underlie production are involved. Furthermore, the use of protocols can facilitate differentiating what strategies are involved and provide evidence that any theory of this skill assuming one strategy will likely be incomplete.
DTIC
Mental Performance; Psychological Tests

19980038361 CASDE Corp., Alexandria, VA USA
Immersive Visualization of Complex Situations for Mission Rehearsal ***Final Report, Apr. 1996 - Jan. 1997***
Kasper, Peter K., CASDE Corp., USA; Sep. 1997; 21p; In English
Contract(s)/Grant(s): DASW01-96-C-0032; B74F61102C01
Report No.(s): AD-A337487; ARI-RN-97-35; ARI-RN-97-35; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The program objectives of this report included identification of an appropriate rehearsal scenario as well as the requirements and specifications for necessary computer hardware and software. Key considerations in identifying the training scenario were intrinsic benefit to the Army, effectiveness of virtual environments for training and benefit from implementation over a distributed computer system.
DTIC
Virtual Reality; Distributed Interactive Simulation; Education; Computer Programs

19980038362 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA

Training Efficiently in Virtual Environments: Determinants of Distance Perception of Stationary Observers Viewing Stationary Objects ***Final Report, Feb. - Sep. 1995***

Witmer, Bob G., Army Research Inst. for the Behavioral and Social Sciences, USA; Kline, Paul B., Army Research Inst. for the Behavioral and Social Sciences, USA; Sep. 1997; 64p; In English

Report No.(s): AD-A337488; ARI-RN-97-36; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The accurate perception and estimation of distance is an important element of many military tasks. It is necessary for orienting oneself on the battlefield, for making optimal use of terrain features during navigation, and for judging the distance from one point to another. It is also a component of both route and configuration knowledge and acquisition. In order to maximize transfer from Virtual Environment (VE) to the real world, it is important to develop an understanding of the capabilities and limitations of this new training medium. Toward that end, the present study sought to gain insight about the conditions affecting distance estimation of VEs. The purpose of this research is to examine factors that influence the perception of distance in VEs. Two experiments were designed to investigate the relative effects of such factors on distance estimates of a stationary observer positioned at near and medium distances from an object. Factors found to improve distance estimates in these experiments will be incorporated into the design of VEs for subsequent investigations.

DTIC

Visual Perception; Virtual Reality; Space Perception; Distance

19980038380 Georgia Inst. of Tech., Atlanta, GA USA

Individual Feedback Propensities and Their Effects on Motivation, Training Success, and Performance ***Final Report, Jun. 1992 - Jun. 1997***

Herols, David M., Georgia Inst. of Tech., USA; Parsons, Charles K., Georgia Inst. of Tech., USA; Fedor, Donald B., Georgia Inst. of Tech., USA; Sep. 1997; 63p; In English

Contract(s)/Grant(s): MDA903-92-K-0107; B74F61102C10

Report No.(s): AD-A337479; ARI-RN-97-31; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This research project had as its goal the development, validation, and field testing of new measures of individual differences that assess people's propensities to seek, generate, or interpret performance feedback information in a particular way. Specifically, based on preliminary work, it was thought that internal and external propensities exist that make individuals more or less likely to prefer, rely on, seek, or attend to primarily internally or externally generated performance cues. These propensities, if identified and measured, would be related to skill acquisition, performance improvement, self regulatory processes, performance maintenance, as well as a variety of affective and cognitive responses to performance settings based on the interaction of the performer's feedback predispositions and the characteristics of the feedback available. In summary, this study proposed to help one better understand the role of dispositions in explaining how different individuals go about shaping their feedback environment, processing feedback information, and responding to such information. The driving belief behind this line of research has been that individuals differ in ways that are specific to their orientation toward performance feedback situations, and that such differences, if identified and appropriately measured, would be valuable in better understanding the links between feedback and performance as well as other outcomes of interest.

DTIC

Mental Performance; Feedback; Motivation

19980040094 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA

Concept Vectors: A Synthesis of Concept Mapping and Matrices for Knowledge Representation in Intelligent Tutoring Systems

Dyson, Mark L., Air Force Inst. of Tech., USA; Dec. 16, 1997; 68p; In English

Report No.(s): AD-A335179; AFIT/GCS/ENG/97D-07; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A review of the literature relating to intelligent tutoring systems (ITS) reveals that the bulk of research to date is focused on the student, and on methods for representing the knowledge itself. From student models to learning schemas to presentation methods, comparatively little attention has been paid to the problem of educators attempting to build viable lesson plans for use in an ITS environment - yet when this problem is addressed in the literature, it is recognized as a potentially daunting one. This thesis addresses the problem of ITS lesson plan development by proposing a practical, computable approach for knowledge engineering that is based on proven classroom methods. The document then details a system for dynamically creating lesson plans from a

knowledge base created under the described methodology, using already-established algorithms of proven tractability, and then discusses how this system can be integrated into existing and future ITS design.
DTIC
Knowledge Based Systems; Machine Learning

19980040950 Michigan Univ., Ann Arbor, MI USA
Foundation of Stimulus-Response/Stimulus-Stimulus Compatability ***Final Report, 1 Nov. 1993 - 31 Oct.1997***
Kornblum, Sylvan, Michigan Univ., USA; Feb. 10, 1998; 48p; In English
Contract(s)/Grant(s): F49620-94-I-0020; AF Proj. 2313
Report No.(s): AD-A337872; AFRL-SR-BL-TR-98-0180; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research described in this final report continues, and greatly extends our ongoing investigations of basic, elemental, cognitive processes in humans. During the period covered by the report we focussed on validating the original dimensional overlap model, testing some of its fundamental predictions, and recasting the model itself in a computational form. These efforts appear to have been successful. The original model and its taxonomy have become an effective integrative framework in an important domain of human performance (stimulus-stimulus, and stimulus-response compatibility in the broadest sense of these terms), and encompass, in a principled manner, a broad family of performance tasks representing classic problems in human cognition (e.g., Stroop and Stroop-like tasks, Eriksen and Eriksen-like paradigms, and Simon and Simon-like effects). Our work has resulted in the publication of 10 peer reviewed articles, with 4 manuscripts presently under review, one dissertation, and 17 presentations at professional meetings. The model has also contributed an important theoretical perspective to investigators working on psychophysiological and neurophysiological mechanisms of response production, and stimulus-response association processes. The principal goal for our future work is to develop and extend the model further, and test its new properties and implications. Some of these new properties span inter- as well as intra-trial phenomena, and mark the beginnings of the theoretical and empirical bridges that we were hoping, originally, to be able to build between the family of SRC tasks, and the central problems of cognition.
DTIC
Human Performance; Physiological Responses; Neurophysiology; Cognitive Psychology; Taxonomy

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.

19980037427 NASA Marshall Space Flight Center, Huntsville, AL USA
Living Together in Space: The Design and Operation of the Life Support Systems on the International Space Station, Volume 1
Wieland, P. O., NASA Marshall Space Flight Center, USA; Jan. 1998; 302p; In English
Report No.(s): NASA/TM-1998-206956-Vol-1; M-850-Vol-1; NAS 1.15:206956-Vol-1; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

The International Space Station (ISS) incorporates elements designed and developed by an international consortium led by the USA (U.S.), and by Russia. For this cooperative effort to succeed, it is crucial that the designs and methods of design of the other partners are understood sufficiently to ensure compatibility. Environmental Control and Life Support (ECLS) is one system in which functions are performed independently on the Russian Segment (RS) and on the U.S./international segments. This document describes, in two volumes, the design and operation of the ECLS Systems (ECLSS) on board the ISS. This current volume, Volume 1, is divided into three chapters. Chapter 1 is a general overview of the ISS, describing the configuration, general requirements, and distribution of systems as related to the ECLSS, and includes discussion of the design philosophies of the partners and methods of verification of equipment. Chapter 2 describes the U.S. ECLSS and technologies in greater detail. Chapter 3 describes the ECLSS in the European Attached Pressurized Module (APM), Japanese Experiment Module (JEM), and Italian Mini-Pressurized Logistics Module (MPLM). Volume II describes the Russian ECLSS and technologies in greater detail. These documents present thorough, yet concise, descriptions of the ISS ECLSS.
Author
International Space Station; Environmental Control; Life Support Systems; Aerospace Systems; Spacecraft Modules; Systems Engineering; Design Analysis

19980037532 Naval Surface Warfare Center, Carderock Div., Bethesda, MD USA

Material Considerations for the Navy Shipboard Waste Destruction System

Shifler, David A., Naval Surface Warfare Center, USA; Wong, Catherine R., Naval Surface Warfare Center, USA; Oct. 1997; 27p; In English

Contract(s)/Grant(s): Proj. PE60223N

Report No.(s): AD-A336524; NSWCCD-TR-61-97/14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Compliance with MARPOL environmental regulations has required the design of a waste management system to reduce the volume of solid shipboard waste and treat it so that it is safe to carry aboard ship. The U.S. Navy in cooperation with industry has developed a conceptual design of a Plasma Arc Waste Destruction System (PAWDS) capable of meeting strict shipboard weight, size, and operation criteria that has precluded the use of traditional commercial systems. The innovative system design has involved a thorough examination of candidate materials that should be capable of withstanding the processing of a variable waste stream that may include highly corrosive constituents. The structural components of the PAWDS should insure safety of personnel and ship by resisting degradation through high temperature corrosion, erosion, thermal cycling, and other effects.

DTIC

Waste Management; Management Systems; Design Analysis; Structural Design

19980038354 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada

An Evaluation of Contender Helmets for Visual Obstruction and Preliminary Validation of a Visual Obstruction Measuring Tool

Shek, Y., Defence and Civil Inst. of Environmental Medicine, Canada; Dec. 1997; 31p; In English

Report No.(s): AD-A337436; DCIEM-97-R-64; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aim of this study was to (1) use a headform perimeter to evaluate contender army helmets for visual interference; and (2) determine the effectiveness and validity of using the headform perimeter to measure visual interference compared to using human subjects. A headform was made in-house to be used with a standard Goldmann perimeter. The head form perimeter was used to evaluate the six contender helmets for visual obstructions, by measuring loss of field of view (FOV). In a separate study, human subjects FOV measurements were obtained with the same Goldmann perimeter. Subjects' loss of FOV while wearing various helmets were measured. The results showed that: (1) all brimmed helmets caused significant reductions of FOV when compared with baseline measurements (no helmet); (2) brimless helmets (British and Israeli) did not cause any significant reduction of FOV; and (3) the headform FOV data were consistent with subjects' FOV measurements, for three of the six test helmets.

DTIC

Human Factors Engineering; Helmets; Field of View

19980038365 Defence and Civil Inst. of Environmental Medicine, North York, Ontario Canada

An Evaluation of Workload Model Predictions in a Helicopter Environment

Cain, Brad, Defence and Civil Inst. of Environmental Medicine, Canada; Dec. 1997; 71p; In English

Report No.(s): AD-A337570; DCIEM-97-R-66; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report compares the empirical workload results obtained during a field exercise involving four CH-136 Kiowa crews with results predicted from a task network simulation of the exercise. None of the correlation coefficients is outstanding and only a few of the analytical measures explained greater than 50% of the variance in the empirical workload scores. The correlations between the pilots' empirical workload scores and the analytical workload values were generally greater than that found for the observers, possibly a result of the smaller number of subjects in the observer group or perhaps reflecting greater attention focused on the workload of the pilot by the modeling community. The variation of the workload measures within each flight was substantial, suggesting individual differences between subjects as well as differences in the details of each mission played significant roles in determining the perception of workload rated by the subjects. of the overall workload measures, the simpler measures were found to capture the greatest portion of the empirical workload variance although these measures provide little detail in what is actually causing the overload and at best only capture 50% of the workload variance. While the multi-dimensional workload measures may provide greater detail about what is causing high workloads, they do not seem to be capturing a great deal of the workload variance to begin with. Although the correlations found in this study are low and only half the workload variance was captured, the models may still be useful.

DTIC

Evaluation; Helicopters; Workloads (Psychophysiology); Flight Training; Numerical Analysis

19980038367 Armstrong Lab., Wright-Patterson AFB, OH USA

Evaluation Method for Simulated Human Motion ***Interim Report, Jun. 1996 - Jan. 1997***

Wampler, Jeff L., Armstrong Lab., USA; Hale, Robert, Armstrong Lab., USA; Ziolek, Scon, Armstrong Lab., USA; Bridgman, Tom, Armstrong Lab., USA; Oct. 1997; 23p; In English

Contract(s)/Grant(s): AF Proj. 2940

Report No.(s): AD-A337582; AL/HR-TP-1997-0054; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Computer generated human figures, called Human Figure Models (HFMs), are being used for human factors design and maintenance analysis on solid models of Department of Defense system designs. The reliability of products from HFM design analyses are dependent on the accuracy of the human model. This paper describes a method for evaluating the accuracy of an HFM compared to real human motion. Although the evaluation is being performed on the HFM in the Design Evaluation for Personnel, Training and Human Factors (DEPTH) system, the method can be applied to any commercially-available HFM.

DTIC

Evaluation; Human Factors Engineering; Computer Aided Design

19980040040 Air Force Inst. of Tech., Graduate School of Logistics and Acquisition, Wright-Patterson AFB, OH USA

USAF Pilot Perceptions of Workload Assessment in a Combat or High-Threat Environment

Kottas, Kadircan, Air Force Inst. of Tech., USA; Dec. 1997; 206p; In English

Report No.(s): AD-A335182; AFIT/GLM/LAC/97D-1; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This study analyzed the self reported survey responses of 219 Air Force Pilots concerning their perceptions of workload assessment in a combat or a high threat environment. The first objective of this study was to determine and compare the combat workload factors of varying importance in combat workload assessment by aircraft and mission type flown. The second objective was to examine the pilots' perception of combat mission inflight workload. A stepwise regression model to predict the pilots' perceptions of inflight workload using pilots' characteristics data was explored. Research conclusion varied among aircraft types. Combat workload items indicated as distractingly important were similar for all aircraft types, while items in lower level of importance were impacted by aircraft type. Mean Combat Workload (CWL) scores of pilots from each aircraft type were not significantly different. Overall, it was concluded that surveying pilots who had flown in combat or high threat environments provided useful responses to assess pilot workload; however, findings based on subjective assessments, provide tentative grounds for further research.

DTIC

Aircraft Pilots; Combat; Workloads (Psychophysiology); Aeration

19980040041 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia

A Physiological Evaluation of the Chemical, Biological Combat Suit under Warm, Humid and Hot, Dry Climatic Conditions

Amos, D., Defence Science and Technology Organisation, Australia; Gray, B., Defence Science and Technology Organisation, Australia; Hansen, R., Sydney Univ., Australia; Sep. 1997; 26p; In English

Report No.(s): AD-A335193; DSTO-TR-0570; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The physiological responses of a group of nine subjects exercising at a medium metabolic rate in a concept demonstrator low burden chemical protective ensemble have been determined under warm, humid and hot, dry climatic conditions typical of the Townsville and Pilbara regions of northern Australia. There was little difference between the normal combat uniform and the CBCS worn as a combat uniform, without hood, mask and gloves, in terms of increase in rectal temperature and increase in heart rate. The major limitation on soldier performance in the fully encapsulated Chemical, Biological Combat Suit was imposed by the combination of mask, permeable hood and impermeable gloves and not by the suit itself.

DTIC

Physiology; Evaluation; Combat; Suits; Protective Clothing; Physiological Effects; Performance Prediction

19980040045 Hudson Research Associates, Stuyvesant, NY USA

Computer Aided Systems Human Engineering: Performance Visualization System. A Hypermedia Tool for Designers ***Interim Report, Jan. 1990 - Nov. 1996***

Lincoln, Janet E., Hudson Research Associates, USA; Monk, Donald l., Hudson Research Associates, USA; Aug. 1997; 210p; In English

Contract(s)/Grant(s): F41624-94-D-6000; AF Proj. 7184

Report No.(s): AD-A335217; AL/CF-TR-1997-0149; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The Computer Aided Systems Human Engineering: Performance Visualization Subsystem (CASHE:PVS) is a multidocument ergonomics database on CD-ROM. The reference documents in the database provide data, phenomenon descriptions, models, and standards' from over 70 research areas dealing with the perceptual and performance capabilities of the human operator. This information is integrated into an interactive multimedia system that combines state of the art information retrieval, browsing, and navigation with specialized tools that help the designer interpret and apply the ergonomics data available in the product. Behavioral data and phenomena descriptions in text, figures, and tables are accompanied by prototyping simulations, animations, and audio demonstrations that allow users to experience important perceptual and performance phenomena for themselves and provide a rich understanding of how these phenomena relate to the design of human-operated systems. This report provides a system overview of the software and gives detailed discussions of various design and implementation issues associated with the production of the software and its databases.
DTIC
Computer Aided Design; Human Factors Engineering; Data Bases; Systems Engineering; Display Devices

19980040078 Natick Research, Development and Engineering Center, Army Soldier Systems Command, Natick, MA USA
Candidate Fabrics for the 2nd Generation Extended Cold Weather Clothing System ***Final Report***
Auerbach, Margaret A., Natick Research, Development and Engineering Center, USA; Jugueta, Regina D., Natick Research, Development and Engineering Center, USA; Dec. 1997; 50p; In English
Contract(s)/Grant(s): DAAK60-95-P-9059
Report No.(s): AD-A336776; NATICK/TR-98-006; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A literature search was conducted during the summer of 1995 to find potential candidate fabrics and materials for the 2nd Generation Extended Cold Weather Clothing System (ECWCS). The objective was to find alternative materials for the ECWCS which would drastically reduce the weight and bulk of the current system, while providing improved environmental protection over a wide spectrum of climatic conditions. Several materials were identified that showed potential; however, materials testing is needed before a complete evaluation of the materials can be made.
DTIC
Protective Clothing; Cold Weather

19980040089 Department of the Navy, Washington, DC USA
Breathing Gas Cooling and Heating Device
Hughes, Robert, Inventor, Department of the Navy, USA; Courson, Billy, Inventor, Department of the Navy, USA; Rudolph, Joseph, Inventor, Department of the Navy, USA; Sep. 02, 1997; 5p; In English
Patent Info.: Filed 10 Aug. 1995; US-Patent-Appl-SN-513-493; US-Patent-5,662,161
Report No.(s): AD-D018720; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A breathing gas cooling and heating device. Warm breathing gas enters the unit which consists of a heat exchanger mounted in an insulated shell and runs through the heat exchanger tubes. These tubes are in intimate thermal contact with micro-encapsulated phase change materials. The micro-encapsulated phase change material changes phase from solid to liquid, thereby absorbing heat at the temperature of the phase change material, and thereby cooling the gas flowing through the heat exchanger. In situations where heating of the breathing gas is desired, the gas stream absorbs heat from the phase change material. The unit is rechargeable for chilling applications after usage by placing the device in an ambient environment less than the temperature of the phase change of the material or by replacing the phase change material. It is rechargeable for heating applications by warming the device to a temperature above that of the phase change material. The unit circum vents the need for ice, the most commonly available chilling medium, in situations where ice or other cooling is not available. Additionally, the unit can be used by filling it with an ice water slurry for fire fighting applications where ice is readily available. The gas then exits the device in a chilled state. The device is designed to work in conjunction with numerous existing breathing apparatus by virtue of the in-line installation capability to existing systems.
DTIC
Breathing Apparatus; Gas Heating; Gas Cooling; Heat Exchangers; Gas Flow

Subject Term Index

R

S

T

V

W

X

Z

Personal Author Index

Report Documentation Page

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