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July 13, 1998

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Typical Report Citation and Abstract

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

Key

1. Document ID Number; Corporate Source
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3. Author(s) and Affiliation(s)
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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 469)

JULY 13, 1998

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LIFE SCIENCES (GENERAL)

19980107883 Central Lab. of the Research Councils, Rutherford Appleton Lab., Chilton, UK

Differential Two Colour X-Ray Radiobiology of Membrane/Cytoplasm Yeast Cells: TMR Large-Scale Facilities Access Programme

Milani, M., Milan Univ., Italy; Batani, D., Milan Univ., Italy; Bortolotto, F., Milan Univ., Italy; Botto, C., Milan Univ., Italy; Baroni, G., Milan Univ., Italy; Cozzi, S., Milan Univ., Italy; Masini, A., Milan Univ., Italy; Ferraro, L., Milan Univ., Italy; Previdi, F., Milan Univ., Italy; Ballerini, M., Milan Univ., Italy; Costato, M., Modena Univ., Italy; Pozzi, A., Modena Univ., Italy; Salsi, F., Modena Univ., Italy; Allott, R., Central Lab. of the Research Councils, UK; Lisi, N., Central Lab. of the Research Councils, UK; Turcu, E., Central Lab. of the Research Councils, UK; Feb. 1998; 21p; In English; Original contains color illustrations

Contract(s)/Grant(s): NATO-GRC-96/1133; ERBFMGE-CT950053; CNR-96.00266.CT02.115.27689

Report No.(s): RAL-TR-98-011; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11, 0Qx, UK), Hardcopy, Microfiche

Several results of this experiment need to be pointed out, namely: i) the development of an investigation technique based on the use of very soft X-ray in order to damage specific structures inside the cell structure (specifically cell wall and membrane); ii) the use of pressure sensors as a diagnostics of cell response which allows to monitor cell response over a large range of times from fast response up to several hours; iii) the use of dry yeast cells as an ”easy to handle” type of sample; iv) the development of a simple model for X-ray dosimetry of the different cell compartments; v) the study of metabolic oscillation in yeast cell suspension and the observation of the oscillation frequency shift following an exposure to soft X-rays. All these points prove that the availability of high brightness soft X-ray sources, like laser-plasma sources, makes it possible to think of new experiment and to realise new applications. Such experiment could not have been performed with conventional, low intensity, soft X-ray sources which require long exposure times. In this cases indeed cell reaction to the damaging factor would have started before the complete dose deposition, hence changing the biophysics of the process. Further research is now progressing in order to get a more reliable data statistics and improve the comprehension of the biophysical phenomena involved. With respect to point (ii), which again is possible because of the acquisition technique we used, but also because the high brightness of the source allow the required dose to be ”instantaneously” deposited, we want to stress again that it may represent a powerful tool to investigate cell metabolism and the response to X-rays. Instead in cell radiobiology the usual approach ([22] for instance)is based on the study of survival curves, i.e. as the capability of individual cells of developing colonies after damage induced by X-rays, i.e. is based on a response at very long times after irradiation, thereby losing all the information on fast cell response to damages and also all information about cell damages which are not likely to be transmitted to the genetic descendants.

Author

Radiobiology; X Ray Sources; Yeast; Cells (Biology); Biophysics; Diagnosis

19980107915 California Univ., San Diego, CA USA

From the Primitive Atmosphere to the Prebiotic Soup to the Pre-RNA World

Miller, Stanley L., California Univ., USA; RNA Today; May 10, 1996; 1p; In English

Contract(s)/Grant(s): NAGw-2881

Report No.(s): NASA/CR-96-207633; NAS 1.26:207633; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

Organic compounds would have been produced in an earth’s atmosphere that was reducing. The soup would contain amino and hydroxy acids, together with smaller amounts of purines and pyrimidines. The presence’ of sugars is less likely, although they can be produced by the formose reaction from formaldehyde. However, the prebiotic synthesis of RNA has not been demonstrated. One problem is that ribose is not produced selectively over other pentoses and hexoses, except under special conditions. The second problem is that ribose is unstable, with a half-life at pH7 and 100 C of 73 minutes (44 years at 0 C). Other sugars are similarly

unstable. Another problem is that there is no efficient prebiotic synthesis of polyphosphates, nor the glycosidic bond of nucleosides. This suggests that there may have been an informational macromolecule that preceded RNA. The RNA world refers to the time when RNA carried both the genetic information and the catalytic activity, and was subsequently converted to the DNA/protein world when protein synthesis began. Preceeding the RNA world was the Pre-RNA world, where a backbone different from ribose phosphate was used, and the bases may have been different from adenine, uracil, guanine and cytosine. We have shown recently that cytosine and uracil can be synthesized efficiently under prebiotic conditions using a dried lagoon model instead of the usual dilute ocean hypothesis. In addition, we have shown that uracil adds formaldehyde efficiently to give 5- hydroxymethyl uracil, which in turn adds various nucleophiles to give uracil analogs of most of the amino acids that occur in proteins. For example, the ammonia, guanidine and imidazole adducts from the analogs of lysine, arginine and histidine. This suggests that the catalytic potential of RNA may have been much more extensive than previously assumed. The major problem is finding out what was the precursor to the ribose phosphate backbone. This will be the key to developing prebiotic self-replicating systems.
Derived from text
Protein Synthesis; Ribonucleic Acids; Macromolecules; Organic Compounds

19980111016 Indiana Univ., Research and Sponsored Programs, Indianapolis, IN USA
Cell Kinetic and Histomorphometric Analysis of Microgravitational Osteopenia: PARE.03B ***Final Report***
Roberts, W. Eugene, Indiana Univ., USA; Garetto, Lawrence P., Indiana Univ., USA; Feb. 03, 1998; 16p; In English
Contract(s)/Grant(s): NAG2-756
Report No.(s): NASA/CR-1998-207697; NAS 1.26:207697; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Previous methods of identifying cells undergoing DNA synthesis (S-phase) utilized H-3 thymidine (3HT) autoradiography. 5-Bromo-2'-deoxyuridine (BrdU) immunohistochemistry is a nonradioactive alternative method. This experiment compared the two methods using the nuclear volume model for osteoblast histogenesis in two different embedding media. Twenty Sprague-Dawley rats were used, with half receiving 3HT (1 micro Ci/g) and the other half BrdU (50 microgram/g). Condyies were embedded (one side in paraffin, the other in plastic) and S-phase nuclei were identified using either autoradiography or immunohistochemistry. The fractional distribution of preosteoblast cell types and the percentage of labeled cells (within each cell fraction and label index) were calculated and expressed as mean q standard error. Chi-Square analysis showed only a minor difference in the fractional distribution of cell types. However, there were significant differences (p less than 0.05) by ANOVA, in the nuclear labeling of specific cell types. With the exception of the less-differentiated A+A'cells, more BrdU label was consistently detected in paraffin than in plastic-embedded sections. In general, more nuclei were labeled with 3H-thymidine than with BrdU in both types of embedding media. Labeling index data (labeled cells/total cells sampled x 100) indicated that BrdU in paraffin, but not plastic gave the same results as 3HT in either embedding method. Thus, we conclude that the two labeling methods do not yield the same results for the nuclear volume model and that embedding media is an important factor whenusing BrdU. As a result of this work, 3HT was chosen for used in the PARE.03 flight experiments.
Author
Autoradiography; Microgravity; Experimentation

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AEROSPACE MEDICINE

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

19980096425 Army Research Inst. of Environmental Medicine, Natick, MA USA
The Effect of Hyperthermia on Intracellular Sodium Concentration in Isolated Human Cells: A Preliminary Report
Gaffin, S. L., Army Research Inst. of Environmental Medicine, USA; Koratich, M. S., Army Research Inst. of Environmental Medicine, USA; Hubbard, R. W., Army Research Inst. of Environmental Medicine, USA; Jun. 1996; 4p; In English; Science and Technology for Force, 24-27 Jun. 1996, USA; Sponsored by Assistant Secretary of the Army (Research, Development and Acquisition), USA
Report No.(s): AD-A331123; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Groups of human squamous epithelial cells labeled with the sodium s ensitive fluorescent dye, Sodium Green (Molecular Probes, OR) were subjected to a 20 minute hyperthermic stress at temperatures as high as 50 deg C and then cooled to 37 deg C. Changes in fluorescence were determined at one minute intervals using an interactive laser cytometer. Cells raised to temperatures in excess of 43 deg C showed a significant rise in fluorescence and thus a rise in intracellular sodium concentration, Na(+)i. Upon return to 37 deg C, Na(+)i in these cells did not fall but continued to rise at an increased rate compared to controls.
DTIC
Hyperthermia; Cytology; Cytometry; Epithelium

19980107912 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Heat Acclimation Procedures: Preparation for Humid Heat Exposure
Taylor, Nigel A. S., Wollongong Univ., Australia; Patterson, Mark J., Wollongong Univ., Australia; Regan, Jodie M., Defence Science and Technology Organisation, Australia; Amos, Denys, Defence Science and Technology Organisation, Australia; Oct. 1997; 27p; In English
Report No.(s): DSTO-TR-0580; AR-010-356; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., P.O. Box 4331, Melbourne Victoria 3001, Australia), Hardcopy, Microfiche

Thermal homeostasis is rigorously challenged under extremely hot conditions, particularly during prolonged exercise, with even highly trained individuals failing to maintain thermal homeostasis. As a consequence, the incidence of heat illness increases, particularly during the first five days of heat exposure. However, humans have evolved so that heat dissipation and conservation mechanisms are able to adapt to a range of environmental conditions. These physiological changes can be brought about in response to acute natural climatic changes, artificial heat exposure and to endurance exercise training. This report summarizes the physiological changes accompanying heat adaptation and critically reviews heat adaptation procedures. Finally, recommendations are made concerning the implementation of heat adaptation procedures for military personnel. These recommendations include: specification of the thermal environment; the level of thermal strain; the use of exercise; exposure duration; and the subsequent maintenance of heat adaptation.
Author
Homeostasis; Thermal Environments; High Temperature Environments; Temperature Effects; Climate Change; Heat Acclimatization

19980111107 Washington Univ., Bellingham, WA USA
Visualization, Identification and Scaling of Complex Ecotoxicological Dynamics at Varying Physical and Temporal Scales ***Final Report, 1 Jun. 1994 - 30 Sep. 1997***
Landis, Wayne G., Washington Univ., USA; Matthews, Robin A., Washington Univ., USA; Matthews, Geoff rey B., Washington Univ., USA; Dec. 10, 1997; 489p; In English
Contract(s)/Grant(s): F49620-94-I-0285; AF Proj. 2312
Report No.(s): AD-A336623; AFRL-SR-BL-TR-98-0132; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

We have developed and confirmed experimentally the Community Conditioning Hypothesis. The hypothesis states that impacts to ecological structures are persistent, the variables containing information change over time, and ecological systems are irreversible. We confirmed persistence of effects in experiments ranging from 90 to 180 days for 3-L microcosms to 240 days tor an outdoor mesocosm. Even wide differences in seasonal conditions or microclimate variation did not hide effects on larger systems. We conducted two types of experiments where microcosms were exposed to multiple stresses: (1) JP-8 stress was followed by heat shock and (2) two exposures 80 days apart to JP-8. For JP-8/heat, the initial stressor pattern was dominant with only minor changes in trajectory attributable to heat shock. For JP-8/JP-8, the second doing was dominant Thus. impacts due to multiple-stressor events can vary widely depending on timing and stress type. to aid analysts of effects at the community level, we developed a software package called MuSCLE that includes multivariate data analysis, pattern recognition, and visualization tools. We translated our results to the landscape level using metapopulation dynamic models. We found that impacts upon one patch can have dramatic effects upon other patches that are not contaminated.
DTIC
Applications Programs (Computers); Thermal Shock; Topography; Microclimatology; Dynamic Models

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BEHAVIORAL SCIENCES

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

19980076091 Georgia Univ., Dept. of Psychology, Athens, GA USA
An Improved Measure of Reading Skill: The Cognitive Structure Test ***Final Report***
Sorrells, Robert, Georgia Univ., USA; Britton, Bruce, Georgia Univ., USA; Jan. 1997; 134p; In English
Report No.(s): AD-A331166; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This study compared the construct validity and the predictive validity of a new test, called the Cognitive Structure Test, to multiple-choice tests of reading skill, namely the Armed Forces Vocational Aptitude Battery Paragraph Comprehension Test (ASVABpc) and the Scholastic Aptitude Test (SAT) . to test the hypothesis that the Cognitive Structure Test is a better test of reading skill, 347 Air Force recruits read 16 technical and scientific passages (8 from the ASVABpc and 8 from the SAT) and took both multiple-choice and Cognitive Structure tests on the passages. For each passage the recruits' Cognitive Structure Test

responses were compared to the responses of two experts who also read the passage and took the Cognitive Structure Tests (a total of 32 experts) . These experts also took the multiple-choice tests. Results indicated that t he two tests measured very similar constructs and had similar reliability (Chronbach's Alpha) ratings (Cognitive Structure Test, .63; Multiple- choice test, .68) Results showed that the Cognitive Structure Test was superior to the multiple-choice tests in predicting final Technical School grade point averages for the recruits, and equivalent to the multiple-choice tests in predicting the ASVAB vocational and general science tests, and general knowledge tests. For the ASVAB passages, the Cognitive Structure Test predicted the final Techschool scores, but the multiple-choice test did not. Both tests predicted domain specific knowledge and general ability.
DTIC
Aptitude; Psychological Tests

19980096431 Naval War Coll., Newport, RI USA
The Principles of Operational Leadership and the Fog of Life: Why Some Succeed and Others Fail ***Final Report***
Martin, William C., Jr., Naval War Coll., USA; May 1997; 26p; In English
Report No.(s): AD-A328111; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Warfighters must give increased attention to the study of leadership. Intuition and military superiority alone will not promise success. The study of Operational Leadership will illuminate those values that contribute to victory. Further, education and an understanding of history can best determine the course of action the Operational Commander should consider in preparing for hostilities. Aristotle notes that it is possible to reason correctly from false premises, thus coming up with logically correct, but untrue conclusions. To avoid this potential pitfall, a Commander must possess the precise knowledge of the Principles of Operational Leadership, and use these precepts correctly in order to secure success in future conflicts. This paper's approach towards Operational Leadership provides: (a) The Principles of Operational Leadership; (b) The historical examples of Operational Leadership through the case studies of three distinct battles during the Civil War involving General U. S. Grant, and; (c) Describes how the acquired Principles of Operational Leadership and historical lessons must be cultivated in a stressful academic atmosphere, prior to being tested on the battlefield. This paper judges Grant's performance using the Principle's of Operational Leadership. This review and analysis of General Grant's Operational Leadership through a 'window of history', offers a practical example for military leaders, to assist them in achieving their ultimate objective - victory. These practical examples from history and an education on the tenets of Operational Leadership, accomplished under a stressful regimen, can better guarantee success in tomorrow's conflicts.
DTIC
Military Operations; Decision Making

19980111034 Naval Aerospace Medical Research Lab., Pensacola, FL USA
A Cost-Benefit Analysis of the Impact of Selection Testing on Advanced Flight Training
Blower, D. J., Naval Aerospace Medical Research Lab., USA; Aug. 18, 1997; 17p; In English
Report No.(s): AD-A331215; NAMRL-SR-97-01; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents a numerical example showing how selection testing can reduce costs in advanced T-45 training. Selection testing provides savings by reducing the rate of attrition. With reduced attrition, fewer students are required to enter the training curriculum to achieve a set number of graduates to fill operational seats. Balanced against this positive impact are at least three factors associated with selection testing that must be taken into account in any cost-benefit analysis. These are 1) R&D costs, 2) administrative costs, and 3) costs associated with rejecting qualified applicants. It is shown that, under certain readily quantifiable circumstances, selection testing might save over $2 million per T-45 advanced strike class. The major goal of this report is to provide a quantitative framework for the rational discussion of selection tests as a prelude and partner to military training curricula.
DTIC
Flight Training; Flight Tests; Cost Effectiveness; Education

19980111113 Columbia Univ., Dept. of Psychology, New York, NY USA
Augmentation of 'Visual Perception of Elevation' ***Final Report, 1 Sep. 1993 - 31 Aug. 1997***
Matin, Leonard, Columbia Univ., USA; Jan. 26, 1998; 108p; In English
Contract(s)/Grant(s): F49620-93-I-0563; AF Proj. 3484
Report No.(s): AD-A336547; AFRL-SR-BL-TR-98-0154; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Seventeen graduate and undergraduate students participated to various degrees in different phases of the research. Several, more extensively involved, regularly joined in laboratory meetings, ongoing discussions, and formulation of research designs and plans in addition to participating in the construction of apparatus, and collection and processing of experimental data. Others were essentially focused on data collection and processing. The experiments were all concerned with the visual perception of elevation, most particularly with analysis of the significant influence of visual pitch. on the elevation of visually perceived eye level (VPEL). An undergraduate's honor's thesis involved measurements of both VPEL settings and manual matches to targets through a range

of elevations above and below VPEL, and showed that the influence of the visual field on VPEL was part of a shift of the entire dimension of perceived elevation along with closely related sensorimotor mislocalizations. A graduate student's master's thesis measured the relation between VPEL and the perception of visual pitch over a range of pitches on a large group of subjects; the mechanisms for both are at most minimally connected.
DTIC
Visual Perception; Visual Fields; Eye (Anatomy)

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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.

19980096465 Hughes Training, Inc., Falls Church, VA USA
Human Factors Integration: Cost and Performance Benefits on Army Systems ***Final Report***
Booher, Harold R., Hughes Training, Inc., USA; Jul. 1997; 61p; In English
Contract(s)/Grant(s): DAAL01-95-C-0121; DA Proj. 1L1-62716-AH-70
Report No.(s): AD-A330776; ARL-CR-341; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents and, to the degree possible, quantifies the benefits of human factors integration (HFI) effort to selected Army programs. Four Army weapon systems were identified for documenting HFI lessons learned and quantitative benefits. These systems are two aviation systems, Comanche and Apache; one nuclear, biological, chemical (NBC) reconnaissance vehicle, Fox; and the Army's advanced howitzer program, Crusader. The Comanche aircraft provides the most comprehensive lessons learned for HFI, based on its application of the Army's manpower and personnel integration (MANPRINT) program from its inception. The Apache helicopter provides some quantitative examples of benefits from HFI applications on design and development of changes to a system already in the Army inventory. The Fox reconnaissance vehicle (XM93E1 NBC) demonstrates quantitative benefits and lessons learned from HFI applications on a non-major system. The Crusader was chosen because it illustrates the critical role played by HFI technologies in conducting realistic battlefield scenarios in war games. Attention is given to the effects of HFI in five major areas: (1) The acquisition process; (2) System design and development; (3) Operational performance and testing; (4) Cost avoidance, and (5) Safety benefits.
DTIC
Human Factors Engineering; Helicopters; Systems Engineering; Reconnaissance; Howitzers; Manpower

19980111102 Oklahoma Univ., School of Industrial Engineering, Norman, OK USA
A Human Factors Perspective On Human External Loads ***Final Report***
Shehab, Randa L., Oklahoma Univ., USA; Schlegel, Robert E., Oklahoma Univ., USA; Palmerton, David A., Civil Aeromedical Inst., USA; May 1998; 34p; In English
Contract(s)/Grant(s): DTFA02-95-T-80473
Report No.(s): DOT/FAA/AM-98/13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Title 14 part 133 of the Federal Code of Regulations (14 CFR 133) titled, "Rotorcraft External Load Operations," describes the operation and certification rules governing helicopter external load operations. Specifically, part 133.45 addresses rotorcraft operations involving human external loads (HELS) and the design of personnel lifting devices used in HEL operations. to determine if there is a need for imposing new regulations on HEL operations, the Rotorcraft Standards Directorate of the Aircraft Certification Service requested the Civil Aeromedical Institute to review all available accident databases to determine if HEL operations are unsafe or sufficiently problematic to warrant a change in the existing regulations. This report investigates HEL accidents, categorizes commercially available equipment used in different personnel lifting operations, and provides human-factor related recommendations affecting the use of these HEL lifting devices. A review of accident data between 1973 and 1996 from several databases did not reveal any accident trends or highlight any specific safety issues related to HEL operations. A review of commercially-available HEL equipment showed the devices were designed for either short-term, rescue-type operations or long-term, work-related activities where the user is required to remain in the device for extended periods of time. Suggestions concerning the safety, comfort, and use of HEL devices are provided, as well as recommendations that standard operating procedures, training for HEL crew members, and minimal equipment specifications be added to the current regulation.
Author
Rotary Wing Aircraft; Human Factors Engineering; Loads (Forces); Regulations; Helicopters; Aerospace Medicine; Certification

19980111110 Armstrong Lab., Crew Systems Directorate, Brooks AFB, TX USA

Physiological Effects of Chemical Protective Garments During Exercise and Heat Stress ***Interim Report***

Bomalaski, Susan H., Armstrong Lab., USA; Constable, Stefan H., Armstrong Lab., USA; Jan. 1998; 19p; In English

Contract(s)/Grant(s): AF Proj. 7930

Report No.(s): AD-A336598; AL/CF-TR-1993-0130; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The present study was designed to examine the effect of protective garments, with a range of insulation and permeability characteristics, on changes in physiological parameters during exercise and on heat balance in warm and hot environments. Dressed in the U.S. Army Battle Dress Uniform (BDU), the U.S. Army Chemical Defense Ensemble (CDE), a butyl rubber Toxic Agent Protective (TAP) suit, and the CDE covered by a two-piece vinyl rainsuit (RAIN) volunteers walked on a treadmill at a workrate of 481 + 35.4 watts. Environmental conditions for hot experiments were 38/26/43 degrees Celsius, Tdb/Twb/Tbg, and for warm trials, 29/24/34 degrees Celsius. The subjects exercised until reaching 39 degrees Celsius Tre, max HR, or volitional fatigue. Pre- and post-experiment nude and clothed weights were measured and used to calculate sweat production (SP) and sweat loss (SL). TAP and RAIN had significantly shorter tolerance times than the CDE or BDU in both warm and hot environments. For the same suit, tolerance time was reduced in the hot environment compared to warm conditions. Sweat production was significantly increased as suits became less permeable and as the temperature increased from warm to hot. Sweat evaporation (SE) was affected significantly only by the ensemble. Body heat storage occurred at a lower rate than predicted, especially in the hot environments where Tdb was greater and Tsk which should make radiative heat loss negligible and in trials where individuals wore impermeable ensembles (TAP and RAIN) which should have blocked evaporative heat loss.

DTIC

High Temperature Environments; Radiative Heat Transfer; Physiological Effects; Physical Exercise; Heat Tolerance

19980137405 NASA Kennedy Space Center, Cocoa Beach, FL USA

A Data Base of Nutrient Use, Water Use, CO2 Exchange, and Ethylene Production by Soybeans in a Controlled Environment

Wheeler, R. M., NASA Kennedy Space Center, USA; Mackowiak, C. L., NASA Kennedy Space Center, USA; Peterson, B. V., NASA Kennedy Space Center, USA; Sager, J. C., NASA Kennedy Space Center, USA; Knott, W. M., NASA Kennedy Space Center, USA; Berry, W. L., California Univ., USA; Sharifi, M. R., California Univ., USA; Apr. 1998; 40p; In English

Report No.(s): NASA/TM-1998-207903; NAS 1.15:207903; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A data set is given describing daily nutrient and water uptake, carbon dioxide (CO2) exchange, ethylene production, and carbon and nutrient partitioning from a 20 sq m stand of soybeans (Glycine max (L.) Merr. cv. McCall] for use in bioregenerative life support systems. Stand CO2 exchange rates were determined from nocturnal increases in CO2 (respiration) and morning drawdowns (net photosynthesis) to a set point of 1000 micromol/ mol each day (i.e., a closed system approach). Atmospheric samples were analyzed throughout growth for ethylene using gas chromatography with photoionization detection (GC/PH)). Water use was monitored by condensate production from the humidity control system, as well as water uptake from the nutrient solution reservoirs each day. Nutrient uptake data were determined from daily additions of stock solution and acid to maintain an EC of 0.12 S/m and pH of 5.8. Dry mass yields of seeds, pods (without seeds), leaves, stems, and roots are provided, as well as elemental and proximate nutritional compositions of the tissues. A methods section is included to qualify any assumptions that might be required for the use of the data in plant growth models, along with a daily event calendar documenting set point adjustments and the occasional equipment or sensor failure.

Author

Carbon Dioxide; Water; Controlled Atmospheres; Soybeans; Photosynthesis; Photoionization; Seeds

Subject Term Index

Personal Author Index

Report Documentation Page

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16. Abstract

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