ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series) N87-15160 – N87-16783
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AEROSPACE MEDICINE
AND BIOLOGY

A CONTINUING BIBLIOGRAPHY
WITH INDEXES

(Supplement 297)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in April 1987 in

- Scientific and Technical Aerospace Reports (STAR)
- International Aerospace Abstracts (IAA).

NASA  Scientific and Technical Information Office
National Aeronautics and Space Administration
Washington, DC

1987
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INTRODUCTION

This Supplement to Aerospace Medicine and Biology lists 89 reports, articles and other documents announced during April 1987 in Scientific and Technical Aerospace Reports (STAR) or in International Aerospace Abstracts (IAA). The first issue of the bibliography was published in July 1964.

In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of 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. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by STAR categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in IAA or STAR, including the original accession numbers from the respective announcement journals. The IAA items will precede the STAR items within each category.

Seven indexes — subject, personal author, corporate source, foreign technology, contract, report number, and accession number — are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1987 Supplements.

Information on the availability of cited publications including addresses of organizations and NTIS price schedules is located at the back of this bibliography.
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TYPICAL REPORT CITATION AND ABSTRACT

NASA SPONSORED

ACCESSION NUMBER → N87-11481# Umpqua Research Co., Myrtle Creek, Ore.
TITLE → A PROTOTYPE SPACE FLIGHT INTRAVENOUS INJECTION SYSTEM Final Report
AUTHOR → G. V. COLOMBO May 1985 65 p
COSATI CODE →

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

NASA SPONSORED

ACCESSION NUMBER → A87-11660* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
TITLE → EFFECT OF ANTIGRAVITY SUIT INFLATION ON CARDIOVASCULAR, PRA, AND PVP RESPONSES IN HUMANS
AUTHORS → S. E. KRAVIK, L. C. KEIL, G. GEELEN, C. E. WADE, P. R. BARNES
JOURNAL TITLE →
PUBLICATION DATE →

Medical emergencies, especially those resulting from accidents, frequently require the administration of intravenous fluids to replace lost body liquids. The development of a prototype space flight intravenous injection system is presented. The definition of requirements, injectable concentrates development, water polisher, reconstitution hardware development, administration hardware development, and prototype fabrication and testing are discussed.

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

The effects of lower body and abdominal pressure, produced by antigravity suit inflation, on blood pressure, pulse rate, fluid and electrolyte shift, plasma vasopressin and plasma renin activity in humans in upright postures were studied. Five men and two women stood upright for 3 hr with the suit being either inflated or uninflated. In the control tests, the suit was inflated only during the latter part of the trials. Monitoring was carried out with a sphygmomanometer, with sensors for pulse rates, and using a photometer and osmometer to measure blood serum characteristics. The tests confirmed earlier findings that the anti-g suit eliminates increases in plasma renin activity. Also, the headward redistribution of blood obtained in the tests commends the anti-g suit as an alternative to water immersion or bed rest for initial weightlessness studies.

M.S.K.
51

LIFE SCIENCES (GENERAL)

A87-20213#
FLIGHT RESULTS FROM THE BIORACK EXPERIMENTS ON THE SPACELAB D-1 MISSION

The Biorack experiments flown on the German Spacelab D-1 mission have provided striking evidence of the effects of gravity on bacteria, unicellular organisms, white blood cells and insect development. They have shed new light on the mechanisms of geotropism in plant roots. Two major biological fields, cell proliferation and cell differentiation, have emerged as being of particular importance and meriting further investigations. Author

A87-20497
RNA AS AN ENZYME
THOMAS R. CECH (Colorado, University, Boulder) Scientific American (ISSN 0036-8733), vol. 255, Nov. 1986, p. 64-69, 72-75.

The discovery that some RNAs can catalyze their own replication and that of other RNAs and can also assemble RNA is reviewed. The splicing process involved in these transformations is described, showing the nature of the structures that participate. The types of RNAs in various organisms that self-splice are considered, and the evolutionary implications of the enzymatic activities of these RNAs are briefly addressed. Author

A87-20869
CONTROL OF ACTIVITY OF THE DIAPHRAGM IN RAPID- EYE-MOVEMENT SLEEP

EEG, electrooculogram, and neck and diaphragm EMG records obtained on cats with implanted electrodes, were used to investigate the respiration rates during REM sleep (REMS). The inspiratory slopes during the slow-wave sleep and tonic REMS (when no eye movements were recorded) were similar. However, during phasic REMS, many breaths displayed either increases (excitation) or decreases (inhibition) in slope, compared with the tonic REMS. The occurrence of these altered slopes increased with the frequency of phasic events. I.S.

A87-20875
CLOSED-CIRCUIT METABOLIC SYSTEM WITH MULTIPLE APPLICATIONS
J. A. MOLNAR, J. J. CUNNINGHAM, S. MIYATANI, A. VIZULIS, J. D. WRIGHT (Massachusetts General Hospital; Harvard University, Boston; Environics Adaptive Technology, Newton, MA) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Oct. 1986, p. 1582-1585. refs

The design of an efficient and versatile closed-circuit metabolic system is described. The system includes a pressure sensor, electronic control unit for regulating air pressure within a closed chamber, and a liquid crystal display calculator. Compared with a standard indirect calorimetry system, the new device had improved precision during studies of O2 consumption both at room temperature and at 5 deg C. Some potential applications include maintenance of pressure and O2-controlled environments, exposure to toxic gases, and study of diurnal variations in metabolic rate in various species including humans. I.S.

A87-21171
STABLE ISOTOPE EVALUATION OF THE ORIGINS OF AMINO ACIDS IN FOSSILS
MICHAEL H. ENGEL (Oklahoma, University, Norman) and STEPHEN A. MACKO (Newfoundland, Memorial University, Saint John's, Canada) Nature (ISSN 0028-0836), vol. 329, Oct. 9, 1986, p. 531-533. Research supported by the Petroleum Research Fund. refs

Laboratory experiments were carried out to evaluate the effects of racemization on the stable carbon and nitrogen isotopic compositions of amino acid enantiomers. The results indicate that the death of an organism, low-temperature diagenetic reactions such as racemization should not cause a significant shift in the stable carbon or nitrogen isotopic compositions of the resultant D- and L-amino acid enantiomer products. Hence, a comparison of these enantiomers from individual amino acids isolated from fossils may provide a method for establishing the absolute indigeneity of these compounds. K.K.
The effect of a given internal heat load on thermal balance was examined in rats with direct and indirect calorimetry at ambient temperatures (Ta) 18, 24, and 28°C. The internal heat was loaded was significantly higher than that in the yaw plane for the initial latency of motion-induced emesis. Following a sham surgical procedure (stapedectomy) performed on two of the latter animals and one additional new animal, the emetic incidence decreased from 100 to 69 percent, but the frequency and latency were not altered significantly.

Author

A87-21432
Baylor Coll. of Medicine, Houston, Tex.

Vestibular-visual conflict in pitch and yaw planes in the squirrel monkey
MAKOTO IGARASHI, WALTER B. KULECZ, KAZUTOYO KOBAYASHI, and HIDEHITO ISAGO (Baylor College of Medicine, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Nov. 1986, p. 1071-1074. ref

Direction conflicting vestibular and visual (optokinetic) stimuli either in the pitch or yaw plane were given to squirrel monkey subjects. The conflict sickness symptom score in the pitch plane was significantly higher than that in the yaw plane for the initial exposure session (p less than 0.01). A significant score difference was also encountered when the exposure sessions were repeated (p less than 0.05).

Author

A87-21800

Cyto morphology and ultrastructure of the maize root meristem in weightlessness (Tsitomorfo logia i ultrstrukтура kor nevoi meristem y kukuruzy v nevesmomosti)

The root meristem cells of maize seedlings grown in weightlessness aboard the Cosmos-1515 biosatellite were examined using light microscopy and electron microscopy. Major cytological and ultrastructural characteristics, and the features of morphogenesis of the space-grown seedlings were compared with those of the control cultures. The results indicate that weightlessness and other space flight factors had no significant effect on the structural and morphogenetic characteristics of the experimental cultures.

I.S.

A87-21840

Studies of lithium aerosols that could be released in accidents involving space nuclear systems

The potential health hazards of accidents involving the lithium employed in space power systems are presently assessed by means of a lithium aerosol-generating system in which the metal is inductively heated to as much as 1300°C and dispersed by argon gas into a chamber where it is burned in air. The intense
white flame thus produced generates branched-chain condensation aerosol particles. Rats have been exposed to 4 hr of breathing atmospheres contaminated by these aerosols at various concentrations; histopathologic lesions were observed in the nasal turbamines, larynx, and lungs of these animals. The pulmonary lesions were a secondary extension of the upper respiratory tract lesions.

V.C.

A87-21862
THE INFLUENCE OF THE VESTIBULAR APPARATUS ON THE VISUAL ANALYZER [VLIANIEVESTIBULIARNOGOAPPARATANAZRITEL’NYI ANALIZATORY]
V. F. MESHMAN Moscow, Izdatel’stvo Nauka, 1986, 112 p. In Russian. refs
Evidence is presented for the influence of vestibular activity on the visual system, using measurements of the biopotentials evoked in various regions of the visual system by stimulation of the vestibular system, as well as of the changes effected by vestibular stimuli in the visual system responses to visual stimuli. The changes in the bioelectric activity of the retina and optic nerve, corpora quadrigemina, the outer geniculate body, and the optic zone of the cortex observed after application of physical stresses or electric stimuli to the vestibular apparatus are considered. The mechanisms of the vestibulooptic interactions and the physiological significance of the vestibular influence are discussed.

I.S.

A87-22768
EFFECTS OF CHRONIC CONTINUOUS WAVE MICROWAVE RADIATION (2.45 GHz) ON THE FORAGING BEHAVIOR OF THE WHITE-THROATED SPARROW
FRED E. WASSERMANN, DEBORAH A. PATTERSON, THOMAS H. KUNZ (Boston University, MA), SAM P. BATTISTA (Arthur D. Little, Inc., Cambridge, MA), and DAVID BYMAN (Pennsylvania State University, Dunmore) Space Power (ISSN 0883-6272), vol. 6, 1986, p. 99-105. Research supported by the Boston University Manomet Bird Observatory and DOE. refs (Contract EPA-68-02-3278)
To determine possible environmental effects of the Satellite Solar Power System, the effect of chronic continuous microwave radiation on the foraging behavior of the white-throated sparrow was studied using an optimal foraging laboratory technique. Exposure to microwaves at the proposed frequency of 2.45 GHz for seven days at power densities of 0.0, 0.1, 1.0, 10.0 and 25.0 mW/sq cm did not result in foraging behavior trends for a dose response effect. No significant differences in the foraging behaviors for these birds was noted among preexposure, exposure, and postexposure periods under the temperature and humidity conditions of the study.

R.R.

N87-15678# National Aeronautics and Space Administration, Washington, D.C.
REFERENCE MISSION OPERATIONAL ANALYSIS DOCUMENT (RMOAD) FOR THE LIFE SCIENCES RESEARCH FACILITIES
Jan. 1987 215 p
(NASA-TM-89604; NAS 1.15:89604) Avail: NTIS HC A01 CSCL 06C
The space station will be constructed during the next decade as an orbiting, low-gravity, permanent facility. The facility will provide a multitude of research opportunities for many different users. The pressurized research laboratory will allow life scientists to study the effects of long-term exposure to microgravity on humans, animals, and plants. The results of these studies will increase our understanding of this foreign environment on basic life processes and ensure the safety of man’s long-term presence in space. This document establishes initial operational requirements for the use of the Life Sciences Research Facility (LSRF) during its construction.

Author

N87-15679# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 9
(Contract NASW-3676)
This is the ninth issue of NASA’s USSR Space Life Sciences Digest. It contains abstracts of 46 papers recently published in Russian language periodicals and bound collections and of a new Soviet monograph. Selected abstracts are illustrated with figures and tables from the original. Additional features include reviews of a Russian book on biological rhythms and a description of the papers presented at a conference on space biology and medicine. A special feature describes two paradigms frequently cited in Soviet space life sciences literature. Information about English translations of Soviet materials available to readers is provided. The abstracts included in this issue have been identified as relevant to 28 areas of aerospace medicine and space biology. These areas are: adaptation, biological rhythms, body fluids, botany, cardiovascular and respiratory systems, developmental biology, endocrinology, enzymology, equipment and instrumentation, gastrointestinal system, genetics, habitability and environment effects, hematology, human performance, immunology, life support systems, mathematical modeling, metabolism, microbiology, morphology and cytology, musculoskeletal system, nutrition, neurophysiology, operational medicine, perception, personnel selection, psychology, radiobiology, and space biology and medicine.

Author

N87-15680# Federal Aviation Administration, Washington, D.C.
Office of Aviation Medicine.
CHARLES R. CRANE, DONALD C. SANDERS, BOYD R. ENDECOTT, and JOHN K. ABBOTT May 1986 27 p
(AD-A169666; FAA/AM-86-5) Avail: NTIS HC A03/MF A01 CSCL 06T
Acrolein, an organic aldehyde (CH2=CH-CHO), is extremely irritating to the respiratory passages at very low concentrations. It is known to be present in the smoke from certain materials used in aircraft cabin interiors and could contribute, therefore, to an individual’s failure to escape from a burning aircraft. In order to assess acrolein’s ability to produce physical incapacitation in a mammal, laboratory rats were exposed continuously to measured atmospheric concentrations of acrolein vapor until they expired. The exposure time required to produce lethality was measured, as well as the time at which physical incapacitation occurred. Incapacitation was defined operationally as loss of the ability to walk in a motor-driven wheel, which was enclosed in the exposure chamber. Dose-response curves were generated by equating these two endpoints, time-to-incapacitation and time-to-death, to the atmospheric acrolein concentration via statistically derived regression equations. Experimental results suggest that the acrolein dose that will produce physical incapacitation could be 10 to 100 times greater than has been predicted in the past. The possible relationship between the effective toxic doses of acrolein for rats, and those required for humans, is discussed.

G.R.A

N87-16503# National Aeronautics and Space Administration, Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, INDEX TO ISSUES 5-9
LYDIA RAZRAN HOOKE Washington NASA Jan. 1987 112 p
(Contract NASW-3676)
(NASA-CR-3922(10); NAS 1.26:3922(10)) Avail: NTIS HC A06/MF A01 CSCL 06B
An index to issues 5 through 9 of the USSR Space Life Sciences Digest is provided in two sections. The first section lists bibliographic citations of abstracts contained in the Digest issues
covered, grouped by topic area categories. Cross references to other relevant abstracts in different categories are also provided. The second section provides a key word index for the same set of abstracts.

N87-16504*# National Aeronautics and Space Administration, Washington, D.C.
LIFE SCIENCES SPACE STATION PLANNING DOCUMENT: A REFERENCE PAYLOAD FOR THE EXOBIOLOGY RESEARCH FACILITIES
Feb. 1987 62 p
NASA-TM-89606; NAS 1.15:89606 Avail: NTIS HC A04/MF A01 CSCL 06B
The Cosmic Dust Collection and Gas Grain Simulation Facilities represent collaborative efforts between the Life Sciences and Solar System Exploration Divisions designed to strengthen a natural exobiology/Planetary Sciences connection. The Cosmic Dust Collection Facility is a Planetary Science facility, with Exobiology a primary user. Conversely, the Gas Grain Facility is an exobiology facility, with Planetary Science a primary user. Requirements for the construction and operation of the two facilities, contained herein, were developed through joint workshops between the two discursive areas, as were representative experiments comprising the reference payloads. In the case of the Gas Grain Simulation Facility, the astrophysics Division is an additional potential user, having participated in the workshop to select experiments and define requirements.

NEUROPHYSIOLOGICAL BASES OF EVENT-RELATED POTENTIALS Annual Report, 1 May 1985 - 30 Apr. 1986
CHARLES S. REBERT 8 Aug. 1986 66 p
Contract F49620-82-K-0016
(AD-A172995; AFOSR-85-0910TR; AR-4) Avail: NTIS HC A04/MF A01 CSCL 06C
In order to more fully understand the physiological and psychological significance of event-related brain potentials, cortical and subcortical recordings were obtained from monkeys performing an operant conditioning task (cued reaction time). During the past year three cynomolgus monkeys were studied following the administration of MPTP, a drug that selectively destroys nigra-striatal dopaminergic neurons in the pars compacta of the substantia nigra. This manipulation indicated the critical role of the nigra-striatal dopamine for task performance enhancement would be to determine if increasing nigra-striatal dopaminergic activity would enhance performance and electrophysiological responsivity.

N87-16506# Desmatics, Inc., State College, Pa.
STATISTICAL IMPACT ACCELERATION INJURY PREDICTION MODELS BASED ON -G SUB X ACCELERATOR DATA
CARL A. MAURO, KEVIN C. BURNS, and DENNIS E. SMITH Oct. 1986 48 p
Contract N00014-85-C-0846
(AD-A173720; TR-126-1) Avail: NTIS HC A03/MF A01 CSCL 06Q
Since 1974, the Naval Biodynamics Laboratory (NBDL) has collected, as part of its research effort on acceleration impact injury prevention, an extensive data base from -G sub x accelerator runs on Rhesus subjects. Over this time period, Desmatics, Inc. has been actively involved in the development of statistically based models to predict injury in Rhesus subjects resulting from indirect head/neck impact acceleration in the -X direction. The objectives of the present technical report are: (1) to summarize, update, and consolidate the Desmatics modeling efforts for fatal injury; (2) to investigate extending the injury prediction models to include nonfatal injury criteria; and (3) to evaluate the accuracy and validity of the prediction models obtained in the modeling efforts.

N87-16507# Veterans Administration Hospital, Loma Linda, Calif.
TISSUE INTERACTIONS WITH NONIONIZING ELECTROMAGNETIC FIELDS Final Report, Mar. 1979 - Feb. 1986
Contract DE-A01-79ET-20078 (DE86-014715; DOE/ET-29078/T2) Avail: NTIS HC A02/MF A01
This report provides an overview of this research program focused on basic research in nervous system responses to electric fields at 60 Hz. The emphasis in this project was to determine the fundamental mechanisms underlying some phenomena of electric field interactions in neural systems. The five studies of the initial program were tests of behavioral responses in the rat based upon the hypothesis that electric field detection might follow psychophysical rules known from prior research with light, sound and other stimuli; tests of electrophysiological responses to normal forms of stimulation in rat brain tissue exposed in vitro to electric fields, based on the hypothesis that the excitability of brain tissue might be affected by fields in the extracellular environment; tests of electrophysiological responses of spontaneously active pacemaker neurons of the Aplysia abdominal ganglion, based on the hypothesis that electric field interactions at the cell membrane might affect the balance among the several membrane-related processes that govern pacemaker activity; studies of mechanisms of low frequency electromagnetic field interactions with bone cells in the context of field therapy of united fractures; and manipulation of cell surface receptor proteins in studies of their mobility during EM field exposure.

N87-16508# Arizona Univ., Tucson. Dept. of Biochemistry.
G. TOLLIN 1986 7 p
Contract DE-AC02-78ER-04927 (DE87-000753; DOE/ER-04927/17) Avail: NTIS HC A02/MF A01
Studies to elucidate the detailed mechanisms of light-induced one-electron transfer reactions involving chlorophyll and electron donors and acceptors in lipid bilayer vesicles are reported. The interactions between the elementary steps in these processes and parameters such as bilayer viscosity, surface electrical charge, and donor and acceptor structure are described. A body of fundamental information which can be used to devise strategies for increasing the yields of the high energy products of such reactions, to physically separate these products so as to decrease the probability of reverse electron transfer (i.e., back reaction), and to facilitate secondary electron transfer to external donors and acceptors were sought. Such information should prove useful in the development of biomimetic systems for practical solar energy conversion based on green plant photosynthesis.

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AEROSPACE MEDICINE
Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.
A87-20868 OCCLUSION PRESSURE AND VENTILATION DURING SLEEP IN NORMAL HUMANS
A87-20870
PLASMA ADRENOCORTICOTROPIN AND CORTISOL RESPONSES TO BRIEF HIGH-INTENSITY EXERCISE IN HUMANS
MICHAEL J. BUONO, JOHN E. YEAGER, and JAMES A. HODGDON (San Diego State Heart Institute; U.S. Naval Health Research Center, San Diego, CA) Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Oct. 1986, p. 1337-1339. refs
Contract NAVY ORDER M0096-PN001-1050
The effect of 1-min-long high-intensity exercise (on a cycle ergometer at 120 percent maximum O2 uptake) on plasma levels of cortisol and adrenocorticotropin (ACTH) was investigated. Blood samples were collected at rest and at 5, 15, and 30 min after the exercise. Following exercise, mean plasma ACTH levels increased immediately (and briefly), while the cortisol levels increased at 15 min postexercise. The observed temporal sequence suggests that the increase in plasma cortisol is the result of ACTH-induced steroidogenesis in the adrenal cortex.
I.S.

A87-20871
INFLUENCE OF CENTRAL VENOUS PRESSURE CHANGE ON PLASMA VASOPRESSIN IN HUMANS
PETER NORSK, FLEMMING BONDE-PETERSEN, and JORGEN WARBERG (Copenhagen, University, Denmark) Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Oct. 1986, p. 1352-1357. refs
Danish Space Board
Simultaneous changes in central venous pressure (CVP) and plasma arginine vasopressin (AVP) were examined before, during, and after lower body positive pressure (LBPP) or lower body negative pressure (LBNP) was applied to induce graded changes in central blood volume. It was found that in spite of large changes in CVP and significant changes in blood volume and in esophageal pressure observed as a result of LBPP and/or LBNP applications, the values of plasma AVP did not change significantly as a result of either the LBPP or the LBNP. It is concluded that cardiopulmonary mechanoreceptors in humans do not play a major role in regulation of AVP secretion during short-term changes in CVP.
I.S.

A87-20872
EFFECT OF HYDRATION ON PLASMA VOLUME AND ENDOCRINE RESPONSES TO WATER IMMERSION
The effect of hydration status on early endocrine responses and on osmotic and intravascular volume changes during immersion was determined in humans undergoing successive periods of dehydration, immersion, rehydration, and immersion. Immersion caused an isotonic expansion of plasma volume, as well as suppression of plasma renin activity and aldosterone, which all occurred independently of hydration status. On the other hand, the concentration of plasma vasopressin (PVP) was found to decrease during dehydrated immersion, but not during rehydrated immersion. It is concluded that plasma tonicity is not a factor influencing PVP suppression during water immersion.
I.S.

A87-20873
INDUCTION OF PERIODIC BREATHING DURING SLEEP CAUSES UPPER AIRWAY OBSTRUCTION IN HUMANS
ERGUN ONAL, DONALD L. BURROWS, ROBERT H. HART, and MELVIN LOPATA (Illinois, University Hospital; USVA, West Side Medical Center, Chicago, IL) Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Oct. 1986, p. 1438-1443. U.S. VA-supported research. refs
To test the hypothesis that periodic breathing predisposes upper airways to collapse, periodic breathing was induced in normal human subjects during NREM sleep by administering hypoxic mixtures of O2 and N2. In periodically breathing subjects, the nadir of periodic changes in tidal volume, V(T), corresponded with the highest pulmonary resistance (Rp); there was a significant linear relationship between Rp and 1/V(T), indicating the development of obstructive hypopneas. It is concluded that periodic breathing resulting in periodic diminution of upper airway muscle activity is associated with increased upper airway resistance that predisposes upper airways to collapse.
I.S.

A87-20874
NITROGEN GAS EXCHANGE IN THE HUMAN KNEE
Human decompression sickness is presumed to result from excess inert gas in the body when ambient pressure is reduced. Although the most common symptom is pain in the skeletal joints, no direct study of nitrogen exchange in this region has been undertaken. For this study, nitrogen tagged with radioactive N-13 was prepared in a linear accelerator. Nine human subjects rebreathed this gas from a closed circuit for 30 min, then completed a 40- to 100-min washout period breathing room air. The isotope N-13 was monitored continuously in the subject's knee during the entire period using positron detectors. The concentration in most knees continued to rise for at least 30 min into the washout period. Various causes of this unexpected result are discussed, the most likely of which is an extensive redistribution of gas within avascular knee tissues.
Author

A87-2142
EFFECT OF INSPIRATORY VOLUME ON INTRATHORACIC PRESSURE GENERATED BY AN L-1 MANEUVER
RICHARD COTE, LLOYD TRIPP, TOM JENNINGS, ALVA KARL, CHUCK GOODYEAR (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6652), vol. 57, Nov. 1986, p. 1035-1038. refs
Since each muscle has an optimal length at which it can generate the maximum tension, an optimal inspiratory volume may exist for producing the maximum intrathoracic pressure during the
L-1 maneuver. Intrathoracic pressures were measured in eight healthy men after they inspired various volumes of air and performed the L-1 straining maneuver in a 1-G environment. Both the peak and mean intrathoracic pressures increased at greater inspiratory volumes, except for the mean intrathoracic pressure at the highest volumes. The ability to increase intrathoracic pressure with large inspiratory volumes may improve +Gz tolerance.

A87-21429
EFFECTS OF ATROPINE ON THERMOREGULATORY RESPONSES TO EXERCISE IN DIFFERENT ENVIRONMENTS
BRUCE S. CADARETTE, LESLIE LEVINE, PAUL B. ROCK, LOU A. STEPHENSON, and MARGARET A. KOLKA (U.S. Army Research Institute of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Nov. 1986, p. 1050-1055. refs

The effect of atropine on the thermoregulatory responses of humans exercising in three environments: hot-dry (HD), warm-moderate (WM), and warm-wet (WW), which provided similar heat stress but different evaporative capacities, was investigated. Atropine-induced increases in the Tsk and heart rate and decreases in the whole body sweating rate were the largest in the HD group, while an elevated rectal temperature and significantly reduced exercise time were recorded only in HD. The results indicate that the whole body sweating rate depression had its greatest effect in HD, whereas evaporation was critical to heat dissipation; in WW and MW, sensible heat loss accounted for a greater portion of heat exchange.

A87-21434* University of South Florida, Tampa.
THERMOREGULATORY RESPONSES TO HEAT AND VIBRATION IN MEN
W. A. SPAUL (South Florida University, Tampa, FL), R. C. SPEAR (California, University, Berkeley), and J. E. GREENLEAF (NASA, Ames Research Center, Moffett Field, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Nov. 1986, p. 1082-1087. refs

The effect of vibration on thermoregulatory responses was studied in heat-acclimated men exposed suddenly to simultaneous heat and whole body vibrations (WBVs) at two intensity levels, each at graded frequencies between 5 and 80 Hz. The mean rectal temperature (Tre) became elevated more quickly in the WBV exposures than in the controls (heat exposure alone). Both intensity- and frequency-dependent WBV relationships were recorded in localized blood flows and in sweat rates. Thus, vibration appears to reduce the efficiency of the cooling mechanisms during a heat exposure.

A87-21436
DECOMPRESSION SICKNESS INCIDENCE OVER 63 MONTHS OF HYPOBARIC CHAMBER OPERATION
STEPHEN PIWINSKI, JOHN MILLS, ROBERT CASSINGHAM, ARTHUR SIPPEN, ROBERT MITCHELL, (U.S. Army School of Aviation Medicine, Fort Rucker, AL) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Nov. 1986, p. 1097-1101. refs

U.S. Army hypobaric chamber operations over a 63-month period were retrospectively reviewed, and incidence rates for decompression sickness were calculated. The overall incidence rates was 1.38/1000 exposures. The rate for interior technicians monitoring chamber operations was 6.6/1000 exposures. The increased incidence of decompression sickness for technicians was especially pronounced for the 10,668-m and 13,106-m flight profiles. Rapid decompression after the 7,620-m flight profile did not appear to increase the incidence of decompression sickness.

A87-21924
MOTION ARTIFACT FROM SPOT AND BAND ELECTRODES DURING IMPEDANCE CARDIOGRAPHY
MINGHAI QU (Shandong University, Jinan, People’s Republic of China), YUJIAN ZHANG (Shanghai University of Science and Technology, People’s Republic of China), JOHN G. WEBSTER, and WILLIS J. TOMPKINS (Wisconsin, University, Madison) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, Nov. 1986, p. 1029-1036. refs

Impedance cardiology for monitoring cardiac output during stress tests was modified. Employing an off-line microcomputer, the instrument ensemble averaged impedance signals to minimize the effect of motion artifacts. A new four-spot electrode array was proposed to replace the usual encircling band electrode array. Ten normal subjects were tested, and the signal-to-noise ratio from the spot electrode array was compared to that from a typical band electrode array at rest and during four levels of exercise on a treadmill. The average of the signal-to-noise ratios for ten subjects from the spot electrode array was 13.6-45.5 percent larger than that from the band electrode array at rest and during four levels of exercise.

A87-21925
CARDIAC OUTPUT MONITORING BY IMPEDANCE CARDIOGRAPHY DURING TREADMILL EXERCISE
YUJIA ZHANG (Shanghai University of Science and Technology, People’s Republic of China), MINGHAI QU (Shandong University, Jinan, People’s Republic of China), JOHN G. WEBSTER, WILLIS J. TOMPKINS, B. ANN WARD (Wisconsin, University, Madison) et al. IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, Nov. 1986, p. 1037-1042. refs

Impedance cardiology for monitoring cardiac output during stress tests was modified. An ensemble-averaging technique was adapted for eliminating motion artifacts. An array consisting of four spot ECG electrodes was applied for impedance cardiogram (ICG) monitoring and compared to conventional encircling band electrodes. Ten normal adults were tested, comparing the cardiac output obtained by the ICG monitoring system to that simultaneously obtained by the carbon dioxide rebreathing method at rest and during three levels of treadmill exercise. The results show that the correlation coefficient between the spot electrode ICG and the CO2 rebreathing method is 0.90, and that between the band electrode ICG and the CO2 rebreathing method is 0.96. If the peak-to-valley height of dZ/dt is used instead of the peak height of dZ/dt in computing cardiac output, the correlation coefficient between the spot electrode ICG and the CO2 rebreathing method can be improved to reach the value of 0.95.

BEDREST IN HEALTHY WOMEN: EFFECTS OF MENSTRUAL FUNCTION AND ORAL CONTRACEPTIVES Final Report

With the development of the space shuttle program, space flight for the first time is available to individuals who have not been specially selected and trained to be astronauts. In addition, women are being actively recruited into the space program, both as mission specialists and as career astronauts. One purpose of this project was to examine some of the physiological responses of women to a simulated weightlessness program (12 day horizontal bedrest), to compare their responses to those reported in men during similar programs, and to test whether menstrual function might alter some of the physiological changes which occur during bedrest, specifically changes in the plasma volume, exercise tolerance, and venous compliance before and after bedrest.
A NEW APPROACH TO NON-INVASIVE OXYGENATED MIXED VENOUS PCO₂ Final Report

JOSEPH A. FISHER (Toronto Univ., Ontario) and CLIFFORD A. VENOUS PCO₂
Fick technique. The Fick principle states that the cardiac output is equal to the CO₂ production divided by the arterio-venous CO₂ content difference of the pulmonary vessels. A review of the principles involved in the various techniques used to estimate venous CO₂ partial pressure is presented. B.G.

Gerald L. Mechanic 1986 10 p
(Contract NAS2-181)
(NASA-CR-180095; NAS 1.26:180095) Avail: NTIS HC A02/MF A01 CSCL 06S

The amounts of nonmineralized and mineralized collagen in bone from control, immobilized, and immobilized reambulated monkeys were examined. In order to understand structure function relationships of bone collagen and the response of a variety of conditions on the three dimensional structure of the collagen fibril, the stereochemistry of the cross-linking reactions as well as the stereospecific packing of the collagen molecules were studied. B.G.


INTERCORTICAL INTERACTIONS IN VISUAL PROCESSING Final Report
Jeremiah I. Nelson May 1986 24 p
(Contract N62696-83-M-3126)
(AD-A169674; NADC-86066-60) Avail: NTIS HC A02/MF A01 CSCL 06S

Microelectrodes were used to record responses from single cells in the visual system of cats, at the level of the visual cortex. Interactions were discovered and measured between the cell under study and neighboring cells, when these neighbors were stimulated with large patterns. The interactions obey specific rules. It is argued that these rules are ideal for separating and strengthening the neural response to one object from the response of myriad other neurons in a cluttered background. The next step in this project will be multielectrode array studies to isolate and identify the neurons participating in these interactions. GRA

SCHOOL OF AEROSPACE MEDICINE, Brooks AFB, Tex.
KENT K. GILLINGHAM May 1986 9 p
(AD-A170441; USAFSAM-TR-86-12) Avail: NTIS HC A02/MF A01 CSCL 06N

G tolerance varies widely among individuals. To assure that aircrew with abnormally low G tolerance are not assigned to aircraft that operate in the high-G environment, a G-tolerance standard and the means to implement that standard are necessary. Since 1977 the USAF SAM has used, in human centrifuge operations, an informal G-tolerance standard for selecting experimental subjects, evaluating medically disqualified aircrew, and ensuring efficacy of high-G training for aircrew. That standard consists of the subject's being able to sustain for 15 s a rapidly applied +7-G sub z load, without totally losing peripheral vision or losing consciousness, while wearing a functioning anti-G suit, performing an anti-G straining maneuver, and sitting in a conventionally configured fighter aircraft seat. Inability to tolerate a 7-G, 15-s, rapid-onset G profile in a centrifuge is also the basis of internationally recognized (NATO, ASCC) definitions of low G tolerance. The rationale for choosing the 7-G, 15-s standard is discussed. Experience with use of this standard and the equivalent standard of 8 G for 5 s when the F-16-configured seat is used reveals that fewer than 1% of actively flying fighter aircrews are unable to meet the standard. GRA

N87-15686# California Univ., Irvine. Dept. of Community and Environmental Medicine.
EXPLORATORY STUDY OF THE POTENTIAL EFFECTS OF EXPOSURE TO SONIC BOOM ON HUMAN HEALTH. VOLUME 2: EPIDEMIOLOGICAL STUDY Final Report, Nov. 1984 - May 1986
(Contract F33615-81-C-0500)
(AD-A170953; AAMRL-TR-86-020-VOL-2) Avail: NTIS HC A08/MF A01 CSCL 06S

A study has been carried out to investigate possible human health effects caused by exposure of people to sonic boom. The subjects of the study were the residents of Nevada. This state was selected for the study because supersonic military flight operations have been carried out in Nevada, primarily within the boundaries of the Tactical Fighter Weapons Center (TFWC) Range Complex near Las Vegas, longer than in any other area within the United States. This volume presents the results of an epidemiological study to search for any health effects. The health effects study was built entirely on a statewide epidemiological evaluation of mortality for Nevada residents from 1968 to 1983, supplemented by hospital discharge morbidity data. The results of the statewide study revealed no convincing evidence to prove or disprove any relationship between exposure to sonic boom and adverse health phenomena. Statewide, age-adjusted mortality in Nevada is unremarkable compared to national figures. Crude death rates did vary directly with exposure to sonic booms but this relation disappeared when mortality was age-adjusted. Analyses of time trends and bivariate linear regressions failed to yield convincing associations between sonic boom exposure and age-adjusted mortality. Access to a population of weapons-range workers and to their health records, which was an additional key component of the research study, was not granted. GRA

SCHOOL OF AEROSPACE MEDICINE, Brooks AFB, Tex.
Lloyd Kaufman and Samuel J. Williamson 24 Jun. 1986 85 p
(Contract AF-AFOSR-0050-82)
(AD-A171076; AFSOSR-86-0515TR) Avail: NTIS HC A05/MF A01 CSCL 06B

Sensitivity to changing speed was studied with gratings of various spatial frequencies drifting across a screen while the average velocity was modulated. Thresholds expressed either as the velocity amplitude (difference between peak and average velocities) or as the maximum acceleration, increased monotonically with average velocity. The threshold for velocity contrast (velocity amplitude divided by average velocity) actually decreased with average velocity. The velocity contrast was minimal for velocity modulation frequencies of about 2 Hz and for spatial frequencies in the range of 2-4.5 c/d. In addition to these basic findings, we failed to find any effect of selective adaptation to changing speed other than that could be attributed to smooth motion. It seems unlikely that mechanisms tuned to respond to changing speed per se are present in the human perceptual system. However, it is not possible to generalize from this to situations where higher derivatives are introduced by causing stimuli to change direction of motion. Author (GRA)
solution to form a surface Ru(II)-N2 complex. This complex is electrochemically detectable and distinguishable from the Ru(II) precursor. At short times, the reaction follows first-order kinetics with a rate constant 10 times greater than for the equivalent homogeneous reaction. The reaction rate is proportional to PN2 up to 8 atm and possibly higher. The sensitivity approaches 1/10 atmosphere and the minimum electrode response time at elevated PN2 is 0.1 sec. This N2 sensing system holds promise for eventual configuration into an implantable unit for in situ measurements of tissue PN2 during compression and decompression of an experimental animal.

GRA

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**N87-15689#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE EFFECT OF LONG TERM MONOCULAR OCCLUSION ON VERNIER THRESHOLD: ELASTICITY IN THE YOUNG ADULT VISUAL SYSTEM M.S. Thesis
RICHARD J. DENNIS Jun. 1986 86 p
(AD-A171289; AFIT/CI/NE-86-122T) Avail: NTIS HC A05/MF A01 CSCL 06P

Five subjects (ages 19 to 22) were monocularly occluded for six days. Their vernier thresholds and fixation integrity measurements (using a modified Haidinger's brush) were determined at pre-occlusion, two, four, and six days of monocular occlusion, and 24 hours after patch removal. The occluded eye demonstrated a significant rise in vernier threshold after the two day occlusion period. The threshold continued at that level throughout the six day occlusion period before returning to normal within 24 hours after removal of the patch. The non-occluded eye did not show a matching enhancement effect characteristic of the competition model. Every subject also manifested an amount of eccentric fixation in the occluded eye. The eccentric fixation did not generally increase with time occluded, but did show an elastic response by returning to normal foveal fixation in 24 hours. The decrement in vernier performance in the occluded eye is probably best explained as a temporary (elastic) eccentric fixation rather than the loss of channels as theorized in the competition model. Our data did indicate a faster drop off of vernier acuity with retinal eccentricity than did the interpolated data of Westheimer's (1979) postulating that a secondary process was also contributing to the rise in threshold.

GRA

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**N87-15690#** Case Western Reserve Univ., Cleveland, Ohio.
VERNON ROWLAND and HENRY GLUCK Aug. 1986 4 p
(Contract DAAG29-83-K-0089)
(AD-A171316; ARO-204723-L-S) Avail: NTIS HC A02/MF A01 CSCL 05J

Efforts were directed toward improved understanding of the slow potential (SP) of the brain. This electrically recordable dynamic differs from the conventional EEG in being nonrhythmic and from durations of 1 to many fold longer than the longest enduring components of the EEG. It is best elicited by use of motivating (conditioned) stimuli and by signals (conditioning stimuli) related to them in the learning process. A study was made of the relation of multiple firing potentials of neurons to the SP as both are related to temporal (fixed interval) conditioning controlled by medial forebrain bundle (MFB) electrical reward in the rat. A correlation was observed of the pacing of the level of expectancy in the trained subject with the SP, which, in this context, has been termed the Anticipatory Potential Gradient or APG.

GRA

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**N87-15692#** Technion - Israel Inst. of Tech., Haifa.
MODELS OF CEREBRAL SYSTEM MECHANICS Final Report
S. SOREK, J. BEAR, Z. KARNI, and M. FEINSOD 20 Jul. 1986
121 p
(Contract AF-AFOSR-0233-85)
(AD-A171483; EOARD-TR-86-07; SR-2) Avail: NTIS HC A06/MF A01 CSCL 06P

A model of a system is a simplified version of the real system. The simplification is done by introducing a set of assumptions that express our understanding of the system's behavior. In the process of simplification, we omit non-dominant effects, leaving the main features of the system. The objective of simplification is to obtain a set that can be solved by available tools and still maintain the main characteristics of the real system. The model is a tool that provides forecasts of the response of the real system to various excitations. Thus it is essential that the model retains those features that are the subject of investigations. This volume contains 7 papers dealing with models of brain mechanics. The objective of the models is to provide a tool for simulating the mechanical behavior of the cerebral system, as manifested by pressure, velocity, stress and strain variations, in response to changes in input pressures and fluxes.

GRA
The identification of characteristics of noise susceptible or noise resistant individuals is necessary for the development of noise susceptibility risk profiles. Fifty-six Naval aviators, categorized as having either incurred a hearing loss (i.e., hearing threshold levels greater than 40 dB at 4000 to 8000 Hz) or retained normal hearing (i.e., hearing threshold levels less than or equal to 25 dB at 125 to 8000 Hz) after thousands of flight hours were compared along several auditory and non-auditory dimensions. The following variables occurred differentially in the two groups: Minimal Auditory Intensity Differential (MAID) scores at 2000 Hz (p less than .01) and 4000 Hz (p less than .001); iris pigmentation (blue eyes were overrepresented in the noise susceptible group; p less than .05); blood type (type A occurred more often in the noise susceptible population; p less than .05); systolic blood pressure (sitting; noise susceptible group was higher; p less than .05); calcium, albumin, and LDH levels (higher in the noise resistant group; p less than .05); and present tobacco usage (more noise-susceptible aviators were currently smokers; p less than .05). The noise susceptible population also tended (p less than .10) to exhibit elevated cholesterol and triglyceride levels, higher contralateral acoustic reflexes, and had fewer individuals who had never smoked. Although no classic profile of the noise susceptible or noise resistant individual definitively emerged, results suggested that at least one measurement device (MAID test) may serve as an early warning sign.

GRA
A variety of dose responses have been observed for cancer induction following low linear energy transfer (LET) radiation. In general, however, the response is curvilinear, with a rapidly rising component in the intermediate dose range followed by a plateau or decline in incidence at high doses. The response is more linear at low doses, whereas the response at intermediate doses is approximated by a dose-squared relationship. Models for this response are based on the biophysical theory of cellular effects. However, many types of effects contribute to the tumorigenic processes, and host factors play a major role. At low dose rates the carcinogenic effect is generally reduced, which is caused by a diminution of the dose-squared component and results in a linear or decline in incidence at high doses. The response is more linear component in the intermediate dose range followed by a plateau induction following low linear energy transfer (LET) radiation. In both experiments, the results showed that, as frequency increased, the acceleration of the matching response decreased for both types of stimuli. However, in exp. I the combined-axis stimuli produced higher response accelerations than the y-axis vibrations, while in exp. II matching responses were the same for both vibration types.

behavioral sciences

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

features and objects in visual processing

Anne Treisman (California, University, Berkeley) Scientific American (ISSN 0036-8733), vol. 255, Nov. 1986, p. 114B-122, 124, 125.

The unconscious mental processes underlying the ability to perceive meaningful wholes in the visual world are discussed. The automatic extraction of features from a scene is examined, describing the experiments which reveal the simple features of the visual world that are used in the initial stage of visual processing. The assembly of these features into objects is considered, emphasizing the roles of expectation and focused attention in this process.

C.D.

anti-g training of japanese air self defense force fighter pilots


The high-G training program designed for pilots of high-performance aircraft (such as the F-15) is described. The program included periods of centrifuge rides of two basic patterns: a tracking performance and a simulated aerial combat maneuver (SACM). Mean relaxed G tolerances for the gradual onset run (GOR) and the rapid onset run (ROR) were found to be +5.5 Gz and +4.9 Gz, respectively. Physiological problems included petechiae, vertigo, general malaise, limb pain, nausea, and neck pain. Some trainees suffered brief periods of loss of consciousness (LOC) at GOR and/or ROR, but all F-15 trainees completed the SACM pattern without LOC.

I.S.
A87-23046

EXPOSURE-DURATION EFFECTS IN LOCALIZATION JUDGMENTS


The effects on localization accuracy of increasing exposure duration beyond 100 msec are explored for a wide range of object separations. Previous reports that localization accuracy for objects separated by a few minutes of arc increases for exposures up to at least 400 msec are confirmed. It is reported that localization of larger objects at larger separations does not improve when the exposure duration is increased beyond 100 msec. This difference between the small- and large-scale results can be explained by the difference in the spatial-frequency content of the objects being localized. When high-frequency objects are substituted for spectrally broadband objects in the large-scale case, the exposure-duration effects for widely separated objects become similar to those obtained in the small-scale case. These results suggest that the exposure-duration effect previously reported in hyperacuity studies is not specific to the localization task per se but rather is a suprathreshold version of the familiar form of spatiotemporal interaction seen in contrast-threshold results. They also suggest that a single type of mechanism underlies small- and large-scale localization.

Author

A87-23065

COORDINATION OF VESTIBULAR AND VISUAL PERCEPTUAL CUES IN REAL-TIME SIMULATION


The current lack of understanding of the interactions that may occur between visual, vestibular, and proprioceptive information limits perceptual realism in real time flight simulation. An attempt is presently made to specify the nature of perceptual interactions in simulation, such that they may be taken into account during initial programming of platform motion and visual systems to achieve a higher degree of perceptual fidelity. Attention is given to the evaluation and calibration of criteria for displays using the human visual system as a calibrating instrument, the establishment of the characteristics of visual flow patterns to furnish optimum impression of visual motion, and the determination of physiological thresholds for vestibular/proprioceptive motion detection and identification.

O.C.

A87-23067

EFFECTIVE TRAINING FOR A MODERN AIR COMBAT VEHICLE


Attention is given to a low cost, highly effective Intermediate Training Device (ITD) simulation unit for modern fighter aircraft which mediates the transition from conventional to digital aircraft instruments for navigation, stores management and radar operation. Through the implementation of hands-on training for cockpit familiarization, and the development of skills for complex attack systems involving engaged both air and surface targets, military training objectives are met more economically with ITD than with the systems formerly employed.

O.C.

A87-23069

COMPARISONS OF PERFORMANCE IN VARIOUS VISUAL SYSTEMS COMMON TO SIMULATION


A comparative evaluation is conducted of visual systems employed in simulation programs, using standard parameters and common references together with simplified comparison tables. The greatest shortcomings of current technology are the lack of suitable vertical fields of view, inadequate scene resolution and brightness, and lack of stereoscopic displays. Ironically, the simulators that most closely approximate real world scenes are the ones psychologically prone to be judged most severely with respect to what flaws remain. It is noted that training for long endurance flights requires simulators with highly refined cue coordination capabilities.

O.C.

A87-23225#

PSYCHOLOGICAL UNEASINESS BEFORE RIDING HUMAN-CENTRIFUGE OR DISORIENTATOR


A survey for assessing an individual's psychological uneasiness before riding a human-centrifuge or disorientator was developed. The test consisted of 40 descriptions of physiological and psychological states. The subjects (60 experienced pilots, 261 candidate pilots, and 60 nonpilots) had never ridden these devices before. The psychological uneasiness levels of the nonpilots were the highest of the three groups.

K.K.

N87-15695*# National Aeronautics and Space Administration, Washington, D.C.

ON THE PILOT'S BEHAVIOR OF DETECTING A SYSTEM PARAMETER CHANGE

N. MORIZUMI and H. KIMURA 1986 18 p Transl. into ENGLISH from Japan Society for Aeronautical and Space Sciences Journal (Japan), v. 33, no. 380, 1985 Original language document was announced in IAA as A86-25229 Transl. by SCITRAN, Inc., Santa Barbara, Calif. (Contract NASW-4004)

This paper deals with the detection characteristics of a human pilot, who is engaged in a compensatory control, to a sudden change in the controlled element's characteristics. Taking the case where the change manifests itself as a variance change of the monitored signal, it is shown that the detection time, defined to be the time elapsed until the pilot detects the change, is related to the monitored signal and its derivative. Then, the detection behavior is modeled by an optimal controller, an optimal estimator, and a variance-ratio test mechanism that is performed for the monitored signal and its derivative. Results of a digital simulation show that the pilot's detection behavior can be well represented by the model proposed here.

Author


MINIMUM POINTS AND VIEWS FOR THE RECOVERY OF 3-DIMENSIONAL STRUCTURE


This paper presents mathematical analyses of motion perception and the development of mathematical representations of the world. The authors present a generalization of visual motion and the development of mathematical representations of the world. They present a generalization of visual motion and the development of mathematical representations of the world. They present a generalization of visual motion and the development of mathematical representations of the world. They present a generalization of visual motion and the development of mathematical representations of the world. They present a generalization of visual motion and the development of mathematical representations of the world. They present a generalization of visual motion and the development of mathematical representations of the world. They present a generalization of visual motion and the development of mathematical representations of the world. They present a generalization of visual motion and the development of mathematical representations of the world.
determine whether human subjects could recover 3D information at these theoretical levels, we presented subjects with pairs of displays and asked them to determine whether they represented the same or different 3D structures. Number of points was varied between 2 and 5; number of views was varied between 2 and 6; and the motion was either fixed axis with constant angular velocity, fixed axis with variable velocity, or variable axis with variable velocity. Accuracy increased with views, but decreased with points, apparently due to the increased difficulty of the comparison task as the structure became more complex. Subjects’ performance exceeded theoretical expectations, implying that they exploited regularities in addition to those in the theoretical analyses. Some possible additional regularities, and possible grouping effects, are discussed. Author (GRA)

N87-15697#  Arizona State Univ., Tempe.  THE EFFECTS OF RESPONSE MODALITY ON INTERFERENCE BETWEEN STIMULUS DIMENSIONS V. G. CUQLOCK and KATHRYN A. BLOEM Jul. 1986 25 p (Contract DAAQ29-84-K-0197) (AD-A171177; ARO-222561-L5) Avail: NTIS HC A02/MF A01 CSCL 05J  This report concerns the effects of response modality and the relation between stimulus dimensions on subjects ability to report one dimension of a multidimensional stimulus. Subjects were asked to report, as rapidly as possible, either the name or the ink color of colored words. The relation between the ink color and word was either congruent (Blue in blue ink), neutral (Door in blue ink), or incongruent (Blue in red ink). Responses were made either manually or vocally. Results are consistent with previous findings in the area of Stroop (Stroop, 1935) research. That is, as responding into two of one dimensions is more difficult when the relation between dimensions is incongruent than when the relation between dimensions is congruent or neutral. But in addition, results show that no interference from an incongruent, ink-color dimension results when subjects respond vocally to the word dimension, whereas when subjects respond manually to this dimension, the incongruence between the colors and word produce interference. Results suggest a limitation on the usefulness of a color dimension when a word dimension requires a speeded-speech response. Author (GRA)

N87-15698#  Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.  NOVICE RULES FOR ASSESSING IMPORTANCE IN SCIENTIFIC TEXTS Interim Report, Aug. 1985 - Jul. 1986.  DIANA DEE-LUCAS and JILL H. LARKIN Aug. 1986 37 p (Contract MDA903-85-K-0160; DA PROJ. 2Q1-61102-B-74-F) (AD-A171551; ARI-RN-86-89) Avail: NTIS HC A03/MF A01 CSCL 05J  Scientific texts are typically densely packed with complex content, making it particularly difficult for novice learners to identify important information. The current study found that novice readers judge importance on the basis of form (i.e., definition or fact) in which information is presented. In this study, expert and novice physicists judged the importance of sentences in physics texts when they were presented as definitions or facts. The definitions and facts were identical in content differing only in minor wording changes. Sentence form influenced the importance judgments of novices, but not those of experts. Novices judged sentences that were identical in content as more important when they were presented as definitions. These results indicate that textbook writers need to be aware of how form influences novices’ perception of what is important in order to effectively guide attention to critical text content. Techniques for altering readers’ attention (i.e., signaling and strategy instruction) are discussed. Author (GRA)

N87-15699#  Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.  HUMAN REAL TIME PERCEPTION IN NOISE MICHAEL J. STOCK, CHARLES W. NIXON, VERNIE G. FISHER, III, and CHARLES D. GOODYEAR 20 Aug. 1986 41 p (AD-A172374; AAMRL-TR-86-034) Avail: NTIS HC A03/MF A01 CSCL 20A  A novel device, the Real Time Perception Analyzer (RTPA), has been developed to measure the perception of real time as well as simple and choice reaction time under microgrcic conditions on board the space shuttle. This study examined only real time perception; reaction times were not measured. The RTPA real time perception task produces a target dot that moves from left-to-right across a narrow, horizontal light bar. A vertical marker is positioned almost two inches beyond the right end of the light bar. The subject’s task is to push a switch when it is estimated that the target dot has moved beyond the end of the light bar, a region where the dot is no longer visible, and reached the vertical marker. Sixteen subjects performed the time perception task under various conditions of quiet and noise exposure. Errors consisted of underestimations or overestimations of the actual time intervals which ranged from 1.75 to 14.0 seconds. Results indicate that subjects overestimated time intervals and that the greatest errors occurred for the shortest time intervals and in noises that changed during the task. Also, female subject estimates of time intervals were consistently shorter than those of the male subjects. These findings are compared to earlier research on time estimation and verify that the RTPA provides a reliable and sensitive measure of the perception of real time in noise. Author (GRA)
same attention to measurement properties and validation as any other measures on individuals; (2) there are tendencies to substitute same attention to measurement properties and validation as any physical measures, which scale physical quantities or events, for behavioral measures, which are representative of how well an individual can perform a given task. Performance measures are behavioral measures, and acquire meaning through validation operations beyond those required for physical measurement. Not all the measures obtainable on individuals or systems are appropriately called performance measures; (3) task performance must be viewed as a construct. Tasks are complex and multidimensional; individual proficiency must be inferred from limited observations. For proposed measures, it is necessary to show that measures are reliable, that they tap the most important components of successful performance, and that they are credible as representatives of individual task proficiency.

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A87-21798
AUTOMATION OF THE HUMAN OPERATOR STATE EVALUATION (OB AVTOMATIZATSII OTSENKI SOSTOIANII CHELOVEKA-OPERATORA)
A. M. KARPUKHINA, V. I. NEDASHKOVSKAIA, V. A. SALAMATOV (Nauchno-Issledovatel'skiy Institut Psihologii, Kiev, Ukrainian SSR), and IU. A. PLUSHCH (AN USSR, Institut Problem Modelirovania v Energetike, Kiev, Ukrainian SSR) Elektronnoe Modelirovanie (ISSN 0204-3572), vol. 8, Sept-Oct. 1986, p. 76-83. In Russian. refs

The paper is concerned with the possibility of evaluating the psychophysiological state of the human operator on the basis of the energy characteristic of the electric potential dynamics of biologically active skin points. An instrument implementing this approach is described. The method and instrument proposed here can also be used for studying the structural-functional organization of the bioelectric characteristics of the psychophysiological states of man in relation to the structure of human operator activities.

A87-23229*# National Aeronautics and Space Administration
Langley Research Center, Hampton, Va.
A FLEXIBLE TELEROBOTIC SYSTEM FOR SPACE OPERATIONS

This paper describes the objective and design of a proposed goal-oriented knowledge-based telerobotic system for space operations. This design effort encompasses the elements of the system executive and user interface and the distribution and general structure of the knowledge base, the displays, and the task sequencing. The objective of the design effort is to provide an expandable structure for a telerobotic system that provides cooperative interaction between the human operator and computer control. The initial phase of the implementation provides a rule-based, goal-oriented script generator to interface to the existing control modes of a telerobotic research system, in the Intelligent Systems Research Lab at NASA Research Center. Author

N87-15700 Florida Univ., Gainesville.
ADAPTIVE CONTROL OF ROBOTIC MANIPULATORS Ph.D.
Thesis
L. SASRI TOSUNOGLU 1986 269 p
Avail: Univ. Microfilms Order No. DA8616692

Currently industrial robot manipulators operate slowly to avoid dynamic interactions between links. Typically each joint is controlled independently and system stability and precision are maintained at the expense of underutilizing these systems. As a result, productivity is limited, and more importantly, the lack of reliability has hindered investment and wider industrial use. This work addresses the adaptive control of spatial, serial manipulators. Centralized adaptive controllers which yield globally asymptotically stable systems are designed via the second method of Lyapunov. Actuator dynamics is also included in the system model. Lagrange equations are used in deriving dynamic equations for n-link, spatial robot manipulators which are modeled with rigid links connected by either revolute or prismatic pairs. Although manipulators may exhibit structural flexibility, the rigid link assumption is justified, because control of manipulators needs to be understood precisely before flexibility is included. The plant, which represents the actual manipulator, and the reference model, representing the ideal robot, are both expressed as distinct, nonlinear, coupled systems. Error-driven system dynamics is then written and adaptive controllers which assure global asymptotic stability of the system are given utilizing the second method of Lyapunov. It is shown that these control laws also lead to asymptotically hyperstable systems. Integral feedback is introduced to compensate for the steady-state system disturbances. Dissert. Abstr.

N87-15701# Report Store, Lawrence, Kans.
B. WILLIAMS and L. WASCHER 1 Jul. 1986 56 p
(Contract DAAL02-86-P-1599) (AD-A171142; HEL-FI-5-86) Avail: NTIS HC A04/MF A01
CSOL 05B

This report surveys the status of ergonomics databases in the member countries of the International Ergonomics Association. Most ergonomic data is available only in the literature where it was first reported. Few formal data collections exist and very few computerized databases were found in this survey. Handbooks and textbooks are still the main sources of collected ergonomics data. Anthropometry is the only body of information in which we found significant collections of international data currently available in computerized form. Most ergonomics data are still embedded in the published literature. Recent use of the computer for ergonomics data gathering and data analysis has created the potential for previously existing limited studies of small populations to be extended into entirely new automated databases, but this potential has not been realized. After reviewing the strengths and weaknesses of available published data compendia and then
describing the few large scale databases found in the survey, this report presents some examples of how existing data-gathering systems could be used to build new automated databases. GRA

N87-15702# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
USE OF DISJUNCTIVE RESPONSE REQUIREMENTS IN DUAL-TASK ENVIRONMENTS: IMPLICATIONS FOR AUTOMATION Ph.D. Thesis
ROBERT J. SOHLEN May 1986 107 p (AD-A171277; AFIT/CI/NR-86-133D) Avail: NTIS HC A06/MF A01 CSCL 05J

Two experiments were conducted to assess the difference in resource requirements for choice and disjunctive (Donder's Type c) responses in a dual-task environment. Experiment 1 utilized two binary tasks paired in all possible combinations of choice and disjunctive response requirements. For both tasks the disjunctive responses were faster and less error prone with the additional benefit of improving performance on the concurrent task. Experiment 2, using a primary-secondary dual-task paradigm, contrasted the resource cost of responding to the cost of not responding to stimuli that had varying degrees of similarity to the go stimuli. Results demonstrated a high degree of operator involvement in terms of resource use even when a response was not required. These results were discussed in terms of reducing operator workload within a semiautomated multitask environment by employing disjunctive responding in place of binary choice responding. Author (GRA)

N87-15703# Arizona State Univ., Tempe.
DIANE L. DAMOS 15 Aug. 1986 23 p Prepared in cooperation with the University of Southern California, Los Angeles (Contract NO0014-82-C-0179) (AD-A171492; REPT-916416-FTN) Avail: NTIS HC A02/MF A01 CSCL 17B

The primary purpose of this contract was to examine the effect of voice generation and recognition systems on dual-task performance, although three other research efforts on complementary topics also were investigated. This report is divided into four sections. The first section provides background information for the first experiments conducted under this contract. The second section describes each of the six experiments examining the effect of voice generation and recognition systems on dual-task performance and summarizes their results. The third section briefly discusses the three other research efforts performed on this contract in support of current activities at the Naval Biodynamics Laboratory and the Naval Aerospace Medical Research Laboratory. The last section lists the products of the contract. GRA

N87-16331# California Univ., Santa Barbara.
DUTY CYCLE TESTING AND PERFORMANCE EVALUATION OF THE SM-229 TELEOPERATOR
ROBERT S. STOUGHTON and DANIEL P. KUBAN (Oak Ridge National Lab., Tenn.) In NASA. Lewis Research Center The 20th Aerospace Mechanics Symposium p 133-148 May 1986 Previously announced as N86-31059 (Contract DE-AC05-84OR21400) Avail: NTIS HC A04/MF A01 CSCL 06H

The first known experimental studies and analyses of teleoperator performance for specific duty cycles are discussed. The results are presented in two distinct areas as position usage patterns, and as three-dimensional power grids. The position usage patterns are a valuable means to assess the available motion range. The power grids are a unique concept for evaluating joint performance. Final conclusions contain recommendations to upgrade the teleoperator for optimum performance. Author (GRA)

N87-16516# California Univ., Berkeley.
SYSTEM MODELING AND VIBRATION ANALYSIS OF BAND/WHEEL MECHANICAL SYSTEMS Ph.D. Thesis
KON-WELL WANG 1985 150 p (Contract N00014-85-K-0566) Avail: NTIS HC A02/MF A01 CSCL 06K

High speed axially moving bands, driven by rotating wheels, are the basic elements in many machines. In this research, a model describing the coupled motions is formulated and verified. Hamilton's Principle is used to derive the equations of motion and boundary conditions. The resulting equations are linearized and then discretized by applying the Galerkin Method. The results show that the mechanism of vibration coupling is the finite equilibrium curvature of the band. The transverse vibrations of the spans are linearly coupled to their longitudinal motions and to the motion of the wheels. The contributions of various system parameters to the coupling are clarified. The effects of different types of linear damping on the band/wheel system dynamics are analyzed. The damping in each mode is examined by calculating the real part of the corresponding eigen-value. Once the dominating modes are identified, one can minimize the principal span vibration by adjusting the damping distribution of the system. Dissertation. Author (GRA)

N87-16517# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ROBOTIC MANIPULATOR CONTROL PERFORMANCE EVALUATION Ph.D. Thesis

A robotic manipulator dynamically based controller performance baseline is established by the creation and utilization of a hierarchical robotic evaluation environment. Creation of a hierarchical robotic evaluation environment provides an original solution to the problems that previously constrained real-time evaluation of modern manipulator control schemes. Utilization of that environment fulfills the application of proposed theories. The performance baseline is established by simulated and experimental evaluation of feedforward dynamics and feedback control design for joint motion high speed trajectory tracking robot control. The real-time performance produced by application of all proposed robotic control techniques to harmonic and gear driven manipulators can be extrapolated from the baseline. A feedforward loop composed of uncoupled inertia and gravity dynamics exhibited the best tracking accuracy. Forces unmodeled by those dynamics can be effectively treated as disturbances to the feedback loop. Dynamic based control techniques exhibited the potential to control high speed gross motion of a manipulator without additional sensor devices. GRA

A PULSATING ANTI-GRAVITY SUIT FOR ACCELERATION PROTECTION: SYSTEM DESCRIPTION AND PRELIMINARY EXPERIMENTS Interim Report

This document describes a system designed to study the feasibility of augmenting tolerance to acceleration stress using external pressure pulsations synchronized to the electrocardiogram. The system, known as synchronized pulsating anti-gravity suit, consists of a modified G Suit, a controller and a pneumatic subsystem. The modified suit has individual bladders for calf, thigh, and abdomen with separate in/outlet ports. A microcomputer controls the synchronization, phasing and sequencing of pressure pulses in the bladders. Desired high and low pressures are obtained using feedback of pressure signals to a set of comparators. Solenoid valves and related circuitry regulate the flow of air in and out of the bladders. Results based on the centrifuge experiments suggest the feasibility of obtaining improved tolerance with a synchronized pulsating suit. GRA

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A program to apply the best aircraft control and display ideas and principles generated since World War II to an integrated, computer-based system for vertical and translational instrument flight is reviewed. A generic thrust-borne aircraft capable of vertical takeoff and landing (VTOL) and six degrees of maneuvering freedom was simulated, as were a forward-looking contact analog display and a downward-looking horizontal situation display. Features incorporated in these displays included command guidance symbology, directionally compatible frequency-separated quasi-pursuit flight path predictors with vernier-deviation indications, a unique integrated presentation of altitude and vertical speed vector against air mass movements and reduced orders of magnitude, and features of the simulated control system included automatic stabilization of position and velocity vector against air mass movements and reduced orders of maneuvering performance control. A holistic experimental approach was applied to screen critical dynamic design variables, optimize their response surfaces, and investigate direction of display motion and its effect on flight performance. GRA

Speech recognition technology could be especially advantageous to single-crewmember helicopters like the Light Helicopter Family (LHX). Before speech recognition can be considered a viable technology for helicopters, several issues remain to be resolved. One of these is changes in the voice that occur as a result of stress, noise, and vibration. This paper reports the results of an investigation conducted to determine the effect of vibration-induced changes in the voice on the accuracy of a speech recognition system. A series of flight tests were conducted using 12 participants and 8 different flight maneuvers. Data were collected with the participants speaking 50 phonetically balanced words into the speech recognizer while seated in the copilot’s seat of a UH-1H helicopter during each of the 8 flight maneuvers. The results indicate that speech recognition system accuracy is not affected by helicopter vibration. GRA

The literature on optical alignment and image difference tolerances for binocular devices are reviewed. Tolerances for vertical and horizontal misalignment and for rotation, magnification and luminance differences are recommended. Recommendations are made for cullimation tolerance and for eye relief and exit pupil diameter for helmet-mounted binocular displays. Formulas are derived for magnification difference tolerances for partially and totally overlapping fields of view. GRA
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