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

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IAA (A-10000 Series)      A79-16981—A79-20476

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# AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY  
WITH INDEXES

(Supplement 192)

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 March 1979 in

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

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# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 247 reports, articles and other documents announced during March 1979 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964, since that time, monthly supplements have been issued.

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 in two major sections -- *IAA Entries* and *STAR Entries*, in that order. 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. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1979 Supplements.

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## TYPICAL CITATION AND ABSTRACT FROM STAR

<b>NASA SPONSORED DOCUMENT</b>		<b>AVAILABLE ON MICROFICHE</b>
<b>NASA ACCESSION NUMBER</b>	<b>N79-10741*</b> #	
<b>TITLE</b>	McDonnell-Douglas Astronautics Co Huntington Beach Calif <b>GENERALIZED ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM COMPUTER PROGRAM (G1894), PHASE 3 Final Report</b>	<b>CORPORATE SOURCE</b>
<b>AUTHOR REPORT NUMBER</b>	R E McEnulty Sep 1978 23 p refs (Contract NAS9-14877)	<b>PUBLICATION DATE</b>
<b>COSATI CODE</b>	(NASA-CR-151836 MDC-G7699) Avail NTIS HC A02/MF A01 CSCL 06K	<b>CONTRACT OR GRANT AVAILABILITY SOURCE</b>

The work performed during Phase 3 of the Generalized Environmental Control Life Support System (ECLSS) Computer Program is reported. Phase 3 of this program covered the period from December 1977 to September 1978. The computerized simulation of the Shuttle Orbiter ECLSS was upgraded in the following areas: (1) the payload loop of the Shuttle simulation was completely recoded and checked out; (2) the Shuttle simulation water and freon loop initialization logic was simplified to permit easier program input for the user; (3) the computerized simulation was modified to accept the WASP subroutine, which is a subroutine to evaluate thermal properties of water and freon; (4) the 1108 operating system was upgraded by LEC; (5) the Shuttle simulation was modified to permit failure cases which simulate zero component flow values; and (6) the Shuttle SEPS version was modified and secure files were setup on the 1108 and 1110 systems to permit simulation runs to be made from remote terminals.

S E S

## TYPICAL CITATION AND ABSTRACT FROM IAA

<b>NASA SPONSORED DOCUMENT</b>		
<b>AIAA ACCESSION NUMBER</b>	<b>A79-12869 *</b>	
<b>AUTHOR'S AFFILIATION</b>	Studies on the erythron and the ferrokinetic responses in beagles adapted to hypergravity D A Beckman J W Evans (California, University, Davis, Calif), and J Oyama (NASA, Ames Research Center, Biomedical Research Div Moffett Field, California, University, Davis, Calif)	<b>TITLE</b> <b>AUTHORS</b>
<b>PUBLICATION DATE</b>	<i>Aviation, Space, and Environmental Medicine</i> , vol 49, Nov 1978, p 1331-1336 23 refs Grant No. NCA2 OR180 505	<b>TITLE OF PERIODICAL</b> <b>CONTRACT, GRANT OR SPONSORSHIP</b>

Red cell survival, ferrokinetics, and hematologic parameters were investigated in beagle dogs exposed to chronic hypergravity (2.6 Gx). Ineffective erythropoiesis, red cell mass, plasma volume, and Cr 51 elution were significantly increased, maximum Fe 59 incorporation was decreased, and there was no change in the mean erythrocyte life span following autologous injection of Cr 51 labeled red cells and Fe 59 labeled transferrin. Red cell count, F(cells), total body hemoglobin (Hb), susceptibility to osmotic lysis, and differential reticulocyte count were increased. White blood cell count, venous blood %Hb, mean cell volume, mean cell Hb, mean cell Hb concentration, and serum iron were decreased. No changes were observed for body mass, mg Fe per g Hb, iron binding capacity, percent saturation of iron carrying capacity, or the electrophoretic mobility of purified Hb. This study indicated that chronic exposure to hypergravity induced changes in red cell size, volume, total mass, and membrane permeability.

(Author)

# AEROSPACE MEDICINE AND BIOLOGY

*A Continuing Bibliography (Suppl. 192)*

APRIL 1979

## IAA ENTRIES

**A79-17123** Lifecloud The origin of life in the universe F Hoyle and C Wickramasinghe (University College, Cardiff, Wales) London, J M Dent and Sons, Ltd, 1978 189 p \$11 75

The astronomical basis of the origin of life is explored It is argued that astronomy is involved in the origin of life at the level of complex biomolecules, particularly the chains of sugar molecules linked through hydrogen atoms and known as polysaccharides Evidence relating to these chains and to the nitrogenated ring molecules is presented, and it is shown how these two types of biomolecules were built from their constituent atoms It is also argued that the interstellar cloud of gas and dust in which the solar system formed continued to add biomolecules long after the early high-temperature phase of the solar nebula and planetary material had been completed These additions provided building blocks for more complex forms, which eventually developed into the first living cells Comet-sized bodies are postulated as the likely site of fitting biomolecules into complex forms P T H

**A79-17569 #** Robots and artificial intelligence (Roboty i iskusstvennyy intellekt) A V Timofeev Moscow, Izdatel'stvo Nauka, 1978 192 p 17 refs In Russian

The functional diagrams of three generations of robots (programmed, sensitized, and intellectual robots) are studied, and the current status of the problem of modeling intelligence is surveyed Principles, algorithms, and means of sensitizing and controlling robots are studied Concepts of hierarchy and adaptation in robot control systems, predicate calculus as the language of robots, teaching and adaptation in a logical deduction system, logic planning algorithms, situation recognition algorithms, programmed motion algorithms, and adaptive control algorithms are discussed Attention is given to the economic, psychological, and social aspects of robotization P T H

**A79-17585** A numerical method of film analysis with differentiation R C Haut, E P Remmers, and W W Meyer (GM Research Laboratories, Warren, Mich) In International Instrumentation Symposium, 24th, Albuquerque, N Mex, May 1-5, 1978, Proceedings Part 1 Pittsburgh, Pa, Instrument Society of America, 1978, p 139-148 6 refs

A numerical method of curve fitting with subsequent differentiation is presented The scheme is applied to high-speed movie film data to determine accelerations A harmonic method of curve fitting is utilized because of its ease in computation and interpretation The problem of divergence of the differentiated series approximation was dealt with by the utilization of a modified differentiation process based on Lanczos' convergence factors A procedure for determining an appropriate cutoff frequency is proposed with some comments on the analysis of both approximations and observational errors and the problem of truncation The result of applying this technique to high speed film data was found to compare favorably with direct acceleration measurements Further development of the error estimation methods presented in this paper is expected to increase the usefulness of this technique in a wide range of problems where differentiation of digital data is required (Author)

**A79-17683** The man-computer division of tasks in the case of the control of complex technical systems (Zur Aufgabenteilung Mensch-Rechner bei der Fuhung komplexer technischer Systeme) W Stein (Forschungsinstitut fur Anthropotechnik, Meckenheim, West Germany) In Modern methods to safeguard traffic at sea, in the air, and on land, National Meeting, Hamburg, West Germany, October 17-19, 1978, Reports Volume 1 Dusseldorf, Deutsche Gesellschaft fur Ortung und Navigation, 1978 22 p 31 refs In German

Specific examples for the considered technical systems are considered, taking into account problems related to the control and the guidance of an aircraft Questions related to the considered degree of automation and the operations which are to be performed by man are discussed The characteristics of these operations are determined by a number of factors related to the size and complexity of the controlled systems, and requirements concerning safety, reliability, and accuracy It is concluded that a complete automatization of flight control processes does not appear feasible within the foreseeable future, even if reliability and safety considerations should be disregarded This conclusion is partly based on the low flexibility of the current automatic systems The degree of system flexibility provided does not satisfy the requirements for an approach in an airport area with a high traffic density G R

**A79-17695** Ergonomic problems regarding the interactive touch input via screens in onboard and ground-based flight control (Ergonomische Probleme der interaktiven Beruhreingabe uber Bildschirme bei der bord- und bodenseitigen Flugfuhung) K-P Holzhausen and K P Gartner (Forschungsinstitut fur Anthropotechnik, Werthoven, West Germany) In Modern methods to safeguard traffic at sea, in the air, and on land, National Meeting, Hamburg, West Germany, October 17-19, 1978, Reports Volume 3 Dusseldorf, Deutsche Gesellschaft fur Ortung und Navigation, 1978 20 p 13 refs In German

A significant problem concerning the integration of display and switching functions is related to the fact that numerous informative data which have to be processed by man must be read from only a few display devices A satisfactory ergonomic design of integrated display devices and keyboards is in many cases difficult, because not all functions which can be displayed and selected are simultaneously available A technical solution which provides an integration of display and functional elements on the basis of the highest flexibility is obtained by using a cathode ray tube with a touch-sensitive screen Aspects of sequential page selection for a virtual functional keyboard of an information management system are considered The employment of an integrated data input/data output system is demonstrated for the cases of onboard and ground-based flight control Ergonomic studies conducted to investigate the suitability of an employment of touch-sensitive screens are also discussed G R

**A79-18008 \*** Radio tracking of a fin whale (Balaenoptera physalus) G C Ray, D Wartzok (Johns Hopkins University, Baltimore, Md), E D Mitchell, V M Kozicki (Environment Canada, Sainte Anne de Bellevue, Quebec, Canada), and R Maiefski Science, vol 202, Nov 3, 1978, p 521-524 20 refs Research supported by Environment Canada, Contracts No NAS2 9300, No N00014-75-C-0701

Tracking of a fin whale tagged with an implantable beacon transmitter (IBT) is described. The IBT, which was fired from a modified 12-gauge shotgun, weighs 517 g and is 70 cm long, including a 46-cm antenna. Data on whale movement and breathing are presented. Contact was lost after 27.8 hours of intermittent tracking, presumably as a result of battery leakage. Potential range and duration of IBT transmission are considered, and the significance of transmitter location and orientation in the whale blubber is considered. M L

**A79-18201 Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings** Edited by E J Baise and J M Miller (Michigan University, Ann Arbor, Mich) Santa Monica, Calif, Human Factors Society, Inc, 1978, 729 p. Members, \$15, nonmembers, \$20

Consideration is given to such areas as ergonomics in industry, visual performance in driving, safety in high risk environments, training simulators, current issues in the design of training and evaluation systems, and human factors in manual materials handling. Papers are also presented on visual performance in aviation, consumer impact on product design, visual displays and performance, transportation safety, and the human factors approach to energy conservation and technology. B J

**A79-18202 Quantifying operator preference during human factors test and evaluation** M L Fineberg (BDM Corp, McLean, Va) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 24-28, 9 refs

A human factors evaluation instrument was constructed the goal of which was the quantification of operator preference in helicopter design within four major areas of human factors consideration: handling qualities, comfort/discomfort, human engineering design, and safety. Each area had a common scale against which 10 specific parameters were evaluated. The ten items within each area were chosen using system operators' expertise, human factors standards, and human factors experimental literature. The instrument was validated using a sample of 16 aviators during the conduct of an actual operational test, indicating that the instrument provides an effective method of quantifying the preference of operational aviators. B J

**A79-18203 Time estimation as a technique to measure workload** D Gunning (Bunker Ramo Corp, Dayton, Ohio) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 41-45, 6 refs. Contract No F33615-76-C-0013

Hart's time estimation technique (1975, 1976) is based on current findings in psychological research which demonstrate that human time perception is dependent on the amount of mental activity or information processing which occurs during a given time interval. Hart has developed a time estimation task and has tested the adequacy of the task to measure pilot workload in several flight simulation studies. In the present paper Hart's technique is used in a flight simulation study to investigate the workload for a two-pilot transport aircraft. The successes and failures of the technique are discussed, and recommendations are made for its future use. B J

**A79-18204 System operability - Concept and measurement in test and evaluation** W R Helm (US Navy, Pacific Missile Test Center, Point Mugu, Calif) and M L Donnell (Decisions and Designs, Inc, McLean, Va) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 46-50, 11 refs

In conducting adequate system evaluation, as in the related area of program evaluation, there are four major methodological issues

that must be successfully resolved. These issues are conceptualization, i.e., the classification procedures for subdividing subject matter, measurement, i.e., the process of developing and employing operational definitions of constructs, design, i.e., systematic data collection, and, finally, interpretability, i.e., how the results fulfill the purpose of the evaluation. Mission Operability Assessment Technique (MOAT) is a tool for system evaluation which incorporates these four issues within its structure. This paper emphasizes how MOAT can be used to conceptualize and measure problems encountered in system evaluation. Specific examples include how MOAT will be used on the F-18 fighter aircraft to provide indices of man-system compatibility across a mission profile. (Author)

**A79-18205 Perception of graphic displays of space** R R Rosinski (Pittsburgh, University, Pittsburgh, Pa) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 78-80. Contract No N00014-77-1-0679

When computer-generated graphic representations of spatial layout are viewed from geometrically incorrect station points, the virtual space is transformed or distorted. This paper describes an experiment in which observers were required to make direct optical judgments of surface orientations under seven degrees of optical magnification in order to assess the effects of virtual space distortions on perceived space. It is found that magnification (minification) compresses (dilates) perceived space, and it is suggested that accuracy of perception of spatial layout may be increased by manipulating virtual space. B J

**A79-18206 The importance of providing stereoscopic vision in training for nap-of-the-earth /NOE/ flight** D E Erwin (US Army, Research Institute for the Behavioral and Social Sciences, Alexandria, Va) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings

Santa Monica, Calif, Human Factors Society, Inc, 1978, p 81-86

Results are presented from two preliminary studies which investigated the importance of binocular disparity for the perception of three-dimensional layout of the terrain in NOE flight. In the first experiment, it was found that stereoscopic movies taken from the cockpit of a helicopter in NOE flight produce more compelling impressions of three-dimensionality than a nondisparate bioptic display. The results of the second experiment show that simple reaction times for detection of the three dimensionality in static binocular displays were substantially longer than for detection of fusibility of otherwise identical bioptic displays. In addition, it was found that detection of fusibility required much more time than detection of a light flash. B J

**A79-18207 AWAVS, a research facility for defining flight trainer visual system requirements** S C Collyer and W S Chambers (US Naval Training Equipment Center, Orlando, Fla) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 99-104, 8 refs

The goal of the Navy's AWAVS (Aviation Wide Angle Visual System) program is to recommend design criteria for future flight simulator visual systems, with emphasis on two aspects: improvement of visual system technology and determination of the effects of visual system parameters on pilot performance and training. The present paper describes the AWAVS experimental facility and discusses behavioral research plans, emphasizing carrier landing studies to be performed during the first phase of the program. B J

**A79-18208 Augmented feedback in adaptive motor skill training** D O Cote, B H Williges, and R C Williges (Virginia Polytechnic Institute and State University, Blacksburg, Va) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 105-109, 22 refs. Grant No AF-AFOSR-77-3161A

Two training models in motor learning and the effects of visually presented augmented feedback on training and transfer were examined in two studies using a two-dimensional pursuit tracking task. Training in both studies consisted of three-minute trials and continued until criterion performance was attained, the transfer task in both studies consisted of one seven-minute session in which tracking difficulty shifted each minute. The findings of both studies led to the conclusion that visually presented augmented feedback in the form of bar graphs in a two-dimensional pursuit tracking task does not aid tracking performance in training or transfer. B J

**A79-18209** Application of performance model to assess aviator critical incidence. R H Shannon (U S Naval Safety Center, Norfolk, Va) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 140-144 7 refs

The paper considers aviator critical incidence involving unsafe acts, with a critical incident defined as one in which pilot error is either causal or contributory to a flight incident. Nine regression equations are used to assess student aviator performance at various stages of naval air training. The predictor variables are 12 factors based on error behavior in the first stage of training. B J

**A79-18210** The effects of prediction, quickening, frequency separation, and percent of pursuit in perspective displays for low-visibility landing. R S Jensen (Illinois, University, Urbana, Ill) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 208-212 9 refs

Because the curved approach and landing task requires rapid and precise interpretation of complex information, the use of pictorial displays which exploit the perceptual system simplification mechanism seems warranted. This paper presents a rationale for applying some well-known concepts - prediction, quickening, frequency separation, and percent of pursuit - to the development of forward looking cockpit displays for low-visibility curved approach and landing tasks that may permit a compromise of the magnification principle. B J

**A79-18211** An investigation of pictorial and symbolic aircraft displays for landing. N M Simonelli (Illinois, University, Urbana, Ill) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 213-217

Each of four different approach to landing displays was flown by a different group of four male instrument pilots. A pictorial approach 'gate' symbology with perspective runway was compared to an electronic ILS-type display. Best performance overall was achieved with the combination of both these displays. No reliable lateral performance difference was found among displays but the variability tended to be less for displays with the perspective runway, especially close to the threshold. The vertical performance, however, was best on those displays that contained the vertical deviation scale and pointer irrespective of the presence of the runway. It was concluded that the pictorial information is of benefit in stabilizing lateral control, but the approach gates as used in the study did not, by themselves provide adequate guidance cues for precise vertical control. (Author)

**A79-18212** Factors that affect display size criteria in a cockpit display system. M J Barnes (U S Naval Weapons Center, China Lake, Calif) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 218-221 6 refs

Two simulation experiments are described. The first experiment used a saturated partial factorial design to screen for the most important factors from 10 candidates identified from a literature review (Barnes, 1976). Results of the second experiment were used

to generate regression analysis models which predicted detection performance in terms of cockpit display size, number of targets, target/background contrast, SNR, and target configuration. Further analysis was performed to study subject difference using d-prime and beta measures from signal detection theory. B J

**A79-18213** Pilot performance during flight simulation with peripherally presented visual signals. J C H Schwank, J M Bermudez, B A Smith, and D A Harris (U S Air Force Academy, Colorado Springs, Colo) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 222-226 8 refs

The paper describes two experiments involving 48 male pilot trainees which studied the effectiveness of three types of instrument displays during flight in a GAT-1 simulator. Both experiments showed that there was no decrement in pilot performance during a complex instrument maneuver, involving normal and peripheral displays. Subjects were less prone to deviate from a given compass heading using the peripheral display (P less than 001). A secondary task (digit cancelling) also did not diminish performance across displays. B J

**A79-18214** Human factors considerations in the design and evaluation of a helmet mounted display using a light emitting diode matrix. W F Moroney (U S Navy, Pacific Missile Test Center, Point Mugu, Calif) and J F Barnette (USAF, Instrument Flight Center, Randolph AFB, Tex) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 227-229

The paper discusses human factors considerations in the design and evaluation of a helmet mounted display (HMD) which uses an LED matrix. Consideration is given to such specific issues as minimizing additional helmet weight, limiting bulk, insuring adequate brightness/contrast, providing a large exit pupil, avoiding reduction in visual field, and avoiding restricting head movements. The HMD was evaluated in flight as a device to provide energy maneuverability data to pilots. Preliminary results are discussed. B J

**A79-18215** Night vision goggles and in-flight evaluation of the inside/outside refocusing problems in a UH-1H helicopter. L W Stone, M G Sanders, D D Glick, R W Wiley, and K A Kimball (U S Army, Aeromedical Research Laboratory, Fort Rucker, Ala) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 230-234 7 refs

Eight U S Army aviators hovered an instrumented Army JUH-1H helicopter 10 feet above the ground at night under four visual conditions using the unaided eye (normal night vision) and three configurations of the AN/PVS-5 night vision goggles (NVG). The NVG configurations included (1) 40-deg FOV plano tubes focused at infinity, (2) a bifocal arrangement in which the bottom 14% of the field was focused at approximately 22 inches, and (3) a bifocal arrangement with the bottom 24% focused at 22 inches. Analysis of the data indicates no significant difference between configurations in terms of control movements. In terms of aircraft status variables, radio measured altitude indicated a large variability under the 40-deg plano NVG. B J

**A79-18216** Simulator Training Requirements and Effectiveness Study /STRES/. B W Cream, F T Eggemeier, G A Klein (USAF, Human Resources Laboratory, Wright Patterson AFB, Ohio), C A Semple (Canyon Research Group, Inc, Westlake Village, Calif), P W Caro (Seville Research Corp, Pensacola, Fla), and D E Seay (United Air Lines Flight Training Center, Denver, Colo) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 251-255

The basic objectives of the U S Air Force/Army/Navy Simulator Training Requirements and Effectiveness Study (STRES) are to

define, collect, analyze, and present data, findings and conclusion relevant to the use, effectiveness, and cost of aircrew training devices. This paper reviews the philosophy, approach, difficulties, and current status of STRES. B J

**A79-18217 Life cycle costing of simulated vs actual equipment for intermediate maintenance training.** F T Eggemeier and G A Klein (USAF, Human Resources Laboratory, Wright-Patterson AFB, Ohio) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings

Santa Monica, Calif, Human Factors Society, Inc, 1978, p 267-271 7 refs

Initial results are presented of a two-phase effort to develop life cycle cost (LCC) estimates of training equipment for F-16 avionics intermediate station maintenance personnel. This initial phase was a preliminary analysis of major cost factors differentiating simulated and actual test equipment. It was conducted to provide an early estimate of the cost of a training simulator and to decide if a more detailed LCC study was warranted. Total estimated 15 year costs for simulated equipment trainers were approximately 50% less than comparable estimates for actual equipment trainers. B J

**A79-18218 Perceptual localization, feature identification and ocular motor factors in scanning a visual display.** G Leisman and M Ashkenazi (Brooklyn College, Brooklyn, N Y, U S Veterans Administration Hospital, East Orange, New Jersey, Eye Institute, N J) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings. Santa Monica, Calif, Human Factors Society, Inc, 1978, p 282-286 14 refs. Research supported by the U S Veterans Administration and Eye Institute of New Jersey.

The preprogramming of saccadic eye movements is examined by studying the pattern of ocular-motor sequences while scanning a visual display. The effects of interference employing a backward masking paradigm on the ocular-motor response as well as on position judgment and stimulus identification are examined. Data indicates that the motor programming of an ocular saccade is linked to the perceptual analysis of target position and cannot be set in motion with an impairment in perceptual localization. (Author)

**A79-18219 Effects of information processing requirements on reaction time of the eye.** C L Nelson, R M London, and G H Robinson (Wisconsin, University, Madison, Wis.) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings. Santa Monica, Calif, Human Factors Society, Inc, 1978, p 287-291 10 refs. Contract No N00014-75-C-0364

This experiment measured eye reaction time as a function of presence or absence of a central control task, type of command, and knowledge of target direction prior to command. It was found that eye reaction time was greater when a subject was involved in a central tracking task than when he was not, it was greater when the command was symbolic than when it was spatial, and it was longer when the target direction was unknown prior to command. These variables also interacted, so that the effect of unknown target direction was greater with a symbolic command. Results of this experiment also showed that subjects sometimes used an initial compensatory pattern of eye-head movements. There were large intersubject differences, but use of compensation generally increased with complexity of centrally located information which required processing. (Author)

**A79-18220 \* Secondary visual workload capability with primary visual and kinesthetic-tactile displays.** R D Gilson, M W Burke, and R J Jagacinski (Ohio State University, Columbus, Ohio) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings. Santa Monica, Calif, Human Factors Society, Inc, 1978, p 293-297 7 refs. Army-sponsored research, Grant No NsG-2179

Subjects performed a cross adaptive tracking task with a visual secondary display and either a visual or a quickened kinesthetic tactile (K-T) primary display. The quickened K-T display resulted in superior secondary task performance. Comparisons of secondary workload capability with integrated and separated visual displays indicated that the superiority of the quickened K-T display was not simply due to the elimination of visual scanning. When subjects did not have to perform a secondary task, there was no significant difference between visual and quickened K-T displays in performing a critical tracking task. (Author)

**A79-18221 Air Combat Maneuvering Range /ACMR/ - Has operational performance measurement entered a Golden Age.** A P Ciavarella and C A Brictson (Dunlap and Associates, Inc, La Jolla, Calif) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings. Santa Monica, Calif, Human Factors Society, Inc, 1978, p 365-368 5 refs. Contract No N61339-77-C-0167

Three years of aircrew performance measurement related to air combat effectiveness using the Navy's Air Combat Maneuvering Range (ACMR) are described. Performance assessment methods were based on air combat engagement outcomes (i.e. wins, losses, draws), weapon delivery accuracy measures, and metrics derived from antecedent events. When used in an operational setting, the aircrew assessment methods have been used to identify squadron performance differences, evaluate competitive exercises, and provide diagnostic training feedback to operational users. The use of continuously recorded quantitative measures from systems such as ACMR represents a 'Golden Age' in the performance measurement field. The availability of objective performance criteria promises to be of substantial benefit to both the operational user and the research community in such areas as pilot selection and training, fleet combat readiness and pilot workload and stress. (Author)

**A79-18222 Cross-validation of regression equations to predict performance in a pursuit tracking task.** R E Savage, R C Williges, and B H Williges (Virginia Polytechnic Institute and State University, Blacksburg, Va) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings. Santa Monica, Calif, Human Factors Society, Inc, 1978, p 369-372 6 refs. Grant No AF-AFOSR-77-3161A

A double, cross-validation procedure was used to validate regression equations which predict training time to learn a two-dimensional pursuit tracking task. Motor skill and information processing tasks were used as predictors. The results yielded a reliable regression equation for each training condition, and these equations were quite similar in cross-validation. Subsequently, a regression equation based on pooled data from the original and cross-validation sample was calculated for each training condition. To establish the usefulness of a regression approach for selecting training strategies, these equations will be used in a future study where students will be matched, mismatched, and randomly assigned to various training alternatives. (Author)

**A79-18223 Control logic design criteria for multifunction switching devices.** G L Calhoun (Bunker Ramo Corp, Dayton, Ohio) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings. Santa Monica, Calif, Human Factors Society, Inc, 1978, p 383-387 5 refs. Contracts No F33615-73-C-0391, No F33615-76-C-0013

Differences between conventional switching and multifunction switching are considered, and eight criteria for the control logic design of multifunction switching in aircraft are examined. Studies of the acceptability to pilots of multifunction switching are surveyed. Optimization of switch/function assignment and determination of operator selections required for task performance are discussed with reference to the criteria. M L

**A79-18224 \* Man/terminal interaction evaluation of computer operating system command and control service concepts.** D W

Dodson and N L Shields, Jr (Essex Corp, Huntsville, Ala) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 388-392 6 refs Contract No NAS8-31848

The Experiment Computer Operating System (ECOS) of the Spacelab will allow the onboard Payload Specialist to command experiment devices and display information relative to the performance of experiments Three candidate ECOS command and control service concepts were reviewed and laboratory data on operator performance was taken for each concept The command and control service concepts evaluated included a dedicated operator's menu display from which all command inputs were issued, a dedicated command key concept with which command inputs could be issued from any display, and a multi display concept in which command inputs were issued from several dedicated function displays Advantages and disadvantages are discussed in terms of training, operational errors, task performance time, and subjective comments of system operators (Author)

**A79-18225 Target-terrain classification and detection performance** L A Olzak (Hughes Aircraft Co, Culver City, Calif) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 393-397 10 refs Contract No N00123-77-C-1134

The interactive effects of target and background characteristics were investigated Five multiple-vehicle target conditions that varied in number and configuration were embedded into oblique aerial photographs of real terrain Target proximity to roads was manipulated, and terrain complexity was evaluated by a subjective scale of scene heterogeneity Results indicated that performance improved as the number of vehicles comprising a target increased An interaction between number of vehicles and proximity to roads suggested that local context is a relatively more important performance predictor when searching for single-vehicle targets than when searching for multiple-vehicle targets The heterogeneity measure was found to be an inadequate predictor of detection performance, and some alternatives are discussed (Author)

**A79-18226 Estimating percentiles of nonnormal anthropometric populations - Final report** H F Martz, Jr (California, University, Los Alamos, N Mex) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 445-449 8 refs

The paper presents a nonparametric percentile estimation method, based on the use of a kernel-type probability density function estimator, for estimating percentiles of nonnormal anthropometric populations The method is called nonparametric because no assumption about the statistical distribution of the underlying population is required The method is considered simple to use although a single nonlinear equation must be solved by numerical techniques Two examples of method use are examined In the first example, the nonparametric method is compared to the standard Gaussian method for the analysis of data on hip breadth, a Gaussian trait In the second example, which involves grip-strength data, a non Gaussian trait, the value of the nonparametric method is indicated M L

**A79-18227 Team performance - A model for research** D L Dieterly (USAF, Human Resources Laboratory, Moffett Field, Calif) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 486-492 11 refs

The paper deals with repetitive team performance and the implications for training to improve team performance The literature on team research is reviewed to gain insight into available information about team performance under task overload conditions,

a model of team performance is developed in terms of task design, and future research requirements are determined on the basis of this model A series of constraints is imposed to reduce the task considerably The relationship of the model to training is indicated Task function design is discussed in detail Based on the concepts introduced, some broad research directions are suggested S D

**A79-18228 Physiological biorhythm as a correlate of pilot error accidents and incidents.** H W Hendrick and H E Jones (Southern California, University, Los Angeles, Calif) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 498-501

Aircraft accidents and incidents attributed to pilot error were hypothesized to have occurred while the pilot was in a critical phase for one or more biorhythms From screening accident and incident reports for a large military unit, two groups of 25 pilots who had been involved in pilot error accidents and one group of 50 pilots who had been involved in pilot error incidents were identified 13 of the accident validation group and 12 of the cross validation group were found to have been in a critical physiological phase at the time of accident, or twice the number expected by chance For the incident group, 20 of the 50 pilots were in a critical physiological phase at the time of incident Results for all three groups exceeded chance at the 0.25 level Results for emotional and intellectual biorhythms, and for double critical phases were found not significant (Author)

**A79-18230 Anatomical frames of reference and biomechanics.** H M Reynolds and R P Hubbard (Michigan State University, East Lansing, Mich) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 607-610 9 refs Contract No F49620-78-C-0012

Segment axes systems for simulations have been defined by the inertial tensor unique to each simulated body segment When empirical three-dimensional data are sought that describe either the mass distribution or the kinematic properties of the human body, anatomical frames of reference are needed for the sake of measurement methodology and data comparability Anatomical axes systems are based on anatomical landmarks that must represent functional and stable features in the skeletal geometry This presentation discusses the role of anthropometric landmarks used in defining anatomical coordinate axes systems, and results, using present preliminary anatomical frames of reference, in a kinematic study of the human hip joint (Author)

**A79-18231 Anatomical coordinate systems for human body segments** A J Padgaonkar, S M Lawson, and A I King (Wayne State University, Detroit, Mich) In Human Factors Society, Annual Meeting, 22nd, Detroit, Mich, October 16-19, 1978, Proceedings Santa Monica, Calif, Human Factors Society, Inc, 1978, p 676-679 U S Department of Transportation Contract No HS-146 3-711

An anatomically based coordinate system is a useful tool for standardizing the placement of instrumentation on segments of the human body or human surrogate It is suggested that this system be based upon a fixed set of anatomical landmarks that are easily located by palpation and/or X-ray A set of coordinate systems for the head, torso and extremities is proposed Such systems will aid investigators in comparing data acquired at different laboratories involved in impact injury research These systems can also be used for accurately locating the center of gravity of a body segment and for describing body motion in an impact environment (Author)

**A79-18250 The trajectories of saccadic eye movements** A T Bahill (Carnegie-Mellon University, Pittsburgh, University, Pittsburgh, Pa) and L Stark (California, University, Berkeley and San Francisco, Calif) *Scientific American*, vol 240, Jan 1979, p 108-117

The paper describes the use of advanced bioengineering techniques involving the use of the digital computer for the study of eye movements. Since the neurological control signals that drive the eyeball muscles are faithfully reflected in the movements of the eyeball, the shape of the signals can be deduced from study of saccadic trajectories. The reciprocal innervation model for conceptualizing the control of eye movements is described and its usefulness in saccade studies is illustrated. P T H

**A79-18287 Biped stability considerations with vestibular models** H Hemami, F C Weimer, C S Robinson (Ohio State University, Columbus, Ohio), C W Stockwell (Hewlett Packard Co., Loveland, Colo.), and V S Cvetkovic (Institut za Automatizaciju i Telekomunikaciju, Belgrade, Yugoslavia) *IEEE Transactions on Automatic Control*, vol AC-23, Dec 1978, p 1074-1079. 10 refs. NSF Grant No. ENG-74-21664, Grant No. NIH-NS 13903

Recent experimental work has resulted in certain models for the semicircular canals and otoliths. The accuracy and adequacy of these models are analyzed here by incorporating them in stability studies of biped robots - one degree and two-degree-of-freedom inverted pendulums. It is shown that a variety of feedback signals can stabilize biped models of these types. Additional information could limit the choice of such signals. (Author)

**A79-18305 \* Statistical studies of animal response data from USF toxicity screening test method** C J Hilado and A M Machado (San Francisco, University, San Francisco, Calif.) *Journal of Combustion Toxicology*, vol 5, Aug 1978, p 261-269. Grant No. N5G-2039

Statistical examination of animal response data obtained using Procedure B of the USF toxicity screening test method indicates that the data deviate only slightly from a normal or Gaussian distribution. This slight departure from normality is not expected to invalidate conclusions based on theoretical statistics. Comparison of times to staggering, convulsions, collapse, and death as endpoints shows that time to death appears to be the most reliable endpoint because it offers the lowest probability of missed observations and premature judgements. (Author)

**A79-18306 Renal damage in mice following exposure to the pyrolysis products of polytetrafluoroethylene** H L Lucia, A K Burton, R C Anderson, M F Stock, and Y C Alarie (Pittsburgh, University, Pittsburgh, Pa.) *Journal of Combustion Toxicology*, vol 5, Aug 1978, p 270-277. 13 refs. Grant No. NBS 5-9005

Mice exposed to the pyrolysis products of polytetrafluoroethylene (PTFE) developed necrosis of the epithelium of the distal and proximal convoluted tubules. The histologic lesion was seen at 24 hours, and recovery occurred by 14 days in most animals. A few animals exposed to the highest dosage showed permanent alterations. Abnormalities in renal weight and urine output were noted immediately following exposure. At the lower dosages, these abnormalities were reversed by 14 days, but they persisted past that time after exposure to the highest dosage. (Author)

**A79-18307 \* Two-week studies of survivors from exposures to pyrolysis gases** T J Buccu, C J Hilado, W H Marcussen, and A Furst (San Francisco, University, San Francisco, Calif.) *Journal of Combustion Toxicology*, vol 5, Aug 1978, p 278-289. Grant No. N5G-2039

Swiss Webster male mice which had survived near-lethal concentrations of pyrolysis gases from a variety of polymeric materials were killed two weeks after exposure, and the lungs, heart, liver, kidney, and spleen were examined. Microscopic examination revealed no significant effects on the liver, kidney, and spleen, while the effect on lungs could not be determined because of the high level of pathology in both experimental and control animals. The polymeric materials which were pyrolyzed were polyethylene, ABS, polycarbonate, polyaryl sulfone, polyether sulfone, polyphenylene sulfide, modified polyphenylene oxide, chlorinated polyvinyl chloride, polyvinylidene fluoride, and fluorene polycarbonate. It is suggested that tissue specimens should be examined 24 or 48 hr after exposure

rather than 2 wks after exposure, since the 2 wk period permits healing to occur. M L

**A79-18425 Multi-PIERRE - A learning robot system** N V Findler and J N Shaw (New York, State University, Buffalo, N Y) *Computers and Graphics*, vol 3, no 2-3, 1978, p 107-112. 12 refs. NSF Grant No. MCS-76-24278

The objective of the project described is to enable a human user to establish on-line a 'lifelike' three-dimensional environment in which he can put several robots with definable 'personality' characteristics. These robots can operate either entirely on their own or under partial human control. They learn, plan their actions and co-exist with each other at different levels. The learning processes range from simple rote learning to associative and procedural learning. The cognitive structure proposed for the robots seems sufficient for a self-dependent device to be sent to a potentially hostile environment in which it has to survive and accomplish various tasks. The system consists of two programs running simultaneously, one on a graphics computer, the other on a large-scale central machine connected to the former via a voice-grade telephone line. (Author)

**A79 18474 # On the relationship between pilot rating and pilot dynamics I - An experimental approach** K Tanaka (National Aerospace Laboratory, Chofu, Tokyo, Japan), K Noguchi (Mitsubishi Research Institute Co., Tokyo, Japan), and H Morihisa *Japan Society for Aeronautical and Space Sciences, Transactions*, vol 21, Nov 1978, p 128-138. 11 refs.

A manual control experiment was conducted to study the relationship between pilot tracking behavior and pilot rating. In order to reveal the relationship, the obtained pilot ratings were compared with the estimated pilot-describing functions and the variances of the time series data. In the experiment, a second order stable controlled element and the Cooper-Harper pilot rating scale were employed. It was shown that when the pilot ratings were good, the pilot dynamics was in good accordance with the crossover model and that, on the other hand, when the pilot ratings were bad, a higher-order lead element should have been used in considering a pilot model. Moreover, there proved to be a correlation between the pilot ratings and the variance of the displayed error, and between the pilot ratings and the variance of the numerical differentials of the control output. (Author)

**A79-18475 # On the relationship between pilot rating and pilot dynamics II - An analytical approach** N Goto (Kyushu University, Fukuoka, Japan) *Japan Society for Aeronautical and Space Sciences, Transactions*, vol 21, Nov 1978, p 139-152. 14 refs.

This paper deals with an analytical approach to interpreting pilot rating in the terms related to pilot dynamics. An attempt is made at mathematically defining some key words used in the pilot rating system, assuming an analog pilot form. Using the definitions, pilot rating is discussed from the viewpoint of the variation in the pilot's gain and lead time constant. New measures are introduced in the definition of the pilot's workload and compensation effort. The application of the analysis to a previous experimental result shows that this approach is promising in understanding pilot rating, although simpler rules may be required to apply it to practical situations. (Author)

**A79-18954 Exercise ventilation correlates positively with ventilatory chemoresponsiveness** B J Martin, J V Weil, K E Sparks, R E McCullough, and R F Grover (Colorado, University, Medical Center, Denver, Colorado, University, Boulder, Colo.) *Journal of Applied Physiology, Respiratory, Environmental and Exercise Physiology*, vol 45, Oct 1978, p 557-564. 35 refs. Grant No. NIH-HL-14985

**A79-18955 \*** Influences of physical conditioning and de-conditioning on coronary vasculature of dogs H L Wyatt and J Mitchell (Texas, University, Dallas, Tex) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Oct 1978, p 619-625 24 refs Grants No NIH HL-06296, No NGR-44-012-151

**A79-18956** Relaxed +Gz tolerance in healthy men - Effect of age D H Hull, R A Wolthuis, K K Gillingham, and J H Triebwasser (USAF, School of Aerospace Medicine, Brooks AFB, Tex, PARAF Hospital, Wroughton, Wilts, England) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Oct 1978, p 626-629 12 refs

Fifty-three healthy US Air Force aircrewmembers, 26-55 yr old, volunteered for a centrifuge study designed to determine the effect of age on relaxed +Gz tolerance. Each was subjected to G forces of gradual and rapid onset, with G tolerance determined by standardized contraction of peripheral visual fields. Of the subject characteristics studied, only age was positively correlated with rapid-onset G tolerance, both age and weight were positively correlated with gradual-onset G tolerance. A combination of age and weight gave a stronger positive correlation with G tolerance (rapid- and gradual-onset) than did either characteristic alone. No significant negative correlations were observed. We conclude that aging may offer some protection from G stress, there is no evidence that aging leads to a decrement in G tolerance (Author)

**A79-18957** Modeling the effect of axial bronchial tension on expiratory flow T A Wilson (Minnesota, University, Minneapolis, Minn) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Nov 1978, p 659-665 16 refs Grants No NIH-HL-19205, No NIH-HL 21584

Previous modeling of the expiratory flow-limiting mechanism is extended by including axial tension in the airway walls as one of the forces that affect airway mechanics. The analysis supports the Dawson-Elliott explanation of the plateaus in isovolume pressure-flow (IVPF) curves and shows that axial tension has the effect of increasing maximum flow and introducing a negative-effort-dependent region. Solutions for boundary conditions representing a cannula in the airways are qualitatively different with flow approaching zero as the pressure drop across the system becomes large (Author)

**A79-18958** Analysis of Pco<sub>2</sub> differences during rebreathing due to slow pH equilibration in blood A Bidani and E D Crandall (Pennsylvania, University, Philadelphia, Pa) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Nov 1978, p 666-673 30 refs Research supported by the American Heart Association, Grant No NIH-19737

**A79-18959** Exercise performance and hemodynamics during dietary potassium depletion in dogs H S Lowensohn, R E Patterson, and R A Olsson (US Army, Walter Reed Army Institute of Research, Washington, D C) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Nov 1978, p 728-732 23 refs

**A79-18960** Effect of exercise on collateral development in dogs with normal coronary arteries M V Cohen, T Yipintsoi, A Malhotra, S Penpargkul, and J Scheuer (Montefiore Hospital and Medical Center, Albert Einstein College of Medicine, Bronx, NY) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Nov 1978, p 797-805 38 refs Grant No PHS HL-17809

Experiments were conducted on sedentary-control and treadmill-running groups of one-year-old purebred beagles with normal coronary arteries in order to assess the effects of chronic exercise on the coronary collateral circulation after a 10-12-week training period. Because a better appreciation of the effect of physical training on the collateral vasculature was considered

desirable, collateral flow following acute coronary occlusion (left anterior descending coronary artery) was quantitated in the trained dogs and matched sedentary controls. It is shown that despite evidence of a training effect shown by changes in exercising heart rates, collateral flow is not different in the two animal groups. S D

**A79 18961** Growth of pulmonary circulation in normal pig Structural analysis and cardiopulmonary function A Rendas, M Branthwaite, and L Reid (Brompton Hospital, London, England) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Nov 1978, p 806-817 47 refs Research supported by the Brompton Hospital

**A79-18962** Phosphorylase a in human skeletal muscle during exercise and electrical stimulation P D Gollnick, J Karlsson, K Piehl, and B Saltin (Gymnastik- och Idrottshogskolan, Stockholm, Sweden) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Dec 1978, p 852-857 26 refs Research supported by the Swedish Medical Research Council and Swedish Sport Federation SMRC Project B73 40x-2203-07B, SMRC Project B75-04-4251-01, SMRC Project B74 14X 4251-02

**A79 18963 \*** Response of the rat erythrocyte to ozone exposure E C Larkin (California, University, Davis, Calif), S L Kimzey (US Veterans Administration Hospital, Martinez, Calif), and K Siler (NASA, Johnson Space Center, Houston, Tex) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Dec 1978, p 893-898 19 refs Grants No PHS-RR 00169, No PHS-ESHL 00628-06, No PHS-HL-17957 03 NASA Order T 52981-D

Sprague-Dawley rats were exposed to high (6-8 ppm) and moderate (1.5 ppm) amounts of ozone (O<sub>3</sub>) for various time periods. Response of the rat erythrocyte to ozone was monitored with red blood cell potassium (rubidium) influx studies, with storage stress combined with ultrastructural studies and with levels of erythrocyte glutathione peroxidase and superoxide dismutase. Erythrocytes of rats exposed to O<sub>3</sub> showed no significant changes either in their potassium influx or in their glutathione peroxidase and superoxide dismutase activities compared to controls. Erythrocyte differential counts on O<sub>3</sub>-exposed animals showed significant changes initially as well as following storage stress compared to controls. Rats exposed to 8 ppm O<sub>3</sub> for 4 h showed a marked increase in echinocytes. These consistent transformations from discocytes to echinocytes following O<sub>3</sub> exposure suggest latent erythrocyte damage has occurred (Author)

**A79-18964** Effect of decompression per se on nitrogen elimination B A Hills (Texas, University, Galveston, Tex) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Dec 1978, p 916-921 17 refs Contract No N00014-75-C-1035

The elimination of nitrogen from each of 10 unanesthetized guinea pigs has been monitored after switching to a nitrogen-free breathing mix (normoxic He O<sub>2</sub>), either without decompression or on decompression to 2.21 or 1 ATA, following an exposure of 2 h at 4 ATA on normoxic N<sub>2</sub> O<sub>2</sub>. Normoxic conditions were maintained throughout to avoid vasomotor effects of oxygen that could have complicated interpretations derived from previous studies. Results confirmed that inert gas washout rates decrease with decompression per se. This can be explained simply on the basis of the decrease in driving force for nitrogen elimination caused by depositing gas into bubbles where they form in tissue in a somewhat random manner. A very rough estimate shows that about 83% of all body tissue retained its gas in supersaturated solution on decompression to 2.21 ATA but only 79% did so at 1 ATA (Author)

**A79-18965** Effects of exercise, vitamin E, and ozone on pulmonary function and lipid peroxidation C J Dillard, R E Litov,

W M Savin, E E Dumelin, and A L Tappel (California, University, Davis, Calif) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Dec 1978, p 927-932 30 refs NIH-supported research, Grant No AF-AFOSR 77-3153 EPA Project 2-P01-ES-00628-05A1

**A79-18966**      **Effect of physical conditioning on cardiac mitochondrial function** S Penpargkul, A Schwartz, and J Scheuer (Albert Einstein College of Medicine, Montefiore Hospital and Medical Center, Bronx, NY) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Dec 1978, p 978-986 41 refs Grant No NIH-15498

An experimental study is conducted to compare respiratory activities, oxidative phosphorylation, and calcium transport of the mitochondria isolated from hearts of physically conditioned and sedentary rats, respectively. It is found that mitochondria from conditioned hearts exhibit depressed oxidative capacity as compared to mitochondria from sedentary hearts. In particular, mitochondrial calcium uptake in the presence of respiratory substrates alone is not different in the two specimen groups. But the mitochondrial calcium uptake in the presence of a high concentration of ATP or ADP and respiratory substrates is lower in preparations from conditioned hearts. However, the mitochondrial protein content is greater in conditioned hearts, suggesting that the oxidative capacity as well as calcium uptake per gram heart is not depressed. Mitochondrial alterations may play a role in the long-term adaptation of the heart to physical conditioning.      S D

**A79-18967 \***      **Distribution of pulmonary ventilation and perfusion during short periods of weightlessness** D B Michels and J B West (California, University, La Jolla, Calif) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 45, Dec 1978, p 987-998 26 refs Grant No NGL-05 009-109

Airborne experiments were conducted on four trained normal male subjects (28-40 yr) to study pulmonary function during short periods (22-27 sec) of zero gravity obtained by flying a jet aircraft through appropriate parabolic trajectories. The cabin was always pressurized to a sea level altitude. The discussion is limited to pulmonary ventilation and perfusion. The results clearly demonstrate that gravity is the major factor causing nonuniformity in the topographical distribution of pulmonary ventilation. More importantly, the results suggest that virtually all the topographical nonuniformity of ventilation, blood flow, and lung volume observed under 1-G conditions are eliminated during short periods of zero gravity.      S D

**A79-18994**      **Human engineering study of information processing applicable to helmet-mounted displays** T Schroeder (US Air Force Academy, Colorado Springs, Colo) *Human Factors*, vol 20, Oct 1978, p 513-519 20 refs USAF sponsored research

The present investigation examined and compared the pilot's decision-making capabilities when visual stimuli, similar in nature to those used in helmet-mounted displays, were displayed separately in each visual field. Fifteen student subjects experienced three different combinations of spatial and verbal hemiretinal stimuli. On one third of the trials, the left hemiretinae received verbal information, while the right hemiretinae simultaneously received spatial-type information. On another third of the trials, each set of hemiretinae received the opposite type of stimuli. On the remainder of the trials, both hemiretinae simultaneously received the same verbal and spatial-type inputs. Results indicate that the performance measure of latency was significantly decreased under the condition of verbal input to the right hemiretinae and spatial-type input to the left. No accuracy effects were seen as a result of the varying hemifield of stimulation. It was concluded that responses to the verbal right presentations were faster because transcallosal transmission was either unnecessary or inconsequential to the response. (Author)

**A79-18995**      **Collision avoidance response stereotypes in pilots and nonpilots** D B Beringer (Illinois, University, Urbana, Ill) *Human Factors*, vol 20, Oct 1978, p 529-536 15 refs Research supported by the Link Foundation

A two-part study was conducted to investigate the effects of target variables upon pilot and nonpilot collision avoidance responses to simulated approaches which were head-on or nearly so. Part I investigated the effect of bearing and found that nonpilots preferred to turn left in a head-on approach. Although pilots generally turned right under the same conditions, 25% exhibited the nonpilot left-turn response. The nonpilot response bias seemed related to the type of control used for aircraft pilotage. Part II examined the effects of bearing and collision index (a geometric construct representing an index for optimal response selection) upon the responses of 24 pilots. Two subgroups were identified, one apparently attending primarily to bearing while the other attended to aspect. Only one subject appeared to use the optimal collision index construct for response selection. (Author)

**A79-18996**      **Peripheral acuity and photointerpretation performance** J C Leachtenauer (Boeing Aerospace Co., Seattle, Wash) *Human Factors*, vol 20, Oct 1978, p 537-551 16 refs

Previous laboratory studies have shown a relationship between measures of peripheral acuity and performance in searching for artificial targets. In the present study, these findings were extended to the case of real targets in aerial photography using trained image interpreters. Correlations between field size and search performance ranged from 0.619 to 0.920. Significant increases in field size resulted from repeated testing but not, on an overall basis, from training. A measure of peripheral field size appears to provide a useful selection tool, the benefits of field expansion training remain somewhat in question. (Author)

**A79-18997**      **Line criteria in target acquisition with television** R A Erickson (US Naval Weapons Center, China Lake, Calif) *Human Factors*, vol 20, Oct 1978, p 573-588 24 refs

Experimental data obtained from tests of target acquisition with electrooptical raster scan systems are discussed. The study is limited to objects of military interest such as 'point' targets for detection and vehicles, ships, and aircraft for detection, recognition and identification. The equations describing the viewing geometry that can be used in calculating estimated target acquisition performance by system operators are derived in terms of equipment parameters such as sensor field of view, system line number, display size, and target size on the display. Some examples of these calculations are provided.      S D

**A79-18998**      **Evoked potential correlates of display image quality** F E Gomer (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio) and K G Bish (Systems Research Laboratories, Inc., Dayton, Ohio) *Human Factors*, vol 20, Oct 1978, p 589-596 15 refs Contract No F33615-75-C-0127

The paper examines the possibility that evoked potential (EP) recordings can serve to link subjective judgments concerning the apparent quality of displayed information with more quantitative measures of perception that are derived from psychophysical studies. For this purpose, the effects of horizontal resolution and shades of gray on the amplitude of the average steady-state EP are assessed in six male subjects (24-29 yr) of normal visual acuity. It is shown that the number of TV lines have a greater influence on EP amplitude than does the gray shade level. Suggestions for future research are indicated.      S D

**A79-18999**      **Speed and load stress as determinants of performance in a time sharing task** I L Goldstein (Maryland, University, College Park, Md) and P W Dorfman (Rice University, Houston, Tex) *Human Factors*, vol 20, Oct 1978, p 603-609 17 refs Research supported by the University of Maryland

The effects of speed and load stress were investigated in a task where operators responded to moving visual stimuli that entered critical zones in each of three visual displays. As expected, increases in either speed or load stress resulted in significantly poorer performance. More importantly, the effects of speed stress were made apparent by a speed by load stress interaction. At the lowest level of load stress where the operator was only required to attend to one display, increases in speed stress did not have any apparent effect. However, as load stress increased to two displays and especially to three displays, increases in speed stress had a significant negative impact on performance. Data concerning the timing of these responses further supported this analysis. It appears that future generalizations about the effects of speed stress must consider the level of load stress present in the task. (Author)

**A79-19000** Visual target acquisition and ocular scanning performance J B Mocharnuk (McDonnell Douglas Astronautics Co., St Louis, Mo.) *Human Factors*, vol 20, Oct 1978, p 611-631 29 refs

The present research investigated the effects of information and physical variables on visual search performance and on the ocular activity associated with that performance. Three experiments were completed using a brief exposure technique. The manipulated variables included memory load, exposure duration, and the physical grouping of information within a display. Several patterns emerged from the data. Stimulus information appeared to have no effect on eye movement measures. Instead, the physical restrictions imposed on the search task were responsible for changes in ocular behavior. However, there was a substantial effect of information on total search performance. The per item search rate increased as the total information in the display increased. This information effect was interpreted in terms of a variable processing rate hypothesis. (Author)

**A79-19375 #** A visual simulator with transformation of the perspective in the raster of television pictures (Ein Sichtsimulator mit perspektivischer Verzeichnung des Rasters von Fernsehbildern) H Heising Meckenheim, Forschungsinstitut für Anthropotechnik (Forschungsinstitut für Anthropotechnik, Bericht, No 34), 1977 78 p 18 refs In German \$5 43

A system which simulates the outside visual environment as seen by an aircraft pilot during the approach for landing was developed for the ergonomical investigation of visual simulation problems. The system makes use of a television simulation concept which involves the computer-controlled transformation of perspective in the raster scan of a television display. An approximately correct representation of three-dimensional structures located at a distance is obtained in addition to the exact transformation of the earth's surface which is considered as a plane. A detailed description is given of an analog computer which had been developed to satisfy the exacting requirements concerning computational speed and accuracy for the line-by-line image calculations. G R

**A79-19425 #** Influence of high-altitude conditions on the metabolism of nucleic acids and proteins in the thymocytes of the rat (Vliianie uslovii vysokogor'ia na obmen nukleinovykh kislot i belkov v timotsitakh krysa) G S Komolova and I A Egorov (Akademiia Nauk SSSR, Institut Biokhimi, Moscow, USSR) *Akademiia Nauk SSSR, Doklady*, vol 242, Oct 21, 1978, p 1433-1435 14 refs In Russian

**A79-19426 #** 3'5'-cyclic AMP content in rat tissues during hypoxic adaptation and gamma irradiation (Soderzhanie 3'5'-tsAMF v tkaniakh krysa pri adaptatsii k gipoksii i deistvii gamma-oblucheniia) V F Makeeva, G S Komolova, E N Troitskaia, and I A Egorov (Akademiia Nauk SSSR, Institut Biokhimi, Moscow, USSR) *Akademiia Nauk SSSR, Doklady*, vol 242, Oct 21, 1978, p 1436, 1437 12 refs In Russian

**A79-19449 \*** Identification of a tripeptidyl aminopeptidase in the anterior pituitary gland - Effect on the chemical and biological properties of rat and bovine growth hormones T W Doebber, A R Divor, and S Ellis (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.) *Endocrinology*, vol 103, no 5, 1978, p 1794-1804 21 refs

**A79-19664 #** Aggregation of red cells and blood viscosity as models of materials experimentation in the space environment L Dintenfass (Sydney Hospital, Sydney, University, Sydney, Australia) *American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 17th, New Orleans, La., Jan 15-17, 1979, Paper 79-0310* 14 p 29 refs

The importance of studies of blood properties under conditions of weightlessness has been substantiated by findings on cardiovascular conditions of astronauts in the Skylab experiment. These findings include a decrease in haematocrit, an elevation of density of red cells, the presence of abnormal shapes of red cells subsequent to orbital flights, and changes in the distribution of blood volume in astronauts (with increased volume contained in the upper part of the body). The latter was associated with the 'chicken leg' syndrome due to decreased fluid level in the lower extremities. The present paper deals with a scheduled Spacelab experiment aimed at studying the maximum size of aggregates of red cells, the kinetics of aggregation, blood viscosity at different shear rates, and the effects of lipids, proteins, different diseases, ABO blood groups, and effects of some drugs and additives. V P

**A79-19665 #** The growth of single crystals from proteins in gravity-free space W Litke (Freiburg, Universität, Freiburg im Breisgau, West Germany) *American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 17th, New Orleans, La., Jan 15-17, 1979, Paper 79-0311* 5 p

A procedure for growing large single crystals of Escherichia coli beta-galactosidase in space is proposed. Crystallization in space would eliminate convection, which causes multinucleation, multinucleation produces a large number of crystals too small for X-ray or neutron diffraction analysis. The equipment, physical conditions, and reagents required for the crystallization procedure are described. The possibility of crystallizing lysozyme in space is considered. M L

**A79-19759 #** Computation of rigid-body rotation in three-dimensional space from body-fixed linear acceleration measurements N K Mital and A I King (Wayne State University, Detroit, Mich.) *American Society of Mechanical Engineers, Winter Annual Meeting, San Francisco, Calif., Dec 10-15, 1978, Paper 78-WA/Bio-5* 9 p 8 refs Members, \$150, nonmembers, \$300 US Department of Transportation Contract No HS-5-01232

An effective and reliable method is developed to compute rigid-body rotation in three-dimensional space from experimentally measured angular acceleration using a body-fixed nine-accelerometer module. The method is found to be very accurate for hypothetical data and reasonably accurate for experimental data. The validation procedure also indicates the tremendous advantage of computing these rotations rather than measuring them from film. Not only is the latter procedure slow and time consuming, but also it is a restrictive technique in that it cannot provide data after the film targets rotate out of view or are hidden by obstructions. Furthermore, the computed results provide the rotations as seen by the three orthogonal cameras. G R

**A79-20023 #** From the laboratory to the Spacelab - Training program for Spacelab payload experts (Vom Labor zum Spacelab - Trainingsplan für Spacelab-Nutzlastexperten) J R Hordinsky and G Neuhauser (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bonn, West Germany) *Deutsche Gesellschaft für Luft- und Raumfahrt and Hermann-Oberth-Gesellschaft, Deutscher Luft- und Raumfahrtkongress, Darm-*

## A79-20024

stadt, West Germany, Sept 19-23, 1978, DGLR Paper 78-182 17 p  
14 refs In German

The paper deals with the development of a training concept aimed at minimizing the training period of scientists for work in space. The lecture covers such topics as preliminary planning considerations, basic introduction to the relevant fields and the spacecraft itself, detailed study of test objectives, familiarization and experience with the equipment, crew systems training, space systems training, and medical, clinical, and biochemical training V P

**A79-20024 #** Experiences of a payload specialist involved with the simulated Spacelab Mission ASSESS II (Erfahrungen eines Nutzlastexperten bei der simulierten SPACELAB-Mission ASSESS II) K Kramp (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Raumsimulation, ESA, Cologne, West Germany) *Deutsche Gesellschaft für Luft- und Raumfahrt and Hermann-Oberth-Gesellschaft, Deutscher Luft- und Raumfahrtkongress, Darmstadt, West Germany, Sept 19-23, 1978, DGLR Paper 78-183* 10 p In German

The ASSESS II Spacelab experiments simulation program is outlined in this report by a participating European payload specialist. The four topics discussed are selection of payload specialists, the medical experiment - training and execution, the simulated mission, and the actual mission. Subjects considered include qualifications of payload specialists, medical experiments involving measurement of temperature, EEG, EKG, stress hormones, psychological effects, work under time pressure and evaluation of the psychological situation in the simulated mission and in the actual mission, when deviation from normal body rhythms was also studied M L

**A79-20267 \*** The augmentation algorithm and molecular phylogenetic trees R Holmquist (California, University, Berkeley, Calif.) *Journal of Molecular Evolution*, vol 12, Oct 27, 1978, p 17-24 15 refs NSF Grant No PCM-76-18627, Grant No NGR-05 003 460

Moore's (1977) augmentation procedure is discussed, and it is concluded that the procedure is valid for obtaining estimates of the total number of fixed nucleotide substitutions both theoretically and in practice, for both simulated and real data, and in agreement, for experimentally dense data sets, with stochastic estimates of the divergence, provided the restrictions on codon mutability resulting from natural selection are explicitly allowed for. Tateno and Nei's (1978) critique that the augmentation procedure has a systematic bias toward overestimation of the total number of nucleotide replacements is disputed, and a data analysis suggests that ancestral sequences inferred by the method of parsimony contain a large number of incorrectly assigned nucleotides M L

## STAR ENTRIES

**N79-14708#** Joint Publications Research Service Arlington, Va

**TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 47**

27 Oct 1978 52 p refs Transl into ENGLISH from various Russian journals

(JPRS-72134) Copyright Avail NTIS HC A04/MF A01

Information is presented on the U S S R s research efforts in the following areas (1) ergonomics, (2) industrial microbiology (3) instruments and equipment (4) psychology and (5) scientists and scientific organizations

**N79-14709#** Joint Publications Research Service Arlington, Va

**PSYCHOLOGICAL EXPERIMENT ON COMPONENTS OF THE MEANING OF WORK**

V I Batov and M V Yermolayeva *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci No 47 (JPRS-72134) 27 Oct 1978 p 1-8 refs Transl into ENGLISH from Tekh Estetika (Moscow), No 8, 1978 p 13-15

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The goal of the investigation finding psychological criteria for standardization of activities, has many levels On the level of operations formalization is possible In other words, a norm can be worked out for the method of performance of a concrete action so that the performance can be monitored and evaluated but the internal aspect of the action, related to the goal function was assumed to be unformalizable and that is precisely why difficulties arise in standardizing operator activity These difficulties result primarily from the fact that the problem of measuring the individual indexes of inner activity in human factors engineering and ergonomics has hardly even been raised The article is devoted to a discussion of the possibility of objectively defining certain mechanisms of inner activity Author

**N79-14710#** Joint Publications Research Service, Arlington, Va

**EFFECTS OF LASER RADIATION ON MORPHOLOGY OF PERIPHERAL BLOOD AND BONE MARROW UNDER EXPERIMENTAL AND CLINICAL CONDITIONS**

G V Golovin, I G Dutkevich and A P Sarkisyan *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci No 47 (JPRS-72134) 27 Oct 1978 p 28-37 refs Transl into ENGLISH from Vestn Khir (Leningrad) no 8 1978 p 121-126

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Experimental studies have shown that, under specific irradiation modes low-energy laser radiation stimulates physiological functions of the organism improves metabolic processes, has an anti-inflammation and vasodilating effect, stimulates erythropoiesis glycogen synthesis tissular regeneration, etc Conversely studies have also shown that under certain other conditions laser irradiation does cause some damage to the hemopoietic system These results of experimental research illustrate adequately the extent to which the obtained data are contradictory and difficult to compare due to the differences in radiation methods used insufficient number of animals in experimental groups etc At the same time it is obvious that the hemopoietic system does react and it is just as obvious that more comprehensive studies of such reactions are required

LS

**N79-14711\*#** National Aeronautics and Space Administration, Washington, D C

**MATERIALS OF THE FINAL REPORTS ON THE JOINT SOVIET-AMERICAN EXPERIMENT ON THE KOSMOS-936 BIOSATELLITE**

N V Timofeyev-Resolskiy G P Parfenov M G Tairbekov, R N Platonova, A V Rostopshina, V P Zhvalikovskaya I Ye Mosgovaya V N Shvets Ye Ye Kovalev, V Ye Dudkin et al Dec 1978 45 p refs Transl into ENGLISH of 'Materialy Itogovykh Otchetov po Sovmestnym Sovetsko-Amerikanskum Eksperimentam na Biosputnike Kosmos-936', Inst of Med and Biol Probl Moscow, 1978 p 1-58 Transl by Kanner (Leo), Associates, Redwood City, Calif

(Contract NASw-3199)

(NASA-TM-75582) Avail NTIS HC A03/MF A01 CSCL 06C

Biological experiments onboard the Kosmos-936 investigated the effect of weightlessness on the basic components of cells the genetic structure and energy apparatus Genetic studies were made on the *Drosophila melanogaster* Experiments were made on higher vegetation and fungi as well The results indicate that weightlessness cannot be the principal barrier for normal development An experiment with ectopic osteogenesis in weightlessness was carried out Measurements were made of cosmic radiation inside and outside the biosatellite G G

**N79-14712#** Instituto de Pesquisas Espaciais Sao Jose dos Campos (Brazil)

**THE APPLICATION OF REMOTE SENSORS TO A MODEL FOR FISH MAPPING [O SENSORIAMENTO REMOTO APLICADO A UM MODELO DE CARTAS DE PESCA]**

Sydnea Maluf Oct 1978 12 p refs In PORTUGUESE, ENGLISH summary Presented at the 5th Simp Latinoam sobre Oceanog Biol, Sao Paulo, Brazil, 20-25 Nov 1978

(INPE-1379-PE/176) Avail NTIS HC A12/MF A01

A methodology for the determination of the best potential fishing zones, for sardines, in the Brazilian coastal area of the southwestern tropical Atlantic Ocean, between latitudes 21 deg 45'S and 25 deg 00'S and longitudes 40 deg 50'W and 47 deg 00'W is presented A fishing chart model was developed from observations relative to the months of July, August, September November and December Marine fishing charts containing such zones are presented for the September month The potentiality of the VHRR-IR and the surface charts of NOAA's satellite in determinating fishing zones is demonstrated G G

**N79-14713#** Kentucky Univ, Lexington

**DYNAMIC RESPONSE OF VERTEBRAL ELEMENTS RELATED TO USAF INJURY Final Report, 1 Jan - 31 Dec 1977**

J F Lafferty Feb 1978 27 p refs

(Contract F49620-77-C-0043)

(AD-A059489 AFOSR-78-1261TR)

Avail NTIS

HC A03/MF A01 CSCL 06/5

Test specimens obtained from fresh-frozen Rhesus vertebral columns are used to determine shear load distribution and stress-strain characteristics of the facets relative to the soft tissue The specimens consist of two vertebrae and the intervening disc with the longitudinal ligaments intact Results of the initial tests show that at the onset of shear stress the facets sustain from 60 percent to 80 percent of the load, with increasing shear force the fraction of the load carried by the disc and ligaments increases to 50-60 percent Failure of the facets resulted from bilateral fracture of the inferior facets at the margin Without facets failure typically occurs due to separation of the end plates from the vertebral body The tests indicate that failure sequence progresses through (1) facet fracture, (2) end plate separation, and (3) tearing of ligaments Author (GRA)

**N79-14714#** Los Alamos Scientific Lab, N Mex

**A PRELIMINARY TOXICOLOGICAL STUDY OF SILASTIC 386 FOAM ELASTOMER CATALYST**

D M Smith, G A Drake J E London, and R G Thomas Jun 1978 4 p refs

(Contract W-7405-eng-36)

(LA-7366-MS) Avail NTIS HC A02/MF A01

The acute oral LD superscript 30 subscript 50 values in mice and rats for cured Silastic 386 (95 parts foam elastomer plus 5 parts catalyst) were greater than 5 g/kg. According to classical guidelines, the mixture would be considered slightly toxic or practically nontoxic in both species. Skin application studies in the rabbit demonstrated the mixture to be mildly irritating. Eye irritation studies, also in the rabbit, showed the cured Silastic 386 to be a mild but transitory irritant. The sensitization study in the guinea pig did not demonstrate the mixture to be a sensitizer. Author

**N79-14715#** Duke Univ., Durham, N C. Medical Center  
**MECHANISMS OF RECOMBINATION AND FUNCTION OF DNA IN BACTERIA** Progress Report, 6 May 1978 - 31 Jul. 1977

W R Guild 1977 4 p refs  
 (Contract E(40-1)-3941)  
 (ORO-3941-33) Avail NTIS HC A02/MF A01

Work centered around a detailed description and analysis of mechanisms of gene transfer and recombination in pneumococcus. In addition to the study of transformation, much effort has gone into developing and exploiting the use of bacteriophages in this species, in particular with respect to transfection and transduction. Some of the areas of progress are described. Author

**N79-14716#** Joint Publications Research Service, Arlington, Va  
**SPACE BIOLOGY AND AEROSPACE MEDICINE, VOL. 12, NO. 6**

O G Gazenko, ed. 21 Dec 1978 139 p refs. Transl into ENGLISH of Kosm Biol i Aviakosm Med (Moscow), v 12, no 6, 1978 p 3-82

(JPRS-72487) Copyright Avail NTIS HC A07/MF A01  
 In-flight monitoring and ground-based simulation studies on the physiological effects of manned space flight are reported.

**N79-14717#** Joint Publications Research Service, Arlington, Va  
**DYNAMICS OF COSMONAUTS' BLOOD BIOCHEMISTRY DURING SPACE MISSIONS**

I S Balakhovskiy and T A Orlova. In its Space Biol and Aerospace Med, Vol 12, No 6 (JPRS-7248) 21 Dec 1978 p 1-8 refs. Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), v 12 no 6, 1978 p 3-8

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 The results of biochemical analyses of blood samples taken from crew members of Soyuz-11, Soyuz-14, Soyuz-17 and Soyuz-18 during missions are presented. Data were compared to the results of model experiments and background findings on these and other cosmonauts. G G

**N79-14718#** Joint Publications Research Service, Arlington, Va  
**STUDIES OF HEMODYNAMICS AND PHASE STRUCTURE OF CARDIAC CYCLE IN THE CREW OF SALYUT-4**

V A Degtyarev, V G Doroshev, N D Kalmukova, Z A Kinlova, N A Lapshina, A A Lepskiy and V N Rabozin. In its Space Biol and Aerospace Med, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 9-15 refs. Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), v 12, no 6, 1978 p 9-14

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 The flights of Salyut and Skylab orbital research stations initiated extensive studies of the cardiovascular system in the course of long-term weightlessness. Studies begun by the crew of Salyut and Salyut-3 stations were continued on Salyut-4. For the first time, a number of tests were made in the morning, right after the cosmonauts woke up i.e. under conditions close to basal metabolism. A distinct lability of most hemodynamic indices was observed during the period of adaptation to earth's gravitation. G G

**N79-14719#** Joint Publications Research Service, Arlington, Va

**DYNAMIC MEDICAL MONITORING OF FLIGHT CREWS IN THE COURSE OF LONG-TERM FLIGHTS**

V V Rassvetayev, A V Ivanov, V A Kolosov, V N Kuznetsov, and N F Mikhaylik. In its Space Biol and Aerospace Med, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 18-19 refs. Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), v 12 no 6, 1978 p 14-17

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Results of flight crews monitoring during long-term flights establish two types of reactions of the main physiological systems during flights: reactions of functional systems in response to brief complication of professional work (emotional and motivational factors are the triggering mechanism of such reactions) and reactions resulting from the combined effect of tense work and adverse flight factors (these reactions are based on developing fatigue and relative exhaustion of body systems). G G

**N79-14720#** Joint Publications Research Service, Arlington, Va

**INVESTIGATION OF COMPOSITION OF TRACE CONTAMINANTS IN THE AIR ENVIRONMENT OF THE SOYUZ-22 SPACECRAFT**

V P Savina, K N Mikos, V Ye Ryzhkova, A I Gorshunova, Yu G Nefedov, V A Akesenov, and A A Lepskiy. In its Space Biol and Aerospace Med, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 20-23 refs. Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), v 12 no 6, 1978 p 18-20

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Air samples collected directly in flight on the Soyuz-22 spacecraft manned compartment made it possible to determine the concentrations of methane, ethane, heptane, methanol, acetaldehyde, n-propanol, ethanol, acetone, and ethylbenzene that were close to the concentrations demonstrated in mockup studies on the ground. The concentration of methane did not exceed 217 mg/cu m throughout the flight. The concentrations of methanol, ethanol, n-propanol and acetaldehyde were close to the levels obtained in the ground-based chamber studies. The somewhat higher concentration of acetone in the manned compartment may be related to the large amount of equipment and polymer materials in the spacecraft cabin. G G

**N79-14721#** Joint Publications Research Service, Arlington, Va

**EFFECTS OF HYPERHYDRATION ON HUMAN ENDURANCE OF ORTHOSTATIC AND LBNP TESTS**

A I Grigoryev, B S Katkovskiy, A A Savilov, V S Georgiyevskiy, B R Dorokhova, and V M Mikhaylov. In its Space Biol and Aerospace Med, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 24-29 refs. Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), v 12, no 6 1978 p 20-24

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A method was developed that would be feasible in space flight practice for raising the level of body hydration by means of intake of water and salt, directed toward maintaining resistance to orthostatic factors and lower body negative pressure (LBNP). G G

**N79-14722#** Joint Publications Research Service, Arlington, Va

**CHANGES IN HUMAN RENAL FUNCTION IN PASSIVE HEAD-UP AND HEAD-DOWN POSITIONS**

A K Merzon and V S Zeligman. In its Space Biol and Aerospace Med, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 30-34 refs. Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), v 12, no 6, 1978 p 25-28

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The decrease in renal excretion of sodium and fluid in passive orthostatic position interpreted as a homeostatic reaction to acute migration of blood to the lower part of the body, with decrease in blood supply to organs above the level of the heart. This reaction occurs with the involvement of both neurohumoral and

hormonal influences on the kidneys, and its purpose is to speedily restore the intravascular volume. The kidneys play the role of a vascular buffer, since additional amounts of blood are diverted into the systemic circulation from their vessels as a result of vasoconstriction. The increase in renal retention of sodium and fluid is also involved in increasing the intravascular volume. G G

**N79-14723#** Joint Publications Research Service, Arlington, Va

**STABILITY OF CIRCADIAN SYSTEM OF THE BODY**

S I Stepanova *In its Space Biol and Aerospace Med*, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 35-42 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12, no 6, 1978 p 28-34

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The dynamics of changes in the structure of pilot activity were monitored while piloting an aircraft in the presence of hypoxia. Stability of acrophases and para-acrophases on a time scale is found to be a good criterion of constancy of circadian rhythm. The interval within which the position of the phase fluctuates from day to day is called the wandering (walk) zone of this phase. The wider the zone, the less stable the position of the phase on the time scale. A narrow walk zone is indicative of stable position of the phase on the local time scale. G G

**N79-14724#** Joint Publications Research Service, Arlington, Va

**DYNAMICS OF IMPAIRMENT OF PILOT PERFORMANCE IN THE PRESENCE OF HYPOXIA**

V V Lapa and G M Chernyakov *In its Space Biol and Aerospace Med*, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 43-48 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12, no 6, 1978 p 34-38

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It is shown that disturbances in pilot performance under hypoxic conditions, corresponding to altitudes of up to 5600 m, develop gradually and have a complex genesis. Central mechanisms of the functional system that regulates movements are the first to be impaired. Then changes appear in distribution and switching of attention. Complex forms of thinking processes were found to be the most resistant to hypoxia. G G

**N79-14725#** Joint Publications Research Service, Arlington, Va

**COMBINED EFFECT OF HYPEROXIA, LOW PRESSURE AND EXERCISE ON THE RATE OF METHYLKETONE EXCRETION FROM THE HUMAN BODY**

A V Sedov, G A Gaziyev, N A Surovtsev, G Ye Mazneva, O N Shevkun, A N Ivanov, L I Kobzeva, G A Ryakhovskaya, and L A Popova *In its Space Biol and Aerospace Med*, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 49-53 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12, no 6, 1978 p 39-42

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It is established that exposure of albino rats to an atmosphere of 96% oxygen (PO<sub>2</sub> 729 mm Hg) for 2 days at normal barometric pressure does not have an appreciable effect on elimination of ketones from the organism. 15 days of restricted movement also fails to influence ketone excretion. At the same time the combination of hyperoxia and hypokinesia accelerates methylketone excretion. A significant increase in rate of excretion of methylketones was observed in exhaled air under the combined influence of hyperoxia, low barometric pressure and physical exercise. Evidently the increased rate of methylketone excretion under the influence of the above-mentioned factors may be an indirect indication of changes in fat and carbohydrate metabolism. G G

**N79-14726#** Joint Publications Research Service, Arlington, Va

**PRINCIPAL RESULTS OF EXPERIMENT WITH MAMMALS ONBOARD THE KOSMOS-782 BIOSATELLITE**

O G Gazenko, A M Genin, Ye A Ilin, V V Portugalov, L V Serova, and R A Tigranyan *In its Space Biol and Aerospace Med*, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 54-63 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12, no 6, 1978 p 43-49

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The results of physiological, morphological and biochemical studies conducted after the experiment confirmed the previous conclusions that mammals can adapt to prolonged (19.5 days) weightlessness, and that there are no pathological changes in main vital organs and tissues under such conditions. G G

**N79-14727#** Joint Publications Research Service, Arlington, Va

**SPERMATOGENESIS IN DOGS DURING MANY YEARS OF CHRONIC EXPOSURE TO GAMMA RADIATION AND IN THE AFTEREFFECT PERIOD**

G I Plakhuta-Plakutina *In its Space Biol and Aerospace Med*, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 64-70 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12, no 6, 1978 p 50-55

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The morphological changes in canine reproductive glands were studied after continuous exposure to gamma radiation for several years at a low dose rate. Obtained data confirm the possibility of restoration of spermatogenesis in dogs at the long term following chronic exposure to gamma radiation at different dose rates. G G

**N79-14728#** Joint Publications Research Service, Arlington, Va

**DNA CONTENT OF ANIMAL ORGANS DURING SPACE FLIGHT ON KOSMOS-690 SATELLITE**

F T Guseynov, G S Komolova, I A Yegorova, R A Tigranyan, and L V Serova *In its Space Biol and Aerospace Med*, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 71-76 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12, no 6, 1978 p 55-59

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The DNA levels in the liver, spleen and bone marrow of rats were studied following exposure to gamma-radiation during a flight aboard the Kosmos-960 satellite. The assays of DNA in animal organs at longer terms confirm the hypothesis that space flight conditions enhance the radiation effect, and this could be due to retardation of recovery processes. G G

**N79-14729#** Joint Publications Research Service, Arlington, Va

**STATE OF BLOOD CLOTTING DURING PROLONGED HYPOKINESIA**

L P Svindkina *In its Space Biol and Aerospace Med*, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 77-81 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12, no 6, 1978 p 59-63

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The animals developed hypercoagulation under the influence of 14 days of hypokinesia, followed by relative hypocoagulemia by the 30th day. G G

**N79-14730#** Joint Publications Research Service, Arlington, Va

**THE COMBINED EFFECT OF CARBON MONOXIDE AND NORMOBARIC HYPEROXIA ON ANIMALS**

B I Abidin, V I Belkin, V V Kustov, and A N Kondratyev *In its Space Biol and Aerospace Med*, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 82-87 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12, no 6, 1978 p 63-67

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The combined effect on the organism of carbon monoxide in a concentration of 500 + or - 20 mg/cu m, and an artificial

gas environment with elevated partial oxygen pressure, with continuous exposure for 30 days, is characterized by antagonism of their biological effects with some prevalence of the influence of the latter over that of carbon monoxide. It is concluded that maximum permissible concentrations of each factor can be used when an organism is exposed to both simultaneously, without any correction of these concentrations. G G

N79-14731# Joint Publications Research Service Arlington, Va

**BLOOD LIPID CHANGES IN HYPOXIC RATS**

G A Gribanov, S A Sergeyev and A S Aleksenko *In its Space Biol and Aerospace Med* Vol 12 No 6 (JPRS-72487) 21 Dec 1978 p 88-93 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)* v 12 no 6, 1978 p 67-71

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Analyses of total lipids (TL) and other blood serum components of hypoxic rats revealed certain changes manifested by the tendency toward decrease of TL with redistribution of lipid components in both absolute and relative values. This was evidently due to increase in activity of some hydrolytic enzyme systems the ultimate effect of which was an increase in DG, FFA, C, LPD and other components. The changes in proportion of lipid fractions were closely related to the qualitative and quantitative changes in LP and first of all in beta- and pre-beta-LP. The increase in inorganic phosphate of blood serum in the presence of hypoxia may be indicative of both an increase in breakdown of phosphorus-containing organic compounds in blood and tissues (with the exception of blood serum PL), and migration thereof into the vascular stream from different organs under the acute effect of the hypoxia factor. G G

N79-14732# Joint Publications Research Service Arlington, Va

**EFFECT OF INTERMITTENT HYPOXIA ON FUNCTIONAL ACTIVITY OF PERIPHERAL BLOOD NEUTROPHILS**

N A Luchina *In its Space Biol and Aerospace Med* Vol 12 No 6 (JPRS-72487) 21 Dec 1978 p 97-101 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12 no 6 1978 p 73-76

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Chronic, intermittent hypoxia induced phasic changes in functional activity of leukocytes, the nature of which is largely determined by the time of exposure of the organism. G G

N79-14733# Joint Publications Research Service, Arlington Va

**EFFECT OF CEREBROCRANIAL TRAUMA ON REACTIVE DISTINCTIONS OF HYPOTHALAMIC AND HIPPOCAMPAL VESSELS IN THE PRESENCE OF HYPOXIA**

Yu N Orestenko and N M Kovalev *In its Space Biol and Aerospace Med*, Vol 12 No 6 (JPRS-72487) 21 Dec 1978 p 102-107 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12, no 6, 1978 p 76-79

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Reactive changes in blood supply and tonus of vessels of the anterior hypothalamus and dorsal hippocampus were observed in the course of development of altitude hypoxia, before and after determinate closed cerebrocranial trauma. These studies demonstrated the reactive distinctions of hypothalamic and hippocampal vessels in response to hypoxic hypoxia before and after closed cerebrocranial trauma, as well as in response to the trauma itself. There were independent mechanisms of regulation of circulation and tonus in these structures which serve as a manifestation of local regulatory influences. As compared to the hippocampus, the hypothalamus is a more reactive, but also stable structure of the brain when the organism is exposed to extreme factors (hypoxia cerebrocranial trauma). G G

N79-14734# Joint Publications Research Service Arlington, Va

**ROLE OF VESTIBULAR SYSTEM IN BEHAVIOR OF ANIMALS SUBMITTED TO PROLONGED SLOW ROTATION**

G I Gorgiladze *In its Space Biol and Aerospace Med*, Vol 12, No 6 (JPRS-72487) 21 Dec 1978 p 108-110 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, v 12, no 6 1978 p 79-80

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It is shown that animals placed in a ground-based rotating system choose the center of rotation, and that such behavior is controlled by the vestibular system. On the other hand when rotated in weightlessness rats strive toward the periphery rather than the center of rotation. These facts should probably be interpreted as follows. In the former case the animals get rid of excessive stimulation of vestibular receptors whereas during rotation in weightlessness as they move from the center of rotation to the field of greater accelerations they try to compensate for the shortage of impulsion from the otolith system. G G

N79-14735# Joint Publications Research Service, Arlington, Va

**EFFECT OF PSYCHOPHYSIOLOGICAL SELF-REGULATION ON EMOTIONAL STABILITY OF AVIATION CADETS IN FLIGHT AND ON EFFECTIVENESS OF ASSIMILATION OF FLIGHT TRAINING PROGRAM**

V S Lozinsky *In its Space Biol and Aerospace Med*, Vol 12 No 6 (JPRS-72487) 21 Dec 1978 p 111-114 refs Transl into ENGLISH from *Kosm Biol i Aviakosm Med (Moscow)*, V 12, no 6 1978 p 80-82

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Methods of psychophysiological self-regulation for exerting a deliberate influence on emotional stability of cadets and for improving assimilation of flight training programs, were studied. The results obtained indicate that psychophysiological self-regulation is an effective means for increasing emotional stability of student pilots under extreme flying conditions. This method can be used to upgrade the quality of flight training. G G

N79-14736# Joint Publications Research Service Arlington Va

**TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 53 EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION**

12 Jan 1979 56 p refs Transl into ENGLISH from various Russian articles (JPRS-72606) Copyright Avail NTIS HC A04/MF A01

The effects of superhigh frequency electromagnetic radiation on biological activity are examined from observations of human erythrocytes and the liver and brain tissue of rats. The therapeutic aspects of magnetic fields and their clinical application are reviewed.

N79-14737# Joint Publications Research Service Arlington, Va

**INVESTIGATION OF THE ACTIVITY OF SOME ENZYMATIC SYSTEMS IN RESPONSE TO A SUPER-HIGH FREQUENCY ELECTROMAGNETIC FIELD**

Yu D Dumanskiy, L A Tomashevskaya, and A N Marzeyev *In its Transl on USSR Sci and Technol Biomed and Behavioral Sci*, No 53 (JPRS-72606) 12 Jan 1979 p 1-7 refs Transl into ENGLISH from *Gigiena i Sanit (Moscow)* No 8 1978 p 23-27

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The influence of different levels of superhigh frequency (SHF) energy on some enzymatic processes in subcellular reactions of the brain of white rats was investigated. Results indicate that the biological effects of SHF fields with PFDs of 100 and 1000 micron w/sq cm are accompanied by a certain complex of biochemical changes reflecting disturbances in the body's metabolism when it is exposed to such fields for a long period of time. These are a decline in cytochrome oxidase activity in mitochondria, an increase in G-6-PHD activity in liver and brain

hyaloplasm and activation of mixed function oxidase in the microsomal fraction of rat liver. The noted changes were unidirectional in nature in response to different PFD's. Maximum deviations were observed basically following one month of irradiation, as the exposure time was increased, the expressiveness of the changes weakened somewhat. A R H

**N79-14738#** Joint Publications Research Service, Arlington, Va

**EFFECTS OF INTERMITTENT MAGNETIC FIELD ON ACTIVITY OF CARBOHYDRATE METABOLISM ENZYMES AND OXYGEN UPTAKE IN TESTICULAR TISSUE**

N A Udintsev and S M Khlynin *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 53 (JPRS-72606) 12 Jan 1979 p 8-13 refs Transl into ENGLISH from Ukr Biokhim Zh (Kiev) no 6 1978 p 714-717

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Testicular tissue from male albino rats put in the inter-polar space of a 200 Oe magnet with a gradient of not more than 5% and frequency of 50 Hz, once for 24 h and several times for 6.5 h per day for 5 days were examined. Single exposure to the field for one day was found to increase glucose-6-phosphate dehydrogenase activity. Diminution is appreciable 24 to 28 hours after exposure to the field, as is that of cytochromozidase and hexokinase activity in mitochondria. There is an increase in lactate hydrogenase and succinate dehydrogenase activity. A return to the base level is observed on the 7th to the 14th day. In the case of multiple exposure there is no stimulation, enzyme activity diminishes (with the exception of that of lactate dehydrogenase). These changes are consistent with the dynamics of testosterone level in plasma and the testes. A R H

**N79-14739#** Joint Publications Research Service, Arlington, Va

**EFFECTS OF MICROWAVES ON CATECHOLAMINE METABOLISM IN THE BRAIN**

A N Grin *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 53 (JPRS-72606) 12 Jan 1979 p 14-16 refs Transl into ENGLISH from Vrachebnoe Delo (Kiev), no 10, 1978 p 129-130  
N79-14736 05-51)

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One hundred thirty-two male albino rats weighing 180 to 450 g, were exposed daily to continuous superhigh frequency fields with energy flux, density of 500 and 50 micron W/sq cm. Duration of daily exposure constituted 7 h per day for 1 month. In addition in order to assess the role not only of intensity, but duration of radiation, in biological changes in the brain, the rats were examined on the 5th, 10th, 20th and 30th days. A Luch-2 (12.6 cm wavelength) unit was used to irradiate the rats. An EF-ZMA unit with attachment was used for fluorimetric assay of epinephrine, norepinephrine, dopamine, and dopa. Changes in catecholamine levels in the brain as related to microwave irradiation are listed in tables.

**N79-14740#** Joint Publications Research Service, Arlington, Va

**EFFECTS OF ELECTROMAGNETIC FIELD INDUCTION ON DEVELOPMENT OF THE GREEN ALGAE, SCENEDESMUS QUADRICAUDA (TURBPIN) BREB AND COMPOSITION OF FREE AMINO ACIDS IN ITS BIOMASS AND MEDIUM**

K K Yankyavichyus, S F Budrene, and R I Razyulite *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 53 (JPRS-72606) 12 Jan 1979 p 17-26 refs Transl into ENGLISH from Tr Akad Nauk Lit SSR Ser B (Vilnius), no 4 p 121-129

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Changes in the qualitative and quantitative composition of free amino acids and accumulation of biomass in a bacteriologically pure culture of *Scenedesmus quadricauda* (Turpin) Breb green algae under the influence of magnetic field induction (EMFI) revealed that magnetization of the medium in flux without algae

(with later algae addition), at EMFI of 0.015, 0.030, 0.126, 0.385, 0.530, 0.970 and 1200 wb/sq m stimulated development of algae and elicited a quantitative change in free amino acids in their biomass and in the medium. Premagnetization of the medium without the algae in static position at low levels (0.005 and 0.025 Wb/sq m) had a stimulating effect on development of algae and reduced concentration of amino acids in the biomass. Premagnetization of the medium without algae in flux, at all indicated EMFI levels, and of medium without algae in static position at low EMFI levels, apparently stimulates incorporation of free amino acids in proteins. A R H

**N79-14741#** Joint Publications Research Service, Arlington, Va

**DEPENDENCE OF THE FUNCTIONAL ACTIVITY OF LIVER MITOCHONDRIA ON MICROWAVE RADIATION**

Yu D Dumanskiy and V F Rudichenko *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 53 (JPRS-72606) 12 Jan 1979 p 27-32 refs Transl into ENGLISH from Gigiyena i Sanit (Moscow), No 4, 1976 p 16-19

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Forty-two white rats were irradiated with microwave energy with various power flux densities three times a day, five days a week, over a four month period. The activity of the mitochondria in various functional states was determined by the polygraphic method. The effect of the microwave radiation on the oxygen uptake and phosphorylation of live mitochondria during the oxidation of succinate is discussed. A R H

**N79-14742#** Joint Publications Research Service, Arlington, Va

**STATE OF PROCESS OF OXIDATION PHOSPHORYLATION OF LIVER MITOCHONDRIA ON EXPOSURE TO AN ELECTRIC FIELD**

I P Kozyarn and V F Rudichenko *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 53 (JPRS-72606) 12 Jan 1979 p 33-57 refs Transl into ENGLISH from Gigiyena i Sanit (Moscow) no 11, 1978 p 26-29

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The effect of industrial frequency electric field (IFE) on the principal metabolic pathways was investigated in male white rats. Results indicate that prolonged exposure to IFE causes a reduction in the content of copper and iron in the liver tissue. The reduction in the level of copper was characterized by identical values among the animals exposed to IFE with an intensity of 1 to 2 kv/min and a considerable reduction in the level of the biotics when the field intensity was 4.7 and 15 kv/min. The iron content in the liver was characterized by somewhat different relationships. When exposed to IFE with an intensity of 1 to 2 kv/min, a considerable reduction was observed in the iron content in the liver. With an increase in the field intensity to 7 and 15 kv/min, the tendency towards reduction in the iron content depending on the field intensity was less marked. With succinate oxidation, an intensification was observed in the phosphorylating respiration in animals exposed to IFE intensity of 4 to 7 kv/min. Stimulation of the phosphorylating respiration, with an increase in the field intensity of 15 kv/min, was replaced by inhibition in this process. A R H

**N79-14743#** Joint Publications Research Service, Arlington, Va

**MECHANISM OF EFFECTS OF MICROWAVES ON ERYTHROCYTE PERMEABILITY FOR POTASSIUM AND SODIUM IONS**

E Sh Ismailov *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 53 (JPRS-72606) 12 Jan 1979 p 38-41 refs Transl into ENGLISH from Biol Nauki (USSR) no 3 1971 p 58-60

Avail NTIS HC A04/MF A01

Exposure to microwaves appreciably alters the permeability of human erythrocytes for potassium and sodium ions. These ions migrate between the cell and medium over a concentration

gradient Erythrocyte permeability for K(+) and Na(+) changes under the influence of microwaves due to inhibition of active transport thereof and change in diffusion through pores in the membrane. The latter may be due to the effect of UHG energy on both the membrane proper and hydrate membrane of sodium and potassium ions  
Author

**N79-14744#** Joint Publications Research Service, Arlington, Va

**DETERMINATION OF A GENERALIZED OUTPUT INDEX OF A BIOLOGICAL EXPERIMENT AFTER MULTIPLE TESTS**

I P Los and A M Serdyuk *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 53 (JPRS-72606) 12 Jan 1979 p 42-48 refs Transl into ENGLISH from Vrachebnoe Delo (Kiev), no 6 1975 p 113-117

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Particular difficulties encountered in studying the biological activity of certain physical factors such as electromagnetic fields noise, vibration, and experimental conditions on a factor-organism model can be solved by using a mathematical plan of the experiment. The psychophysical concept of desirability scales is applied to obtain a generalized index consideration not only for its statistical sensitivity and effectiveness, but also for its acceptability in solving the problem of the selection of adequate tests and criteria for evaluating deviations. A formula is given for transforming the individual responses obtained in each test into a dimensionless scale which is subsequently converted to a generalized index. Equal biological significance of the scales, determined by the variation factor of the indexes on which the determination of the scale specifications is based makes it possible to select tests which are sensitive and adequate to a given factor by the method of comparison  
A R H

**N79-14745#** Joint Publications Research Service, Arlington, Va

**TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY BIOMEDICAL AND BEHAVIORAL SCIENCES, NO 51**

10 Jan 1979 76 p refs Transl into ENGLISH from various Russian journals (JPRS-72588) Copyright Avail NTIS HC A05/MF A01

Various Soviet news releases are presented. The replacement of heart valves, visual discrimination in data processing and carbon monoxide release by humans in protective clothing are reported.

**N79-14746#** Joint Publications Research Service, Arlington, Va

**FUNCTIONAL OUTCOMES OF PROSTHETIC CARDIAC VALVE REPLACEMENT**

N M Amosov, Ya A Bendet, N M Verich, M Yu Atamanyuk, G V Knyshov, N G Cherkashina, and V M Khandoga *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 51 (JPRS-72588) 10 Jan 1979 p 1-10 refs Transl into ENGLISH from Grud Khir (Moscow) no 5 1978 p 3-8

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The experience of 1625 operations and the remote results of 930 patients showed that prosthetic cardiac valve replacement ensured satisfactory results in heart defect patients. A comparative study in dynamics of the physical state and work fitness of 120 patients, using submaximal load tests, are reviewed  
J A M

**N79-14747#** Joint Publications Research Service Arlington, Va

**VISUAL INFORMATION PROCESSING**

T P Zinchenko *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 51 (JPRS-72588) 10 Jan 1979 p 11-20 refs Transl into ENGLISH from Tekh Estetika (Moscow), no 10 1978 p 9-12

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The purpose of the research was to study the processes involved in visual information processing during recognition, classification, and visual search. The perception experiment of one and multidimensional stimuli was directed to relevant and irrelevant parameter effects on recognition. The possibilities of filtration and blocking of irrelevant information during classification of one and multidimensional stimuli were also examined  
J A M

**N79-14748#** Joint Publications Research Service Arlington, Va

**LIBERATION OF CARBON MONOXIDE BY MAN WHEN WORKING IN PROTECTIVE GEAR**

A V Sedov, G A Gaziyeu, G Ye Mazneva, N A Surovtsev, L I Kobzeva, and O N Shevkun *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 51 (JPRS-72588) 10 Jan 1979 p 33-36 refs Transl into ENGLISH from Gig Sant (Moscow), no 8, 1978 p 107-108

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The effective disposal of carbon monoxide released by the human body within protective clothing was studied. Subjects performed physical work of varying difficulty requiring energy outlays of 400 and 600 kcal/hr while breathing pure oxygen in low barometric pressure. As the size of the load increased the intensity of CO liberation from both smokers and nonsmokers increased. When the physical load is increased by 200 kcal/hr, the rate of CO release doubles  
J A M

**N79-14749\*** National Aeronautics and Space Administration Pasadena Office, Calif

**GAS DIFFUSION LIQUID STORAGE BAG AND METHOD OF USE FOR STORING BLOOD Patent**

Herman Bank (JPL) and Edward L Cleland inventors (to NASA) (JPL) Issued 2 Jan 1979 5 p Filed 28 Jun 1976 Supersedes N78-25760 (16 - 16, p 2164) Sponsored by NASA (NASA-Case-NPO-13930-1, US-Patent-4,132,594, US-Patent-AppI-SN-700467, US-Patent-Class-195-18, US-Patent-Class-422-41, US-Patent-Class-422-48, US-Patent-Class-55-15-8, US-Patent-Class-128-214D, US-Patent-Class-128-272, US-Patent-Class-150-1, US-Patent-Class-206-439, US-Patent-Class-210-DIG 23) Avail US Patent and Trademark Office CSCL 06B

The shelf life of stored whole blood may be doubled by adding a buffer which maintains a desired pH level. However, this buffer causes the generation of CO<sub>2</sub> which if not removed at a controlled rate, causes the pH value of the blood to decrease, which shortens the useful life of the blood. A blood storage bag is described which permits the CO<sub>2</sub> to be diffused out at a controlled rate into the atmosphere, thereby maintaining the desired pH value and providing a bag strong enough to permit handling. Official Gazette of the U S Patent and Trademark Office

**N79-14750\*** National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md

**DETERMINATION OF ANTIMICROBIAL SUSCEPTIBILITIES ON INFECTED URINES WITHOUT ISOLATION Patent**

Grace L Picciolo, Emmett W Chappelle, Jody W Deming (New England Medical Ctr., Boston, Mass), Christian G Shrock (New England Med Ctr., Boston, Mass), Hillar Vellend (New England Med Ctr., Boston, Mass), Michael J Barza (New England Med Ctr., Boston, Mass) and Louis Weinstein, inventors (to NASA) (New England Med Ctr., Boston, Mass) Issued 2 Jan 1979 7 p Filed 23 Apr 1976 Supersedes N77-26797 (15 - 17, p 2306) Sponsored by NASA (NASA-Case-GSC-12046-1, US-Patent-4,132,599, US-Patent-AppI-SN-680015, US-Patent-Class-195-103 5K, US-Patent-Class-195-103 5L) Avail US Patent and Trademark Office CSCL 06A

A method is described for the quick determination of the susceptibilities of various unidentified bacteria contained in an aqueous physiological fluid sample, particularly urine, to one or more antibiotics. A bacterial adenosine triphosphate (ATP) assay is carried out after the elimination of non-bacterial ATP to

determine whether an infection exists. If an infection does exist a portion of the sample is further processed, including subjecting parts of the portion to one or more antibiotics. Growth of the bacteria in the parts are determined again by an ATP assay, to determine whether the unidentified bacteria in the sample are susceptible to the antibiotic or antibiotics under test.

Official Gazette of the U S Patent and Trademark Office

**N79-14751\*** National Aeronautics and Space Administration  
Pasadena Office, Calif  
**COUPLING APPARATUS FOR ULTRASONIC MEDICAL  
DIAGNOSTIC SYSTEM Patent**

Robert E Frazer inventor (to NASA) (JPL) Issued 19 Dec 1978 5 p Filed 15 Nov 1976 Supersedes N78-25761 (16 - 16, p 2164) Sponsored by NASA

(NASA-Case-NPO-13935-1, NASA-Case-NPO-13944-1, US-Patent-4,130,112, US-Patent-Appl-SN-741749, US-Patent-Class-128-2V, US-Patent-Class-73-633 US-Patent-Class-73-644) Avail US Patent and Trademark Office CSCL 06B

An apparatus for the ultrasonic scanning of a breast or other tissue is reported that contains a cavity for receiving the breast a vacuum for drawing the breast into intimate contact with the walls of the cavity, and transducers coupled through a fluid to the cavity to transmit sound waves through the breast. Each transducer lies at the end of a tapered chamber which has flexible walls and which is filled with fluid, so that the transducer can be moved in a raster pattern while the chamber walls flex accordingly, with sound transmission always occurring through the fluid. Official Gazette of the U S Patent and Trademark Office

**N79-14753#** Joint Publications Research Service, Arlington, Va

**TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY  
BIOMEDICAL AND BEHAVIORAL SCIENCE, NO 54**

18 Jan 1979 96 p refs Transl into ENGLISH from various Russian Journals

(JPRS-72650) Copyright Avail NTIS HC A05/MF A01

Investigations on environment pollution and physiological effects are described

**N79-14754#** Joint Publications Research Service, Arlington, Va

**CHEMICALS IN ENVIRONMENT AFFECT MAN'S PHYSIOLOGY**

T I Bonashevskaya *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci No 54 (JPRS-72650) 18 Jan 1979 p 60-74 refs Transl into ENGLISH from Vestn Akad Med Nauk SSSR (Moscow), no 4, 1978 p 44-52

Copyright Avail NTIS HC A05/MF A01

The role of chemical contaminants of the environment in the development of disease is discussed. The problems of establishing criteria for normal and pathological states are considered. Results indicate that the normal state is extremely dynamic with a wide range of fluctuations. Methods of investigation used include physiology, biochemistry and morphology. A specific study done on the effects of benzene inhalation on the livers of rats is described and the results are discussed. S B S

**N79-14755\*#** National Aeronautics and Space Administration  
Ames Research Center, Moffett Field, Calif  
**INDOMETHACIN-ANTIHISTAMINE COMBINATION FOR  
GASTRIC ULCERATION CONTROL Patent Application**

Patricia A Brown (San Jose State Univ, Calif) and Joan Vernikos-Danellis inventors (to NASA) Filed 29 Dec 1978 19 p

(NASA-Case-ARC-11118-2, US-Patent-Appl-SN-974476) Avail NTIS HC A02/MF A01 CSCL 06E

Gastric ulcers caused by the ingestion of indomethacin by subjects under stress are significantly reduced by administering to the subjects, together or in sequence such antihistaminic drugs as pyrilamine, promethazine, metiamide, or cimetidine. The dosages may range from 25 to 200 mg daily for the indomethacin and from 200 mg to 15 g daily for the antihistamine. NASA

**N79-14756\*#** National Aeronautics and Space Administration  
Marshall Space Flight Center, Huntsville, Ala

**PROSTHETIC URINARY SPHINCTER Patent Application**

Curtis R Helms and Harold M Smyly, inventors (to NASA) Filed 12 Oct 1978 11 p

(NASA-Case-MFS-23717-1, US-Patent-Appl-SN-950877) Avail NTIS HC A02/MF A01 CSCL 06B

A pump/valve unit which requires a minimum of implant area and surgery is described for controlling bladder function by regulating the inflation and deflation of a urethral collar in a prosthetic urinary sphincter device. The pump has a press bulb of silicone elastomer which provides a reservoir for fluid solution. The valve unit includes a movable member which operates by depression of a flexible portion of the valve unit housing in order to control fluid flow between the reservoir and the collar. A pressure sensing means operates the valve member in order to relieve excess pressure in the collar should too much pressure be applied by the patient. NASA

**N79-14757#** Royal Aircraft Establishment, Farnborough (England)

**THE PHYSIOLOGICAL SIGNIFICANCE OF LIGHT FOR  
HUMAN BEINGS**

F Hollwich, B Dieckhues, and C O Meiners. Jun 1978 26 p refs Transl into ENGLISH from Lichttechnik (West Ger) v 27 no 10, 1975 p 388-394

(RAE-Lib-Trans-1976 BR65200) Avail NTIS HC A03/MF A01

Over the many thousands of years of its development, the human eye has completely adapted itself to natural daylight. Artificial lighting, however, to which many of us are exposed for the major part of the day, differs from natural daylight as regards spectral composition, intensity and monotony. This paper discusses the physiological effects of artificial lighting on man on the basis of experimental and clinical investigations on humans and animals. Author

**N79-14758#** Royal Aircraft Establishment, Farnborough (England)

**INVESTIGATIONS INTO THE IMPORTANCE OF THE  
DIRECTION OF CENTRIFUGAL FORCES ACTING ON THE  
HUMAN BODY**

L Buehrlen. Oct 1977 31 p refs Transl into ENGLISH from Luftfahrtmedizin (Ger), v 1, 1937 p 307-325

(RAE-Lib-Trans-1945, BR66016) Avail NTIS HC A03/MF A01

Centrifugal force tests were carried out on men in sitting and lying positions. The centrifugal measurement was carried

out to an accuracy of within a few per cent by means of the optical recording of the speed of rotation of the centrifuge In the sitting position, the same phenomena were observed as those familiar from flight practice Prolonged acceleration forces above 5 g led to disturbances of vision In the lying position no troublesome disturbances were noted up to 10 g, above 10 g breathing became considerably more labored and from 15 g upwards, almost impossible At 14-15 g, disturbances of vision occurred, although the brain and consciousness were in no way affected  
Author

**N79-14759#** Bureau of Radiological Health Rockville, Md Div of Electronic Products  
**ELECTROMAGNETIC FIELDS IN BIOLOGICAL MEDIA PART 1 DOSIMETRY - A PRIMER ON BIOELECTROMAGNETICS Final Report**  
Stanley M Neuder Jul 1978 32 p refs  
(PB-285793/6 FDA/BRH-78/128-Pt-1  
DHEW/PUB/FDA-78/8068-Pt-1) Avail NTIS  
HC A03/MF A01 CSCL 06R

Microwave and radiofrequency dosimetry the determination of microwave and radiofrequency energy deposition in biological bodies are discussed in terms of basic mathematical and physical considerations of electromagnetic interaction with biological systems The electrical characteristics of the biological medium are mathematically related to the electromagnetic field properties Variations of biological characteristics and internal field behavior as a function of exposure field frequency are discussed Dosimetry aspects are stressed in terms of power absorption during field exposures  
GRA

**N79-14760#** Joint Publications Research Service Arlington, Va  
**TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY BIOMEDICAL AND BEHAVIORAL SCIENCES, NO 52**  
12 Jan 1979 107 p refs Transl into ENGLISH with various Russian journals  
(JPRS-72604) Copyright Avail NTIS HC A06/MF A01

Various planning methods applicable to scientific medical research are discussed Problem-oriented program approach, principles of automation systems analytic approach, and classification of biomedical data for information retrieval systems are among the topics covered

**N79-14761#** Joint Publications Research Service, Arlington, Va  
**A COMPLEX SYSTEM FOR PLANNING SCIENTIFIC MEDICAL RESEARCH**  
A M Chernukh G V Pogodayev, and B V Morozov *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci No 52 (JPRS-72604) 12 Jan 1979 p 25-30 refs  
Transl into ENGLISH from Vestn Akad Med Nauk SSSR (Moscow) no 9 1978 p 3-7

Copyright Avail NTIS HC A06/MF A01

Formation of a standard plan of scientific research on the basis of comprehensive analysis and subsequent evaluation of the future development of different directions of medical science combining them with one another and other branches of science and technology is discussed Emphasis is placed on the improvement of the system of planning and coordination of scientific research  
J M S

**N79-14762#** Joint Publications Research Service, Arlington, Va  
**PROBLEM-ORIENTED PROGRAM APPROACH TO PLANNING AND MANAGEMENT OF MEDICINE**  
A M Chernukh A B Petrovskiy, and O V Filippov *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci No 52 (JPRS-72604) 12 Jan 1979 p 31-38 refs  
Transl into ENGLISH from Vestn Akad Med Nauk SSSR (Moscow) no 9, 1978 p 8-14

Copyright Avail NTIS HC A06/MF A01

The ways and means of organizing and managing medical science in the USSR are considered in terms of intensification of the special purpose or problem-oriented aspect of planning scientific research Advantages of the method of special purpose programmed planning are listed along with problems that could be developed on the basis of the special purpose programmed approach  
J M S

**N79-14763#** Joint Publications Research Service, Arlington Va  
**NEW PRINCIPLES OF AUTOMATION OF BIOMEDICAL RESEARCH**  
V P Kaznacheyev, M B Shtark, Yu K Postoyenko A A Kiselev, and V N Burakovskiy *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci No 52 (JPRS-72604) 12 Jan 1979 p 39-53 refs Transl into ENGLISH from Vestn Akad Med Nauk SSSR (Moscow), no 9 1978 p 14-26

Avail NTIS HC A06/MF A01

The application of automation and computer technology to the development of modern biomedical research is discussed The selection of the appropriate general purpose processing equipment in the form of a particular class of computer and a set of peripherals that link the object or experimenter directly to the computer is emphasized The organization of the SAMBI system is given including its main elements and functions Control algorithms which implement real time control of the heart rhythm, arterial pressure central venous pressure, and respiratory rhythm are described  
J M S

**N79-14764#** Joint Publications Research Service Arlington, Va  
**THE CONCEPTION OF THE SYSTEMS ANALYTIC APPROACH TO PLANNING AND ORGANIZATION OF MEDICAL SCIENTIFIC RESEARCH**  
S A Gasparyan *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 52 (JPRS-72604) 12 Jan 1979 p 54-60 refs Transl into ENGLISH from Vestn Akad Med Nauk SSSR (Moscow) no 9 1978 p 26-30

Copyright Avail NTIS HC A06/MF A01

The need to develop a classification of medical problems is addressed Specifically six classes of scientific medical problems are discussed in terms of planning and organization of medical science research  
J M S

**N79-14765#** Joint Publications Research Service, Arlington Va  
**CURRENT STATUS AND PROSPECTS OF CONTINUED REFINEMENT OF PLANNING AND COORDINATION OF SCIENTIFIC MEDICAL RESEARCH**  
A A Kiselev, L Ya Pimenova and O V Filippov *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 52 (JPRS-72604) 12 Jan 1979 p 61-70 refs Transl into ENGLISH from Vestn Akad Med Nauk SSSR (Moscow) no 9 1978 p 30-37

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The connection between recognized social needs and the probabilistic nature of the process of scientific search for the means to meet these needs is discussed Emphasis is placed on the administration of financial support of biomedical research The intensification and expansion of studies and the coordinated distribution of resources in accordance with the objective structure of social and scientific priorities are among the topics considered  
J M S

**N79-14766#** Joint Publications Research Service, Arlington Va  
**THE SYSTEMS ANALYTIC APPROACH TO THE PROBLEM OF CLASSIFICATION OF SCIENTIFIC MEDICAL RESEARCH**  
A A Kiselev, A B Petrovskiy and L A Pimenova *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci No 52 (JPRS-72604) 12 Jan 1979 p 71-81 refs

Transl into ENGLISH from Vestn Akad Med Nauk SSSR (Moscow) no 9 1978 p 38-43

Copyright Avail NTIS HC A06/MF A01

The administration of medical science is addressed in terms of gathering and processing needed information in order to (1) evaluate current status, trends of development and potential of different scientific directions (2) determine and distribute scientific potential of medicine, and (3) coordinate research with due consideration of the mutual influences of different directions, their contribution to public health practice, and solution of other national problems Application of automated information retrieval systems to permit a multiaspect search for information needed by administrative bodies is considered with emphasis on the development of a classification system for medical science

J M S

**N79-14767#** Joint Publications Research Service, Arlington Va

**USE OF THE SYSTEMS ANALYTIC APPROACH FOR ORGANIZATION AND COORDINATION OF COMPLEX BIOMEDICAL RESEARCH**

G I Mchedlishvili and M K Babunashvili *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, No 52 (JPRS-72604) 12 Jan 1979 p 82-93 refs Transl into ENGLISH from Vestn Akad Med Nauk SSSR (Moscow), no 9, 1978 p 43-50

Avail NTIS HC A06/MF A01

Application of systems theory to the management and planning of biomedical research is addressed Decision making theories applicable to problems pertaining to planning control and forecasting of scientific research are emphasized J M S

**N79-14768#** Royal Aircraft Establishment, Farnborough (England)

**PSYCHOLOGICAL ASPECTS OF THE HUMAN-OPERATOR'S ACTIVITY WHILE TRACKING**

M A Kremen Jul 1978 15 p refs Transl into ENGLISH from Vopr Psikhologii (USSR) v 6, 1977 p 70-77 (RAE-Lib-Trans-1979, BR65481) Avail NTIS

HC A02/MF A01

The importance of studying the problem of tracking is proven A conclusion is substantiated about the regulatory role of the dynamic image of processes (objects) when forming control movements in tracking operations Some concepts are introduced which reflect specific characteristics of the dynamic image A general substantiation and formulation is given of the concept of formation and decay of the dynamic image Some essential characteristics of the formulation and decay of the dynamic image are revealed in case of multi dimensional tracking G Y

**N79-14769\*#** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

**A SIMULATOR STUDY OF THE INTERACTION OF PILOT WORKLOAD WITH ERRORS, VIGILANCE, AND DECISIONS**

H P Ruffell Smith Jan 1979 58 p refs

(NASA-TM-78472 A-7354) Avail NTIS HC A04/MF A01 CSDL 05H

A full mission simulation of a civil air transport scenario that had two levels of workload was used to observe the actions of the crews and the basic aircraft parameters and to record heart rates The results showed that the number of errors was very variable among crews but the mean increased in the higher workload case The increase in errors was not related to rise in heart rate but was associated with vigilance times as well as the days since the last flight The recorded data also made it possible to investigate decision time and decision order These also varied among crews and seemed related to the ability of captains to manage the resources available to them on the flight deck G G

**N79-14770#** Air Force Human Resources Lab Brooks AFB Tex

**SUBJECTIVE MOTION DISCRIMINATION IN THE SIMULATOR FOR AIR-TO-AIR COMBAT Final Report, Sep 1975 - Jan 1976**

Philip A Irish III and James E Brown Aug 1978 33 p refs (AD-A059742 AFHRL-TR-78-26) Avail NTIS HC A03/MF A01 CSDL 14/2

The primary objective of this study was to acquire subjective information on the ability of pilots to perceptually differentiate between selected conditions of motion cueing in the Simulator for Air-to-Air Combat (SAAC) A second objective was to prepare the initial framework for follow-on studies designed to determine the contributions of motion cueing to pilot performance and training in the SAAC Four high experience F-4 pilots and four low experience F-4 pilots flew six contact maneuvers in the SAAC under eight experimental conditions of platform motion G-seat and G-suit Subjective ratings were collected from the pilots on the effectiveness of the motion-cueing systems after the completion of each maneuver The results indicated that the pilots could discriminate changes in G-suit performance via the ratings However no differences in the pilot ratings were elicited by changes in the G-seat or platform motion system operation

Author (GRA)

**N79-14771#** Minnesota Univ, Minneapolis Dept of Psychology

**PROCEEDINGS OF THE 1977 COMPUTERIZED ADAPTIVE TESTING CONFERENCE**

David J Weiss ed Jul 1978 457 p refs Conf held at the Univ of Minn Minneapolis 19-22 Jul 1977 (Contracts N00014-76-C-0243 NR Proj 150-382 RR0420401) (AD-A060049) Avail NTIS HC A20/MF A01 CSDL 05/8

This report is the Proceedings of the 1977 Computerized Adaptive Testing Conference held July 19-22, 1977 at the University of Minnesota These Proceedings include 27 papers (26 of which were presented at the Conference) discussions of these papers by Darrell Bock Frederic Lord, Mark Reckase, Richard Ferguson and David Weiss and a panel discussion entitled 'Future Directions for Computerized Adaptive Testing' with presentations by Frederic Lord, Mark Reckase, Fumiko Samejima, Vern Urry, and David Weiss The papers are organized into the following topical sessions (1) Improving Ability Measurement Using Different Item Formats (2) Alternative Models for Adaptive Testing (3) Psychological and Subgroup Effects (4) Performance Testing by Interactive Simulation, (5) Implementations of Adaptive Testing (6) Achievement/Performance Testing Viewed as a Classification Problem (7) Achievement Testing Viewed as a Trait Measurement Problem and (8) Computer-Based Testing as an Alternative to Paper-and-Pencil Testing Author (GRA)

**N79-14772#** Bolt Beranek and Newman Inc Cambridge Mass **A MODEL FOR THE PILOT'S USE OF ROLL-AXIS MOTION CUES IN STEADY-STATE TRACKING TASKS Final Report, 15 Jan. 1975 - May 1978**

William H Levison May 1978 87 p refs

(Contract F44620-75-C-0060)

(AD-A059504, BBN-3808, AFOSR-78-1233TR) Avail NTIS HC A05/MF A01 CSDL 01/3

An experimental and analytical study was undertaken jointly by the Aerospace Medical Research Laboratory and Bolt Beranek and Newman Inc to test a model for the pilot's use of roll-axis motion cues Principal experimental variables were the presence or absence of simulator motion, the nature of the external disturbance, simulated vehicle dynamics and the nature of the motion cues provided during moving-base simulation The effects of motion cues on closed-loop system performance and pilot response behavior were qualitatively and quantitatively dependent on the details of the tracking task The optimal-control model for pilot/vehicle analysis provided a relatively task-independent framework for accounting for the pilot's use of motion cues The availability of motion cues was modeled by augmenting the set of assumed perceptual variables to include the position, velocity, acceleration and acceleration rate of the roll-axis simulator with the exception that position information was omitted when the roll tilt cue was absent Results were consistent with the hypothesis of attention-sharing between visual and motion variables Author (GRA)

**N79-14773#** Royal Aircraft Establishment, Farnborough (England)

**EVALUATION OF THE AMOUNT OF EXPOSURE TO VIBRATIONS TRANSMITTED TO THE WHOLE BODY CASE OF VIBRATIONS DUE TO A LOADER MOUNTED ON CATERPILLAR TRACKS, A FORK-LIFT TRUCK AND A HYDRAULIC EXCAVATOR**

Boulangier Mistrot Poirot, and Roure Mar 1978 77 p refs  
Transl into ENGLISH of "Evaluation du degre d'exposition a des vibrations transmises a l'ensemble du corps Cas des vibrations engendrees par une chargeuse montee sur chenilles, un chariot elevateur et un excavateur hydraulique", Rept-245/RE Inst Nat de Rech et de Securite, Oct 1976  
(RAE-Lib-Trans-1930, BR65531) Avail NTIS HC A05/MF A01

The amount of vibration to which three types of vehicles subjected their drivers during a working day was studied. A comparative analysis was carried out using either the conditions of Standard E90-400 or the improvements recommended by INRS. Recommendations are made for improving the seats in the vehicles to try to reduce the drivers' exposure to vibrations to acceptable limits. J M S

**N79-14774#** Royal Aircraft Establishment Farnborough (England)

**COMPARATIVE EXPERIMENTS ON PERFORMANCE AND FATIGUE EFFECTS ON PILOTS USING TRACKING TESTS AND PHYSIOLOGICAL MEASUREMENT PARAMETERS**

H Strasser, K-P Klinger, W Mueller-Lummroth and G Brilling Jul 1978 8 p  
Transl into ENGLISH from paper presented to the 21st Intern Congr on Aviation and Space Med, Munich 17-21 Sep 1973 p 237-238  
(RAE-Lib-Trans-1971, BR65486) Avail NTIS HC A02/MF A01

Trials on a pursuit tracking test with simple position control and four reference inputs were carried out initially on ten male industrial employees aged between 40 and 65. Physiological parameters were also measured during testing, namely heart beat frequency, a measure of irregular heart beat and evoked potentials. Performance was evaluated in terms of the number of errors per unit time. Expected learning curves were produced, but during the adaptive tests the rate of learning increased with time. Runs of the same tests with the same physiological parameters being measured were then performed by a group of nine navy pilots aged 25 to 36, run I without alcohol, run II with 0.6 deg/infinity alcohol. They showed quicker adaptation and faster reactions than the older industrial subjects. The pulse rates of the pilots were higher than those of the group of older subjects. Both groups showed a drop in the evoked potentials during testing caused by tiredness. A lowering of vigilance level caused by small quantities of alcohol could be detected. J M S

**N79-14775#** Civil Aeromedical Inst, Oklahoma City, Okla  
**VISUAL PERFORMANCE ASSESSMENT THROUGH CLEAR AND SUNSCREEN-TREATED WINDOWS**

Kenneth W Welsh, Paul G Rasmussen, and John A Vaughan Aug 1978 16 p refs  
(AD-A059750, FAA-AM-78-28) Avail NTIS HC A02/MF A01 CSCL 01/3

Five combinations of external and internal brightness levels were used. Light transmission values through the clear, gold, silver, and bronze panels were 92, 20, 18, and 8 percent, respectively. Visual performance tests were conducted at 6 m (20 ft) on 12 subjects with normal visual acuity and color vision. Two tasks were conducted under brightness levels on the external display and in the subject's booth, respectively of 1.1, 5.1, 50.1, 5.5, and 50.5 fL. Visual acuity using Landolt C figures and scores on a contour identification task were minimally impaired for any luminance ratio when the clear (control) panel was used. With the sunscreen panels, scores on both tests decreased as a function of target brightness and panel density. With one external/internal luminance ratio (5:1), identification of signal light colors was generally impaired while viewing through sunscreen materials. Decreases were particularly evident for green

and red lights presented at intermediate and low intensity levels. Author

**N79-14776#** Oregon State Univ, Corvallis Dept of Industrial and General Engineering

**THE DEVELOPMENT AND EVALUATION OF OBJECTIVE FREQUENCY DOMAIN BASED PILOT PERFORMANCE MEASURES IN ASUPT Final Report, Mar 1977 - Feb 1978**

Edward D McDowell 30 Apr 1978 41 p refs  
(Grant AF-AFOSR-3294-77 AF Proj 2313)  
(AD-A059477, AFOSR-78-1239TR) Avail NTIS HC A03/MF A01 CSCL 05/9

To realize its full research potential a need exists for the development of an automated objective pilot performance evaluation system for use in the Advanced Simulator for Undergraduate Pilot Training (ASUPT) facility. The present report documents the approach taken for the development of frequency domain pilot control movement based measures and presents data collected from an evaluation study. The results indicate that frequency domain based measures of a pilot's control movements do discriminate between pilot experience levels. These finds are encouraging and demonstrate the potential of this approach for developing an automated objective pilot performance measurement system. Author (GRA)

**N79-14777#** Drexel Univ, Philadelphia, Pa  
**MECHANISMS OF ACTIVATED CARBON DEGRADATION BY PERSPIRATION Final Report, Jul 1976 - Jun 1978**

Louis L Pytlewski Jul 1977 19 p refs  
(Contract DAAA15-75-C-0195 DA Proj 1L7-62710-A-095)  
(AD-A059872, AD-E410057, DU-SW-4 ARCSL-CR-77035) Avail NTIS HC A02/MF A01 CSCL 15/2

These investigations covered two distinct subjects: activated charcoal degradation by perspiration and decomposition of chloramine B. Both untreated and treated activated charcoal samples were exposed to synthetic sweat solutions or aqueous solutions of individual components of synthetic sweat. Change in activated charcoal capacity was measured using carbon tetrachloride pick-up measured under static conditions. Gas chromatography was also used for dynamic measurements to determine if individual components could be ranked as to their poisoning effects. Neither static or dynamic tests uncovered any material which could be positively identified as causing capacity reduction. The studies showed that poisoning effects could be reduced by pretreating the charcoal with a pH 7 buffer or by coating the charcoal with hydrophobic substances. Thermal decomposition of chloramine B was studied in two temperature ranges: low (ambient to 100 C) and high (100 C to 185 C). In the low range, decomposition was determined to be the result of hydrolysis of the chloramine B salt. In the high range, decomposition was violent with the generation of a large amount of heat, characteristic of N-Cl compound decomposition. Author (GRA)

**N79-14778#** Wisconsin Univ - Madison  
**EFFECTS OF INFORMATION PROCESSING REQUIREMENTS ON REACTION TIME OF THE EYE**

Christine L Nelson, Robert M London, and Gordon H Robinson 1 Sep 1978 7 p refs  
Presented at the 22d Ann Meeting of the Human Factors Soc  
(Contracts N00014-75-C-0364, NR Proj 197-028)  
(AD-A060099, TR-78-10) Avail NTIS HC A02/MF A01 CSCL 05/2

This experiment measured eye reaction time as a function of presence or absence of a central control task, type of command and knowledge of target direction prior to command. It was found that eye reaction time was greater when a subject was involved in a central tracking task than when he was not, it was greater when the command was symbolic than when it was spatial, and it was longer when the target direction was unknown prior to command. These variables also interacted, so that the effect of unknown target direction was greater with a symbolic command. Results of this experiment also showed that subjects sometimes used an initial compensatory pattern of

eye-head movements There were large inter-subject differences but use of compensation generally increased with complexity of centrally located information which required processing It thus appears that reaction time of the eye responds to information processing variables in a manner similar to other motor response systems Author (GRA)

**N79-14779#** Aerospace Medical Research Labs Wright-Patterson AFB Ohio  
**REACH CAPABILITY OF MEN AND WOMEN A THREE-DIMENSIONAL ANALYSIS**  
 Kenneth W Kennedy Jul 1978 110 p refs  
 (AF Proj 7184)  
 (AD-A060312 AMRL-TR-77-50) Avail NTIS  
 HC A06/MF A01 CSCL 05/5

This report contains descriptions of the outer and inner boundaries of the 5th, 50th, and 95th percentile grasping-reach envelopes of men and of women The reach envelopes are intended to guide the placement of critical hand operated controls for the seated operating and working body positions The most important envelope is the 5th percentile, since it describes that past which 95 percent of the using population can reach Thus a controller located at the boundary of this envelope can be reached by an equivalent percentage of the male or female adult populations A critical review of previous investigations of arm reach and a description of the Aerospace Medical Research Laboratory's Grasping-Reach Measuring Device are presented The data-gathering procedures and the methods of analyses are included Applications of the data are also discussed Data are presented in both graphic and tabular form Vertical (X-Z) and (Y-Z) planes, and horizontal (X-Y) planes through the various percentile envelopes are presented GRA

**N79-14780#** Technology Inc San Antonio, Tex Life Sciences Div  
**ENGINEERING TEST AND EVALUATION DURING HIGH G VOLUME 2: ANTI-G VALVES Final Report, 1 Feb 1976 - 30 Sep 1976**  
 Roy W Thompson, Larry J Meeker Gary L Wilson, Arnold G Krueger, and Paul E Love Jun 1978 85 p ref  
 (Contract F41609-75-C-0026)  
 (AD-A059521, SAM-TR-78-11-Vol-2) Avail NTIS  
 HC A05/MF A01 CSCL 06/11

In this second volume of a three-volume study report, a protocol for testing anti-G valves is described and the test results from 6 specimens are reported The test items include 2 inservice USAF units 2 RAF units and 2 prototype experimental units (electronic and fluidic) A suggested standardized performance evaluation protocol for future applications is proposed Author (GRA)

**N79-14781#** National Technical Information Service, Springfield Va  
**HUMAN WORK MEASUREMENT. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Oct 1978**  
 Carolyn A Shonyo Nov 1978 175 p Supersedes NTIS/PS-77/1054, NTIS/PS-76/0945, NTIS/PS-75/797  
 (NTIS/PS-78/1197/9, NTIS/PS-77/1054, NTIS/PS-76/0945 NTIS/PS-75/797) Avail NTIS HC \$28 00/MF \$28 00 CSCL 05I

Reports dealing with measurement techniques of human work at jobs and tasks are summarized Specific topics included are work analysis and evaluation, workload management, operations analysis, task complexity and performance measurement This bibliography contains 168 abstracts GRA

**N79-14782\*#** Cornell Univ, Ithaca, N Y Lab for Planetary Studies  
**EXOBIOLGY AND THE ORIGIN OF LIFE Annual Status Report, 1 Oct 1977 - 30 Sep 1978**  
 Carl Sagan 1 Sep 1978 13 p refs  
 (Grant NGR-33-010-101)  
 (NASA-CR-157988) Avail NTIS HC A02/MF A01 CSCL 06C

Research supported wholly or in part by NASA is summarized, Topics covered include the molecular analysis of ultraviolet-photoproducted organic solids synthesized under simulated Jovian conditions, the molecular analysis of organic solids produced by electrical discharge in reducing atmospheres the organic chemistry of interstellar grains the spectra of possible organic solids present as aerosols in planetary atmospheres far infrared studies of organic polymers of possible astrophysical interest, organic dust synthesized in reducing environments by ultraviolet radiation or electric discharge the diffusion of galactic civilizations, eavesdropping on galactic civilizations Lander imaging as a detector of life on Mars, and continuing puzzles about Mars Bibliographic data is included for four additional publications not supported by NASA grant, but related to the objectives of the program A R H

**N79-14795#** Joint Publications Research Service, Arlington Va  
**DEVELOPMENT OF AEROSPACE-AVIATION EQUIPMENT DESCRIBED**  
 Buguslaw J Witowski *In its* Transl on Eastern Europe Sci Affairs No 614 (JPRS-72605) 12 Jan 1979 p 21-26 Transl into ENGLISH from Skrzydlata Polska (Warsaw), 12 Nov 1978 p 11  
 Avail NTIS HC A03/MF A01

A technology assessment of developments in aeronautical equipment is presented Two devices are described in detail The first is an electric taste meter which serves to determine the taste threshold of cosmonauts and flight personnel It expands the scope of scientific research work accomplishments The second is a cardiometer which serves to monitor the physical training of pilots and cosmonauts Advances in other areas are also briefly described, such as photographic reconnaissance equipment storage protective runway coatings and aircraft radio equipment S B S

**N79-14989#** Joint Publications Research Service, Arlington, Va  
**INFORMATION-HANDLING CAPACITY OF A HUMAN OPERATOR IN DETECTION OF SIGNALS AGAINST A NOISY BACKGROUND**  
 N M Novikova *In its* Transl on USSR Sci and Technol Phys Sci and Technol No 58 (JPRS-72625) 16 Jan 1979 p 21-24 refs Transl into ENGLISH from Izv Vyssh Ucheb Zaved, Radioelektron (Moscow) no 9, 1978 p 97-99

Copyright Avail NTIS HC A05/MF A01

Analysis of the information handling capacity of multifunction radar stations indicates that one of the main bottlenecks in handling and analysis of information is the human operator In order to increase his information handling capacity and reliability it is necessary to investigate his time characteristics (the time for detection of a signal by the human operator as a function of the signal brightness) under conditions where time is short Two series of experiments were conducted In the first series, detection time was determined in the absence of noise In the second series, detection time was determined in the presence of random pulses G Y

**N79-15551#** Bureau of Radiological Health, Rockville, Md  
**THE PHYSICAL BASIS OF ELECTROMAGNETIC INTERACTIONS WITH BIOLOGICAL SYSTEMS**  
 Leonard S Taylor, ed (Maryland Univ, College Park) and Augustine Y Cheung ed (Maryland Univ, College Park) Apr 1978 403 p refs Workshop held at College Park Md, 15-17 Jun 1977, sponsored in part by ONR and Naval Med Res and Develop Command  
 (HEW-Pub-FDA-78-8055) Avail NTIS HC A18/MF A01  
 Microwave effects upon living organisms are studied by the biophysical aspects of electromagnetic field interactions with biological systems

**N79-15552#** Virginia Commonwealth Univ Richmond Dept of Biophysics

**SURVEY OF MICROWAVE AND RADIOFREQUENCY BIOLOGICAL EFFECTS AND MECHANISMS**

S F Cleary *In Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 1-33 refs*

Avail NTIS HC A18/MF A01

Representative works from the recent literature are reviewed to define the nature of the biological effects of microwave and radiofrequency exposure and the proposed basic physical interaction mechanisms. The results of studies of neuroendocrine alterations, hematopoietic effects and effects on neural systems are considered. It is suggested that biomembranes may be the primary site for microwave and radiofrequency alterations and that the most likely interaction mechanism appears to involve macromolecular ensembles stabilized by long-range systems of weak time-varying cooperative interactions. Author

**N79-15553#** Veterans Administration Hospital Little Rock Ark **MOLECULAR ABSORPTION OF NON-IONIZING RADIATION IN BIOLOGICAL SYSTEMS**

Karl David Straub *In Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 35-42 refs Prepared in cooperation with Arkansas Univ for Med Sci Little Rock*

Avail NTIS HC A18/MF A01

The absorption of EM radiation is determined by the bulk dielectric properties of living tissues, cells and biomolecules in solution. Among many possible examples the following five are given: (1) The network of membranous lipid-containing structures within and at the outside limit of cells poses a series of barriers to thermalization of the absorbed radiation; (2) subsequent temperature elevation may cause membrane structures or complex protein assemblies to pass through phase transitions altering their properties; (3) spatial anisotropy in the arrangement of large molecular assemblies results in specialized functions which can be completely changed if some of the molecules are rotated or translated by EM radiation; (4) quantum effects such as proton tunneling with resulting isomerization of DNA base pairs may also be influenced by EM radiation; and (5) otherwise random motion of gates in excitable channels of nerve membranes may be brought into forced oscillation by EM radiation with resultant membrane depolarization. G G

**N79-15554#** Tufts Univ Medford Mass Dept of Chemistry

**MILLIMETER WAVE AND FAR INFRARED ABSORPTION IN BIOLOGICAL SYSTEMS**

K H Illinger *In Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 43-66 refs*

Avail NTIS HC A18/MF A01

The hierarchy of interactions of millimeter wave and far infrared radiation with biological systems is surveyed. The significance of existing experimental data and theory is summarized and problems and applications discussed. Author

**N79-15555#** California Univ Los Angeles Dept of Anatomy and Brain Research Inst

**POSSIBLE MECHANISMS OF WEAK ELECTROMAGNETIC FIELD COUPLING IN BRAIN TISSUE**

S M Bawin, A Sheppard and W R Adey *In Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 75-90 refs Submitted for publication*

(Contracts F44620-70-C-0017 N00014-A-200-4037 Grants FD-67801 NSF GB-27740)

Avail NTIS HC A18/MF A01

Anionic binding sites on cell surface macromolecules were observed for a series of amplitude and frequency windows that strongly suggest resonant interactions based on long range order ELF fields between 6 and 20 Hz reduced Ca-45(2+) efflux from chick and cat forebrain tissue by about 15% with a maximum effect for fields in air at 10 and 56 V/m. Isolated chick cerebral

tissue was also exposed to a 147 MHz field 0.8 mW/2 cu cm and amplitude modulated at frequencies from 0.5 to 35 Hz. There was a frequency window for increased efflux (15%) at modulating frequencies from 9 to 20 Hz and a window in incident field strength for increased Ca-45(2+) efflux only between 0.1 and 1.0 mW/cu cm. It is assumed that membrane surface charge sites behave coherently over a considerable area, and that a coherent patch may be triggered to change state by a very weak trigger at one point. G G

**N79-15556#** Pennsylvania Univ Philadelphia Dept of Bioengineering

**CLASSICAL THEORY OF MICROWAVE INTERACTIONS WITH BIOLOGICAL SYSTEMS**

H P Schwan *In Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 91-112 refs*

Avail NTIS HC A18/MF A01

The established mechanisms responsible for the interaction of microwaves and other electrical fields with biological systems are surveyed. Foremost is the heat development which results from the absorption of microwaves. The relative contribution to this heat development caused by the various tissue constituents including ions, water, biopolymers, bound water and lipids are discussed. Direct field interactions with various biocomponents are also considered. These include membrane interactions, biopolymer interactions, interactions with biological fluids and field-generated forces acting on biological particles and cells. These forces are frequently neglected in discussions and yet pertain to a large number of published observations. Author

**N79-15557#** Queen Elizabeth Coll London (England) Dept of Physics

**DETERMINATION OF BOUND WATER IN BIOLOGICAL MATERIALS FROM DIELECTRIC MEASUREMENTS**

G H Grant *In Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 113-120 refs*

Avail NTIS HC A18/MF A01

For aqueous biological materials variations in permittivity occurring between 100-1000 MHz are principally due to the water of hydration and the hydration of such materials can be determined by measurement of the dielectric permittivity. Measurements of the static permittivity and the relaxation time can be used to predict the absorption of microwave energy by a hydrated biological macromolecule based on a suitable model. Using a spherical shell model for the macromolecule and the experimentally determined permittivities and conductivities the variation of specific energy absorption as a function of frequency was calculated. It is shown that in a certain frequency region the absorption is much greater for bound water than for free water. G G

**N79-15558#** Miami Univ Coral Gables Fla Lab for Quantitative Biology and Lab for Water Research

**INTERFACIAL AND INTRACELLULAR WATER EXPECTED ANOMALIES IN DIELECTRIC PROPERTIES**

James S Clegg and W Drost-Hansen *In Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 121-131 refs*

(Grant NSF PCM-76-24037)

Avail NTIS HC A18/MF A01

Evidence is provided that water adjacent to surfaces in inanimate systems differs markedly in its properties from ordinary bulk water. Calculations of the amount of intracellular surface area (rat liver cells) strongly suggest that a large fraction of intracellular water should be so perturbed by proximity to various ultrastructural surfaces. Such vicinal water plays an important role in the interactions of biological systems with electromagnetic radiation, particularly in the microwave region. G G

**N79-15559#** Purdue Univ Lafayette Ind Dept of Physics **MICROWAVE FREQUENCIES AND THE STRUCTURE OF THE DOUBLE HELIX**

E W Prohovsky *In* Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 133-144 refs

(Grant NSF DMR-74-14367)  
Avail NTIS HC A18/MF A01

The vibrational modes of homopolymer DNA double helices are calculated. These calculations were refined by comparison with IR and Raman observation from 1200  $\text{cm}^{-1}$  to about 200  $\text{cm}^{-1}$ . The agreement is reasonably good. These calculations also indicate the existence of a number of bands within the microwave region of the spectrum. It is possible to use these calculations to predict absorption. Low lying vibrational modes are also of importance in predicting conformation or shape changes in macromolecules. G G

**N79-15561#** Washington Univ Seattle Bioelectromagnetics Research Lab

**MICROWAVE AND RF DOSIMETRY**

Chung-Kwang Chou and Arthur W Guy *In* Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 165-216 refs

(Contract F41609-76-C-0032 Grants FD-00646 GM-05681 RSA-16-P-56818)

Avail NTIS HC A18/MF A01

Factors which determine the microwave and RF power absorption in tissues are pointed out to emphasize the complexity of the microwave and RF dosimetry. Quantification of power absorption is therefore necessary for any meaningful research results. Current available instrumentations and techniques for measuring microwave and RF field intensity in air and specific absorption rates in tissues are summarized. Applications of dosimetric techniques in assessing power absorption in animals or human models and in establishing threshold for observed biologic effects are elaborated. Author

**N79-15562#** Maryland Univ College Park Inst for Physical Science and Technology

**ELECTRIC FIELD MEASUREMENTS WITHIN BIOLOGICAL MEDIA**

A Y Cheung *In* Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 217-242 refs

Avail NTIS HC A18/MF A01

A miniature isotropic electric field probe for implantation electric field measurements within biological tissues is discussed. An analysis employing a transmission line model of a buried antenna as well as insulated dipoles was performed over the 0.9 to 10 GHz range. The antenna impedance modification due to interaction with the surrounding media was computed for a wide range of dielectric parameters typical of various biological materials over a range of ambient temperatures. It was demonstrated analytically and experimentally that for deep implantation in muscle, very little change in probe response occurs with respect to the free space response of the probe over the frequency range of 0.915 GHz to 2.45 GHz. In very close proximity to the muscle-fat or even the muscle-air boundary, no observable change occurs in probe response due to dipole impedance variations. G G

**N79-15563#** Utah Univ Salt Lake City Dept of Electrical Engineering and Bioengineering

**SOME RECENT RESULTS ON THE DEPOSITION OF ELECTROMAGNETIC ENERGY IN ANIMALS AND MODELS OF MAN**

O P Gandhi and M J Hagmann *In* Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 243-259 refs

Avail NTIS HC A18/MF A01

A realistic human model and improved numerical methods were used for calculating the deposition of electromagnetic energy. Both, the average absorption and the distribution of absorbed energy within the model, are in good agreement with experimental measurements made using phantom models. The distribution

of absorbed energy is frequency-dependent and may be explained in terms of resonance of the various body parts. Numerical solutions for man near a ground plane and near reflectors are presented for the first time. At 10 MHz the specific absorption rate (SAR) of man standing on a ground plane is about seven times that for man in free space. Multibody effects were predicted from antenna theory and observed with experiments using anesthetized rats. For two resonant targets separated by  $0.65 \lambda$  an increased SAR 170 percent of the free-space value, was observed. G G

**N79-15567#** Massachusetts Inst of Tech Cambridge Dept of Physics and Research Lab of Electronics

**MICROWAVE THERMOGRAPHY PHYSICAL PRINCIPLES AND DIAGNOSTIC APPLICATIONS**

Philip C Myers and Alan H Barrett *In* Bur of Radiological Health The Phys Basis of Electromagnetic Interactions with Biol Systems Apr 1978 p 309-325 refs

(Grant GM-20370-04)

Avail NTIS HC A18/MF A01

The application of microwave radiometry to the mapping of microwave emission from human tissue is detailed. The relative transparency of human tissue at microwave frequencies permits sensing of the average temperature within a volume extending to depths of one to five cm depending on frequency and tissue type. Receiver temperature sensitivity is of order 0.1 C. Lateral resolution is of order 1  $\text{cm}^2$  and depends on depth, frequency, and antenna aperture size. Frequency-dependent tradeoffs exist between lateral resolution and depth resolution and between temperature sensitivity and depth resolution. Potential applications in diagnostic medicine include detection of cancerous tumors, peripheral vascular disease, incipient strokes, and local inflammations. Clinical trials of application to breast cancer detection indicate true-positive and true-negative rates of about 70% which are comparable to the rates for infrared thermography. G G

**N79-15570#** Rosenstiel School of Marine and Atmospheric Sciences, Miami Fla Div of Biology and Living Resources **NITROGEN FIXATION WITH PHOTOSYNTHETIC MARINE MICROORGANISMS** Progress Report, 15 Feb - 30 Dec 1977

Akira Mitsui Dec 1977 27 p

(Grants NSF AER-76-17159 NSF PFR-76-17159)

(PB-286000/5 NSF/RA-770642)

Avail NTIS

HC A03/MF A01 CSCL 02C

Research into the marine environment to find and develop photosynthetic nitrogen fixing processes capable of providing food and/or fertilizer without the expenditure of non-renewable resources is reported. A great number of pure strains of nitrogen fixing algae were established. Feeding experiments using an aquaculture species of shrimp and food value analysis of blue-green algae were begun, as was a detailed study of acetylene reduction characteristics of certain fast-growing strains. Growth and mortality ratios under differing concentrations of algae were also being examined. GRA

**N79-15571#** California Univ Davis

**ENHANCING BIOLOGICAL PRODUCTION OF AMMONIA FROM ATMOSPHERIC NITROGEN AND SOIL NITRATE** Annual Report

James M Lyons Jun 1978 69 p refs

(Grant NSF AER-77-07301)

(PB-286515/2, NSF/RA-780161)

Avail NTIS

HC A04/MF A01 CSCL 02A

Five significant contributions to an understanding of the genetic control of  $\text{N}_2$  fixation and photosynthesis are reported: (1) an estimate of the energy cost to Rhizobium for fixing  $\text{N}_2$  obtained by using genetically altered free-living cultures of  $\text{N}_2$ -fixing bacteria; (2) the first report of regulation of an enzyme system (hydrogenase) which takes up  $\text{H}_2$  in free-living  $\text{N}_2$ -fixing Rhizobium; (3) the first report of catalytic mutants in ribulose biphosphate carboxylase, the primary enzyme responsible for photosynthetic  $\text{CO}_2$  reduction; (4) the first report of a soybean plant which continues to photosynthesize and to fix  $\text{N}_2$  during and after seed pod development; and (5) the first report of genetically altering the host specificity of Rhizobium bacteria. GRA

**N79-15572#** Vermont Univ Burlington Water Resources Research Center

**DETERMINATION OF THE SECONDARY PRODUCTION AND POPULATION DYNAMICS OF THE ZOOPLANKTON OF THE LAKE CHAMPLAIN ECOSYSTEM Final Report, Jul 1976 - Sep 1977**

Robert Keen (Mich Tech Univ Houghton) and Milton Potash Jun 1978 80 p refs  
(Contract DI-14-34-0001-7096, OWRT Proj A-028-VT(1))  
(PB-286094/8 W78-11376) Avail NTIS HC A05/MF A01 CSCL 08H

The main basin of the lake was sampled intensely July 1976-August 1977 Four other different water masses of the lake were sampled less intensely to provide a picture of the zooplankton of the whole lake In general the species present in the main lake were characteristics of deep, oligotrophic lakes Population densities were maximal in the summer months at about 17 000 per cubic meter and lower than this in the spring and fall Series of samples to study daily vertical migration showed copepods and Mysis to be following the classic pattern Daphnia did not show a strong migration The two species of Bosmina were separated vertically in the water column GRA

**N79-15573#** Environmental Monitoring and Support Lab, Las Vegas Nev

**DISTRIBUTION OF PHYTOPLANKTON IN NORTH CAROLINA LAKES Progress Report, 7 Mar - 14 Nov 1973**

M K Morris, L R Williams, W S Taylor, F A Hiatt, and S C Hern May 1978 81 p refs Prepared in cooperation with Nevada Univ, Las Vegas

(PB-286387/6, EPA-600/3-78-051) Avail NTIS HC A05/MF A01 CSCL 08H

A data report is given presenting the species and abundance of phytoplankton in the 16 lakes sampled by the National Eutrophication Survey in the state of North Carolina Results from the calculation of several water quality indices are also included (Nyggaard's Trophic State Index Palmer's Organic Index, and species diversity and abundance indices) The collection and analysis of phytoplankton data were included in the Survey in an effort to determine relationships between algal characteristics and trophic status of individual lakes GRA

**N79-15575#** Western Kentucky Univ Bowling Green Biophysics Lab

**WAVELENGTH DEPENDENCE OF ULTRAVIOLET-ENHANCED REACTIVATION AND INDUCTION OF MAMMALIAN VIRUSES**

Thomas P Coohill Mar 1978 28 p refs Sponsored in part by WHO  
(Contract FDA-223-74-6067)

(HEW-PUB-FDA-78-8059) Avail NTIS HC A03/MF A01

It was determined that radiation of wavelength 260 nm is the most effective in reducing the ability (capacity) of a mammalian cell (CV-1) to support the growth of the virus herpes simplex An action spectrum for this effect in the ultraviolet (UV) radiation range 235 nm to 302 nm closely resembles the absorption spectrum for nucleic acid These data point to DNA as the target molecule for UV radiation effects on cellular capacity An action spectrum was also completed for radiation-enhanced reactivity over a similar wavelength region in the same system Data on the radiation of simian virus 40 from transformed BHK cells are presented Radiation of wavelength 260 nm or 280 nm is more effective in activating this virus than radiation of wavelengths 240 nm and 297 nm These first results indicate that nucleic acid and/or proteins are the major macromolecules involved in this effect Author

**N79-15576\*#** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

**IMPROVED SUBCUTANEOUS ELECTRODE STRUCTURE Patent Application**

Gordon F Lund inventor (to NASA) (NAC-NRC) Filed 16 Jan 1979 16 p Sponsored by NASA  
(NASA-Case-ARC-11117-1, US-Patent-Appl-SN-003693) Avail NTIS HC A02/MF A01 CSCL 06B

The invention relates in general to a subcutaneous electrode structure useful as a chronic implant for taking electrocardiograms of active animals The electrode comprises a thin inflexible smooth disc of stainless steel having a diameter as of 5 to 30 millimeters which is sutured in place to the tissue of the animal being monitored by means of a plurality of sutures passing through suture holes in the periphery of the disc An electrical connection is made to the disc by means of a flexible lead wire that extends longitudinally of radially directed slot in the disc and held there at the terminal end by means of a spotwelded tab An electrically insulative sleeve, such as silicon rubber, is placed over the wire The wire with the sleeve is captured in the plane of the disc and within the slot by means of crimping tabs extending laterally across the slot and over the insulated wire NASA

**N79-15577#** Civil Aeromedical Inst, Oklahoma City Okla  
**ASSESSMENT OF FACTORS POSSIBLY CONTRIBUTING TO THE SUSCEPTIBILITY OF SICKLE TRAIT ERYTHROCYTES TO MILD HYPOXIA VOLUME 1 DESIGN CONSIDERATIONS AND RESEARCH PROTOCOL**

Jess M McKenzie Aug 1978 10 p refs  
(AD-A059412 FAA-AM-78-30-Vol-1) Avail NTIS HC A02/MF A01 CSCL 06/5

The evidence for mixed dominance of the Hbs(beta) gene in people with the sickle cell trait is studied These individuals whose erythrocytes contain a mixture of hemoglobins (HbA/HbS), are healthy and have a normal life expectancy They are tolerant to moderate altitudes, their erythrocytes become sickled only at oxygen tensions that are hazardous to any person However, there is a possibility that other debilitating factors (e g alcoholism pulmonary disorders) can produce an abnormal susceptibility to hypoxia Those so debilitated are not medically qualified to serve as aircrew members An experimental plan is outlined for estimating the proportion of such individuals in a population of young people with the sickle trait G G

**N79-15578#** Royal Aircraft Establishment, Farnborough (England)

**THE INFLUENCE OF MECHANICAL VIBRATION AND NOISE ON THE PERIPHERAL BLOOD CIRCULATION AT SKIN LEVEL**

H Dupuis and A Weichenrieder Jun 1978 12 p refs Transl into ENGLISH of conf paper from Max-Planck-Inst fuer Landarbeit und Landtechnik Bad Kreuznach, West Germany Presented at the 17th Ann Conf of the Deut Ges fuer Arbeitsmed e V Kiel 5-7 May 1977

(RAE-Lib-Trans-1980, BR66064) Avail NTIS HC A02/MF A01

Ten male test subjects (average age 24.9 years) were subjected to fifteen test variations in a vibration and noise simulator under laboratory conditions These variations consisted of a test at rest (null test) a noise test (100 db(A) of white noise) a static test (grip and pressure from the right hand to produce 25 N) eight vibration tests (various frequencies accelerations and arm positions) with static applications of grip and pressure to produce 25 N and four combined noise and vibration tests (100 db(A) and vibratory stress at various frequencies) The results show that vascular constrictions are a more noticeable effect of noise but static hand force and mechanical vibrations mainly will cause a drop in skin temperature Even a short period of time these forms of stress can lead to peripheral vegetative incapacities G Y

**N79-15579#** Monsanto Research Corp Dayton Ohio  
**PHYSICAL TESTING OF POLYMERS USE IN CIRCULATORY ASSIST DEVICES Annual Report, 1 Sep 1977 - 31 May 1978**

Carl R McMillin Jun 1978 77 p refs  
(Contract N01-HV-7-2918)  
(PB-286129/2 MRC-DA-787 AR-1) Avail NTIS HC A05/MF A01 CSCL 06L

Two lots of polyhexene rubber were received It was found that this material is slightly crystalline with a crystalline melting point of 49C The differential scanning calorimeter shows that as the samples were heated from a low temperature they began to crystallize around room temperature reaching a maximum rate

of crystallization just below its melting point of 49C When the Goodyear polyhexene rubber, with its carbon black filler, is strained in (250%) a cyclic manner the elastic modulus of the second cycle is about 20% of the first cycle modulus GRA

**N79-15580#** Office of Technology Assessment Washington D C  
**ASSESSING THE EFFICACY AND SAFETY OF MEDICAL TECHNOLOGIES**

Sep 1978 135 p refs  
 (PB-286929/5, OTA-H-75, LC-78-600117) Avail NTIS HC A07/MF A01 CSCL 06E

Opportunities for assessment focused on the societal impacts of medical technologies Policy implications of the computed tomography scanner examined the development diffusion use and reimbursement of CT scanners The importance and current status of information on efficacy and safety as well as techniques and programs for generating that information are developed GRA

**N79-15581#** Mayo Foundation Rochester Minn  
**DEVELOPMENT OF HIGH-RESOLUTION ULTRASONIC IMAGING TECHNIQUES FOR DETECTION AND CLINICAL ASSESSMENT OF CARDIOVASCULAR DISEASE**  
**Annual Report, Sep 1977 - 30 Jun 1978**

Titus C Evans Jr, Philip S Green James F Greenleaf and S David Ramsey Jr Jun 1978 46 p Prepared in cooperation with SRI Intern Menlo Park, Calif  
 (Contract N01-HV-7-2928-1)  
 (PB-286696/0, NIH/NHLBI-N01/HV-7-2928-1) Avail NTIS HC A03/MF A01 CSCL 06B

Ultrasound instrumentation and methods for the detection and assessment of atherosclerosis in carotid and femoral arteries of living patients, thereby avoiding the pain, risk and associated drawbacks of angiography were developed and tested Testing of equipment and methods involved laboratory and clinical studies A comparison with double-blind, lesion-by-lesion analysis was found to be necessary and is in progress Significant improvement in the ease of using the clinical instrument in B-scan resolution and in the signal-to-noise ratio of the Doppler system were achieved Digital signal processing is being prepared for use in signal analysis and interpretation Improved B-scan and Doppler electronics are being developed GRA

**N79-15582#** Cincinnati Univ Ohio Coll of Medicine  
**DEVELOPMENT AND EVALUATION OF INSTRUMENT SYSTEMS FOR NONINVASIVE DETECTION, CHARACTERIZATION AND QUANTIFICATION OF ATHEROSCLEROTIC LESIONS**  
**Annual Report, 2 Sep 1977 - 15 Jun 1978**

C P Olinger A K Nigam, J F Wasserman, and J VanderBel-Kahn 15 Jun 1978 54 p refs Prepared in cooperation with Horizons Res Labs, Inc Ft Lauderdale, Fla  
 (Contract N01-HV-7-2924)  
 (PB-286851/1 NIH-N01-7-2924-1) Avail NTIS HC A04/MF A01 CSCL 06E

Advanced noninvasive pulse-echo ultrasound techniques were studied for detecting the presence the extent and the nature of atherosclerosis in living patients A high resolution, large dynamic range, real-time ultrasound imaging equipment was built and iteratively modified to provide the optimum in-vivo plaque images The equipment is also interfaced with ancillary devices capable of general purpose off-line computational analysis for the characterization of the plaque from the echo data Angiographic-pathologic techniques have also been refined to permit a 1-to-1 correlation with the ultrasound imaging and characterization results Both symptomatic and asymptomatic patients were examined and a total of over 200 cases documented GRA

**N79-15583#** National Aviation Facilities Experimental Center Atlantic City N J  
**RNAV PROCEDURAL TURN ANTICIPATION TECHNIQUES EXPERIMENT NO 2, GAT-2A PHASE 3 2 AND 4 NMI OFFSET TRACKING PROCEDURES**  
**Interim Report, Jul - Sep 1977**

Bernard Goldberg and Donald Eldredge Sep 1978 75 p

(FAA Proj 044-326-340)  
 (AD-A060501 FAA-NA-78-34 FAA-RD-78-110) Avail NTIS HC A04/MF A01 CSCL 05/9

The last of a series of interim and data reports dealing with offsets and turn anticipation techniques using a single waypoint analog RNAV (area navigation) system and a noncentered needle CDI (course deviation indicator) instrument is reported Eight instrument rated pilots participated in a series of flight simulation tests employing pilot techniques which were conducted in order to measure total systems crosstrack (TSCT) and flight technical error (FTE) as well as operational pilot performance The tests were designed to assess pilot performance for (1) anticipation of turns while maintaining a desired offset and (2) steady state parallel offset tracking proficiency Performance was measured on these variables horizontal tracking, airspeed control, and procedural performance G Y

**N79-15584#** Navy Personnel Research and Development Center San Diego Calif  
**RELATING PERFORMANCE IN BASIC ELECTRICITY AND ELECTRONICS AND A SCHOOLS**  
**Technical Report, Jun 1976 - May 1977**

Jane Sachar Macy L Abrams and Christine Buckley Oct 1978 62 p refs  
 (ZF5522002)  
 (AD-A060914 NPRDC-TR-79-2) Avail NTIS HC A04/MF A01 CSCL 05/9

Relationships found between BE/E and A' school performance were used (1) to determine the feasibility of applying lower mastery standards for different ratings without significantly affecting follow-on school success, and (2) to develop criteria for reassigning a student early to a class A' school on the basis of his early BE/E performance Few differences were found on BE/E modules between successful and failing class A school students Reassigning students to alternative class 'A' schools using the models in this study were not very accurate in predicting performance and less so in predicting attrition It was recommended that students be permitted through BE/E with lower mastery standards on an experimental basis and that some students omit BE/E entirely to determine whether and to what extent BE/E is a prerequisite to the follow-on school

Author (GRA)

**N79-15585#** Naval Aerospace Medical Inst, Pensacola Fla  
**HUMAN PERFORMANCE IN CONCURRENT VERBAL AND TRACKING TASKS**  
**A REVIEW OF THE LITERATURE**  
**Interim Report, 1967 - 1977**

Steven D Harris Jul 1978 13 p refs  
 (ZF51524004)  
 (AD-A060493, NAMRL-SR-78-2) Avail NTIS HC A02/MF A01 CSCL 05/10

The development of voice interactive computer systems (VIS) for the control of on-board aircraft systems is expected to result in reduced operator work-load and increased effectiveness of naval aviation crews A data base is needed to provide answers to human factors engineering questions arising from this development The research reported in sixteen major scientific journals, as well as in Psychological Abstracts, for the interval 1967-1977 inclusive was examined for reports of investigations of human performance in concurrent verbal and continuous manual control tasks A few readily available technical reports were also examined Adequate experimental data are not available to form a data base to support human factors requirements of the VIS development A comprehensive research program is needed to determine the extent of human operator performance capabilities in timeshared verbal and manual control tasks

Author (GRA)

**N79-15586#** Aerospace Medical Research Labs, Wright-Patterson AFB Ohio  
**THE BEHAVIOR OF OBSERVERS IN DETECTING UNBRIEFED TARGETS AT DIFFERENT AIRCRAFT SPEEDS WITH SIDE-LOOKING RADAR**  
**Technical Report, 10 Nov 1964 - 10 Nov 1977**

Herschel C Self Jun 1978 103 p refs  
 (AD A060909, AMRL-TR-77-95) Avail NTIS

HC A06/MF A01 CSCL 05/9

The numerous false positives found in SLR studies with unbriefed targets pose a severe problem for operational systems. The present study examines this problem and derives mathematical equations for describing observer behavior. Twenty USAF Radar Observers were trained and tested on side-looking radar. They searched for unbriefed airfields, industrial sites, railroad yards and tank farms at simulated aircraft speeds of 700-2110 knots. A data camera photographed every object on the display designated as a target. Tripling aircraft speed reduced target detections by only 17% while reducing reaction time by 56%. The high percentage of false positives was found to be due to the similarity of the radar signatures of targets and non-target objects. The false positive problem was shown to not be solvable by (1) Better selection and/or training of observers, (2) Use of the expressed confidence in response correctness of observers or (3) Use of teams of independently-working observers. The relationships between measures of performance were examined in detail. Selection of superior observers was found to be complicated by the conflicting behavioral requirements of different performance measures. Author (GRA)

**N79-15587#** Massachusetts Inst of Tech, Cambridge Dept of Psychology  
**EXPERIMENTS IN TEXTURE PERCEPTION Final Report**  
 Whitman A Richards Jan 1978 121 p refs  
 (Contract F44620-74-C-0076 ARPA Order 2765)  
 (AD-A059630, AFOSR-78-1165TR) Avail NTIS  
 HC A06/MF A01 CSCL 06/16

The human visual system appears to process spatial frequency information by filtering operations similar to that performed in color vision. In the more general case textures will have luminance distributions varying in two dimensions (i.e. in both X and Y). If a two-dimensional texture is created with orthogonal luminance profiles (whereby the axis orientations of X and Y are 90 degrees apart) then the X and Y profiles are independent and four spatial frequencies will be needed for X and four for Y. The most general case of texture equivalence, where many orientations are present in a texture, has not yet been solved. Preliminary experiments show that orientation equivalence can be attained by utilizing only four independent orientations. This constraint suggests an upper bound of sixteen on the number of fixed spatial frequencies required to create an equivalence to any two-dimensional texture pattern. These limitations of human visual processing suggest that data transmission rates of textural information can be greatly compressed. G G

**N79-15588#** National Aeronautics and Space Administration  
 Ames Research Center, Moffett Field, Calif  
**THE 14TH ANNUAL CONFERENCE ON MANUAL CONTROL**  
 Nov 1978 692 p refs Conf held at Univ of Southern Calif  
 Los Angeles, 25-27 Apr 1978  
 (NASA-CP-2060 A-7615) Avail NTIS HC A99/MF A01 CSCL  
 05H

Human operator dynamics during actual manual control or while monitoring the automatic control systems involved in air-to-air tracking, automobile driving, the operator of undersea vehicles and remote handling are examined. Optimal control models and the use of mathematical theory in representing man behavior in complex man machine system tasks are discussed with emphasis on eye/head tracking and scanning, perception and attention allocation, decision making and motion simulation and effects.

**N79-15589#** Illinois Univ at Chicago Circle Chicago Coll of Engineering  
**DIRECTIONAL ERRORS OF MOVEMENTS AND THEIR CORRECTION IN A DISCRETE TRACKING TASK**  
 Robert J Jaeger, Gyan C Agarwal, and Gerald L Gottlieb /in  
 NASA Ames Res Center The 14th Ann Conf on Manual Control  
 Nov 1978 p 3-18 refs Prepared in cooperation with Rush Med Center Chicago

(Grants NSF ENG-76-08754, NS-00196 NS-12877

AA-02156)

Avail NTIS HC A99/MF A01 CSCL 05H

Subjects can correct their own errors of movement more quickly than they can react to external stimuli by using three general categories of feedback: (1) knowledge of results, primarily visually mediated; (2) proprioceptive or kinaesthetic such as from muscle spindles and joint receptors; and (3) corollary discharge or efference copy within the central nervous system. The effects of these feedbacks on simple reaction time, choice reaction time, and error correction time were studied in four normal human subjects. The movement used was plantarflexion and dorsiflexion of the ankle joint. The feedback loops were modified, by changing the sign of the visual display to alter the subject's perception of results, and by applying vibration at 100 Hz simultaneously to both the agonist and antagonist muscles of the ankle joint. The central processing was interfered with when the subjects were given moderate doses of alcohol (blood alcohol concentration levels of up to 0.07%). Vibration and alcohol increase both the simple and choice reaction times but not the error correction time. A R H

**N79-15590#** Tokyo Univ (Japan) Dept of Aeronautics  
**A STUDY OF THE EFFECT OF FORCING FUNCTION CHARACTERISTICS ON HUMAN OPERATOR DYNAMICS IN MANUAL CONTROL**

Kyuichiro Washizu, Keiji Tanaka, and Tatsuo Osawa /in NASA Ames Res Center The 14th Ann Conf on Manual Control  
 Nov 1978 p 19-32 refs Prepared in cooperation with Natl Aerospace Lab Tokyo

Avail NTIS HC A99/MF A01 CSCL 05H

The effect of the spectrum of the forcing function on the human pilot dynamics in manual control was investigated. A simple compensatory tracking experiment was conducted where the controlled element was of a second-order dynamics and the forcing function was a random noise having a dominant frequency. The dominant frequency and the power of the forcing function were two variable parameters during the experiment. The results show that the human pilot describing functions are dependent not only on the dynamics of the controlled element but also on the characteristics of the forcing function. This suggests that the human pilot behavior should be expressed by the transfer function taking into consideration his ability to sense and predict the forcing function. A R H

**N79-15591#** California Univ Berkeley Dept of Mechanical Engineering

**AN EXTENSION OF THE QUICKENED DISPLAY FOR MANUAL CONTROL**

Masayoshi Tomizuka and Wai Ming Tam /in NASA Ames Res Center The 14th Ann Conf on Manual Control  
 Nov 1978 p 33-43 refs

Avail NTIS HC A99/MF A01 CSCL 05H

It is very difficult (or even impossible) for a human to control plants of third order or more with little or no damping by just knowing the instantaneous error. It has been shown that adding first and/or higher order derivatives to the error signal and displaying the combined signal are effective in facilitating human control over such plants. This signal quickening technique by Birmingham and Taylor is further extended to incorporate the future trajectory variation into the displayed signal so as to minimize the tracking error. A method for tuning free parameters in ordinary and extended quickening is established by applying discrete-time optimal control. Experimental results for a triple integrator plant indicate the effectiveness of the proposed method to achieve high quality tracking. A R H

**N79-15592#** Connecticut Univ Storrs Dept of Electrical Engineering and Computer Science

**EFFECTS OF UNCERTAINTY ON MANUAL TRACKING PERFORMANCE**

Arye R Ephrath and Barbara Chernoff /in NASA Ames Res Center The 14th Ann Conf on Manual Control  
 Nov 1978 p 45-53 refs

Avail NTIS HC A99/MF A01 CSCL 05H

Transient phenomena and target acquisition modes associated with interrupted observations during ground-to-air AA tracking were investigated. Using a two-axis control stick the subjects tracked a computer-generated airplane image on a CRT display. The airplane image executed a low-level straight pass. At certain pseudo-random times during each 25-second run the screen was blanked for a period of one second. When the target image reappeared, the subjects reacquired it and continued tracking, attempting to minimize vector RMS error for the entire run (including the blanked period). The results reveal an increase both in tracking error and in error variance during the blanked period only when the target disappears while in the crossover region. Blanking at other times effected increased variance but had no effect on the mean error. A blanking period just before crossover produced an increase lag while a blanking just after crossover resulted in a lead and thus made the error curve more symmetric. A R H

**N79-15593\*** Connecticut Univ Storrs Dept of Electrical Engineering and Computer Science  
**MODELING THE EFFECTS OF HIGH-G STRESS ON PILOTS IN A TRACKING TASK**

Jonathan Korn and David L Kleinman /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 55-62 refs

Avail NTIS HC A99/MF A01 CSCL 05H

Air-to-air tracking experiments were conducted at the Aerospace Medical Research Laboratories using both fixed and moving base dynamic environment simulators. The obtained data which includes longitudinal error of a simulated air-to-air tracking task as well as other auxiliary variables was analyzed using an ensemble averaging method. In conjunction with these experiments, the optimal control model is applied to model a human operator under high-G stress. Author

**N79-15594\*** Systems Research Labs Inc, Dayton Ohio  
**AAA GUNNERMODEL BASED ON OBSERVER THEORY**  
R S Kou, B C Glass C N Day and M M Vikmanis /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 63-74 refs Prepared in cooperation with AMRL

Avail NTIS HC A99/MF A01 CSCL 05H

The Luenberger observer theory is used to develop a predictive model of a gunner's tracking response in antiaircraft artillery systems. This model is composed of an observer a feedback controller and a remnant element. An important feature of the model is that the structure is simple hence a computer simulation requires only a short execution time. A parameter identification program based on the least squares curve fitting method and the Gauss Newton gradient algorithm is developed to determine the parameter values of the gunner model. Thus, a systematic procedure exists for identifying model parameters for a given antiaircraft tracking task. Model predictions of tracking errors are compared with human tracking data obtained from manned simulation experiments. Model predictions are in excellent agreement with the empirical data for several flyby and maneuvering target trajectories. A R H

**N79-15595\*** Illinois Univ, Urbana Dept of Mechanical and Industrial Engineering  
**MODELING THE HUMAN AS A CONTROLLER IN A MULTITASK ENVIRONMENT**

T Govindaraj and William B Rouse /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 75-83 refs

(Grant Nsg-2119)

Avail NTIS HC A99/MF A01 CSCL 05H

Modeling the human as a controller of slowly responding systems with preview is considered. Along with control tasks, discrete noncontrol tasks occur at irregular intervals. In multitask situations such as these, it has been observed that humans tend to apply piecewise constant controls. It is believed that the magnitude of controls and the durations for which they remain constant are dependent directly on the system bandwidth, preview distance, complexity of the trajectory to be followed, and nature of the noncontrol tasks. A simple heuristic model of

human control behavior in this situation is presented. The results of a simulation study whose purpose was determination of the sensitivity of the model to its parameters, are discussed. Author

**N79-15596\*** Illinois Univ Urbana Dept of Psychology  
**THE INTERNAL MODEL: A STUDY OF THE RELATIVE CONTRIBUTION OF PROPRIOCEPTION AND VISUAL INFORMATION TO FAILURE DETECTION IN DYNAMIC SYSTEMS**

Colin Kessel and Christopher D Wickens /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 85-97 refs

(Contract F44620-76-C-0009)

Avail NTIS HC A99/MF A01 CSCL 05H

The development of the internal model as it pertains to the detection of step changes in the order of control dynamics is investigated for two modes of participation: whether the subjects are actively controlling those dynamics or are monitoring an autopilot controlling them. A transfer of training design was used to evaluate the relative contribution of proprioception and visual information to the overall accuracy of the internal model. Sixteen subjects either tracked or monitored the system dynamics as a 2-dimensional pursuit display under single task conditions and concurrently with a sub-critical tracking task at two difficulty levels. Detection performance was faster and more accurate in the manual as opposed to the autopilot mode. The concurrent tracking task produced a decrement in detection performance for all conditions though this was more marked for the manual mode. The development of an internal model in the manual mode transferred positively to the automatic mode producing enhanced detection performance. There was no transfer from the internal model developed in the automatic mode to the manual mode. Author

**N79-15597\*** Connecticut Univ, Storrs Dept of Electrical Engineering and Computer Science  
**A COMPARISON OF MOTOR SUBMODELS IN THE OPTIMAL CONTROL MODEL**

Roy E Lancraft and David L Kleinman /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 101-112 refs

Avail NTIS HC A99/MF A01 CSCL 05H

Properties of several structural variations in the neuromotor interface portion of the optimal control model (OCM) are investigated. For example it is known that commanding control-rate introduces an open-loop pole at  $S=0$  and will generate low frequency phase and magnitude characteristics similar to experimental data. However, this gives rise to unusually high sensitivities with respect to motor and sensor noise-ratios, thereby reducing the models predictive capabilities. Relationships for different motor submodels are discussed to show sources of these sensitivities. The models investigated include both pseudo motor-noise and actual (system driving) motor-noise characterizations. The effects of explicit proprioceptive feedback in the OCM is also examined. To show graphically the effects of each submodel on system outputs, sensitivity studies are included and compared to data obtained from other tests. A R H

**N79-15598\*** Bolt Beranek and Newman, Inc Cambridge Mass

**CLOSED LOOP MODELS FOR ANALYZING THE EFFECTS OF SIMULATOR CHARACTERISTICS**

Sheldon Baron, Ramal Muralidharan and David L Kleinman /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 113-136 refs

(Contract NAS1-14449)

Avail NTIS HC A99/MF A01 CSCL 05H

The optimal control model of the human operator is used to develop closed loop models for analyzing the effects of (digital) simulator characteristics on predicted performance and/or workload. Two approaches are considered: the first utilizes a continuous approximation to the discrete simulation in conjunction with the standard optimal control model, the second involves a more exact discrete description of the simulator in a closed

loop multirate simulation in which the optimal control model simulates the pilot. Both models predict that simulator characteristics can have significant effects on performance and workload.

Author

**N79-15599\*#** Illinois Univ Urbana Dept of Mechanical and Industrial Engineering

**PROSPECTS OF A MATHEMATICAL THEORY OF HUMAN BEHAVIOR IN COMPLEX MAN-MACHINE SYSTEMS TASKS**

Gunnar Johannsen and William B Rouse /in NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 137-159 refs

(Grant NsG-2119)

Avail NTIS HC A99/MF A01 CSCL 05H

A hierarchy of human activities is derived by analyzing automobile driving in general terms. A structural description leads to a block diagram and a time-sharing computer analogy. The range of applicability of existing mathematical models is considered with respect to the hierarchy of human activities in actual complex tasks. Other mathematical tools so far not often applied to man-machine systems are also discussed. The mathematical descriptions at least briefly considered here include utility, estimation control, queueing, and fuzzy set theory as well as artificial intelligence techniques. Some thoughts are given as to how these methods might be integrated and how further work might be pursued.

ARH

**N79-15600\*#** Institut fuer Informationsverarbeitung in Technik und Biologie, Karlsruhe (West Germany)

**PETRI NETS AS A MODELING TOOL FOR DISCRETE CONCURRENT TASKS OF THE HUMAN OPERATOR**

W Schumacher and G Geiser /in NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 161-175 refs

Avail NTIS HC A99/MF A01 CSCL 05H

The basic concepts of Petri nets are reviewed as well as their application as the fundamental model of technical systems with concurrent discrete events such as hardware systems and software models of computers. The use of Petri nets is proposed for modeling the human operator dealing with concurrent discrete tasks. Their properties useful in modeling the human operator are discussed and practical examples are given. By means of and experimental investigation of binary concurrent tasks which are presented in a serial manner, the representation of human behavior by Petri nets is demonstrated.

ARH

**N79-15601\*#** Office National d Etudes et de Recherches Aeronautiques, Paris (France)

**DISCRETE-TIME PILOT MODEL**

Daniel Cavalli /in NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 177-186 refs

Avail NTIS HC A99/MF A01 CSCL 05H

Pilot behavior is considered as a discrete-time process where the decision making has a sequential nature. This model differs from both the quasilinear model which follows from classical control theory and from the optimal control model which considers the human operator as a Kalman estimator-predictor. An additional factor considered is that the pilot's objective may not be adequately formulated as a quadratic cost functional to be minimized but rather as a more fuzzy measure of the closeness with which the aircraft follows a reference trajectory. All model parameters, in the digital program simulating the pilot's behavior were successfully compared in terms of standard-deviation and performance with those of professional pilots in IFR configuration. The first practical application of the model was in the study of its performance degradation when the aircraft model static margin decreases.

ARH

**N79-15602\*#** Air Force Flight Dynamics Lab Wright-Patterson AFB Ohio

**FLIGHT EXPERIENCE WITH MANUALLY CONTROLLED UNCONVENTIONAL AIRCRAFT MOTIONS**

A Finley Barfield /in NASA Ames Res Center The 14th

Ann Conf on Manual Control Nov 1978 p 189-205

Avail NTIS HC A99/MF A01 CSCL 05H

A modified YF-16 aircraft was used to flight demonstrate decoupled modes under the USAF Fighter Control Configured Vehicle (CCV) Program. The direct force capabilities were used to implement seven manually controlled unconventional modes on the aircraft, allowing flat turns, decoupled normal acceleration control, independent longitudinal and lateral translations, uncoupled elevation and azimuth aiming, and blended direct lift. This paper describes the design, development, and flight testing of these control modes. The need for task-tailored mode authorities, gain-scheduling, and selected closed-loop design is discussed.

Author

**N79-15603\*#** Purdue Univ Lafayette Ind School of Aeronautics and Astronautics

**PILOT-OPTIMAL AUGMENTATION SYNTHESIS**

David K Schmidt /in NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 207-219 refs

Avail NTIS HC A99/MF A01 CSCL 05H

An augmentation synthesis method usable in the absence of quantitative handling qualities specifications and yet explicitly including design objectives based on pilot-rating concepts is presented. The algorithm involves the unique approach of simultaneously solving for the stability augmentation system (SAS) gains, pilot equalization, and pilot rating prediction via optimal control techniques. Simultaneous solution is required in this case since the pilot model (gains, etc) depends upon the augmented plant dynamics and the augmentation is obviously not a priori known. Another special feature is the use of the pilot's objective function (from which the pilot model evolves) to design the SAS.

Author

**N79-15604\*#** Northrop Corp Hawthorne Calif Aircraft Group

**PREDICTION, EVALUATION, AND SPECIFICATION OF FLYING QUALITIES BY MEANS OF STEP TARGET TRACKING**

E D Onstott and W H Faulkner /in NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 221-235 refs

(Contract F33615-77-C-3008)

Avail NTIS HC A99/MF A01 CSCL 05H

A new approach to flying qualities specification and evaluation is presented which coordinates current research in the areas of pilot ratings, pilot-aircraft modeling techniques, and simulation and flight test procedures. A time-domain pilot model is described which can model discontinuous and nonlinear pilot behavior in conjunction with completely general time-varying nonlinear aircraft models to simulate discrete maneuvers. This pilot-aircraft model is applied to an existing set of in-flight simulation data and calculates tracking error and time-on-target statistics for step target tracking that directly relate to the reported pilot comments and ratings. Predicted step target tracking data for eighteen F-5E flight conditions are presented and the use of the method for control system design is demonstrated using the YF-17.

Author

**N79-15605\*#** Illinois Univ Urbana Dept of Mechanical and Industrial Engineering

**ANALYSIS OF A VTOL HOVER TASK WITH PREDICTOR DISPLAYS USING AN OPTIMAL CONTROL MODEL OF THE HUMAN OPERATOR**

Gunnar Johannsen and T Govindaraj /in NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 237-251 refs

(Grant NsG-2119)

Avail NTIS HC A99/MF A01 CSCL 05H

The influence of different types of predictor displays in a longitudinal VTOL hover task is analyzed in a theoretical study. It was assumed that pitch angle and position are presented to the pilot in separate displays, namely the artificial horizon and position display. The predictive information is calculated by means of a Taylor series. From earlier experimental studies it is well known that predictor displays improve human and system

performance and result in reducing human workload. In this study an optimal control model is used to prove this effect theoretically. Several cases with differing amounts of predictive and rate information are compared. G Y

**N79-15606\***# Waterloo Univ (Ontario) Dept of Systems Design

**VEHICLE STEERING CONTROL A MODEL OF LEARNING**  
Alison Smiley Lloyd Reid and Morris Fraser /*n* NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 255-266 refs Sponsored by Natl Res Council of Canada Prepared in cooperation with Southern California Res Inst and Toronto Univ

Avail NTIS HC A99/MF A01 CSCL 05H

A hierarchy of strategies were postulated to describe the process of learning steering control. Vehicle motion and steering control data were recorded for twelve novices who drove an instrumented car twice a week during and after a driver training course. Car-driver describing functions were calculated, the probable control structure determined and the driver-alone transfer function modelled. The data suggested that the largest changes in steering control with learning were in the way the driver used the lateral position cue. G Y

**N79-15607\***# Systems Technology, Inc Hawthorne Calif  
**USE OF REWARD-PENALTY STRUCTURES IN HUMAN EXPERIMENTATION**

Anthony C Stein R Wade Allen and Stephen H Schwartz /*n* NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 267-278 refs

Avail NTIS HC A99/MF A01 CSCL 05H

The use of motivational techniques in human performance research is reviewed and an example study employing a reward-penalty structure to simulate the motivations inherent in a real-world situation is presented. Driver behavior in a decision-making driving scenario was studied. The task involved control of an instrumented car on a cooperative test course. Subjects were penalized monetarily for tickets and accidents and rewarded for saving driving time. Two groups were assigned different ticket penalties. The group with the highest penalties tended to drive more conservatively. However, the average total payoff to each group was the same, as the conservative drivers traded off slower driving times with lower ticket penalties. G Y

**N79-15608\***# General Motors Research Labs Warren Mich  
Dept of Engineering Mechanics

**THE INFLUENCE OF VEHICLE AERODYNAMIC AND CONTROL RESPONSE CHARACTERISTICS ON DRIVER-VEHICLE PERFORMANCE**

Alexander A Alexandridis Brian S Repa and Walter W Wierwille /*n* NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 279-294 refs Prepared in cooperation with Virginia Polytech Inst and State Univ

Avail NTIS HC A99/MF A01 CSCL 05H

The effects of changes in understeer control sensitivity, and location of the lateral aerodynamic center of pressure ( $c_p$ ) of a typical passenger car on the drivers opinion and on the performance of the driver-vehicle system were studied in a moving-base driving simulator. Twelve subjects with no prior experience on the simulator and no special driving skills performed regulation tasks in the presence of both random and step wind gusts. G Y

**N79-15609\***# Forschungsinstitut fuer Anthropotechnik Meckenheim (West Germany)

**THE DETERMINATION OF THE OPERATING RANGE OF A TWIN-GRIP CONTROL YOKE THROUGH BIOMECHANICAL MEANS**

Klaus-Peter Gaertner /*n* NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 297-306 refs

Avail NTIS HC A99/MF A01 CSCL 05H

A twin-grip control yoke was designed as an ergonomic case study that allows dual axis control inputs both axes being rotational. Inputs are effected by rotating the grips. How the handles were designed with respect to their shape and size and how the angular range of the control yoke in both rotational axes was evaluated. The control yoke which requires two-hand operation was tested to determine its operating range. The intention of this investigation was to find out the optimal form of the control yoke and the maximum permissible range in both rotating axes. In these experiments controls had no spring resistance. G Y

**N79-15610\***# Jet Propulsion Lab, Calif Inst of Tech, Pasadena  
**EVENT-DRIVEN DISPLAYS FOR MANIPULATOR CONTROL**

A K Bęjczy and G Paine /*n* NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 307-332 refs

(Contract NAS7-100)

Avail NTIS HC A99/MF A01 CSCL 05H

The problem of constructing event-related information displays from multidimensional data generated by proximity force-torque and tactile sensors integrated with the terminal device of a remotely controlled manipulator is considered. Event-driven displays are constructed by using appropriate algorithms acting on sensory data in real time. Event-driven information displays lessen the operator's workload and improve control performance. The paper describes and discusses several event-driven display examples that were implemented in the JPL teleoperator project, including a brief outline of the data handling system which drives the graphics display in real time. The paper concludes with a discussion of future plans to integrate event-driven displays with visual (TV) information. G Y

**N79-15611\***# CAE Electronics Ltd Montreal (Quebec)

**MANNED SIMULATIONS OF THE SRMS IN SIMFAC**

Andrew L Lippay Graham D Whitehead, and Claus G Wagner-Bartak /*n* NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 333-341 Prepared in cooperation with Spar Aerospace Products Ltd Toronto

Avail NTIS HC A99/MF A01 CSCL 05H

SIMFAC is a general purpose real-time simulation facility currently configured with an Orbiter-like Crew Compartment and a Displays and Controls (D and C) Subsystem to support the engineering developments of the Space Shuttle Remote Manipulator (SRMS). The simulation consists of a software model of the anthropomorphic SRMS manipulator arm including the characteristics of its control system and joint drive modules. The following are discussed: (1) simulation and scene generation subsystems, (2) the SRMS task in SIMFAC, (3) operator tactics and options, (4) workload, (5) operator errors and sources, (6) areas for further work, and (7) general observations. G Y

**N79-15612\***# Massachusetts Inst of Tech, Cambridge  
Man-Machine Systems Lab

**HUMAN/COMPUTER CONTROL OF UNDERSEA TELEOPERATORS**

T B Sheridan, W L Verplank and T L Brooks /*n* NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 343-357

(Contract N00014-77-C-0256)

Avail NTIS HC A99/MF A01 CSCL 05H

The potential of supervisory controlled teleoperators for accomplishment of manipulation and sensory tasks in deep ocean environments is discussed. Teleoperators and supervisory control are defined, the current problems of human divers are reviewed, and some assertions are made about why supervisory control has potential use to replace and extend human diver capabilities. The relative roles of man and computer and the variables involved in man-computer interaction are next discussed. Finally a detailed description of a supervisory controlled teleoperator system, SUPERMAN is presented. G Y

**N79-15613\*#** Massachusetts Inst of Tech, Cambridge  
Man-Machine Systems Lab  
**DISPLAY AIDS FOR REMOTE CONTROL OF UNTETHERED  
UNDERSEA VEHICLES**  
W L Verplank /in NASA Ames Res Center The 14th Ann  
Conf on Manual Control Nov 1978 p 361-369 refs

(Contract N00014-77-C-0256)

Avail NTIS HC A99/MF A01 CSCL 05H

A predictor display superimposed on slow-scan video or sonar data is proposed as a method to allow better remote manual control of an untethered submersible. Simulation experiments show good control under circumstances which otherwise make control practically impossible. Author

**N79-15614\*#** National Aeronautics and Space Administration  
Ames Research Center Moffett Field Calif  
**A SAFETY MARGIN AND FLIGHT REFERENCE SYSTEM  
AND DISPLAY FOR POWERED-LIFT AIRCRAFT**  
Robert K Heffley and Gordon H Hardy /in its The 14th Ann  
Conf on Manual Control Nov 1978 p 371-379 refs Prepared  
in cooperation with Systems Technol Inc Hawthorne Calif

(Contract NAS2-9418)

Avail NTIS HC A99/MF A01 CSCL 05H

A study was conducted to explore the feasibility of a safety margin and flight reference system for those powered-lift aircraft which require a backside piloting technique. The main objective was to display multiple safety margin criteria as a single variable which could be tracked both manually and automatically and which could be monitored in order to derive safety margin status. The study involved a pilot-in-the-loop analysis of several system concepts and a simulator experiment to evaluate those concepts showing promise. A system was ultimately configured which yielded reasonable compromises in controllability status information content, and the ability to regulate safety margins at some expense of the allowable low speed flight path envelope. G Y

**N79-15615\*#** Air Force Flight Dynamics Lab, Wright-Patterson  
AFB Ohio

**A HEAD-UP DISPLAY FOR MID-AIR DRONE RECOVERY**  
W L Augustine, E L Heft T E Bowen and R L Newman  
/in NASA Ames Res Center The 14th Ann Conf on Manual  
Control Nov 1978 p 381-394 refs Prepared in cooperation  
with Tactical Drone Squadron (11th), Davis-Monthan AFB Ariz  
and Crew Systems Consultants, Yellow Springs, Ohio

Avail NTIS HC A99/MF A01 CSCL 05H

During mid-air retrieval of parachute packages, the absence of a natural horizon creates serious difficulties for the pilot of the recovery helicopter. A head-up display (HUD) was tested in an attempt to solve this problem. Both a roll-stabilized HUD and a no-roll (pitch only) HUD were tested. The results show that fewer missed passes occurred with the roll-stabilized HUD when the horizon was obscured. The pilots also reported that the workload was greatly reduced. Roll-stabilization was required to prevent vertigo when flying in the absence of a natural horizon. Any HUD intended for mid-air retrieval should display pitch roll, sideslip, airspeed, and vertical velocity. G Y

**N79-15616\*#** Bolt, Beranek, and Newman Inc Cambridge  
Mass  
**EVALUATION OF DISPLAY AND CONTROL CONCEPTS FOR  
A TERMINAL CONFIGURED VEHICLE IN FINAL APPROACH  
IN A WINDSHEAR ENVIRONMENT**  
William H Levison /in NASA Ames Res Center The 14th  
Ann Conf on Manual Control Nov 1978 p 395-415 refs

(Contract NAS1-13842)

Avail NTIS HC A99/MF A01 CSCL 05H

A revised treatment of nonrandom inputs was incorporated in the model. Response behavior was observed for two display configurations (a pictorial EADI presentation and a flight-director configuration requiring use of a panel-mounted airspeed indicator), two control configurations (attitude and velocity control wheel steering), and two shear environments each of which contained

a head-to-tail shear and a vertical component in general. Performance trends predicted by the model were confirmed experimentally. Experimental and analytical results both indicated superiority to the EADI display with respect to regulation of height and airspeed errors. Velocity steering allowed tighter regulation of height errors but control parameters had little influence on airspeed regulation. Model analysis indicated that display-related differences could be ascribed to differences in the quality of speed-related information provided by the two displays. Author

**N79-15617\*#** Aerospace Medical Research Labs, Wright-  
Patterson AFB, Ohio Human Engineering Div  
**TWO DIMENSIONAL EYE TRACKING. SAMPLING RATE  
OF FORCING FUNCTION**  
John P Hornseth, Donald L Monk James L Porterfield, and  
Robert L McMurry (Systems Res Lab Dayton, Ohio) /in NASA  
Ames Res Center The 14th Ann Conf on Manual Control  
Nov 1978 p 419-423 refs

Avail NTIS HC A99/MF A01 CSCL 05H

A study was conducted to determine the minimum update rate of a forcing function display required for the operator to approximate the tracking performance obtained on a continuous display. In this study frequency analysis was used to determine whether there was an associated change in the transfer function characteristics of the operator. It was expected that as the forcing function display update rate was reduced, from 120 to 15 samples per second the operator's response to the high frequency components of the forcing function would show a decrease in gain, an increase in phase lag, and a decrease in coherence. Author

**N79-15618\*#** Aerospace Medical Research Labs, Wright-  
Patterson AFB, Ohio Human Engineering Div  
**HEAD TRACKING AT LARGE ANGLES FROM THE  
STRAIGHT AHEAD POSITION**  
Donald L Monk James L Porterfield John P Hornseth, and  
Robert L McMurry (Systems Res Lab Dayton Ohio) /in NASA  
Ames Res Center The 14th Ann Conf on Manual Control  
Nov 1978 p 425-436 refs

Avail NTIS HC A99/MF A01 CSCL 05H

One of the big advantages of a helmet sight in a high performance aircraft is its off-boresight capability in aiming a fire control system. However tracking data using a target that is moving rapidly and randomly for an extended period of time is missing. This study is intended to provide data in this area that will be of value to engineers in designing head control systems. Author

**N79-15619\*#** Human Engineering Labs Aberdeen Proving  
Ground Md  
**LIGHTWEIGHT HELMET-MOUNTED EYE MOVEMENT  
MEASUREMENT SYSTEM**  
John A Barnes /in NASA Ames Res Center The 14th Ann  
Conf on Manual Control Nov 1978 p 437-440

Avail NTIS HC A99/MF A01 CSCL 05H

The helmet-mounted eye movement measuring system weighs 1,530 grams, the weight of the present aviators helmet in standard form with the visor is 1,545 grams. The optical head is standard NAC Eye-Mark. This optical head was mounted on a magnesium yoke which in turn was attached to a slide cam mounted on the flight helmet. The slide cam allows one to adjust the eye-to-optics system distance quite easily and to secure it so that the system will remain in calibration. The design of the yoke and slide cam is such that the subject can in an emergency move the optical head forward and upward to the stowed and locked position atop the helmet. This feature was necessary for flight safety. The television camera that is used in the system is a solid state General Electric TN-2000 with a charged induced device imager used as the vidicon. L S

**N79-15620\*#** Systems Research Labs Inc Dayton, Ohio  
**THE EFFECTS OF CLOSED LOOP TRACKING ON A**

**SUBJECTIVE TILT THRESHOLD IN THE ROLL AXIS**

Marvin Roark and Andrew M Junker (Aerospace Med Res Lab) /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 443-450 refs

Avail NTIS HC A99/MF A01 CSCL 05H

The indifference thresholds for the perception of tilt in the roll axis were experimentally determined in a moving base simulator under three tracking task difficulties. The threshold level determined in this experiment is approximately 5 to 7 degrees (lg) Author

**N79-15621\*# Bolt, Beranek, and Newman Inc., Cambridge, Mass**  
**USE OF THE TILT CUE IN A SIMULATED HEADING TRACKING TASK**

William H Levison and Andrew M Junker (Aerospace Med Res Lab) /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 451-462 refs

(Contract F44620-74-C-0060)

Avail NTIS HC A99/MF A01 CSCL 05H

The task was performed with subjects using visual-only cues and combined visual and roll-axis motion cues. Half of the experimental trials were conducted with the simulator rotating about the horizontal axis, to suppress the tilt cue, the remaining trials were conducted with the simulator cab tilted 90 deg so that roll-axis motions were about earth vertical. The presence of the tilt cue allowed a substantial and statistically significant reduction in performance scores. When the tilt cue was suppressed, the availability of motion cues did not result in significant performance improvement. These effects were accounted for by the optimal-control pilot/vehicle model, wherein the presence or absence of various motion cues was represented by appropriate definition of the perceptual quantities assumed to be used by the human operator Author

**N79-15622\*# Systems Technology, Inc., Hawthorne Calif**  
**ROLL TRACKING EFFECTS OF G-VECTOR TILT AND VARIOUS TYPES OF MOTION WASHOUT**

Henry R Jex Raymond E Magdaleno, and Andrew M Junker (Aerospace Med Res Lab) /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 463-502 refs

Avail NTIS HC A99/MF A01 CSCL 05H

In a dogfight scenario the task was to follow the target's roll angle while suppressing gust disturbances. All subjects adopted the same behavioral strategies in following the target while suppressing the gusts and the MFP-fitted math model response was generally within one data symbol width. The results include the following: (1) comparisons of full roll motion (both with and without the spurious gravity tilt cue) with the static case. These motion cues help suppress disturbances with little net effect on the visual performance. Tilt cues were clearly used by the pilots but gave only small improvement in tracking errors. (2) The optimum washout (in terms of performance close to real world, similar behavioral parameters, significant motion attenuation (80 percent), and acceptable motion fidelity) was the combined attenuation and first-order washout. (3) Various trends in parameters across the motion conditions were apparent, and are discussed with respect to a comprehensive model for predicting adaptation to various roll motion cues Author

**N79-15623\*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio**

**A METHOD MOTION SIMULATOR DESIGN BASED ON MODELING CHARACTERISTICS OF THE HUMAN OPERATOR**

D W Repperger and A M Junker /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 503-519 refs

Avail NTIS HC A99/MF A01 CSCL 05H

A design criteria is obtained to compare two simulators and evaluate their equivalence or credibility. In the subsequent analysis the comparison of two simulators can be considered as the same problem as the comparison of a real world situation and

a simulation's representation of this real world situation. The design criteria developed involves modeling of the human operator and defining simple parameters to describe his behavior in the simulator and in the real world situation. In the process of obtaining human operator parameters to define characteristics to evaluate simulators, measures are also obtained on these human operator characteristics which can be used to describe the human as an information processor and controller. First a study is conducted on the simulator design problem in such a manner that this modeling approach can be used to develop a criteria for the comparison of two simulators Author

**N79-15624\*# Systems Technology Inc Hawthorne Calif**  
**INVESTIGATION OF NONLINEAR MOTION SIMULATOR WASHOUT SCHEMES**

Susan A Riedel and L G Hofmann /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 521-532 refs

(Contract F33615-77-C-2065)

Avail NTIS HC A99/MF A01 CSCL 05H

An overview is presented of some of the promising washout schemes which have been devised. The four schemes presented fall into two basic configurations, crossfeed and crossproduct. Various nonlinear modifications further differentiate the four schemes. One nonlinear scheme is discussed in detail. This washout scheme takes advantage of subliminal motions to speed up simulator cab centering. It exploits so-called perceptual indifference thresholds to center the simulator cab at a faster rate whenever the input to the simulator is below the perceptual indifference level. The effect is to reduce the angular and translational simulation motion by comparison with that for the linear washout case. Finally, the conclusions and implications for further research in the area of nonlinear washout filters are presented. L S

**N79-15625\*# National Aerospace Lab., Amsterdam (Netherlands)**

**A THEORETICAL AND EXPERIMENTAL ANALYSIS OF THE OUTSIDE WORLD PERCEPTION PROCESS**

P H Wewerinke /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 535-555 refs

Avail NTIS HC A99/MF A01 CSCL 05H

The outside scene is often an important source of information for manual control tasks. Important examples of these are car driving and aircraft control. This paper deals with modeling this visual scene perception process on the basis of linear perspective geometry and the relative motion cues. Model predictions utilizing psychophysical threshold data from base-line experiments and literature of a variety of visual approach tasks are compared with experimental data. Both the performance and workload results illustrate that the model provides a meaningful description of the outside world perception process, with a useful predictive capability Author

**N79-15626\*# Illinois Univ Urbana Dept of Psychology**  
**LINEAR MODELLING OF ATTENTIONAL RESOURCE ALLOCATION**

Byron Pierce /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 419-423 refs

(Grant AF-AFOSR-3380-77)

Avail NTIS HC A99/MF A01 CSCL 05H

Eight subjects time-shared performance of two compensatory tracking tasks under conditions when both were of constant difficulty, and when the control order of one task (designated primary) was varied over time within a trial. On line performance feedback was presented on half of the trials. The data are interpreted in terms of a linear model of the operator's attention allocation system and suggest that this allocation is strongly suboptimal. Furthermore, the limitations in reallocating attentional resources between tasks, in response to difficulty fluctuations were not reduced by augmented performance feedback. Some characteristics of the allocation system are described and reasons for its limitations suggested Author

**N79-15627\***# Massachusetts Inst of Tech Cambridge  
Man-Machine Systems Lab  
**A MODEL FOR DYNAMIC ALLOCATION OF HUMAN  
ATTENTION AMONG MULTIPLE TASKS**  
Thomas B Sheridan and M Kamil Tulga /in NASA Ames  
Res Center The 14th Ann Conf on Manual Control Nov  
1978 p 569-592 refs

(Grant NsG-2118)  
Avail NTIS HC A99/MF A01 CSCL 05H

The problem of multi-task attention allocation with special reference to aircraft piloting is discussed with the experimental paradigm used to characterize this situation and the experimental results obtained in the first phase of the research. A qualitative description of an approach to mathematical modeling and some results obtained with it are also presented to indicate what aspects of the model are most promising. Two appendices are given which (1) discuss the model in relation to graph theory and optimization and (2) specify the optimization algorithm of the model. Author

**N79-15628\***# San Jose State Univ, Calif  
**PERPETUAL FACTORS INVOLVED IN PERFORMANCE OF  
AIR TRAFFIC CONTROLLERS USING A MICROWAVE  
LANDING SYSTEM**  
Gary Gershzojn /in NASA Ames Res Center The 14th Ann  
Conf on Manual Control Nov 1978 p 593-606 refs

(Grants NGL-05-046-002, NsG-2269)  
Avail NTIS HC A99/MF A01 CSCL 05H

The task involved the control of two simulated aircraft targets per trial, in a 370 -km radius terminal area, by means of conventional radar vectoring and/or speed control. The goal was to insure that the two targets crossed the Missed Approach Point (MAP) at the runway threshold exactly 60 sec apart. The effects on controller performance of the MLS configuration under wind and no-wind conditions were examined. The data for mean separation time between targets at the MAP and the range about that mean were analyzed by appropriate analyses of variance. Significant effects were found for mean separation times as a result of the configuration of the MLS and for interaction between the configuration and wind conditions. The analysis of variance for range indicated significantly poorer performance under the wind condition. These findings are believed to be a result of certain perceptual factors involved in radar air traffic control (ATC) using the MLS with separation of targets in time. Author

**N79-15629\***# Systems Technology, Inc., Hawthorne, Calif  
**THE EFFECTS OF ALCOHOL ON DRIVER PERFORMANCE  
IN A DECISION MAKING SITUATION**  
R Wade Allen, Stephen H Schwartz, Anthony C Stein and  
Jeffrey R Hogge /in NASA Ames Res Center The 14th Ann  
Conf on Manual Control Nov 1978 p 609-629 refs Sponsored  
in part by Natl Highway Traffic Safety Admin

Avail NTIS HC A99/MF A01 CSCL 05H

The results are reviewed of driving simulator and in-vehicle field test experiments of alcohol effects on driver risk taking. The objective was to investigate changes in risk taking under alcoholic intoxication and relate these changes to effects on traffic safety. The experiments involved complex 15 minute driving scenarios requiring decision making and steering and speed control throughout a series of typical driving situations. Monetary rewards and penalties were employed to simulate the real-world motivations inherent in driving. A full placebo experimental design was employed, and measures related to traffic safety driver/vehicle performance and driver behavior were obtained. Alcohol impairment was found to increase the rate of accidents and speeding tickets. Behavioral measures showed these traffic safety effects to be due to impaired psychomotor performance and perceptual distortions. Subjective estimates of risk failed to show any change in the driver's willingness to take risks when intoxicated. Author

**N79-15630\***# Systems Technology Inc., Hawthorne, Calif  
**A DECISION MODEL APPLIED TO ALCOHOL EFFECTS ON**

**DRIVER SIGNAL LIGHT BEHAVIOR**  
Stephen H Schwartz and R Wade Allen /in NASA Ames Res  
Center The 14th Ann Conf on Manual Control Nov 1978  
p 631-645 refs  
(Contract DOT-HS-4-00999)  
Avail NTIS HC A99/MF A01 CSCL 05H

A decision model including perceptual noise or inconsistency is developed from expected value theory to explain driver stop and go decisions at signaled intersections. The model is applied to behavior in a car simulation and instrumented vehicle. Objective and subjective changes in driver decision making were measured with changes in blood alcohol concentration (BAC). Treatment levels averaged 0.00, 0.10 and 0.14 BAC for a total of 26 male subjects. Data were taken for drivers approaching signal lights at three timing configurations. The correlation between model predictions and behavior was highly significant. In contrast to previous research analysis indicates that increased BAC results in increased perceptual inconsistency which is the primary cause of increased risk taking at low probability of success signal lights. Author

**N79-15631\***# Bolt Beranek and Newman, Inc., Cambridge,  
Mass  
**COMBINED MONITORING, DECISION AND CONTROL  
MODEL FOR THE HUMAN OPERATOR IN A COMMAND  
AND CONTROL DESK**  
Ramal Muralidharan and Sheldon Baron /in NASA Ames Res  
Center The 14th Ann Conf on Manual Control Nov 1978  
p 647-662 refs  
(Contract F44620-76-C-0029)  
Avail NTIS HC A99/MF A01 CSCL 05H

A report is given on the ongoing efforts to model the human operator in the context of the task during the enroute/return phases in the ground based control of multiple flights of remotely piloted vehicles (RPV). The approach employed here uses models that have their analytical bases in control theory and in statistical estimation and decision theory. In particular it draws heavily on the modes and the concepts of the optimal control model (OCM) of the human operator. The OCM is being extended into a combined monitoring, decision, and control model (DEMON) of the human operator by infusing decision theoretic notions that make it suitable for application to problems in which human control actions are infrequent and in which monitoring and decision-making are the operator's main activities. Some results obtained with a specialized version of DEMON for the RPV control problem are included. Author

**N79-15632\***# Illinois Univ Urbana Dept of Mechanical  
and Industrial Engineering  
**A MODEL OF HUMAN EVENT DETECTION IN MULTIPLE  
PROCESS MONITORING SITUATIONS**  
Joel S Greenstein and William B Rouse /in NASA Ames  
Res Center The 14th Ann Conf on Manual Control Nov  
1978 p 663-675 refs

(Grant NsG-2119)  
Avail NTIS HC A99/MF A01 CSCL 05H

It is proposed that human decision making in many multi-task situations might be modeled in terms of the manner in which the human detects events related to his tasks and the manner in which he allocates his attention among his tasks once he feels events have occurred. A model of human event detection performance in such a situation is presented. An assumption of the model is that, in attempting to detect events, the human generates the probability that events have occurred. Discriminant analysis is used to model the human's generation of these probabilities. An experimental study of human event detection performance in a multiple process monitoring situation is described and the application of the event detection model to this situation is addressed. The experimental study employed a situation in which subjects simultaneously monitored several dynamic processes for the occurrence of events and made yes/no decisions on the presence of events in each process. Input to the event detection model of the information displayed to the experimental subjects allows comparison of the model's performance with the performance of the subjects. Author

**N79-15633\*** Illinois Univ Urbana Dept of Mechanical and Industrial Engineering  
**PILOT DECISION MAKING IN A COMPUTER-AIDED FLIGHT MANAGEMENT SITUATION**  
 Yee-Yeen Chu and William B Rouse /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 677-690 refs  
 (Grant NsG-2119)  
 Avail NTIS HC A99/MF A01 CSCL 05H

An experimental representation of a computer-aided multi-task flight management situation has been developed. A computer aiding program was implemented to serve as a back-up decision maker. An experiment was conducted with a balanced design of several subject runs for different workload levels. This was achieved using three levels of subsystem event arrival rates, three levels of control task involvement and three levels of availability of computer aiding. Experimental results compared quite favorably with those from a computer simulation which employed a queueing model. It was shown that the aiding had enhanced system performance as well as subjective ratings, and that the adaptive aiding policy further reduced subsystem delay.  
 Author

**N79-15634\*** Utah Univ, Salt Lake City  
**TIME ESTIMATION AS A SECONDARY TASK TO MEASURE WORKLOAD SUMMARY OF RESEARCH**  
 Sandra G Hart, Duncan McPherson (Calif Univ Berkeley) and Leslie L Loomis (San Jose State Univ) /n NASA Ames Res Center The 14th Ann Conf on Manual Control Nov 1978 p 693-712 refs  
 (Grant NGR-45-003-108, NsG-2269)  
 Avail NTIS HC A99/MF A01 CSCL 05H

Actively produced intervals of time were found to increase in length and variability, whereas retrospectively produced intervals decreased in length although they also increased in variability with the addition of a variety of flight-related tasks. If pilots counted aloud while making a production however the impact of concurrent activity was minimized at least for the moderately demanding primary tasks that were selected. The effects of feedback on estimation accuracy and consistency were greatly enhanced if a counting or tapping production technique was used. This compares with the minimal effect that feedback had when no overt timekeeping technique was used. Actively made verbal estimates of sessions filled with different activities performed during the interval were increased. Retrospectively made verbal estimates however, increased in length as the amount and complexity of activities performed during the interval were increased.  
 Author

**N79-15635\*** Nebraska Univ, Lincoln College of Engineering and Technology  
**THE PROTO-TYPE WRIST JOINT ASSEMBLY TACPAW (TRIPLE AXIS COMMON PIVOT ARM WRIST), PHASE 2 Final Report**  
 Leendert Kersten Nov 1978 67 p  
 (Contract NAS8-31897)  
 (NASA-CR-150885) Avail NTIS HC A04/MF A01 CSCL 05H

A wrist joint assembly is described for use with a mechanical manipulator arm for finely positioning an end-effector carried by the wrist joint on the terminal end of the manipulator arm. The wrist joint assembly is pivotable about a first axis to produce a yaw motion, a second axis to produce a pitch motion and a third axis to produce a roll motion. The performance of the wrist configuration is indicative of the capability to produce the 15 ft lb torque in either one of the three motions and the smoothness of operation is notable.  
 G G

**N79-15636\*** Defence Research Establishment, Ottawa (Ontario)  
**PATTERN OF HEAT LOSS FROM A SUBJECT WEARING CF TEMPERATE-CLIMATE COMBAT CLOTHING**  
 David J Hidson and Rita M Crow Jun 1978 21 p refs  
 (AD-A057746 DREO-TN-78-5) Avail NTIS HC A02/MF A01 CSCL 05/9

The patterns of heat loss from a subject wearing CF temperate climate combat clothing using thermal imaging techniques are

examined. The main advantage of thermal imaging is that it presents a complete picture of the surface with a continuous map of temperatures displayed as a black-and-white TV image. This image is both qualitative and quantitative. The thermogram can be compared directly with a photograph of the same subject and the positions of the main areas of heat loss are immediately apparent.  
 G Y

**N79-15637\*** Defence Research Establishment Ottawa (Ontario)  
**EVALUATION OF BRITISH AND CANADIAN CONDUCTIVE RUBBER HEATING ELEMENTS FOR HANDWEAR PRELIMINARY REPORT**  
 Richard W Nolan and Stanley W Catroll Feb 1978 19 p refs  
 (AD-A052826 DREO-TN-77-24) Avail NTIS HC A02/MF A01 CSCL 15/5

A physiological evaluation of British and Canadian conductive rubber heating elements for use in electrically-heated handwear was carried out in the DREO cold room at -40 C. It was found that the difference between the mean hand temperatures of test subjects wearing either type of handwear was not significant.  
 Author (GRA)

**N79-15638\*** Naval Surface Weapons Center, White Oak, Md  
**INVESTIGATION OF TECHNIQUES TO REDUCE ELECTROSTATIC DISCHARGE SUSCEPTIBILITY OF EED'S CONTAINING PLASTIC PLUGS**  
 Howard S Leopold, Gerald R Laib and Louis A Rosenthal 25 Aug 1978 34 p  
 (AD-A059982 NSWC/WOL/TR-78-82) Avail NTIS HC A03/MF A01 CSCL 19/1

Techniques to increase the safety of Navy electroexplosive devices (EED) to a level where they will be immune to human electrostatic discharge are investigated. A protective technique was desired which would not make the EED unduly sensitive to other types of accidental initiation. It was also desired to find a technique that would require a minimum of modification to the various existing EEDs. This report deals specifically with finding a protective technique for EEDs containing a plastic initiator plug. The Mk 70-0 detonator was chosen for this investigation as it is a widely employed example of an EED that uses a plastic plug.  
 G Y

**N79-15639\*** Dayton Univ Research Inst, Ohio  
**EDITING PROCEDURE FOR ANTHROPOMETRIC SURVEY DATA**  
 Paul Kikta and Thomas Churchill Jul 1978 138 p refs  
 (Contract F33615-77-C-0505)  
 (AD-A060393, AMRL-TR-78-38) Avail NTIS HC A07/MF A01 CSCL 09/2

Described in this report are two computer programs designed to edit large masses of anthropometric survey data. The XVAL (eXtreme VALues) program scans for gross errors by sorting out the ten highest and ten lowest values in a given set of data for visual inspection. The EDIT (EDITing) program, a technique for sifting data more finely, tests each data point for each subject by comparing the measured value with a predicted value obtained from regression equations and flagging those which deviate from set limits. Detailed descriptions of input routines and computer output are liberally illustrated at every step. Instructions for the use of these programs are given to enable programmers to apply them to their own data. Computer printouts of the entire XVAL and EDIT programs applied to actual data are included as appendices. The authors emphasize the limitations of these programs by pointing out that however sophisticated the editing routines, they can only serve to discover, identify and flag possible errors. It is left to the experienced professional to confirm the deviant value as an error, assess its nature and decide whether to eliminate, correct or replace it.  
 Author (GRA)

**N79-15640\*** Michigan Univ Ann Arbor Highway Safety Research Inst  
**WHOLE BODY RESPONSE RESEARCH PROGRAM Final Report, 1 Jul 1973 - 31 Aug 1977**  
 Nabih M Alem, John W Melvin, Bruce M Bowman, and Joseph

B Benson 25 Apr 1978 122 p refs Sponsored in part by GM Res Labs (PB-286151/6 UM-HSRI-77-39-1) Avail NTIS HC A06/MF A01 CSCL 13L

Data were generated on the kinematics and response of human surrogates in a realistic automobile impact environment. The program used a test configuration consisting of an idealized hard seat representation of a car seat with a three-point harness restraint system. Three different severity levels of crash test conditions were used. The human surrogates tested in this program were fifteen male cadavers, a Hybrid Anthropomorphic Test Device and a Hybrid 3 ATD. In addition, mathematical simulations of the response and kinematics of a 50th percentile male occupant were performed at the three levels of crash severity using the MVMA Two-Dimensional Crash Victim Simulator. GRA

**N79-15641#** Michigan Univ, Ann Arbor Highway Safety Research Inst

**WHOLE BODY RESPONSE RESEARCH PROGRAM  
APPENDIX A METHODOLOGY Final Report, 1 Jul 1973 - 31 Aug 1977**

N M Alem, J B Benson, G L Holstein, and J W Melvin 25 Apr 1978 113 p refs Sponsored in part by GM Res Labs

(PB-286152/4, UM-HSRI-77-39-2) Avail NTIS HC A06/MF A01 CSCL 13L

The following topics are discussed: (1) experimental procedures, (2) digital signal processing, (3) three-dimensional X-ray technique, (4) measurement of 3-D motion, and (5) fast algorithm for computing HIC (Head Injury Criterion). GRA

**N79-15642#** Michigan Univ, Ann Arbor Highway Safety Research Inst

**WHOLE BODY RESPONSE RESEARCH PROGRAM  
APPENDIX B RAW DATA Final Report, 1 Jul 1973 - 31 Aug 1977**

N M Alem 25 Apr 1978 310 p refs Sponsored in part by GM Res Labs

(PB-286153/2, UM-HSRI-77-39-3) Avail NTIS HC A14/MF A01 CSCL 13L

The appendix is organized in 11 data packages. Each of the first 9 packages is devoted to one cadaver. The 10th package is devoted to Part 572 ATD test series, and the last package contains previously unreported raw data. Each cadaver raw data package is divided into two or more groups of data sheets. The first group pertains to the description of the cadaver and the instrumentation as well as the thorax autopsy, while the remaining group(s) pertain to each test conducted on that cadaver, each of which contains a detailed set-up diagram and photographs, the filtered signals and a graphcheck of the test. GRA

**N79-15643#** Michigan Univ, Ann Arbor Highway Safety Research Inst

**WHOLE BODY RESPONSE RESEARCH PROGRAM  
APPENDIX C PROCESSED DATA Final Report, 1 Jul 1973 - 31 Aug 1977**

N M Alem 25 Apr 1978 348 p refs Sponsored in part by GM Res Labs

(PB-286154/0, UM-HSRI-77-39-4) Avail NTIS HC A15/MF A01 CSCL 13L

Detailed results of data processing consist of the graphical output of measured and computed accelerations, velocities and displacements as well as forces. For each test, a summary sheet is included which gives the peaks of all the variables and the times at which they occurred. GRA

**N79-15644#** General Accounting Office, Washington, D C Procurement and Systems Acquisition Div

**THE DEPARTMENT OF THE ARMY'S FOOD IRRADIATION PROGRAM IS IT WORTH CONTINUING**

29 Sep 1978 58 p (PB-286399/1, PSAP-78-146) Avail NTIS HC A04/MF A01 CSCL 06H

In the last 25 years, the Department of Defense has spent \$51 million on food irradiation research. The Army's food irradiation program is directed at using high doses of radiation to sterilize meats, thus preserving them from spoilage. The

objective is to use irradiated meats in military rations. Despite the years of research, the Army has not yet convinced the Food and Drug Administration that the irradiated meats are safe and nutritious. Legal, scientific, and economic barriers must be dealt with before radiation-sterilized meats can be used in military rations. GRA

**N79-15645#** Committee on Science and Technology (U S House)

**EXTRATERRESTRIAL INTELLIGENCE RESEARCH**

Washington GPO 1979 91 p Hearings before the Subcomm on Space Sci and Applications of the Comm on Sci and Technol 95th Congr 2d Sess No 97 19-20 Sep 1978 (GPO-35-355) Avail Subcomm on Space Sci and Applications

The hearings concerning space research for analyzing the radiation from space for evidence of intelligent life are reported. The history of attempts to establish extraterrestrial communications is reviewed. Problems of signal transmission and detection are discussed in terms of the long distance and resulting time for responses. F O S

**N79-15890#** Institutes for the Achievement of Human Potential, Philadelphia Pa Inst for Clinical Investigation

**THE CHILD IN COMA**

Edward B LeWinn /in NASA Ames Res Center Human Neurol Develop Nov 1978 p 17-19

Avail NTIS HC A04/MF A01 CSCL 06E

Children in coma continue to pose medical, social, economic, ethical, moral, and legal problems. Modern life-support technology has aggravated these problems. Coma is viewed as a pathological state of unconsciousness from which the patient has not achieved arousal and which calls for vigorous action to help him regain consciousness. There are two variables that have an especially important bearing on the ability to achieve arousal. These are the character of the brain injury that caused the coma, and environmental factors that affect the patient after the injury. G G

**N79-15891#** Nassau Hospital, Mineola N Y Coma Recovery Inst

**COMA RECOVERY**

Mihai D Dimancescu /in NASA Ames Res Center Human Neurol Develop Nov 1978 p 21-23

Avail NTIS HC A04/MF A01 CSCL 06E

Arousal from coma is defined as a function of the reticular activating system that is located between the spinal cord and the diencephalon core of the brain stem. This system receives information from all the sensory functions of the body for distribution to the various parts of the cortex in order to maintain normal activities. Multimodal neurosensory stimulation techniques are outlined that are designed to help the patient recover from the comatose state. G G

**N79-15892#** Institutes for the Achievement of Human Potential, Philadelphia, Pa Inst for Clinical Investigation

**THE CONTROL AND PREVENTION OF SEIZURES IN CHILDREN, A DEVELOPMENTAL AND ENVIRONMENTAL APPROACH**

Edward B LeWinn /in NASA Ames Res Center Human Neurol Develop Nov 1978 p 25-27 ref

Avail NTIS HC A04/MF A01 CSCL 06E

The clinical effectiveness of neurophysiological and developmental factors in controlling and preventing seizure mechanisms is detailed. It is shown that as cortical control advances with maturation, it requires increasingly severe environmental adversity to release this residual defensive reflex mechanism. Administration of anticonvulsant drugs is discouraged because of possible undesirable neuronal effects on the very young brain. G G

**N79-15893#** San Jose State Univ Calif  
**VESTIBULAR INFLUENCES ON OTHER SENSORY AND MOTOR PROCESSES**

Brant Clark /in NASA Ames Res Center Human Neurol

Develop Nov 1978 p 29-33

Avail NTIS HC A04/MF A01 CSCL 06P

Vestibular effects on perceptual and motor processes are widespread It is shown that gyrovisual modulation may take three forms (1) gyrovisual inhibition (monitoring tasks and spurious motion) (2) gyrovisual facilitation (tracking) and (3) gyrovisual conflict (motion sickness and disorientation in flight) G G

**N79-15894\*#** National Aeronautics and Space Administration  
Ames Research Center Moffett Field Calif

**VISION**

Richard F Haines *In its* Human Neurol Develop Nov 1978  
p 35-45 Original contains color illustrations

Avail NTIS HC A04/MF A01 CSCL 06P

Visual input methods are considered for the therapeutic treatment of autistic and brain-damaged patients and to provide a controlled stress environment for visual perception problems G G

**N79-15895\*#** Linus Pauling Inst for Science and Medicine  
Menlo Park Calif

**ORTHOMOLECULAR ENHANCEMENT OF HUMAN DEVELOPMENT**

Linus Pauling *In* NASA Ames Res Center Human Neurol  
Develop Nov 1978 p 47-51

Avail NTIS HC A04/MF A01 CSCL 06P

The importance of molecules introduced into the human body by the way of foods is emphasized Examples of orthomolecular therapy are given that range from the control of epileptic seizures, the therapy of mental illness to the prevention of the common cold G G

**N79-15896\*#** Institutes for the Achievement of Human Potential  
Philadelphia Pa

**INTELLIGENCE**

Glenn Doman Janet Doman Susan Aisen Miki Nakayachi Gail Engebretson Conceicao DeSousa and Bruce Hagy *In* NASA  
Ames Res Center Human Neurol Develop Nov 1978 p 53-58

Avail NTIS HC A04/MF A01 CSCL 05J

Genetic and environmental facts in the development of human intelligence are discussed Intelligence is considered to be the major portion of the human potential G G

**N79-15897\*#** Trans World Airlines, Inc Kansas City, Mo  
**DEVELOPMENT OPPORTUNITIES IN THE SPACE ENVIRONMENT**

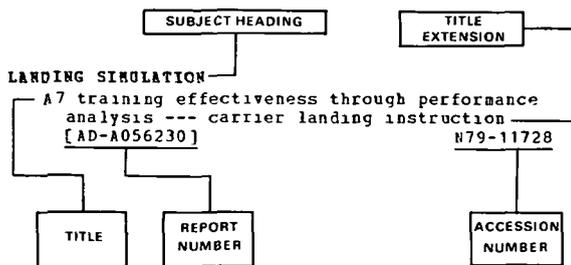
Richard D Norton *In* NASA Ames Res Center Human Neurol  
Develop Nov 1978 p 59-63

Avail NTIS HC A04/MF A01 CSCL 06P

Human physiological changes are outlined which occur in a space environment It is shown that flexibility and adaptability are keys to maximizing neurological and body-functions for purposes of life support and health under reduced gravity conditions Controlled manipulation of gravity in a space environment could reduce some aging problems by delaying the physical collapse of the skeleton the cardiovascular system and of tissues and organs G G

# SUBJECT INDEX

## Typical Subject Index Listing



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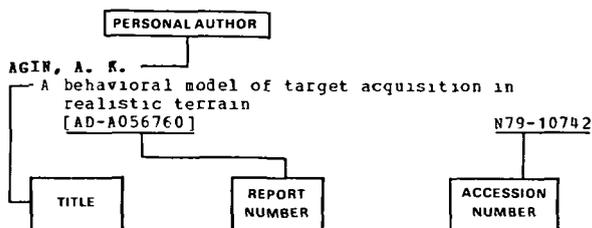
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