



## ACCESSION NUMBER RANGES

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STAR (N-10000 Series)      N82-12027 - N82-14048

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# AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY  
WITH INDEXES

(Supplement 230)

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 February 1982 in

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

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# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 244 reports, articles and other documents announced during February 1982 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964.

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

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged 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 1982 Supplements.

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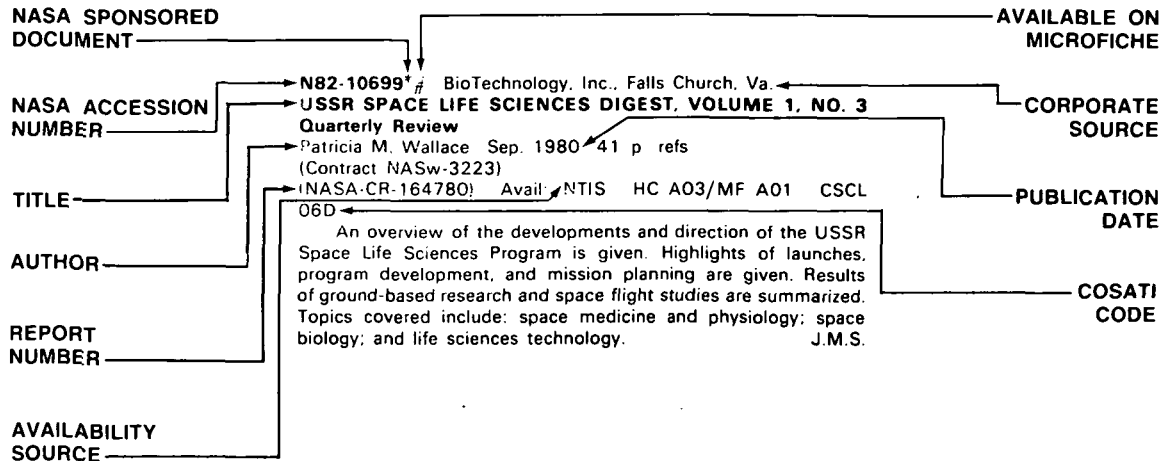
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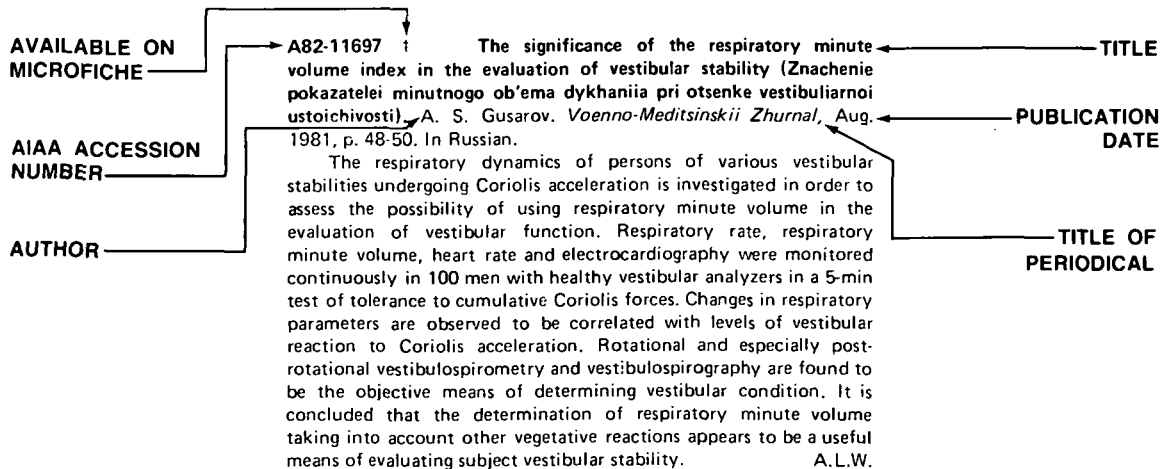
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# AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 230)

MARCH 1982

## IAA ENTRIES

**A82-12869** Eye movement measurement of readability of CRT displays. P. A. Kolers, R. L. Duchnick, and D. C. Ferguson (Toronto, University, Toronto, Canada). *Human Factors*, vol. 23, Oct. 1981, p. 517-527. 15 refs. Research supported by the Department of Communications.

Eye movement was recorded as people read texts presented on a CRT in two different spacings, two different character densities, and at five different scrolling rates. Differences in efficiency of reading single- and double-spacing were statistically significant, but were of little practical significance. Character densities of 35 characters or 70 characters per line favored the smaller-size character with respect to efficiency of reading. Comparison of scrolling rates suggested that the static page was processed more efficiently than was the page scrolled at the subject's preferred rate or at a rate 10% slower than that; pages presented faster than the preferred rate were read more efficiently. Little if any change in preferred rate occurred as a function of practice with 16 pages of text. Systems in which, by program control, text was presented at rates 10% or 20% faster than the preferred scrolling rate should lead to more efficient performance, but might create some problems of user acceptance. (Author)

**A82-12870** Visual fatigue and cathode ray tube display terminals. R. R. Mourant, R. Lakshmanan, and R. Chantadisa (Oakland University, Rochester, MI). *Human Factors*, vol. 23, Oct. 1981, p. 529-540. 6 refs. Research supported by Oakland University.

The results of experiments to determine the effects of cathode ray tube (CRT) usage on visual fatigue are reported. Two studies were conducted: two 3-hr sessions, in which subjects were divided into recommended contrast (20) and low contrast (1.61 and 3.18) CRT users and hard copy (5.25 and 2.18 contrast), with a one hour break between sessions; and two 2-hr sessions, with the hard copy contrast at 5.25 and the CRT at 20. The second study was to observe the effects of age, of the presence of a peripheral column of figures, and of blink frequency as an indicator of fatigue. CRT employment was found to have a measurably greater impact on eye fatigue than hard copy reading, although the effects were ameliorated with breaks in the routine. Age did not have a perceptible effect on fatigue; blink rate and outfocus time increased in both tests with the CRT, and the presence of a peripheral column resulted in less fatigue in the two-hour set. Further studies using a larger sample are recommended, as well as regular breaks for CRT users. M.S.K.

**A82-12871** An evaluation of alphanumeric, graphic, and color information displays. T. S. Tullis. *Human Factors*, vol. 23, Oct. 1981, p. 541-550. 9 refs.

Four different types of CRT display formats were evaluated in the context of a computer-based telephone line testing system. The formats considered were narrative, which used complete words and phrases; structured, which used a tabular format; black-and-white graphics, which used a schematic of the telephone line; and color graphic, which also used a schematic but added color coding. The evaluation measured speed and accuracy of the subjects' interpretation of the displays of test results. Accuracy did not significantly vary with format but speed did. Response times for both graphic formats were consistently shorter than those for the narrative format. With additional practice, however, response times for the structured format were just as short. There was no significant

difference between response times for the black-and-white graphic and color graphic formats. (Author)

**A82-12873** Effects of visual display units on the eyes - A bibliography /1972-1980/. R. A. Matula (Bell Telephone Laboratories, Inc., Murray Hill, NJ). *Human Factors*, vol. 23, Oct. 1981, p. 581-586. 140 refs.

Visual display units (VDUs) have been reported to cause such eye difficulties as eyestrain, visual discomfort, and visual fatigue. In addition, there are effects on visual accommodation as well as effects arising from contrast and glare sensitivity. This bibliography brings together in one place the widely dispersed literature on the effects of VDUs on the eyes. (Author)

**A82-12874** The interaction between the edge effect and target conspicuity in visual search. T. H. Monk (Medical Research Council, Perceptual and Cognitive Performance Unit, Brighton, England). *Human Factors*, vol. 23, Oct. 1981, p. 615-625. 13 refs.

The term 'edge effect' in visual search is used to describe the finding that targets appearing in the outer half of a display have longer search times than those appearing in the inner half. The interaction between the edge effect and target conspicuity was explored using two experiments. Under conditions of target uncertainty, it was shown that the magnitude of the edge effect was unaffected by target conspicuity. In addition, two manipulations of the edge effect indicated that as the edge effect decreased, the difference between the search times of inconspicuous and conspicuous target increased. The results are explained in terms of a model based upon the size of the 'mesh' of fixations used to cover the display. Two computer simulations confirmed that the size of this mesh and the magnitude of the edge-effect are inextricably related. (Author)

**A82-12875** Effects of extended practice on dual-task tracking performance. D. L. Damos (New York, State University, Buffalo, NY), A. C. Bittner Jr., R. S. Kennedy, and M. M. Harbeson (U.S. Navy, Naval Biodynamics Laboratory, New Orleans, LA). *Human Factors*, vol. 23, Oct. 1981, p. 627-631. 7 refs.

A critical tracking task combination was examined for inclusion in an exotic environment test battery. Performance increased throughout 15 testing sessions despite the subjects' extensive prior tracking experience. However, consistent individual differences occurred only after Session 10. The implications of these results for research on exotic environments and timesharing abilities are discussed. (Author)

**A82-12951** † Thermoregulatory responses to local convective and radiative cooling (Reaktsii termoregulatsii na lokal'noe konvektivnoe i radiatsionnoe okhlazhdenie). L. I. Danilova, N. K. Poleshchuk, and L. A. Fadeeva (Petrozavodskii Gosudarstvennyi Universitet, Petrozavodsk, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 67, Sept. 1981, p. 1375-1380. 14 refs. In Russian.

The characteristics of thermoregulatory responses to various degrees of local skin cooling induced by convection and radiation are investigated. The extents of physical and chemical thermoregulation were assessed by measurements of ear temperature and gas exchange, respectively, in unanaesthetized rabbits subjected to skin temperature reductions of 2-10 C on their dorsal trunk surfaces upon exposure to an ice-salt mixture of temperature -9-14 C or a jet of cooled air. Under both types of cooling stimuli, the level of both types of thermoregulatory response is found to be directly proportional to the cooling stimulus, however the response to radiative

## A82-12952

cooling is characterized by a slower onset, a longer latency period and a significantly lower ultimate level than the response to the same level of convective cooling. The distinction between the responses is observed to be more pronounced at skin temperature reductions of 7-10 C, indicating the greater danger of insufficient protective adaptation to greater degrees of radiative cooling. A.L.W.

**A82-12952 †** Changes in the heat resistance of rats under various regimes of cold adaptation (Izmenenie teplovoi ustoychivosti kryys pri razlichnykh rezhimakh kholodovoi adaptatsii). Iu. I. Rossomakhin and S. A. Pevnyi (Donetskii Gosudarstvennyi Universitet, Donetsk, Ukrainian SSR). *Fiziologicheskii Zhurnal SSSR*, vol. 67, Sept. 1981, p. 1381-1388. 15 refs. In Russian.

**A82-13110** Articulated hands - Force control and kinematic issues. J. K. Salisbury and J. J. Craig. In: Joint Automatic Control Conference, Charlottesville, VA, June 17-19, 1981, Proceedings. Volume 1. New York, American Institute of Chemical Engineers, 1981. 9 p. (TA-2C). 26 refs. Research supported by the California Institute of Technology; NSF Grant No. DAR-78-15914.

Kinematic and control issues are discussed in the context of an articulated multi-finger mechanical hand. Existence of hand designs with particular mobility properties is shown and a definition of accuracy points within manipulator workspace is given. An approach to optimization of the physical dimensions of the JPL-Stanford hand is given. Several architectures for position and force control of this multi-loop-mechanism are described including a way of dealing with the internal forces inherent in such systems. Preliminary results are shown for the joint torque subsystem used in the hand controller.

(Author)

**A82-13175** An empirical relationship for electromagnetic energy absorption in man for near-field exposure conditions. I. Chatterjee, M. J. Hagmann, and O. P. Gandhi (Utah, University, Salk Lake City, UT). *IEEE Transactions on Microwave Theory and Techniques*, vol. MTT-29, Nov. 1981, p. 1235-1238. 9 refs. Grant No. NIH-ES-02304.

**A82-13226** Hypoxic vasoconstriction and fluid filtration in pig lungs. W. Mitzner and J. T. Sylvester (Johns Hopkins University, Baltimore, MD). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1065-1071. 37 refs. Grant No. NIH-HL-10342.

The effects of hypoxic pulmonary vasoconstriction on the fluid filtration rate in isolated blood-perfused pig lungs are investigated under various pulmonary blood flow conditions in a study of the mechanism of high-altitude pulmonary edema. Fluid filtration rates were measured as slow changes in lung weight in lungs inspiring gas mixtures of 200 and 50 mm Hg O<sub>2</sub> partial pressures and perfused at blood flows from 0.5 to 2.5 l/min. Pulmonary arterial pressure-flow curves reveal that hypoxia caused a marked vasoconstriction at all blood flow rates, accompanied by an increased rate of fluid filtration. The results may be explained by a simple Starling resistor model of pulmonary circulation consisting of recruitable parallel channels, each with its own critical pressure and filtration coefficient which increase upon exposure to hypoxia. A.L.W.

**A82-13227** Arm and leg intravascular temperatures of men during submaximal exercise. L. H. Aulick, S. Robinson, and S. P. Tzankoff (Indiana University, Bloomington, IN). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1092-1097. 24 refs.

**A82-13228** Effect of exhaustive exercise on myocardial performance. G. K. Grimditch, R. J. Barnard, and H. W. Duncan (California, University, Los Angeles, CA). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1098-1102. 25 refs.

Possible changes in cardiac functional capacity in the intact heart following prolonged exhaustive exercise are investigated. Cardiac output, coronary blood flow, aortic blood pressure, left ventricular pressure, maximum rate of left ventricular pressure development and maximum rate of left ventricular pressure relaxation were measured in eight chronically instrumented adult mongrel

dogs run at a constant work load to exhaustion signalled by the animals' refusal or inability to continue. All cardiovascular parameters, with the exception of stroke volume, are found to increase significantly during the transition from rest to steady-state exercise at about 75% of maximum heart rate. In the transition from steady state to exhaustion, only the maximum rates of left ventricular pressure development and relaxation are observed to increase significantly, while all other values exhibited no significant change. Similarly, no significant changes are observed in measurements of maximum cardiac parameters before and after exhaustion. Results indicate that cardiac function and hemodynamic parameters are not depressed at exhaustion in dogs despite observed ultrastructural changes. A.L.W.

**A82-13229** Effects of rib cage or abdominal restriction on lung mechanics. M. Scheidt, R. E. Hyatt, and K. Rehder (Mayo Clinic; Mayo Foundation; Rochester, MN). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1115-1121. 14 refs. Grant No. NIH-HL-21584.

The effects of rib cage and abdominal restriction on transpulmonary pressure gradients and lung mechanics are compared. Measurements of transpulmonary pressure were performed simultaneously at three vertical sites in ten healthy male subjects studied under control conditions, rib cage restriction by a corset extended from the axillae to the lower ribs, predominant abdominal restriction by a water-filled rubber bladder secured by a corset extending from the lower ribs to the hips, and conditions making use of a volume equal to the restricted total lung capacity but without the restrictions (mimic phase). At the same lung volumes, abdominal restriction is found to decrease lung height and increase anteroposterior diameter compared with the control case, while rib cage restriction had the opposite effect. Maximum expiratory flow is observed to increase equally with both types of restriction, while the pleural pressure gradient became more uniform with abdominal restriction and the average static elastic recoil pressure increased equally. A significant correlation between total lung capacity reduction and recoil pressure increase is also obtained. Results indicate that changes in lung mechanics depend primarily on the amount of volume reduction rather than the type of deformation producing the reduction. A.L.W.

**A82-13230** Impaired surfactant phospholipid metabolism in hyperoxic mouse lungs. N. J. Gross (U.S. Veterans Administration Hospital, Hines, IL) and D. M. Smith (Loyola University, Maywood, IL). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1198-1203. 34 refs.

**A82-13231** Steady-state vascular responses to graded hypoxia in isolated lungs of five species. M. D. Peake, A. L. Harabin, N. J. Brennan, and J. T. Sylvester (Johns Hopkins Medical Institutions, Baltimore, MD). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1214-1219. 31 refs. Research supported by the Peel Medical Research Trust and Wellcome Trust.

In the isolated pig lung exposed to graded levels of hypoxia, steady-state pulmonary vasomotor tone is maximum at an O<sub>2</sub> tension, (PO<sub>2</sub>), of 50 Torr. Below 50-Torr decreases in PO<sub>2</sub> cause steady-state tone to fall below this maximum. To determine whether this stimulus-response relation was peculiar to pigs, the steady-state relation between PO<sub>2</sub> and vasomotor tone was measured in the isolated lungs of dogs, rabbits, cats, and ferrets, by using identical techniques in each species. Marked species differences were apparent in both the level of PO<sub>2</sub> required to elicit responses and the amplitude of the responses. The ferret and the pig had the largest vasoconstrictor responses to hypoxia. No significant responses were obtained in the dog. The cat and rabbit were intermediate responders. In the ferret, cat, and rabbit, the stimulus-response relationship was biphasic, as in the pig. On the average, maximal constriction occurred at a PO<sub>2</sub> of 25 Torr. When PO<sub>2</sub> was lowered below 25 Torr, steady-state tone fell. Thus pulmonary vasodilation at low PO<sub>2</sub> occurs in the isolated lungs of several species. (Author)

**A82-13232 Pulmonary injury in rats following continuous exposure to 60% O<sub>2</sub> for 7 days.** G. Hayatdavoudi, J. J. O'Neil, B. E. Barry, B. A. Freeman, and J. D. Crapo (Duke University, Durham; U.S. Environmental Protection Agency, Research Triangle Park, NC). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1220-1231. 34 refs. Grants No. NIH-HL-23805; No. NIH-HL-25044.

Lung injuries and toxic effects associated with the continuous exposure of rats to gas mixtures containing 60% O<sub>2</sub> for a period of 7 days are investigated. Biochemical, morphometric and physiological studies were performed on the lungs of animals following a 7-day exposure and of control animals. It is found that exposure to 60% O<sub>2</sub> for one week does not induce but rather reduces tolerance to 100% O<sub>2</sub> relative to the controls, whereas exposure to 85% O<sub>2</sub> prevents mortality in 100% O<sub>2</sub> for over 96 hours. Activities of lung superoxide dismutases and glucose-6-phosphate dehydrogenase are observed to be unchanged following exposure to 60% O<sub>2</sub>, while a decrease in lung compliance is suggested by changes in total lung capacity and the pressure-volume curves of excised lungs. Morphometric analyses reveal a significant decrease in alveolar air volume and increase in the number of alveolar macrophages. The most significant lesions are found to involve the pulmonary vascular bed: decreases in the volume and thickness of the capillary endothelium, pericapillary fluid accumulations, and perivascular edema in the smaller vessels. Results indicate that exposure to O<sub>2</sub> causes significant lung injury, primarily in the pulmonary capillary endothelium, without stimulating pathways leading to oxygen adaptation. A.L.W.

**A82-13233 Autonomic mechanisms of training bradycardia - Beta-adrenergic receptors in humans.** R. S. Williams, R. S. Eden, M. E. Moll, R. M. Lester, and A. G. Wallace (Duke University Medical Center, Durham, NC). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1232-1237. 29 refs. Research supported by the Henry T. Kaiser Family Foundation; Grants No. NIH-HL-16037; No. NIH-HL-24146.

The role of beta-adrenergic receptor sensitivity in the development of bradycardia observed at rest and during submaximal exercise as a result of physical training in humans is investigated. Heart-rate responses to graded doses of isoproterenol in seven elite marathon runners were compared with those of seven age-matched controls, and the effects of a 6-week period of intense physical training on lymphocyte beta-adrenergic receptors were monitored in 12 normal volunteers. No significant differences in the dose of isoproterenol required to increase heart rate by 25 beat/min is observed between the marathoners and the controls, either in the absence or presence of cholinergic blockade. Likewise, physical training is found to have no effect either on the number or affinity of lymphocyte beta-adrenergic receptors to binding of I-(H-3)dihydroalprenolol, despite evidence for training bradycardia. Results suggest that although reduced sinus-node responsiveness to isoproterenol during cholinergic blockade may be present in some highly trained individuals, altered neuronal input to the sinus node is usually a more important mechanism of training bradycardia. A.L.W.

**A82-13234 Central venous bubbles and mixed venous nitrogen in goats following decompression.** B. G. D'Aoust, H. T. Swanson, R. White, R. Dunford, and J. Mahoney (Virginia Mason Research Center, Seattle, WA). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1238-1244. 18 refs. Grant No. NIH-HL-17503.

**A82-13235 ACTH and cortisol responses to hypoxia in dogs.** H. Raff, S. P. Tzankoff, and R. S. Fitzgerald (Johns Hopkins University; National Institutes of Health, Gerontology Research Center, Baltimore, MD). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1257-1260. 21 refs. Grants No. NIH-HL-10342; No. NIH-HL-07199.

**A82-13236 Hypoxic arousal in intact and carotid chemodenedervated sleeping cats.** J. A. Neubauer, T. V. Santiago, and N. H. Edelman (Rutgers Medical School, Piscataway, NJ). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 51, Nov. 1981, p. 1294-1299. 26 refs. Grant No. NIH-HL-16022.

The relative contributions of the carotid chemoreceptors and hyperpnea to arousal from sleep under hypoxic conditions are investigated in intact and chemodenedervated cats. The arousal response to hypoxic hypoxia was first characterized in 14 intact sleep-deprived cats breathing a mixture of 5% O<sub>2</sub> in N<sub>2</sub> during periods of REM and slow-wave sleep (SWS), then compared with responses to carboxyhemoglobinemia induced by a 6% CO in 40% O<sub>2</sub> breathing gas mixture and to the same hypoxic hypoxia following the bilateral surgical denervation of the carotid chemoreceptors. During a period of SWS unassociated with spontaneous arousals, arousal is found to occur at arterial oxygen saturations which are nearly the same in intact hypoxic and carboxyhemoglobinemic cats and carotid denervated cats, while arousal from REM sleep occurred after twice as much time and required a greater degree of hypoxemia. During both SWS and REM sleep, inhalation of hypoxic oxygen mixtures caused a substantial increase in ventilation in intact animals, while 6% CO did not. Results indicate that some mechanism other than one involving stimulation of the carotid bodies or increased ventilation is responsible for hypoxic arousal, and that the mechanism is stimulated by lowered O<sub>2</sub> saturation. A.L.W.

**A82-13289 \* # Veiling glare reduction methods compared for ophthalmic applications.** D. R. Buchele (NASA, Lewis Research Center, Cleveland, OH). *Applied Optics*, vol. 20, Nov. 1, 1981, p. 3787-3791. 11 refs.

Veiling glare in ocular viewing was simulated by viewing the retina of an eye model through a sheet of light-scattering material lit from the front. Four methods of glare reduction were compared, namely, optical scanning, polarized light, viewing and illumination paths either coaxial or intersecting at the object, and closed circuit TV. Photographs show the effect of these methods on visibility. Polarized light was required to eliminate light specularly reflected from the instrument optics. The greatest glare reduction was obtained when the first three methods were utilized together. Glare reduction using TV was limited by nonuniform distribution of scattered light over the image. (Author)

**A82-13422 The effect of visual-vestibular conflict on the latency of steady-state visually induced subjective rotation.** S. C. P. Wong and B. J. Frost (Queen's University, Kingston, Ontario, Canada). *Perception and Psychophysics*, vol. 30, no. 3, Sept. 1981, p. 228-236. 31 refs. Research supported by the Natural Sciences and Engineering Research Council and Medical Research Council of Canada.

It has been hypothesized that the 25- to 30-sec latency observed in the onset of subjective rotation when a stationary subject is presented with a rotating visual field is the result of visual-vestibular conflict. The paper presents two experiments designed to test whether a reduction in visual-vestibular conflict would reduce the length of the latency period. In the first experiment, subjective rotation was induced by rotating a tall striped drum around an observer sitting in line with its axis of rotation, and vestibular stimulation was provided by the brief rotary acceleration of the observer's chair. Onset latencies were found to be significantly shortened by corroborating vestibular stimulation in the direction of perceived rotation, but to be unaffected by noncorroborating vestibular stimulation. In the second experiment, patients with unilateral (right labyrinth) Meniere's disease, which produces decreased vestibular sensitivity to rightward body rotation, were tested in the same rotating drum apparatus without additional chair rotation, and it was found that the latency to steady-state subjective rotation to the right was shorter than normal, while a level of subjective rotation to the left comparable to that of normal subjects was not reached during the 1-min testing period. Results thus confirm the hypothesis that onset latency of subjective rotation is probably a function of the visual-vestibular conflict. A.L.W.

**A82-13423 The effects of binocular and motion-generated information on the perception of depth and height.** M. A. Hagen (Boston University, Boston, MA) and M. Teghtsoonian (Smith College, Northampton, MA). *Perception and Psychophysics*, vol. 30, no. 3, Sept. 1981, p. 257-265. 21 refs. Grants No. NIH-R01-MH-27947-0; No. NIH-1-R0-HD-10857.

The contributions of binocular vision and head movements to the perception of distance and size in the presence of optical gradient information is investigated. Subjects were asked to make distance and size judgements by the adjustment of a metal tape for target triangles of various sizes placed within a 2.4-m alley with a black, white and gray checked floor and white walls. When judged distance is fitted as either a linear or a power function or target distance, it is found that binocular information is able to reproduce actual target distances than monocular vision, although consistently underestimating them, while head motion did not have any effect on perceived distance. Size judgements are not observed to be influenced by either binocular vision or head motion, consistently exceeding target heights by an average 30 to 40%. Analysis of judged size as a function of target distance reveals that the effect of distance is to increase size judgements for all conditions but monocular view with head motion. The distance judgements support the hypothesis that the binocular stimulus carries information that the monocular stimulus does not, while the size judgements suggest an independence of perceived size from perceived distance. A.L.W.

**A82-13550 †** The application of a combined passive orthostatic test in the flight medical examination (Primenenie kombinirovannoi passivnoi ortostaticheskoi proby vo vrachebno-letnoi eksper-tize). V. D. Vlasov and A. S. Nekhaev. *Voenna-Meditsinskii Zhurnal*, Sept. 1981, p. 49, 50. In Russian.

The potential applicability of a combined passive orthostatic test incorporating both orthostatic and antiorthostatic positions to the medical examination of pilots is assessed. Systolic, diastolic and pulse blood pressures and heart rate were measured in subjects undergoing a combined orthostatic test consisting of 5-min periods in the horizontal, antiorthostatic (-30 deg inclination) and orthostatic (+80 deg inclination) positions, or a control test involving 5 min in the horizontal and orthostatic positions. In the combined orthostatic test, a decrease in arterial systolic pressure, an increase in diastolic pressure, a decrease in pulse pressure and an increase in heart rate relative to those observed in the horizontal position were observed in the orthostatic position, while in the control tests, only an increase in heart rate was observed. The combined orthostatic test is thus seen to produce a more marked cardiovascular response and to merit further investigation as an alternative to the conventional passive orthostatic test used in pilot examination. A.L.W.

**A82-13636 †** The theory of radiometric contact measurements of the internal temperature of bodies (K teorii kontaktnykh radiometricheskikh izmerenii vnutrennei temperatury tel). V. S. Troitskii (Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR). *Radiofizika*, vol. 24, no. 9, 1981, p. 1054-1061. 6 refs. In Russian.

The paper considers the problem of determining the internal temperature of a body by measuring its thermal emission by a radiometer that is in contact with the surface of the body. A method is proposed for the absolute measurement of the internal temperature of dielectric bodies, including certain parts of the human body. An analysis is presented of radiometer input noise as a source of measurement errors. It is shown that the use of the thermodynamic-equilibrium principle of the radiometer input system and calibration with respect to two thermal-emission standards makes it possible to reduce the measurement error to one-tenth of a degree. B.J.

**A82-13699 †** Artificial hypobiosis as a stable functional state of reduced vital activity (Iskusstvennyi gipobioz kak ustoi-chivoe funktsional'noe sostoianie snizhennoi zhiznedeiatel'nosti). N. N. Timofeev (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 12, Oct.-Dec. 1981, p. 52-75. 92 refs. In Russian.

The artificial induction of a state of hypobiosis corresponding to true hibernation in warm-blooded animals is discussed. Following a discussion of distinctions between natural and artificial levels of reduced vital activity, including superficial, deep and superdeep states of hypobiosis, attention is given to the induction of deep hypobiosis by the hibernation method, which consists of the administration of neuroplegic substances, and by the oxycapnic method, which involves the use of hypoxic and hypoxic-hypercapnic gas mixtures. Experimental results are considered which reveal the

relationships characterizing the adjustment of the central and vegetative nervous systems, energy and carbohydrate-liquid metabolism, enzyme activity and tissue and organ morphologies to reduced levels of activity at lower temperatures. It is noted that the results demonstrate the feasibility of achieving reversible states of hypobiosis similar to those observed in heterothermic animals in warm-blooded animals. A.L.W.

**A82-13700 †** Oxygen deficiency in tissues and their blood supply (Defitsit kisloroda v tkaniakh i ikh krovosnabzhenie). M. I. Gurevich, S. A. Bershtein, and A. I. Solov'ev (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 12, Oct.-Dec. 1981, p. 77-98. 109 refs. In Russian.

The role of oxygen in regulating vascular tonus, which in turn determines tissue blood supply, is discussed based on an analysis of literature data. It is shown that the functioning of smooth muscle cells, which determine vascular tonus, primarily results from fluctuations in the level of intercellular metabolism and energy consumption in the provision of a specific level of force commensurate with that of striated muscle, and from aerobic metabolism in the synthesis of high-energy phosphates. Data demonstrating the significant reduction of the electrical, humoral and contractile activity of smooth vascular muscle and its responses to electrical, humoral and mechanical stimuli upon the lowering of the perfusate oxygenation level is presented, and it is concluded that these muscles exhibit reduced excitability under oxygen deficiency, possibly due to the reduction of energy supply to the electrogenic ion pump. The vascular smooth muscle cells thus act as chemoreceptors with built-in contractile mechanisms. A.L.W.

**A82-13825 #** On the place of organic life in the universe and the possibility of extraterrestrial life. R. N. Butler (University College, Galway, Ireland). *Irish Astronomical Journal*, vol. 14, Mar.-June 1981, p. 177-188. 42 refs.

Assessments of the possibility of life elsewhere in the universe are thought to be unduly optimistic, representing a generalization of a single data point, the earth. Some of the assumptions involved in this post-Copernican philosophical view of widespread life in the universe are examined. It is pointed out that if it is to be justifiably assumed that life is a universally occurring process rather than a universally possible process, which has occurred rarely, it must be required (a) that the process be understood; (b) that the chance element involved be quantified; and (c) that the limits of favorable conditions be identified and shown to be reasonably widespread. The role of chance and probability in the development of earthlife, however, cannot be accurately quantified and probably will never even be fully known. C.R.

**A82-13839** A working hypothesis on the interdependent genesis of nucleotide bases, protein amino acids, and primitive genetic code. F. Egami (Mitsubishi-Kasei Institute of Life Sciences, Machida, Tokyo, Japan). *Origins of Life*, vol. 11, Sept. 1981, p. 197-202. 22 refs.

**A82-13840** Are there structural analogies between amino acids and nucleic acids. L. B. Hendry, E. D. Bransome, Jr. (Georgia, Medical College, Augusta, GA), and M. Petersheim (Rochester, University, Rochester, NY). *Origins of Life*, vol. 11, Sept. 1981, p. 203-221. 55 refs.

Space-filling molecular models have been used to examine structural analogies between amino acids and nucleic acids. The three-dimensional structures of amino acid R groups appear to be stereochemically related to cavities formed by removal of single bases in double helical nucleic acids. The common L amino acids may thus be complementary to their codons. (Author)

**A82-13841** Molecular complexes of amino acids with porphyrins as possible precursors of pigment-protein systems. M. P. Kolesnikov, N. I. Voronova, and I. A. Egorov (Akademiia Nauk SSSR, Institut Biokhimmii, Moscow, USSR). *Origins of Life*, vol. 11, Sept. 1981, p. 223-231. 20 refs.

The present communication gives experimental results of the studies of catalytic and photochemical properties of peptide-like

compounds containing metalloporphyrins (hemoproteins and molecular complexes obtained through adsorption of porphyrins and amino acids on volcanic ash). The data suggest that molecular complexes of amino acids with porphyrins could have evolved in the course of chemical evolution and were intermediated between abiogenically synthesized molecules of amino acids and porphyrins and pigment-protein systems of living organisms. (Author)

**A82-13842** Constant AMP synthesis in aqueous solution by electric discharges. Y. Yamagata, T. Mohri, M. Yamakoshi, and K. Inomata (Kanazawa University, Kanazawa, Japan). *Origins of Life*, vol. 11, Sept. 1981, p. 233-235.

An electric discharge was made through a gas mixture of N<sub>2</sub> (7 cm Hg), H<sub>2</sub> (14 cm Hg) and CO<sub>2</sub> (14 cm Hg) over an aqueous solution (100 ml, pH 7.6) of adenosine (0.02 M) and phosphate (0.2 M) in a 5 liter vessel simulating primitive earth conditions. AMP was produced at a constant rate in the solution, and the yield reached about 2% in two months. (Author)

**A82-13843 \*** Effect of polynucleotides on the dimerization of glycine. H. Mizutani and C. Ponnampuram (Maryland, University, College Park, MD). *Origins of Life*, vol. 11, Sept. 1981, p. 237-241. 9 refs. Grant No. NGR-21-002-317.

Results from experiments to determine the effect of polynucleotides on abiobiochemical formation of peptide bonds are reported. The reaction between glycine molecules in an aqueous phase in the presence of a condensing agent was chosen as a model, with polyphosphates being selected as the condensing agent for biologicaly relevant peptide formation. Four types of polynucleotides were used: polygluamic acid (G), polyuridylic acid (U), polyadenylic acid (A), and polycytidylic acid (C); the effects of small anions, acetate, chloride, and phosphate, were also studied. Procedures are given, including concentrations, pH, and incubation time, and the type of amino acid analyzer. The diglycine yields were, in order of most to least: G, C, A, U, and are diagrammed as a function of time; rate of formation followed the same order of magnitude as the final yields. Anion presence displayed no discernible effect. The results are taken to indicate that polynucleotides do have an effect on the formation of peptide bonds, an effect significant in the understanding of chemical evolution. M.S.K.

**A82-13844** Primordial transport of sugars and amino acids via Schiff bases. W. Stillwell and A. Rau (Indiana University; Purdue University, Indianapolis, IN). *Origins of Life*, vol. 11, Sept. 1981, p. 243-254. 58 refs.

Experimental support is given for a model concerning the origin of a primordial transport system. The model is based on the facilitated diffusion of amino acids stimulated by aliphatic aldehyde carriers and sugars stimulated by aliphatic amine carriers. The lipid-soluble diffusing species is the Schiff base. The possible role of this simple transport system in the origin of an early protocell is discussed. (Author)

**A82-13845** Chirality of electrons from beta-decay and the left-handed asymmetry of proteins. A. K. Mann and H. Primakoff (Pennsylvania, University, Philadelphia, PA). *Origins of Life*, vol. 11, Sept. 1981, p. 255-265. 10 refs. NSF Grant No. PHY-78-11608; Contract No. EY-76-C-02-3071.

A simplified mathematical model of the origin of the left-handed asymmetry of proteins in living matter is presented. The model is based on the hypothesis of Vester and Ulbricht (1957) that the chirality of (left-handed) electrons from naturally beta-active elements, e.g. C-14, K-40, etc., was the specific source of the asymmetry; it requires for its application data on the interaction of electrons having nonzero chirality with racemic mixtures of amino acids. This interaction is here treated theoretically in an order-of-magnitude calculation. The analysis yields a very approximate value of the induced steady-state asymmetry in the amino acids at the beginning of protein synthesis and indicates that this asymmetry, though small, may have been sufficient to account for the dominant left-handedness of proteins now observed. (Author)

**A82-13846 \*** Chemical evolution and the origin of life - Bibliography supplement 1979. L. G. Pleasant (George Washington University, Medical Center, Washington, DC) and C. Ponnampuram (Maryland, University, College Park, MD). *Origins of Life*, vol. 11, Sept. 1981, p. 273-288. 340 refs. Contract No. NASw-3165; Grant No. NGR-21-002-317.

**A82-13890 #** A self-contained, man-borne biomedical instrumentation system in the flight testing of naval weapons systems. D. W. Call, D. M. Kelly, and D. G. Robertson (U.S. Navy, Pacific Missile Test Center, Point Mugu, CA). *AIAA, SETP, SFTE, SAE, ITEA, and IEEE, Flight Testing Conference, 1st, Las Vegas, NV, Nov. 11-13, 1981, AIAA Paper 81-2403*. 5 p. 8 refs. Navy-supported research.

Noting that the performance capabilities of some existing and prototype military aircraft exceed human physical tolerances and reaction times, a self-contained, man-borne, in-flight physiological data acquisition system (IFPDAS) was developed to evaluate airborne man-machine systems. A short history of in-flight monitoring of fighter pilots is provided, tracing the expansion of the instrumentation. IFPDAS has capabilities of monitoring physiological and environmental data for recording on cassette tape; ECG, expiratory flow, O<sub>2</sub> inhalation/exhalation, g-force, vertical acceleration, cabin pressure, voice information, and a time code are included. Sensors are contained within the pilots' survival vests, and tests have been conducted on board A-4, F-4, F-14, C-130, and T-38 aircraft. Breathing levels during landing were found to surpass breathing apparatus design parameters. IFPDAS is equipped with 12 channels analog and 32 digital, which are multiplexed on four track magnetic tape for up to four continuous hours. D.H.K.

**A82-13914 #** System to measure head motion during parachute opening shock. T. J. Bozack and J. E. Doerr (U.S. Naval Weapons Center, China Lake, CA). *AIAA, SETP, SFTE, SAE, ITEA, and IEEE, Flight Testing Conference, 1st, Las Vegas, NV, Nov. 11-13, 1981, AIAA Paper 81-2517*. 10 p. 12 refs.

Human tolerance limits to the forces imposed during parachute opening are not well defined. Part of the effort to develop realistic human tolerance limits involves measuring the response of the human, head-neck system to the forces imposed during parachute opening. To accomplish this, human subjects are being instrumented to directly measure the displacement of the head with respect to the upper torso during parachute opening. A small high speed 16-mm camera is mounted on a test jumper and fiber-optic image guides connect the camera to a pair of stereo lenses. This system photographs head motion during parachute opening. A mathematical description of motion is derived from an analysis of the stereo film. (Author)

**A82-14197 \*** Hydrazines and carbonylhydrazides produced from oxidized carbon in earth's primitive environment. C. E. Folsome, A. Brittain (Hawaii, University, Honolulu, HI), A. Smith, and S. Chang (NASA, Ames Research Center, Life Sciences Div., Moffett Field, CA). *Nature*, vol. 294, Nov. 5, 1981, p. 64, 65. 15 refs. Research supported by the University of Hawaii, Grant No. NGR-12-001-109.

Whether abiobiochemical organic compounds can be formed from the interactions of energy sources with nitrogen, oxidized carbon and water is held to be of importance in geochemical models of the primordial earth atmosphere. It is reported that experiments using quenched spark discharges through molecular nitrogen on aqueous suspensions of CaCO<sub>3</sub> and other reactants to simulate the hydro-sphere/atmosphere interface yield hydrazine and carbonylhydrazide in significant but low yields. Such reactions in primitive aquatic environments may have supplied a pathway for chemical evolution and the origin of life, on a primitive earth in which fully oxidized states of carbon were available for the primary synthesis of organic matter. O.C.

**A82-14274** Work and rest on nuclear submarines. A. N. Beare, K. R. Bondi (U.S. Naval Material Command, Naval Submarine Medical Research Laboratory, Groton, CT), R. J. Biersner (U.S. Naval Medical Research and Development Command, Bethesda, MD), and P. Naitoh (U.S. Navy, Naval Health Research Center, San Diego, CA). *Ergonomics*, vol. 24, Aug. 1981, p. 593-610. 30 refs.

Hours of work and sleep were recorded in daily activity logs by 46 enlisted men on two fleet ballistic missile submarines during routine patrols. Total working time (watch standing, nonwatch work, and study) averaged 12 hours a day. Daily sleep time averaged 8.4 hours a day on one ship and 7.6 on the other. Sleep was mildly fragmented in that the men averaged 1.3 sleep episodes, of somewhat less than 6 hours duration, in 24 hours. Thirty of the men were

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standing watch on a 6-hours-on - 12-hours-off rotation which effectively imposed an 18-hour cycle on their activities. The 6-on - 12-off watch schedule appeared to result in less sleep fragmentation than the traditional 4-on - 8-off schedule employed on other naval ships. Questions in the logs were used to assess subjective sleep quality and sleepiness. Sleep quality on patrol was not as good as in a post-patrol period, but the difference between on- and off-patrol sleep quality was small. (Author)

**A82-14275** Diurnal variation in vigilance efficiency. A. Craig, W. P. Colquhoun (Medical Research Council, Laboratory of Experimental Psychology, Brighton, Sussex, England), and R. T. Wilkinson (Medical Research Council, Psychophysiology Section, Cambridge, England). *Ergonomics*, vol. 24, Aug. 1981, p. 641-651. 24 refs.

Five sets of data are presented, obtained from studies that examined the influence of time of day on auditory vigilance performance during the normal waking day. Although both hits and false alarms exhibited a fairly consistent tendency to be lowest at the first test time in the morning, 1 or 2 hours after awakening from sleep, and to increase in parallel thereafter, the magnitude of change was modest and the time-of-day effect was statistically reliable in only a minority of the analyses. The slight changes that did occur seemed largely attributable to shifts in response criterion rather than to altered levels of signal detectability. In admonitory contrast with these findings, which have reassuring implications for vigilance efficiency during normal day-work, additional evidence is presented indicating that detectability levels may alter within the daylight span when the normal sleep-work-rest routine is disturbed. (Author)

**A82-14347 \*** Chronic exposure of a honey bee colony to 2.45 GHz continuous wave microwaves. B. B. Westerdahl and N. E. Gary (California, University, Davis, CA). *Space Solar Power Review*, vol. 2, no. 3, 1981, p. 283-295. 8 refs. Research supported by the U.S. Department of Energy; Contract No. NAS2-9539.

A honey bee colony (*Apis mellifera* L.) was exposed 28 days to 2.45 GHz continuous wave microwaves at a power density (1 mW/sq cm) expected to be associated with rectennae in the solar power satellite power transmission system. Differences found between the control and microwave-treated colonies were not large, and were in the range of normal variation among similar colonies. Thus, there is an indication that microwave treatment had little, if any, effect on (1) flight and pollen foraging activity, (2) maintenance of internal colony temperature, (3) brood rearing activity, (4) food collection and storage, (5) colony weight, and (6) adult populations. Additional experiments are necessary before firm conclusions can be made. (Author)

**A82-14348 \*** Survival, development, and teratology of honey bee brood (*Apis mellifera* L.) following exposure to 2.45 GHz continuous wave radiation. B. B. Westerdahl and N. E. Gary (California, University, Davis, CA). *Space Solar Power Review*, vol. 2, no. 3, 1981, p. 297-303. 8 refs. Research supported by the U.S. Department of Energy; Contract No. NAS2-9539.

**A82-14674 †** Gamma facilities for radiobiological investigations /Design and experimental results/ (Gamma-ustanovki dlia radiobiologicheskikh issledovaniy /Konstruktsii i rezul'taty eksperimental'nykh issledovaniy/). A. N. Gladilkin, I. V. Ignatov, R. A. Kuzin, V. I. Popov, V. V. Iurgov, and A. V. Shafirkin. Moscow, Izdatel'stvo Energoizdat, 1981. 60 p. 37 refs. In Russian.

Facilities for the study of the biological effects of gamma radiation under natural and simulated conditions are discussed, and results of experiments using certain of these devices are presented. Particular attention is given to the Liustra and Kobal't apparatuses used to model chronic galactic cosmic ray and acute solar cosmic ray exposures respectively, under space flight conditions. In large laboratory animals, the Enot 1 and 2 facilities for the modeling of chronic and acute exposures in small laboratory animals under a wide range of dose rates, the Svet apparatus for the determination of the relative biological effectiveness of heavy charged particles, the Start facility used for the final development of space exposure experiments, and the Integral and OU-3 facilities used in radiobiological experiments under high-altitude and space flight conditions. A.L.W.

**A82-14677** SADT/SAINT simulation technique. R. F. Bachert (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH), K. H. Evers, and P. R. Santucci (SofTech, Inc., Dayton, OH). In: NAECON 1981; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 19-21, 1981. Volume 1. New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 4-9. 7 refs.

Structural Analysis and Design Technique (SADT) is a structured technique for doing functional analysis and system design. System Analysis of Integrated Networks of Tasks (SAINT) is a computer simulation tool currently used by the USAF for modeling and analyzing large-scale man-machine systems. By linking SADT with SAINT, a system can be defined in general terms, decomposed to the necessary level of detail, translated into SAINT nomenclature, and entered into the SAINT program. SADT/SAINT provides the capability of translating from one graphic technique to another, as well as from a static model to a dynamic one. A brief explanation is given as to how a SADT activity diagram communicates a system description, how a SAINT model is represented, and how to transition from SADT to SAINT. J.F.

**A82-14703 #** Validating manned system design and engineering change proposals. G. P. Chubb, B. D. Purvis, and E. D. Sharp (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH). In: NAECON 1981; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 19-21, 1981. Volume 1. New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 191-196. 10 refs.

An empirical approach has been developed for the validation of human factors engineering design aspects of major B-52 modernization programs which may be applicable to other systems. The Strategic Avionics Crewstation Design Evaluation Facility (SACDEF) attempts to duplicate the crew workload imposed by the anticipated mission using relatively inexperienced operators to help identify system or design weaknesses. SACDEF employs real-time mini-computer simulations of system mechanization at each crew station. The SACDEF simulation approach is considered applicable in all stages of the life cycle of the system from concept formulation through full-scale development and production to modification/modernization, with a shift in emphasis from the support of acquisition activities to the support of logistics activities as the system progresses. Benefits of validation by the system user include a cross check on contractor design with the identification of problems by user, rather than contractor, personnel, and the prevention of unforeseen operational deficiencies difficult to correct. S.C.S.

**A82-14746** Digital spirometer for automatic pulmonary function. D. E. Turner, J. S. Petrofsky, and R. M. Glaser (Wright State University; U.S. Veterans Administration Medical Center, Dayton, OH). In: NAECON 1981; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 19-21, 1981. Volume 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 584-588. Research supported by the U.S. Veterans Administration and U.S. Air Force.

The purpose of this project was to develop a digital spirometer for automatic pulmonary function. Advantages of this device are that it is: small in size, light weight, portable (battery powered), immune to exercise movement and high G forces, and relatively inexpensive. It can compute and display inspiratory or expiratory pulmonary ventilation over 30 or 60 sec time intervals, respiratory rate and gas temperature over the normal physiological ranges. The system incorporates a commercial turbine flow transducer (KLE 511) and readily available electronic components. A schematic diagram of the electronics package is provided, as is a functional description of the circuit. Accuracy of this instrument was found to be excellent with both constant and pulsatile flows, at various flow rates. (Author)

**A82-14803** Cardiovascular responses to mixed static and dynamic exercise. P. V. Fiore, J. S. Petrofsky (Wright State University, Dayton, OH), and R. M. Glaser (Wright State University; U.S. Veterans Administration Medical Center, Dayton, OH). In: NAECON 1981; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 19-21, 1981. Volume 3. New York, Institute of Electrical and Electronics

Engineers, Inc., 1981, p. 1066-1071. 11 refs. Research supported by the U.S. Veterans Administration and U.S. Air Force.

The purpose of this study was to evaluate the effect of dynamic exercise on the cardiovascular responses during subsequent fatiguing isometric exercise. College-age males performed a series of three fatiguing isometric contractions at a tension of 40% of their maximal voluntary strength of their quadriceps muscles. The period between the contractions was either one, three, or 20 minutes. During this period, subjects either rested (control), pedalled a bicycle ergometer at a load of 0 kp, or at a load which demanded 50% of their maximal oxygen uptake ( $VO_2$  max). Only one combination of experiments was performed by a subject in a 24-hour period. Cardiovascular responses during subsequent static exercise returned to control values following intervals of rest. Pedalling at a load of 0 kp had little effect on altering the cardiovascular response compared to resting control intervals. In contrast dynamic exercise at 50%  $VO_2$  max altered the cardiovascular response markedly to subsequent isometric exercise. (Author)

**A82-14804** **Steady and unsteady pressure-flow relations in bronchial tree models.** D. B. Reynolds, R. M. Glaser (Wright State University, Dayton, OH), and J.-S. Lee (Virginia University, Medical Center, Charlottesville, VA). In: NAECON 1981; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 19-21, 1981. Volume 3. New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 1072-1078. 20 refs. Research supported by the U.S. Veterans Administration; Grant No. NIH-HL-16812.

Few physical model studies of expiratory flow-pressure relations in the bronchial tree have been reported. The present study investigates pressure drop across a model of a canine tracheobronchial tree during steady expiration and unsteady respiration simulating inspiration and expiration. Water was used to amplify pressure drops and flows produced tracheal Reynolds numbers in a physiologically important range between 1000 and 10,000. The results could be described by two distinct power laws, presumably corresponding to laminar and turbulent flow regimes. However, a single equation described the data over the entire range of Reynolds numbers. Unsteady flow results indicated that when the Strouhal number is less than 0.001, unsteady flow behaves nearly steady. (Author)

**A82-14805 #** **A study of performance effects under G stress.** D. W. Repperger, D. B. Rogers, and J. W. Frazier (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH). In: NAECON 1981; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 19-21, 1981. Volume 3. New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 1079-1085.

Several variables must be considered in order to measure human tracking performance changes under G stress. First it is necessary to establish a uniform set of tracking tasks which are sensitive to the stress-nostress condition. In this paper, five tasks were chosen to delineate different levels of tracking difficulty. The five tasks chosen were required to satisfy the criteria of being zero mean, constant variance, and sum of sines. It was also desired to observe, from an experimental study, human performance changes between each task number in the static or stress mode. In comparing the static to the stress mode it was hoped to observe a performance change across the experimental conditions stress-nostress for each task number. This paper reports the results of this experiment and how these performance tasks can be used to study stress effects on pilots exposed to G acceleration. (Author)

**A82-14806** **Comparison of impedance ventricular function indices with systolic time intervals.** M. A. Bassett Frey, B. M. Doerr, B. L. Mann, and D. S. Miles (Wright State University, Dayton, OH). In: NAECON 1981; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 19-21, 1981. Volume 3. New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 1086-1093. 31 refs. Research supported by the American Heart Association.

The purposes of this study were to noninvasively assess

differences in central hemodynamics associated with supine, seated, and standing postures and to examine the relationship between ventricular function (VF) indices obtained by the established method of systolic time interval (STI) analysis and by impedance cardiography (IC). The electrocardiogram, phonocardiogram, and impedance cardiogram were recorded from seven women in three postures. Heart rate, stroke volume (SV) and cardiac output (CO) monitored by IC were significantly changed with posture. All STI VF variables responded to posture; however, IC VF variables were not significantly altered by posture. IC and STI VF variables were strongly correlated in all three postures. IC should provide a safe, atraumatic, and reliable method of monitoring VF, SV, and CO for aerospace physiology. (Author)

**A82-14837** **Automated item recognition as a secondary task for objective assessment of aircrew workload in flight simulators.** R. J. Spicuzza and M. S. Crabtree (Systems Research Laboratories, Inc., Dayton, OH). In: NAECON 1981; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 19-21, 1981. Volume 3. New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 1338-1341. 10 refs. Navy-supported research.

A low-cost, microprocessor-controlled device containing an item recognition task has been designed for assessing workload in laboratories, simulators and aboard airborne flight testing programs. The hardware includes a real-time controller and data collection device, software, and a ground-based data analysis package. A chassis has been constructed such that it is small enough to be portable, and also fits into the nose of the NT-33A aircraft. In order to create a cassette tape containing the operating program and stimulus parameters, a microcomputer containing two floppy disks drives mainframe, CRT terminal, printer, digital tape recorder, and the disk operating system. S.C.S.

**A82-14839** **Evaluation of imbedded radio communications activities as secondary tasks for objective assessment of aircrew workload in simulators, trainers, and actual systems.** M. S. Crabtree and R. J. Spicuzza (Systems Research Laboratories, Inc., Dayton, OH). In: NAECON 1981; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 19-21, 1981. Volume 3. New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 1349-1352.

The use of radio communications activity as a noninterfacing, imbedded secondary task for the objective assessment of varying operator workload has been examined. The basic classes of tasks studied are waypoint passage, jammed communications, threat report, and identification. The simulator system was designed around a PET MDL 2000 computer interfaced to radio switches by a 16-channel multiplexer and A/D converter. Verbal responses and switch-changing data recorded on tape show that the simulation facility provides an excellent device for dual-task performance research concerned with evaluating the sensitivity of radio tasks to changes in operator workload. S.C.S.

**A82-14957** **The physiological response of anthropometrically selected female military personnel to the test parachuting environment.** J. H. Gilbert, H. T. Pheeny, J. E. Doerr, and G. F. LaMora (U.S. Naval Weapons Center, Parachute Engineering Div., China Lake, CA). In: Survival and Flight Equipment Association, Annual Symposium, 18th, San Diego, CA, October 12-16, 1980, Proceedings. Canoga Park, CA, Survival and Flight Equipment Association, 1981, p. 68-75. 12 refs.

Female Naval test parachutists were biomedically monitored to define the stresses encountered during aircraft exit and parachute descent. The subjects were instrumented for pulse rate by an ECG, for respiratory rate, eye movement, and g loads during opening shock; data was telemetered by an FM/FM data acquisition system to a computerized ground station. Nine jumps have been recorded for two subjects, allowing the appearance of any gradients from novice to experienced parachutist physiological responses to become apparent. Results for the females were equivalent to data from tests with males; heart rate, respiratory rate, and lateral eye movements all show peaks in a bimodal response just before parachute deployment and just after landing. Female heart rates did not, however, display adaptive decreases with experience, although the sample is judged to be of insufficient size to be conclusive. M.S.K.

## A82-14959

**A82-14959** An investigation of ripcord pull force capability of male and female skydivers for ripcords located on the left main lift web at chest level. M. Johnston and J. Sherman (Jump Shack, Inc., Farmington Hills, MI). In: Survival and Flight Equipment Association, Annual Symposium, 18th, San Diego, CA, October 12-16, 1980, Proceedings. Canoga Park, CA, Survival and Flight Equipment Association, 1981, p. 80-83.

A study of the actual ripcord pulling capability of trained skydivers, both male and female and also of untrained individuals has been conducted to either confirm or deny two previously conducted studies. One previous study concerned only males, the other concerned only females. The results of this study indicate that there is no need to revise down the FAA TSO requirements for ripcord pull force limits for back mounted parachutes. (Author)

**A82-14962** In-flight physiological monitoring of tactical jet aircrewmembers. D. W. Call, D. G. Robertson, D. M. Kelly (U.S. Navy, Pacific Missile Test Center, Point Mugu, CA), and J. T. Merrifield (USAF, School of Aerospace Medicine, Brooks AFB, TX). In: Survival and Flight Equipment Association, Annual Symposium, 18th, San Diego, CA, October 12-16, 1980, Proceedings. Canoga Park, CA, Survival and Flight Equipment Association, 1981, p. 97-100. 6 refs.

The U.S. Navy and the U.S. Air Force have been involved in developing and employing techniques to obtain in-flight aeromedical data for several years. These joint efforts have been both to acquire physiological data as a research tool in the test and evaluation of aircrew equipment and to carefully define the pilot's response to the multi-stress environment of tactical jet flying. This paper traces the chronology of this development and describes in detail the current in-flight physiological data acquisition system (IFPDAS) used by both services. The IFPDAS recorder is completely self-contained and can be worn by any aircrewmember. The system can monitor, condition and record up to 12 analog and 32 digital channels of physiologic and environmental data on a four track magnetic tape cassette. Data analysis and display are provided by a ground based data reproducer, portable field data processor and teleprinter. (Author)

**A82-14964** Factors affecting seat-man dynamics during emergency egress. G. D. Frisch (U.S. Naval Material Command, Naval Air Development Center, Warminster, PA). In: Survival and Flight Equipment Association, Annual Symposium, 18th, San Diego, CA, October 12-16, 1980, Proceedings. Canoga Park, CA, Survival and Flight Equipment Association, 1981, p. 110-115. 8 refs.

An analysis comprising mathematical simulation and dummy and human tests to determine the adequacy of a crew station configuration is presented. Crew stations were ranked according to the probability of physical interference between limbs and crew station structure during ejection. A Euclidean aircraft coordinate system was devised to identify anthropometric anatomical reference points in relation to position in the cockpit and along the ejection vector. Acceleration at the knee was found to determine lower leg and foot responses, while dummy ejections revealed foot-instrument panel contact at 175 msec into ejection due to inward rolling of the thigh. Knee location and thigh height were determined to be critical parameters affecting the chances of instrument panel collisions during ejection, along with full rudder pedal heel cups and height of the feet above the floor pan. M.S.K.

**A82-14971** Holographic laser eye protection. G. Twine Chisum (U.S. Naval Material Command, Naval Air Development Center, Warminster, PA). In: Survival and Flight Equipment Association, Annual Symposium, 18th, San Diego, CA, October 12-16, 1980, Proceedings. Canoga Park, CA, Survival and Flight Equipment Association, 1981, p. 180-182.

Development of a method of protecting the eyes of military personnel has been pursued for a number of years. The devices developed have marginal acceptability, particularly for aircrew personnel. Efforts under way to develop a holographic diffraction grating protection device indicate that such a device is feasible and that the requirements of high transmittance, multiple wavelength rejection and aircrew helmet visor configuration can be met. A program has been established to develop an operational device. The program anticipates a device which can be evaluated operationally within two years. (Author)

**A82-14973** U.S. Navy molecular sieve on-board oxygen generation system - An update. M. J. Lamb (U.S. Naval Material Command, Naval Air Development Center, Warminster, PA). In: Survival and Flight Equipment Association, Annual Symposium, 18th, San Diego, CA, October 12-16, 1980, Proceedings. Canoga Park, CA, Survival and Flight Equipment Association, 1981, p. 192-195.

An on-board oxygen generator (OBOG) system for operation on Navy tactical aircraft is described. The molecular sieve OBOG has three major components: oxygen concentrator, breathing regulator, and performance monitor. The system filters all gases from the engine bleed air except for argon and oxygen, which are concentrated into a 5% and 95% mix, respectively. The concentrator measures the mass flow rate and the regulator provides the oxygen concentrate on demand. A polarographic partial pressure sensor, and electronics module, and a compensating aneroid maintain the constant absolute pressure at a level equivalent to 28,000 ft in the sensor cavity. Successful tests are enumerated and future operational evaluations are outlined. The OBOG system eliminates the need for LOX generation equipment on board naval ships, and allows placement of V/STOL aircraft on nonaviation sea craft. M.S.K.

**A82-15280** Some contributions of touch, pressure and kinesthesia to human spatial orientation and oculomotor control. J. R. Lackner (Brandeis University, Waltham, MA). *Acta Astronautica*, vol. 8, Aug. 1981, p. 825-830. 21 refs.

Human spatial orientation and oculomotor control are under multimodal influence. It is not possible in the normal animal to stimulate differentially the vestibular receptors without activating other receptor systems whose activity may have a profound influence on postural control and experienced orientation. Many patterns of behavior and response that have been attributed solely to vestibular function are actually dependent wholly or in part on touch, kinesthetic, and proprioceptive stimulation. (Author)

**A82-15351** † The self-stimulation response in cats in a nitrogen-oxygen medium under elevated pressure (Reaktsiia samostimulatsii u koshek v azotno-kislorodnoi srede pod povyshennym davleniem). G. K. Akhmetova, E. L. Poliakov, and G. V. Troshikhin (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 67, Oct. 1981, p. 1476-1479. 13 refs. In Russian.

**A82-15352** † Nucleic acid and protein concentrations in rat raphe nuclei neurons and gliocytes during complete sleep deprivation in the cylindrical treadmill (Soderzhanie nukleinovyykh kislot i belkov v neuronakh i gliotsitakh iader shva krysy pri polnom lishenii sna v tsilindricheskom tretbane). U. M. Malikov and A. N. Panov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 67, Oct. 1981, p. 1506-1510. 20 refs. In Russian.

**A82-15353** † DNA and RNA synthesis in the isolated nuclei of rat skeletal muscle fibers during hypokinesia (Sintez DNK i RNK v izolirovannykh iadrakh volokon skeletnykh myshts krysy pri gipokinezii). I. V. Fedorov, G. S. Komolova, and A. V. Chernyi (Iaroslavskii Gosudarstvennyi Meditsinskii Institut, Yaroslavl; Akademiia Nauk SSSR, Institut Biokhimii, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 67, Oct. 1981, p. 1521-1524. 20 refs. In Russian.

**A82-15358** \* A single-channel model does not predict visibility of asynchronous gratings. A. B. Watson (NASA, Ames Research Center, Moffett Field; Stanford University, Stanford, CA). *Vision Research*, vol. 21, no. 12, 1981, p. 1799, 1800.

A single channel model is shown to lack the capability to predict the visibility of asynchronous compound gratings. A constant Beta was assumed, based on Monte-Carlo simulations, and used to show that an SE of 6.73 (Limb, 1981) lies outside of an acceptable confidence interval. Potential imbalances between two eyes cannot be as large as 1.5 dB, which can only affect one eye, or one region of a retina. An average unbalance of 0.53 dB (SE = 0.12) employed in experiments to measure thresholds was compensated for by estimated threshold reductions. Trial-to-trial variability was included in

the single channel model, as were considerations of retinal inhomogeneity. Temporal sensitivity for 2 and 4 c/deg grating patches were measured, and the amplitude response of a single channel at the two spatial frequencies was obtained. Threshold reductions with a Beta of 3.1 are then determined to not be significant enough to warrant adoption of the single channel model predictions. M.S.K.

**A82-15391** Automatic planning of manipulator transfer movements. T. Lozano-Perez (MIT, Cambridge, MA). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-11, Oct. 1981, p. 681-698. 51 refs. Contract No. N00014-77-C-0389.

The class of problems that involve finding where to place or how to move a solid object in the presence of obstacles is discussed. The solution to this class of problems is essential to the automatic planning of manipulator transfer movements, i.e., the motions to grasp a part and place it at some destination. For example, planning transfer movements requires the ability to plan paths for the manipulator that avoid collisions with objects in the workspace and the ability to choose safe grasp points on objects. The approach to these problems described here is based on a method of computing an explicit representation of the manipulator configurations that would bring about a collision. (Author)

**A82-15475** The sensitivity of the retinal nerve fibre layer to elevated intraocular pressure and graded hypoxia in the cat. F. Grehn (University Eye Clinic, Freiburg im Breisgau, West Germany). (Bundesministerium für Forschung und Technologie, Municipality of Vienna, Vienna Academy of Medicine for Postgraduate Studies, and Vienna Tourist Board, Proceedings of the Symposium on Information Processing in the Retina, Vienna, Austria, July 10-12, 1980.) *Vision Research*, vol. 21, no. 11, 1981, p. 1697-1701. 19 refs. Deutsche Forschungsgemeinschaft Contracts No. GR-161; No. GR-538; No. SFB-70.

The effects of a conduction blockade of the nerve fiber layer in the eye of a cat during transient intraocular pressure (IOP) increases and stages of hypoxia were studied. The experiment comprised 14 cats as subjects, anesthetized and subjected to varying levels of IOP induced by a manometer or hydrostatically by a Ringer solution reservoir connected to a cannula in the anterior eye chamber; hypoxia was induced by altering artificial respiration or by providing hypoxic N<sub>2</sub>/O<sub>2</sub> mixtures. The optic tract ipsilateral to the eye was stimulated electrically to elicit antidromic field potentials of the nerve fiber layer. The impulses in unmyelinated axons during acute IOP elevation were found to conduct longer than synaptic signals transmitted in the retina. Transfer of the results to moderate IOP levels caused by glaucoma are not considered to be justified at present. M.S.K.

**A82-15515** # Experimental studies on the survival capacity in the sealed environment. III. H. Fujiwara (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 22, Mar. 1981, p. 1-12. 12 refs. In Japanese, with abstract in English.

The effects of hypoxia, cold stress, and lethal oxygen and CO<sub>2</sub> concentrations in sealed environments on survival time are evaluated for 57 Sprague-Dawley strain male rats at 4, 7, 9, and 12 weeks of age. At 12 weeks the mean survival time is 4.7 + or - 0.7 hours in a 10 liter chamber ranging from about 2-6 C, and at 4 weeks of age the mean survival time is 10.8 + or - 1.7 hours in a 10 liter chamber ranging from about 2-8 C. The mean lethal oxygen concentration is 4.8 + or - 0.2% for all age groups, while the CO<sub>2</sub> mean lethal concentration is 13.2 + or - 0.3% for all age groups. Results are also compared with theoretical values showing fair agreement. D.L.G.

**A82-15516** # Development of a secondary task method for measuring operator workload. V - Measurement of pilot workload during take off and landing by C-1 jet carrier. Y. Nagasawa, S. Aramaki, and N. Utsuki (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 22, Mar. 1981, p. 13-27. 20 refs. In Japanese, with abstract in English.

An in-flight study of pilot workload during takeoff and landing of a C-1 JASDF jet carrier was conducted. Normal take-off and landing patterns were arbitrarily divided into ten flying segments, and a visual-auditory discriminative secondary task was added, which consisted of a lamp box with red and green lights mounted on the

instrument panel. The subject was required to detect only those signals synchronized with red light and a 1200 Hz tone. No remarkable changes in flying performance were noted, although significant correlations were found between miss rate of secondary task and the task time stress index. Potential workload was derived by means of a time series analysis involving task flow and secondary task performance. D.L.G.

**A82-15517** # Performance changes during exposure to +Gz stress. Y. Nagasawa, M. Iwane, M. Ono, A. Onozawa, S. Ogata, and C. Sekiguchi (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 22, Mar. 1981, p. 29-43. 23 refs. In Japanese, with abstract in English.

The relationship between performance and physiological responses was studied to develop an evaluating method of G tolerance in terms of changes in heart rate, vertical visual field, and tracking performance. Twelve subjects were exposed to 2, 3, 4, and 5 +Gz stress of 60 second durations in an AML human centrifuge, and the mean heart rate was found to elevate with increasing G level, especially above 3 G. Vertical visual field was constricted with increasing G levels, and mean tracking error appreciated with increasing G levels. Frequency characteristics of tracking performance were also analyzed, and a decrease in gain ratio with an increase in phasal difference of performance was observed during exposure to G stress. D.L.G.

**A82-15518** # Aircraft noise and speech communication interference in JASDF air traffic control room. O. Fujiwara and N. Utsuki (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 22, June 1981, p. 57-72. 9 refs. In Japanese, with abstract in English.

The aircraft-induced environmental noise in control rooms of eleven JASDF air traffic control towers was estimated by obtaining noise levels, frequency spectra, speech signal-to-noise ratios, speech interference levels (SIL), and attenuation abilities of the structures. Noise conditions of the ATC rooms were classified into five grades ranging from excellent to bad, according to the peak noise level and SIL. No ATC rooms could be classified as excellent or good, three rooms were estimated as fair, and five were judged to be below poor standards. D.L.G.

**A82-15519** # Thermal test of flying helmet for two different types of impact protection devices - Nylon sling and polystyrene liner. K. Tagami, W. Ogawa, K. Shimizu, N. Kawabata, and F. Tomita (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 22, June 1981, p. 73-83. 11 refs. In Japanese, with abstract in English.

Two types of impact protection devices for flight helmets were tested in hot environments under varying thermal conditions: a polystyrene liner and a nylon sling. Differences of helmet shell, liner, and head skin temperatures were found to be significantly higher for the polystyrene liner helmet than for the nylon sling helmet, whereas the oral temperature of the former helmet did not rise significantly. B.J.

**A82-15520** # A study of self-initiated elimination from the flight training. I - Reasons for self-initiated elimination. M. Okaue and H. Aruga (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 22, June 1981, p. 85-96. 6 refs. In Japanese, with abstract in English.

Flight training students who had eliminated themselves from the training program in JASDF were studied to investigate factors contributing to elimination in terms of causes, training phases of student attrition, ratings in the flight aptitude test (APT), and aircraft accidents concerning students. Most students who quit due to fear of flight or loss of confidence were rated low on the APT flight test, and mean scores of items in the anxiety scale were significantly higher in those students who quit due to too much pressure, fear of flight, or personality traits not suitable for pilots. Accidents appeared to have little statistical significance. D.L.G.

## A82-15521

**A82-15521 # Trouble shooting pattern of emergency through instruments by jet-pilots.** II. Z. Katoh, T. Shimizu, Y. Kakimoto, H. Iwamoto, and T. Nakabayashi (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports, vol. 22*, June 1981, p. 97-112. 6 refs. In Japanese, with abstract in English.

A questionnaire survey was conducted among 119 JASDF jet pilots to obtain data on emergency experience and educational training on emergency aircraft. Results showed that 71% of all pilots had at one time or another experienced some sort of trouble, and most had their first indication of such trouble when abnormal acceleration or deceleration was sensed. This suggests that a high priority information source is body-sense oriented. No significant individual difference or aircraft difference was noted when obtaining sequences of necessary information for diagnosing four types of randomly selected problems. D.L.G.

**A82-15681 An approach to algorithms for processing data from the visual sensor of an integrated robot (Otnosno edin podkhod za algoritmichno osigurivane na videosenzor za integralen robot).** G. E. Kandilarov (B'lgarska Akademiia na Naukite, Institut po Tekhnicheskata Kibernetika i Robotika, Sofia, Bulgaria) and K. B. Kr'stev (B'lgarska Akademiia na Naukite, Institut po Khidrologiia i Meteorologija, Sofia, Bulgaria). *Problemi na Tekhnicheskata Kibernetika i Robotikata*, no. 12, 1981, p. 75-83. 6 refs. In Bulgarian.

The paper describes methods for the automated processing of visual information used for the control of third-generation robots. Particular attention is given to a method for measuring a metric parameter that plays an important role in scene analysis: namely the longest span of the contour of the image obtained from a TV sensor. The methodological error is investigated, and the possibility of taking this error into account when making measurements is considered. It is concluded that the results could be used successfully in the design of visual sensors for integrated robots and control systems which use structural analysis of visual information. B.J.

**A82-15697 \* Digital image processing of bone - Problems and potentials.** E. R. Morey and T. J. Wronski (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, CA). *Metabolic Bone Disease and Related Research*, vol. 2 S, 1980, p. 463-468. 6 refs.

The development of a digital image processing system for bone histomorphometry and fluorescent marker monitoring is discussed. The system in question is capable of making measurements of UV or light microscope features on a video screen with either video or computer-generated images, and comprises a microscope, low-light-level video camera, video digitizer and display terminal, color monitor, and PDP 11/34 computer. Capabilities demonstrated in the analysis of an undecalcified rat tibia include the measurement of perimeter and total bone area, and the generation of microscope images, false color images, digitized images and contoured images for further analysis. Software development will be based on an existing software library, specifically the mini-VICAR system developed at JPL. It is noted that the potentials of the system in terms of speed and reliability far exceed any problems associated with hardware and software development. A.L.W.

**A82-15698 \* Neurotrophic factor - Characterization and partial purification.** H. Popiela and S. Ellis (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, CA). *Developmental Biology*, vol. 83, 1981, p. 266-277. 29 refs.

Recent evidence suggests that neurotrophic activity is required for the normal proliferation and development of muscle cells. The present paper reports a study of the purification and characterization of a neurotrophic factor (NTF) from adult chicken ischiatic-peroneal nerves using two independent quantitative in vitro assay systems. The assays were performed by the measurement of the incorporation of tritiated thymidine or the sizes of single-cell clones by chick muscle cells grown in culture. The greatest amount of neurotrophic activity is found to be extracted at a pH of 8; aqueous suspensions of the activity are stable to long-term storage at room temperature. The specific activity of the substance is doubled upon precipitation with ammonium sulfate or after gel filtration, and increase 4 to 5 fold after salt gradient elution from DEAE cellulose columns. The active fraction obtained after gel filtration and rechromatography on DEAE cellulose exhibits a 7 to 10-fold increase in specific activity.

Electrophoresis of the most highly purified material yields a greatly concentrated band at around 80,000 daltons. Although NTF is purified almost 10-fold as indicated by the increase in specific activity, the maximum activity of the partially purified material is greatly reduced, possibly due to a requirement for a cofactor for the expression of maximum activity. A.L.W.

**A82-15700 \* From inanimate matter to living systems.** S. W. Fox (Miami University, Coral Gables, FL). *American Biology Teacher*, vol. 43, Mar. 1981, p. 127-140. 65 refs. Grant No. NGR-10-007-008.

Current understandings of the origin and evolution of life on earth from inanimate matter are reviewed. Approaches to the study of early life and its origin are considered, and it is noted that whereas the inference of origins from knowledge at hand is the approach favored by most theoreticians, only the laboratory simulation of the assembly of precellular polymers to protocells under geologically relevant conditions is capable of indicating the way in which life began. Progress in simulating the step-by-step emergence of a protocell composed of ordered macromolecules and having numerous protobiological activities through stages characterized by primordial matter, amino acids, proteinoids, protocells, light-active protocells and nucleic-acid instructed cells is discussed, with particular emphasis on experiments with proteinoid microspheres formed from self-ordered copolyamino acids. The subsequent development of ordered, protometabolic, infrastructured protoreproductive protocells is examined noting the importance of the formation of lysine-rich proteinoids with catalytic activities. Attention is also given to questions of the point of the actual emergence of life and scientific and creationist objections to the theory developed. A.L.W.

**A82-15701 † The influence of scopolamine on the formation and fixation of temporary connections in rats with altered brain serotonin levels (Vliianie skopolamina na formirovanie i fiksatsiiu vremennykh svyazei u krysa s izmenennym urovnem serotoninina v golovnom mozge).** V. M. Getsova (Akademiia Nauk SSSR, Institut Vyshei Nervnoi Deiatel'nosti i Neurofiziologii, Moscow, USSR). *Zhurnal Vyshei Nervnoi Deiatel'nosti*, vol. 31, July-Aug. 1981, p. 763-770. 26 refs. In Russian.

**A82-15702 † Mathematical model of the spatial distribution and accumulation of assimilates in plants (Matematicheskaiia model' prostranstvennogo raspredeleniia i nakopleniia assimiliatov v rastenii).** K. M. Sytnik, T. S. Kurchenko, and O. A. Nemchenko (Akademiia Nauk Ukrainskoi SSR, Institut Botaniki and Institut Fizologii, Kiev, Ukrainian SSR). *Akademiia Nauk SSSR, Doklady*, vol. 250, no. 6, 1980, p. 1466-1469. 8 refs. In Russian.

A mathematical model is proposed for the spatial distribution of photosynthesis products (assimilates) in the above-ground and underground parts of plants. The model considers the processes of growth, absorption and the accumulation of substances by cells as continuous in time, and contains explicit equations for the dynamics of the factors specifying the condition of the underground and above-ground parts during the growth of a root vegetable. Possible applications of the model include the description of the relation between the productive and reproductive parts of plants during the growth process, the distribution of assimilates in storage organs, and the formation of the spatial forms of fruits or root vegetables, and the calculation of the influence of ecological factors on the production process. A.L.W.

**A82-15703 † EEG-correlates of training in the voluntary control of heart rate in man (E.e.g.-korreliaty obucheniia proizvol'nomu kontroliu chastoty serdtsiebienii u cheloveka).** A. N. Borgest, M. I. Tafan, and V. N. Chernigovskii (Akademiia Nauk SSSR, Institut Fizologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 250, no. 6, 1980, p. 1487-1490. 12 refs. In Russian.

Changes in EEG processes occurring during the training of healthy human subjects in the voluntary control of heart rate are investigated. Four subjects were monitored by means of electrocardiography and electroencephalography before and after a period of conditional training based on a punishment avoidance model to change, increase and decrease heart rate at will. Amplitudes of the integrated delta- and theta-wave spectra are found to increase significantly during training in the increasing or changing of heart rate, even if the actual rate change was not accomplished, while the

alpha waves increased in integrated amplitude during training in acceleration and decreased during training to slow the heart beat. Spontaneous changes in heart rate are observed to be directly related to changes in alpha-wave amplitude, while the slow-wave patterns do not change at all during spontaneous increases in heart rate and decline during spontaneous decreases. It is proposed that the theta-rhythm variations during heart rate control training reflect a complex relationship between emotional factors of the situation and the adjustment of autonomic functions. A.L.W.

**A82-15704 †** A discrete model of the circadian kinetics of human bone marrow (Diskretnaia model' tsirkadnoi kinetiki kostnogo mozga cheloveka). M. A. Blank (Nauchno-Issledovatel'skii Institut Onkologii, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 252, no. 1, 1980, p. 224, 225. 8 refs. In Russian.

A model is developed expressing the diurnal variation in bone marrow cell division rates. The model is based on data obtained from taps of healthy bone marrow of 77 patients with localized malignant tumors taken at various times of the day, which indicates the greatest number of cell divisions to take place at 3 a.m., and the fewest to take place from 3 to 6 p.m. The rate of cell divisions is expressed as a sine curve with a peak at 3 a.m. corresponding to the M (mitotic) phase of the cell cycle, and the G<sub>1</sub>, S and G<sub>2</sub> phases distributed in the day according to the period of time at which the greatest number of cells are expected to be found in the corresponding state. The model may be used to determine the time of day most suitable for the administration of various phase-specific myelotoxic agents. A.L.W.

**A82-15705 †** Dynamics of plant physiological activity during a light interruption of the dark period of the day (Dinamika aktivnosti fiziologicheskikh protsessov u rastenii v techenie svetovogo preryvaniia temnogo perioda sutok). V. G. Karmanov, G. A. Odumanova-Dunaeva, and E. V. Solov'ev (Vsesoiuznaia Akademiia Sel'skokhoziaistvennykh Nauk, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 252, no. 2, 1980, p. 509-512. 15 refs. In Russian.

**A82-15706 †** Harmful effects of temperature under conditions of elevated pressure in a helium-oxygen environment (Porazhushchee deistvie temperaturnogo faktora v usloviakh povyshennogo davleniia geliokislorodnoi sredy). I. A. Aleksandrov, V. B. Kostkin, B. S. Dashevskii, B. I. Sokolovskii, and L. A. Sirotnina (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 256, no. 1, 1981, p. 225-227. 6 refs. In Russian.

The tolerances of warm-blooded animals to various temperature regimes in a hyperbaric helium-oxygen medium similar to that encountered in deep-sea diving are investigated. Experiments were performed on 85 guinea pigs maintained in a helium-oxygen atmosphere at a pressure of 3,600,000 Pa for 24 hours at temperatures from 22 to 40 C. The animals are observed to have perished at the end of 24 hours when kept at temperatures less than 30 C or greater than 36 C, with deaths occurring sooner the further the environmental temperature was from this zone. Analysis reveals the primary cause of death in these instances to be the disruption of temperature homeostasis. Results thus reveal that normal thermoregulatory mechanisms lose their effectiveness under hyperbaric conditions in an oxygen-helium medium, so that a narrow temperature range must be maintained to prevent either a harmful lowering or elevation in body temperature. A.L.W.

**A82-15707 †** Structural changes in motor neurons during hind limb immobilization (Strukturnye sdvigi v motoneironakh pri immobilizatsii zadnikh konechnostei). T. E. Korneeva and O. S. Merkulova (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 258, no. 1, 1981, p. 247-249. 12 refs. In Russian.

The nature and direction of structural changes in the spinal chord motor neurons of animals with their hind limbs immobilized for periods of from 1 to 5 weeks are investigated. Experiments were performed on frogs kept in a refrigerator and accustomed to a sedentary way of life so as to minimize experimental stresses, and consisted of the determination of perikaryon, nuclear and glycogen areas in motor neurons extracted from the lumbar enlargement of the spinal cord after 1, 2, 4 and 5 weeks of motionlessness. The

reduction in the flow of afferent nerve impulses from the peripheral organs is observed to induce complex changes in nerve cell structure, including an initial increase, followed by a decrease, in cytoplasm area, and an increase in nuclear size. It is concluded that a limitation in motor activity leads to an impairment in spinal center functioning expressed as a decline in the excitability and structural rearrangements of nerve cells. A.L.W.

**A82-15708 †** The classification of hypoxic conditions (O klassifikatsii gipoksicheskikh sostoianii). A. Z. Kolchinskaia (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Patologicheskaiia Fiziologia i Eksperimental'naia Terapiia*, July-Aug. 1981, p. 3-10. 20 refs. In Russian.

The various schemes developed for the classification of hypoxic conditions are examined. Following a brief review of the origin of the term and its recognition as the cause of various conditions, the system adopted at the conference in Kiev in 1949 is presented which distinguishes between hypoxic hypoxia, arising as a result of a decrease in oxygen partial pressure in the inspired air, difficulties in oxygen permeability into the blood, and disturbances in external respiration; hemic hypoxia due to a decrease in the oxygen binding capacity of hemoglobin; circulatory oxygen deprivation caused by a decrease in oxygen transport; and tissue hypoxia, in which tissues are unable to utilize oxygen supplied at normal levels, and which is argued to be a legitimate case of hypoxia. Difficulties in using the 1949 system are pointed out, and a new classification system is proposed which recognizes eight basic types of hypoxia: hypoxic, hyperoxic, hyperbaric, respiratory, circulatory, hemic, tissue and stress hypoxia, and which distinguishes between five stages in its development: latent, compensated, expressed with advancing decompensation, uncompensated and terminal. A.L.W.

**A82-15709 †** The oxygen regime of the human organism under conditions of extreme hypobaric hypoxia (Kislorodnyi rezhim organizma cheloveka v usloviakh krainikh stepenei gipobaricheskoi gipoksii). E. A. Kovalenko, A. Iu. Katkov, V. N. Sementsov, M. P. Bobrovnikskii, and R. N. Chabdarova (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Patologicheskaiia Fiziologia i Eksperimental'naia Terapiia*, July-Aug. 1981, p. 26-31. 15 refs. In Russian.

The dynamics of alveolar, capillary and skin oxygen tension in humans under hypobaric hypoxia at simulated altitudes between 8000 and 10,000 m are investigated. Measurements were made during stepwise and continuous ascents to the simulated altitude tolerance level of up to 10,000 m before and after exposure to either impulsive pressure chamber training or altitude adaptation at 4200 m. It is found that upon ascent to 8000 m, the oxygen tension gradients between alveolar air and capillary blood as well as between capillary blood and the skin decrease. Altitude training is observed to lead to an increase in the maximum altitude tolerated as signaled by the performance of a simple mental task, accompanied by an increase in oxygen tension in the capillary blood, however not in the skin. A.L.W.

**A82-15710 †** Influence of 15-day alimentary starvation on human tolerance to the breathing of pure nitrogen (Vliianie 15-dnevnogo alimentarnogo golodaniia na perenosimost' chelovekom dykhaniiia chistym azotom). A. Iu. Katkov, N. K. Loginova, R. N. Chabdarova, Iu. B. Zolotareva, and T. A. Katargina (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem; Tsentral'nyi Nauchno-Issledovatel'skii Institut Stomatologii, Moscow, USSR). *Patologicheskaiia Fiziologia i Eksperimental'naia Terapiia*, July-Aug. 1981, p. 66-68. 8 refs. In Russian.

Results are presented of an investigation of the effect of alimentary starvation on human tolerance to hypoxia induced by the breathing of pure nitrogen. Subject tolerance times to breathing pure nitrogen were assessed according to performance at a simple writing task, and correlated with continuous simultaneous measurements of respiratory minute volume, respiration and heart rates, electroencephalograms, rheoencephalograms, skin oxygen tension, general gas exchange and degree of deoxygenation. Following the 15-day period of complete fasting, tolerance times to the breathing of pure nitrogen are observed to increase by a factor of approximately 2. Data indicate that the antihypoxic effect of starvation is due to decreased oxygen demand and a decrease in oxygen concentration in the expired air, and is accompanied by changes in the functional states of cerebral vessels and peripheral microvessels. A.L.W.

**A82-15711 †** Some characteristics of the aerial evacuation of the sick and otorhinolaryngologically injured (Nekotorye osobennosti evakuatsii vozduzhnym transportom LORranenykh i bol'nykh). F. N. Teterin and O. A. Nakapkin. *Voenna-Meditsinskii Zhurnal*, July 1981, p. 20, 21. 6 refs. In Russian.

Problems encountered and possible solutions to them in the aerial evacuation of the sick and persons with otorhinolaryngeal injuries are discussed. The most common problem is motion sickness, which is observed in 3% of healthy passengers on jet airplanes and 10% on conventional aircraft and which may aggravate existing vestibular lesions. For this reason, those patients susceptible to motion sickness are evacuated in a lying position and asked to fix their vision at a determined point, and certain antimotion sickness drugs may be administered prior to take-off, including atropine, scopolamine, pyridoxine, dimedrol and aeron. Significant variations in barometric pressure may also cause barotitis and barosinusitis in evacuated patients, which may be prevented by the deceleration or cessation of descents, swallowing maneuvers, loud conversation, lower jaw movements or ear inflation. Counterindications to aerial evacuation remain, however, in cases of injury or illness accompanied by breathing difficulty, unstoppped heavy nosebleed, and abundant liquorrhea with combined otorhinolaryngeal organ and skull damage.

A.L.W.

**A82-15712 †** Management by means of muscular activity under unloaded conditions (Upravlenie aktivnost'iu myshts v 'bezna-gruzochnykh' usloviakh). A. V. Kovalik (Penzenskii Politekhnikheskii Institut, Penza, USSR). *Gigiena Truda i Professional'nye Zabolevaniia*, Aug. 1981, p. 44, 45. In Russian.

The potential of selective muscular activity in the absence of any external burden for the prevention of hypodynamia is assessed. In a first series of experiments, the possibility of voluntarily effecting maximum exercise of various muscles was confirmed by measurements of muscle force and bioelectrical activity, although in most cases the magnitude of the exercise was less in the unloaded state than when overcoming some external burden, and various muscle groups showed more controllability than others. Measurements of the durations possible for alternating muscle exercise in the unloaded state have shown them to range up to 3 hours. The possibility of effecting muscular exercise under unloaded conditions thus allows the development of a training program aimed at improving muscular sense and elevating muscular activity at any time and under any conditions, and permits management by muscular function, guided only by muscular sense.

A.L.W.

**A82-15713 †** The nature of induced EEG activity in the alpha-rhythm range (O prirode vyzvannoi aktivnosti EEG v diapazone al'fa-ritma). F. Ia. Zolotarev (Leningradskii Nauchno-Issledovatel'skii Institut Ekspertizy Trudospobnosti i Organizatsii Truda Invalidov, Leningrad, USSR). *Fiziologiya Cheloveka*, vol. 7, July-Aug. 1981, p. 586-592. 10 refs. In Russian.

The characteristic of alpha-wave activity induced by periodic photostimulus are investigated. Background and induced EEG activity was recorded in subjects lying in a darkened room with their eyes closed 15 cm away from a photostimulator emitting pulses at repetition frequencies from 8 to 14/sec. At stimulation frequencies of 8.0 and 9.5 pulses/sec, the descending front of the induced alpha wave is found to be longer than the ascending front. As the stimulus frequency increases, the duration of the descending front is observed to decrease while the ascending front maintains the same duration, resulting in the descending front becoming shorter than the ascending front. Further increases are observed to lead to a shortening of the ascending front so that the two fronts become equalized. Results, when regarded within the context of the dipole theory of neurons, suggest that both induced and background alpha waves represent an inhibitory post-synaptic potential in cortical neuron membranes.

A.L.W.

**A82-15714 †** Mechanisms of temporal discrimination in the visual analyzer (O mekhanizmax vremennoi diskriminatsii signalov v zritel'nom analizatore). V. I. Shostak and E. B. Stepanian (Voenna-Meditsinskaiia Akademiia, Leningrad, USSR). *Fiziologiya Cheloveka*, vol. 7, July-Aug. 1981, p. 612-615. 17 refs. In Russian.

The functional labilities of various segments of the visual analyzer are measured in an investigation of the mechanisms

determining the critical flicker fusion frequency, which has been established to be significantly lower than the functional lability of other nervous mechanisms. Ocular electrical sensitivity and the critical frequency for the disappearance of a flickering electrical phosphene were measured in subjects viewing achromatic and colored light signals at various levels of illumination. The electrical sensitivity threshold is found to depend on background illumination level, decreasing during the transition from darkness to the photop-peak level. Electrical sensitivity is also observed to decrease from white to green to blue to red light. Critical flicker fusion frequencies determined under the same conditions never exceeded 43 Hz, while frequencies for electrically generated phosphene fusion ranged from 59 to 64 Hz. Results demonstrate that the functional lability of the visual analyzer depends upon the level of adaptation, and suggest that the temporal discrimination capacity of the visual analyzer is greater than the afferent system as a whole due to the relatively large time constant of the receptor photochemical processes.

A.L.W.

**A82-15715 †** Potential for the use of biorhythm structures for the prognosis of the course of a disease (Vozmozhnosti ispol'zovaniia struktury bioritmov v tseliakh prognoza techeniia zabolevaniia). N. I. Moiseeva, L. I. Nikitina, A. V. Morozov, V. V. Denisova, E. S. Vintergal'ter, and A. M. Litvin (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Fiziologiya Cheloveka*, vol. 7, July-Aug. 1981, p. 752-754. In Russian.

The possibility of using the dynamic characteristics of circadian rhythms in the diagnosis of the state and the prognosis of the course of disease is investigated. Measurements of arterial pressure, body temperature, muscular strength, respiratory and heart rates and time sense were made five times daily in the periods before and after, and occasionally during, treatment of 50 patients with cerebral vascular circulation disorders of various causes and 33 patients with local cerebral lesions as a result of acute craniocerebral trauma. In both groups of patients, significant differences are found between the temporal structures of the diurnal variations in physiological parameters even before the start of treatment in patients for whom the outcome of treatment was favorable and those for whom the outcome was not favorable. A marked separation of extremum values, relative constancy of these values and a rather large spread of physiological parameters over the course of the day are found to be characteristics of the curves of those patients with a favorable course of illness, while those with unfavorable outcomes exhibit curve flattening and irregularities in maxima and minima. The structure of biological rhythms can thus be used as an indicator allowing the prognosis of the course of systematic brain diseases and local lesions.

A.L.W.

**A82-15716 †** Removal by negative air ions of changes in mitochondrial respiration under stress (Sniatie otritsatel'nykh aerionami izmenenii dykhanii mitokhondrii pri stresse). M. N. Kondrashova, E. V. Grigorenko, I. B. Guzar, and E. B. Okon (Akademiia Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR). *Biofizika*, vol. 26, July-Aug. 1981, p. 687-691. 21 refs. In Russian.

The possible effects of air ions on mitochondrial oxidative phosphorylation activated by animal exposure to immobilization stress are investigated. Following a preliminary immobilization for periods of 5 to 24 hours, rats were exposed to an air ionizer producing negative ions at concentrations of about 250,000/cu cm for a period of 10 min, after which rat liver mitochondria were separated and their respiratory parameters were monitored for up to 50 min. Rates of phosphorylative metabolism measured upon the addition of succinic acid and ADP or using endogenous substrates are found to be significantly reduced in animals breathing ionized air following immobilization by an amount approximately equal to the rise in respiratory rate observed after stressing. Results thus demonstrate that the negative air ions act on the hyperergic mitochondria resulting from stress, while having little effect on the intact organism.

A.L.W.

**A82-15717 †** The otolith reflex and space perception in cosmonauts (Otolitovyi refleks i funktsiia vospriiatiiia prostranstva kosmonavtov). I. Ia. Iakovleva and L. N. Kornilova. *Vestnik Otorinolaringologii*, July-Aug. 1981, p. 3-6. 18 refs. In Russian.

The vestibular reflexes and space perception capacities of cosmonauts before and after space flights of duration 4-175 days are

examined. The functions were evaluated repeatedly for up to 45 days preflight, 0-5 days post-flight and monthly in prolonged flights in 10 cosmonauts engaged in short-duration flights (4-19 days) and five in extended-duration flights (30-175 days) on board Soyuz or Soyuz-Salyut spacecraft. Whereas all but three of the subjects displayed normal, symmetric otolith response intensities and normal spatial coordinate perception accuracy, post-flight interrogation revealed the occurrence of various types of perceptual illusions in 90% of the subjects, and various types of physical discomfort in 50%. Changes in otolith functions were observed in the first or second day after flight on both groups of subjects, consisting of a hyperreflexia of the otolith reflex and the appearance of asymmetry in most, and a negative otolith reflex in the immediate post-flight period in some subjects. The space perceptual accuracy was found to be disturbed in all cosmonauts. The results may be explained as the vestibular reaction to an unaccustomedly strong stimulus and by a complex disturbance in sensory coordination.

A.L.W.

**A82-15718 †** The frequency of vestibular impairments in chronic purulent medial otitis (Chastota vestibuliarnykh rasstroivst pri khronicheskom gnoinom srednem otite). V. T. Grinchuk and R. Chunea (Il Moskovskii Meditsinskii Institut, Moscow, USSR). *Vestnik Otorinolaringologii*, July-Aug. 1981, p. 10-12. 9 refs. In Russian.

**A82-15719 †** Rhinopneumometric indicators during repeated antiorthostatic exposures (Pokazateli rinopnevmetrii pri povtornykh antiortostaticeskikh vozdeistviakh). V. P. Baranova and I. Ia. Iakovleva. *Vestnik Otorinolaringologii*, July-Aug. 1981, p. 39-42. 11 refs. In Russian.

The responses of various rhinopneumometric indicators are used to evaluate the body fluid shifts taking place during repeated antiorthostatic exposures simulating weightlessness. Nasal vasomotor functions were monitored rhinopneumometrically in 30 healthy male subjects undergoing three series of repetitive antiorthostatic exposures: passive antiorthostasis on a tilt table for a period of 20 min every 1 or 2 days for a month; sleep at a head-down tilt of 5 deg for 30 days; and combined antiorthostasis on a tilt table while performing gymnastic exercises for a month. Analysis of the results indicates that intranasal resistance during antiorthostasis accurately reflects the blood redistribution to the upper half of the body taking place during adaptation to the unaccustomed gravitational conditions.

A.L.W.

**A82-15720 †** Evaluation of natural convection under hyperbaric conditions (Otsenka estestvennoi konveksii v giperbaricheskikh usloviakh). V. S. Koshcheev, M. A. Razran, and G. G. Ter-Akopian. *Gigiena i Sanitariia*, Aug. 1981, p. 20-22. In Russian.

The mobilities and heat transfer capacities of media in a closed volume under various pressures are investigated in a study of human thermal protection requirements at elevated pressures. A method of direct heat loss measurements involving the determination of temperature differences in the wake above an object giving off heat was used to compare the convective heat loss from humans wearing different types of clothing under different atmospheric pressures. Measurements with a calibrated heat source reveal that the bulk velocity of the gaseous medium decreases significantly with increasing pressure, thus complicating the thermographic measurements at pressures greater than 1 MPa. When used at pressures between 0.15 and 0.5 MPa, the method reveals the removal of clothing at pressures close to normal to lead to an insignificant increase in convective heat loss (less than 9%) at room temperature, while elevated pressures (0.4-0.5 MPa) cause an increase by 1/5 in convective heat loss from a clothed person, and by 1/3 in an exposed person.

A.L.W.

**A82-15788** Biologically damaging radiation amplified by ozone depletions. S. A. W. Gerstl, A. Zardecki (Los Alamos National Laboratory, Los Alamos, NM), and H. L. Wiser (U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC). *Nature*, vol. 294, Nov. 26, 1981, p. 352-354. 16 refs.

A two-dimensional model is developed for the increased UV radiation impact on humans due to atmospheric ozone depletion caused by chlorofluoromethane releases into the atmosphere. The radiation amplification factor (RAF) is calculated using a data base which includes a radiative transfer code and atmospheric models. Human sunburn, erythema, and a generalized DNA spectrum were

chosen to express the damaging UV-B effects. Worldwide UV dose levels up to 70 km were included, as well as seasonal and latitudinal variations. A global 10% ozone depletion was considered, yielding an RAF from 2.1-2.5 for erythema and 2.8-3.0 for DNA, with 10% uncertainty. The percentage ozone depletion multiplied by the RAF gives the percentage increase in erythema, DNA damage, and skin cancer rates, respectively. The most probable ozone depletions are expressed as 5-10%, with the minimal depletion occurring in equatorial regions.

M.S.K.

**A82-15813** A comparison of single- and dual-task measures to predict simulator performance of beginning student pilots. D. L. Damos (Arizona State University, Tempe, AZ) and G. Lintern (Canyon Research Group, Inc., Orlando, FL). *Ergonomics*, vol. 24, Sept. 1981, p. 673-684. 18 refs. Contract No. F44620-76-C-0009.

The predictive validity of single- versus dual-task measures in pilot performance involving timesharing skills is compared using two identical one-dimensional tracking tasks. The correlation between successive blocks of dual-task trials and performance in a simulator increased, while the correlation between successive early single-task trials and simulator performance decreased. The last two single-task trials, however, showed a large increase in predictive validity. A control theory analysis of selected single- and dual-task scores suggests that a multiple-task response was employed on the last two single-task trials, resulting in correlations between these trials and the simulator test comparable to those of late dual-task practice. Methodological problems associated with repeated measures designs are pointed out where the workload varies between single- and dual-task conditions.

D.L.G.

**A82-15851** Human factors of outer space production. Edited by T. S. Cheston (Georgetown University, Washington, DC) and D. L. Winter. Boulder, CO, Westview Press, Inc. (AAAS Selected Symposia Series. Volume 50), 1980. 230 p. \$18.50.

The changing requirements and opportunities of space-based activities due to the operational capabilities of the Shuttle, the heterogeneity of Shuttle and space construction crews, lengthier stays in space, advancements in technology, and economic horizons are discussed. Aspects of long duration space flights are considered in terms of the psychological considerations for crew members and space inhabitants, the possibilities for closed food cycles and nutrient requirements, and the design of space habitats, along with methods of personnel selection for psychological adaptivity and competence, new privacy necessities, and physiological changes due to weightlessness. Man-machine interfaces and the use of phytotrons to study environmental requirements of plants in space are explored, and the economic factors of outer space production and communication facilities are examined.

M.S.K.

**A82-15852 \*** Psychological considerations in future space missions. R. L. Helmreich, J. A. Wilhelm, and T. E. Runge (Texas, University, Austin, TX). In: Human factors of outer space production. Boulder, CO, Westview Press, Inc., 1980, p. 1-23. 50 refs. Grant No. NsG-2065.

Issues affecting human psychological adjustments to long space missions are discussed. Noting that the Shuttle flight crewmembers will not have extensive flight qualification requirements, the effects of a more heterogeneous crew mixture than in early space flights is considered to create possibilities of social conflicts. Routine space flight will decrease the novelty of a formerly unique experience, and the necessity of providing personal space or other mechanisms for coping with crowded, permanently occupied space habitats is stressed. Women are noted to display more permeable personal space requirements. The desirability of planning leisure activities is reviewed, and psychological test results for female and male characteristics are cited to show that individuals with high scores in both traditionally male and female attributes are most capable of effective goal-oriented behavior and interpersonal relationships. Finally, it is shown that competitiveness is negatively correlated with the success of collaborative work and the social climate of an environment.

M.S.K.

## A82-15853

**A82-15853** Future directions for selecting personnel. K. Natani (USAF, School of Aerospace Medicine, Brooks AFB, TX). In: Human factors of outer space production. Boulder, CO, Westview Press, Inc., 1980, p. 25-63. 135 refs.

Experiences with Antarctic research station crew members is applied to selection procedures for space crew members. EEG tests are shown to give adequate measurements of stress levels, while multiple input-multiple response tasks reveal changes in selective attention due to physiological compensator reactions; brain hemispheric lateralization tests are noted to show underlying neuro-metric degradations due to stress. The goal is to actively identify individuals with adaptively competent personalities, who will use skills and techniques effectively to reduce risk levels to which they are exposed. Nonadaptive behavior is emphasized as a potentially dangerous character trait in a novel environment, and the 45% occurrence rate of pilot error in aircraft accidents is cited. Finally, isolated duty for extended periods is known to cause personality changes, with symptoms of mental illness present during a transition phase; a favorable outcome to the transition results in an individual with greater psychological integrity. M.S.K.

**A82-15854** Well-being and privacy in space - Anticipating conflicts of interest. J. E. Sieber (California State University, Hayward, CA). In: Human factors of outer space production. Boulder, CO, Westview Press, Inc., 1980, p. 65-78. 15 refs.

The concept of privacy is explored for means of anticipating changing privacy requirements by long term space inhabitants. Because cultural and situational conditions of privacy vary throughout the world, it is suggested that space travellers will establish their own criteria for personal sharing and the control of the flow of information about their lives. A developmental theory of privacy is reviewed, and a breach of privacy is regarded as a form of stress. Failure to adjust to a new environment which causes stress results in an unsuccessful adaptation syndrome, producing measurable physiological changes, e.g. loss of muscle tone or high blood pressure. The effects of stress can affect the stability of fellow workers and the level of work quality, factors which can be catastrophic in a space environment. The possibilities of enhancing the opportunities for stress by continuous monitoring of the physiological state of space inhabitants through telemetry are discussed. M.S.K.

**A82-15855** Habitat requirements, design and options. R. L. Kline (Grumman Aerospace Corp., Bethpage, NY). In: Human factors of outer space production. Boulder, CO, Westview Press, Inc., 1980, p. 79-96.

The steps to permanent human habitations in LEO and GEO are outlined, and the functions and shelter of man in space for long time periods are examined. Space observation and space processing missions will lead to use of orbital cherry pickers, both open and closed, a manned orbit transfer vehicle (MOTV), and eventually to self contained habitats, along with shelters for times of solar flares. Radiation protection requirements for LEO and GEO habitats are defined, noting that the use of tantalum on the inside hull of a GEO habitat will impose weight penalties for the MOTV. Rescue operations from GEO to MOTV to Shuttle to earth are noted to require at least six days, while severely ill persons could be transported in a GEO direct-to-earth lifeboat in six hours. M.S.K.

**A82-15856 \*** Nutritional criteria for closed-loop space food systems. P. C. Rambaut (NASA, Washington, DC). In: Human factors of outer space production. Boulder, CO, Westview Press, Inc., 1980, p. 113-131. 12 refs.

The nutritional requirements for Skylab crews are summarized as a data base for long duration spaceflight nutrient requirements. Statistically significant increases in energy consumption were detected after three months, along with CO<sub>2</sub>/O<sub>2</sub> exhalation during exercise and thyroxine level increases. Linoleic acid amounting to 3-4 g/day was found to fulfill all fat requirements, and carbohydrate and protein (amino acid) necessities are discussed, noting that vigorous exercise programs avoid deconditioning which enhances nitrogen loss. Urinary calcium losses continued at a rate 100% above a baseline figure, a condition which ingestion of vitamin D<sub>2</sub> did not correct. Projections are given that spaceflights lasting more than eight years will necessitate recycling of human waste for nutrient growth,

which can be processed into highly efficient space food with a variety of tastes. M.S.K.

**A82-15857 \*** Rationale for evaluating a closed food chain for space habitats. M. Modell (MIT, Cambridge, MA) and J. M. Spurlock (Georgia Institute of Technology, Atlanta, GA). In: Human factors of outer space production. Boulder, CO, Westview Press, Inc., 1980, p. 133-145. 10 refs. NASA-sponsored research.

Closed food cycles for long duration space flight and space habitation are examined. Wash water for a crew of six is economically recyclable after a week, while a total closed loop water system is effective only if the stay exceeds six months' length. The stoichiometry of net plant growth is calculated and it is shown that the return of urine, feces, and inedible plant parts to the food chain, along with the addition of photosynthesis, closes the food chain loop. Scenarios are presented to explore the technical feasibility of achieving a closed loop system. An optimal choice of plants is followed by processing, waste conversion, equipment specifications, and control requirements, and finally, cost-effectiveness. M.S.K.

## STAR ENTRIES

**N82-12129\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

**CREW ACTIVITIES IN SPACE**

Guion S. Bluford, Jr. /in NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 181-187

Avail: NTIS HC A10/MF A01 CSCL 05H

One of the mission requirements of the Space Shuttle is to serve as a working platform for experiments in space. Many of these experiments will be performed by crewmembers (mission specialists and payload specialists) in a general purpose laboratory called Spacelab. All nonexperiment-related activities or housekeeping activities will be done in the Orbiter, while most of the mission-related activities (experiments) will be done in Spacelab. In order for experimenters to design their experiments to best utilize the capabilities of the Orbiter, the Spacelab, and the crew, the working environment in the Orbiter and in Spacelab is described. In addition, the housekeeping activities required of the crew are summarized. T.M.

**N82-12737** Utah State Univ., Logan.

**HIGHER PLANT ACCLIMATION TO SOLAR ULTRAVIOLET-B RADIATION Ph.D. Thesis**

Ronald Robberecht 1981 109 p

Avail: Univ. Microfilms Order No. 8121390

Plant acclimation to natural and intensified solar UV-B irradiance was investigated in three species, to determine: (1) the relationship between plant sensitivity and epidermal UV attenuation, (2) the effect of phenotypic changes in the leaf epidermis, resulting from UV-B exposure, on plant sensitivity to UV radiation, and (3) the plasticity of these changes in the epidermis leading to plant acclimation to UV-B radiation. Epidermal UV transmittance was found to differ in magnitude and spectral distribution among the three species. Photosynthesis was not significantly depressed in the leaves of any of three species. A trend toward photosynthetic depression of response to UV-B irradiation was found. A mechanism of UV-B attenuation, and increase in the UV-B attenuation capacity of the epidermis, is suggested. It is suggested that the degree of plant sensitivity and acclimation to natural and intensified solar UV-B radiation involves a dynamic balance between the capacity for UV-B attenuation and UV-radiation repair mechanism in the leaf. Dissert. Abstr.

**N82-12738\*** Norwegian Defence Research Establishment, Kjeller.

**NEUROTRANSMITTER MECHANISMS IN THE NUCLEUS ACCUMBENS SEPTI AND RELATED REGIONS IN THE RAT BRAIN**

Ivar Walaas Apr. 1981 26 p refs

(NDRE/PUBL-81/1001; ISSN-0085-4301) Avail: NTIS HC A03/MF A01

The localization of different transmitter candidate, particularly the amino acids gamma aminobutyrate (GABA) and glutamate (GLU), in limbic and basal ganglia regions in the rat brain was compared and the characteristics of nucleus accumbens were studied. The GABA neurons are found in nucleus accumbens, and GABA projections from this nucleus are identified in restricted basal forebrain and mesencephalic regions. The GLU projections from the neocortex or allocortex are terminated in nucleus accumbens and other forebrain and hypothalamic nuclei. Neurotransmitters in local neurons are identified in the hippocampus, nucleus accumbens, septum and caudatoputamen by local kainic acid injections, while neurons in the mediobasal hypothalamus are studied after systemic treatment of newborn animals with monosodium glutamate. E.A.K.

**N82-12739\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**METHOD AND APPARATUS FOR DETECTING COLIFORM ORGANISMS Patent Application**

Kenji Nishioka, David Nibley (Boeing Co., Palo Alto, Calif.), Eldon

Jeffers (Boeing Co., Palo Alto, Calif.), and Richard Brooks, inventors (to NASA) (Boeing Co., Palo Alto, Calif.) Filed 26 Oct. 1981 25 p

(NASA-Case-ARC-11322-1; US-Patent-Appl-SN-315278) Avail: NTIS HC A02/MF A01 CSCL 06C

A sample containing coliform bacteria is cultured in a liquid growth medium. The cultured bacteria produce hydrogen which is vented to a second call containing a buffer solution in which the hydrogen dissolves. By measuring the potential change in the buffer solution caused by the hydrogen, as a function of time, the initial concentration of bacteria in the sample is determined. Alternatively, the potential change in the buffer solution can be compared with the potential change in the liquid growth medium to verify that the potential change in the liquid growth medium is produced primarily by the hydrogen gas produced by the coliform bacteria. NASA

**N82-12740\*** Technische Hogeschool, Delft (Netherlands).

**AN ENGINEERING STUDY OF BACTERIAL KINETICS AND ENERGETICS Ph.D. Thesis**

A. A. Esener 1981 130 p refs

Avail: NTIS HC A07/MF A01

Bacterial kinetics and energetics were studied with reference to engineering applications. Three processes were identified: (1) to biosynthetic process during which presursors are formed from the substrate followed by the polymerization of them into biomass; (2) product formation; and (3) the maintenance processes. The distribution of the input energy and mass in the form of the substrate was studied in an attempt to manipulate the distribution so as to minimize the overall cost of the product. This was accomplished by describing the whole process in terms of a mathematical model and optimizing it according to an objective function. R.J.F.

**N82-12741\*** International Atomic Energy Agency, Vienna (Austria).

**GASTROINTESTINAL ALLERGY IN THE EXPERIMENTAL ANIMAL: THE USE OF RADIOIODINATED SERUM ALBUMIN IN THE ASSESSMENT OF NEW DRUGS Final Report, 15 Oct. 1977 - 30 Nov. 1979**

S. Freier Mar. 1980 24 p refs

(IAEA-R-2067-F) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A rat model to study of gastrointestinal allergy and means to prevent it was developed. Allergic sensitivity to certain proteins by injecting proteins and adjuvants in various regimes was induced in rats. For suckling rats sensitivity was established by oral administration of the protein. A hypersensitive gastrointestinal reaction to challenge was demonstrated by electron microscopy, by light microscopy with conventional staining techniques, and by a radionuclide procedure wherein (51) Cr labelled albumin injected intravenously shortly before the challenge concentrated in the intestinal walls in rough proportion to the severity of the reaction. It is found that suppressing the hypersensitive intestinal reaction, disodium cromoglycate, dexamethazone, aspirin, indomethecan, and ipobrufen are ineffective and aminophylline was a slight amelioration. DOE

**N82-12742\*** Technische Universitaet, Munich (West Germany). Institut fuer Klinische Zytologie.

**COMPILATION OF CELL DATA BANK FOR AUTOMATION IN DIAGNOSTIC CYTOLOGY Final Report**

Karlheinz Otto Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 30 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-158; ISSN-0340-7606) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 6,30

Automated cell recognition systems with high resolution which are required to analyze separate cells to detect cellular margins are discussed. Classified cells are used for compiling a learning data set. The preparation technique was improved, aiming at sufficient cellular isolation. In order to create a learning data set, 10,000 isolated cells were selected. The preparation procedure entails a distinct increase of isolated squamous epithelial cells and a diminution of clusters as well as white blood cells. The significance of specific and stoichiometric staining is shown. Author (ESA)

## N82-12743

**N82-12743#** Medical Biological Lab. RVO-TNO, The Hague (Netherlands).

### **CHEMICAL PROTECTION OF CELLS IN CULTURE AND MICE AGAINST X-IRRADIATION** Progress Report

O. Vos and L. Budke Jan. 1979 16 p (MBL-1979-2; TDCK-71758) Avail: NTIS HC A02/MF A01

The effects of X-rays on the survivability of mice and cells in culture is discussed. Clone formation of heteroploid kidney cells in vitro was used as the survival parameter for the cells. Two germanid thiazolidines give good results, even though the effectiveness level of cysteamine is not reached. Author (ESA)

### **N82-12745** Pennsylvania State Univ., University Park. **SWEATING RESPONSES OF MEN AND WOMEN DURING EXERCISE IN HUMID AND DRY HEAT** Ph.D. Thesis

Andrea Jean Frye 1981 80 p Avail: Univ. Microfilms Order No. 8120427

Four men and four women were matched on aerobic capacity and surface area to weight ratio. Each subject was acclimated to and tested in two equivalent environments (dry bulb temperature and wet bulb temperature). Maximum density of sweat gland activation (SGA sub max) was determined with the use of methacholine. Suppression of sweating due to skin hydration (hidromeiosis) was evidenced in both sexes by significantly lower total body sweat rate (m sub sw) and chest sweat rate (m sub sw) in the humid heat as compared to the dry heat. The women maintained significantly lower M sub sw and chest m sub sw than the men in the humid heat, but there were no differences in sweating rates between sexes in the dry heat. In the women, the SGA relative to SGA sub max (% SGA sub max) was significantly higher in the dry heat than in the humid heat. SGF was similar in both environments. In the men, SGF was significantly higher in the dry heat than in the humid heat, while %SGA sub max was similar in both environments. The women were more sensitive to hidromeiosis than the men, and the nature of the response to hidromeiosis differed between the sexes.

Dissert. Abstr.

### **N82-12746** Texas Univ. at San Antonio. **MEDICAL DIAGNOSTIC APPLICATION OF RADIOFREQUENCY RANGE ELECTROMAGNETIC WAVES** Ph.D. Thesis

Michael Raymond Millner 1981 139 p Avail: Univ. Microfilms Order No. 8120287

A method has been developed, using a scattering or S parameter network analyzer and a loop antenna, for measuring the phase change of the forward reflection S parameter, S11, in relation to volume changes. A phantom was designed utilizing a balloon immersed in saline with displacement volume measured in a standpipe. Volume changes were related to both changes in phase and amplitude of the S11. A model was developed, based on basic electromagnetic theory, of a wave propagating through a layer of water of varying thickness bounded by air. The complex reflection coefficient was calculated, plotted, and compared to the S11 for the phantom. Several different antenna designs were tested, including varying size and types. This method was applied to the study of breathing and cardiac volume changes in man. Both the amplitude and phase of the S11 parameter were correlated with a simultaneously recorded electrocardiogram. In order to correlate these measurements with cardiac volume changes, a dog was anesthetized, and by means of the thermal dilution technique, cardiac output was determined. Dissert. Abstr.

### **N82-12747** California Univ., Los Angeles. **MEASUREMENT OF THE BONE MINERAL DENSITY OF TRABECULAR BONE BY A COHERENT AND COMPTON SCATTERING TECHNIQUE** Ph.D. Thesis

Shih-Shen Ling 1981 170 p Avail: Univ. Microfilms Order No. 8120996

A simplified photon scattering method to measure the bone mineral density of the trabecular bone was studied. The method used the simultaneous detection of the coherent and Compton scattered photons from the bone sample in a narrow beam geometry. The bone mineral density is determined within the scattering volume which is defined by the configuration of the source and detector collimators and scattering angle. The size of the scattering volume is determined by the aperture diameter and the length of both the source and detector collimators for a geometric configuration, and scattering angle. The corrections to the coherent to Compton scattering ratio due to the presence of overlying tissue and the effect of fat content of the sample

to this technique was also studied. A four source focused collimator was constructed to increase the incident photon intensity.

Dissert. Abstr.

### **N82-12748** California Univ., Los Angeles. **THE MAGNETOSTATIC FORCE PRODUCED BY CURRENT LOOPS AND IS MEDICAL APPLICATIONS** Ph.D. Thesis

Osman Kaldirim 1981 132 p

Avail: Univ. Microfilms Order No. 8120984

The magnetostatic force on permeable bodies both theoretically and experimentally was studied. Recent technological advances are tremendously advantageous to the delivery of protein carrying biologically active substances. The use of magnetic fields serves as the driving force in a guidance system to transport these substances to specific sites within the living system. Spheres of protein approximately one micron in diameter are impregnated with magnetite (Fe3O4) along with other desired substances, this combination of elements is then injected into the bloodstream. Once in the bloodstream they flow freely until the desirable site is reached. The magnetic fields and magnetostatic forces which are necessary in the control of microspheres were analyzed. A theoretical analysis of the magnetostatic force due to current loops was made consisting of a systematic design and an experimental study involving the effects of magnetostatic forces on microspheres injected into animals.

Dissert. Abstr.

### **N82-12749** Colorado Univ. at Boulder. **TRANSCUTANEOUS ELECTRICAL PERIPHERAL NERVE STIMULATION: IMPLICATIONS FOR NEURAL CONTROL MECHANISMS** Ph.D. Thesis

Darrell Neal Jones 1981 158 p Avail: Univ. Microfilms Order No. 8122295

Transcutaneous electric nerve stimulation (TENS) is used clinically to control chronic pain. Large nerve fiber activity which is induced by TENS is hypothesized to inhibit pain signals at spinal levels via the gate control mechanism. While TENS is highly effective in the control of chronic pain, few additional neural function effects are reported clinically. The paucity of such observations is enigmatic since the large fiber involvement characteristic of TENS impacts numerous peripheral neural functions. A battery of performance tests was given to volunteers under control conditions and acute clinical levels of TENS. The tests included reaction time tests, force estimation tasks, touch discrimination tests and temperature discrimination tests. The results show no significant TENS effects on sensory discrimination. However, TENS significantly affects motor function, as defined by slowed reaction times and reduced range of response in force estimation.

Dissert. Abstr.

### **N82-12750** California Univ., San Diego. **THREE-DIMENSIONAL STRESS DISTRIBUTION IN ARTERIES: RADIAL COMPRESSION EXPERIMENTS OF ARTERIAL WALL; STRESS CONCENTRATION IN LUNG NEAR A CYLINDRICAL CAVITY; FINITE ELEMENT ANALYSIS OF PLEURAL SURFACE PRESSURE DISTRIBUTION IN DOG'S LUNG DURING ELECTROPHRENIC STIMULATION** Ph.D. Thesis

Cheng-Jen Chuong 1981 167 p Avail: Univ. Microfilms Order No. 8120521

A three dimensional stress strain relationship derived from a strain energy function of the exponential form was proposed for arterial wall. The effect of the nonuniform stress field in the radial direction on the water movement in arterial wall is pointed out. The elastic behavior of rabbit thoracic arteries in radial direction was studied by uniaxial compression order of magnitude of the elasticity in radial direction is the same as that in the circumferential and longitudinal directions. In the vicinity of cylindrical cavity the lung parenchyma can be subjected to very high stress concentration in the circumferential direction. Stress distributions at various infinity stretches as well as longitudinal stretches are given. During the electrophrenic stimulation the diaphragm contracts lowers and the apex t base length of the lung increase up to 25%. It is observed that reversal pleural pressure (p sub pl) gradient in which the basal p sub pl becomes more negative than the optical. This phenomena is studied by finite element method.

Dissert. Abstr.

### **N82-12751\*#** BioTechnology, Inc., Falls Church, Va. **BIOMEDICAL RESEARCH**

Washington NASA Nov. 1981 20 p

(Contract NASw-3469)

(NASA-CR-3487) Avail: NTIS HC A02/MF A01 CSCL 06B

Biomedical problems encountered by man in space which have been identified as a result of previous experience in simulated or actual spaceflight include cardiovascular deconditioning, motion sickness, bone loss, muscle atrophy, red cell alterations, fluid and electrolyte loss, radiation effects, radiation protection, behavior, and performance. The investigations and the findings in each of these areas were reviewed. A description of how biomedical research is organized within NASA, how it is funded, and how it is being reoriented to meet the needs of future manned space missions is also provided. T.M.

**N82-12752\*** General Electric Co., Houston, Tex. Apollo Systems Dept.

**QUANTITATION OF TISSUE LOSS DURING PROLONGED SPACE FLIGHT**

J. I. Leonard 24 Sep. 1979 44 p refs

(Contract NAS9-15487)

(NASA-CR-167460; TIR-74-LSP-9017) Avail: NTIS HC A03/MF A01 CSCL 06P

Data from Skylab missions related to tissue loss in space were analyzed. Significant changes in gross body composition occur during spaceflight, these include: alterations in water balance resulting from headward shifts of fluid, loss of musculoskeletal tissue, and alterations in fat depending upon the balance between caloric intake and energy expenditure. An effort was made to control the more essential components of body weight on the Skylab missions. E.A.K.

**N82-12753\*** General Electric Co., Houston, Tex.

**SKYLAB WATER BALANCE ANALYSIS**

J. I. Leonard 13 Apr. 1977 59 p refs

(Contract NAS9-14523)

(NASA-CR-167461) Avail: NTIS HC A04/MF A01 CSCL 06P

The water balance of the Skylab crew was analyzed. Evaporative water loss using a whole body input/output balance equation, water, body tissue, and energy balance was analyzed. The approach utilizes the results of several major Skylab medical experiments. Subsystems were designed for the use of the software necessary for the analysis. A partitional water balance that graphically depicts the changes due to water intake is presented. The energy balance analysis determines the net available energy to the individual crewman during any period. The balances produce a visual description of the total change of a particular body component during the course of the mission. The information is salvaged from metabolic balance data if certain techniques are used to reduce errors inherent in the balance method. E.A.K.

**N82-12754\*** Technische Hogeschool, Delft (Netherlands).

**IDENTIFICATION OF THE ADAPTIVE FEEDBACK OF THE HUMAN MOTOR SYSTEM USING THE RESPONSE DIFFERENCE METHOD Ph.D. Thesis**

Anthonie Pieter Eland Jun. 1981 132 p refs Sponsored in part by the Netherlands Organization for the Advancement of Pure Research

Avail: NTIS HC A07/MF A01

Proprioceptive and the visual feedback of the human motor system in generating slow, goal directed movement was investigated. Two internal models are considered in the feedforward path. The sensory program specifies the expected position trajectory and its maximum velocity which explains the amplitude and the duration of the movement. The motor program is determined by the sensory program and the load's internal model and specific the amplitude and the duration of the force pattern. Learned goal directed movements are almost completely programmed. E.A.K.

**N82-12755\*** Desmatics, Inc., State College, Pa.

**A MONTE CARLO STUDY OF THE USE OF AUXILIARY INFORMATION IN THE DEVELOPMENT OF AN IMPACT ACCELERATION INJURY PREDICTION MODEL**

Dennis E. Smith and John J. Peterson Sep. 1981 14 p refs (Contract N00014-79-C-0128; NR Proj. 207-037)

(AD-A105463; TR-112-9) Avail: NTIS HC A02/MF A01 CSCL 06/19

This report describes a small-scale Monte Carlo investigation of procedures for incorporating various sources of auxiliary

information into an impact acceleration injury prediction model. Parameter estimates are tabulated and compared for standard and modified models. Based on the results of the investigation, the procedures appear to be helpful in reducing the mean square error of predictions. Author (GRA)

**N82-12756\*** Arizona Univ., Tucson. Dept. of Pharmacology. **OXYGEN TOXICITY AND LUNG COLLAGENOUS PROTEIN Final Technical Report, 1 Sep. 1977 - 28 Feb. 1981**

Klaus Brendel and I. Glenn Sipes 28 Feb. 1981 131 p refs (Contract N00014-77-C-0506)

(AD-A104702) Avail: NTIS HC A07/MF A01 CSCL 06/20

The chemical composition and subunit structure of the basement membrane and collagenous components of the normal lung and of lungs exposed to agents promoting the formation of singlet oxygen and thereby produce oxidative damage to tissue components was investigated. The alveolar basement membrane, the structure and composition of this component of the extracellular matrix of the lung is determined that a complex population of proteins make up the extracellular matrix. Several new collagen types are described as well as high molecular weight non collagens that appear to be associated with normal basement membranes. It is concluded that the characterization of putative changes in the nature of matrix components in pathologic states lags behind a more thorough characterization of normal basement membrane and extracellular components. E.A.K.

**N82-12757\*** Brookhaven National Lab., Upton, N. Y.

**REPAIR OF CHEMICAL DAMAGE IN MAMMALIAN CELLS**

R. B. Setlow 1981 10 p refs Presented at the NATO CNEN Conf., Rome, 24 Aug. - 5 Sep. 1981 Submitted for publication (Contract DE-AC02-76CH-00016)

(DE81-030823; BNL-30055; B10-3767; CONF-810873-1)

Avail: NTIS HC A02/MF A01

The repair of chemical damage to DNA is discussed. Most chemicals of environmental concern do not react directly with cellular macromolecules but must first be activated to nucleophiles. The different reactivities between agents reacting directly and those that react indirectly may produce products whose yields as a function of dose are completely different even though the products themselves may be the same. Nucleotide excision measurements of DNA repair are used extensively to detect agents that react with DNA which measurements help identify dangerous DNA adduct. The chemical damages that mimic UV are repaired by nucleotide excision, and the chemicals give rise to bulky adducts. The excision repair of bulky DNA adducts mimics the repair of UV damage in many ways, however the identity of the repair pathways is still controversial. DOE

**N82-12758\*** Atomic Energy of Canada Ltd., Chalk River (Ontario). Health Sciences Div.

**BIOLOGICAL EFFECTS OF LOW DOSES OF IONIZING RADIATION: THREE REVIEW PAPERS**

J. D. Childs and J. R. Johnson Sep. 1980 81 p refs

(AECL-7059) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

The topics relate to the genetic effects of ionizing radiation. The dose-response relationship for the genetic and carcinogenic effects of low level radiation is discussed. A perspective on radiation exposures resulting from the use of nuclear energy is presented. T.M.

**N82-12759\*** Atomic Energy of Canada Ltd., Pinawa (Manitoba). **RADIATION EFFECTS ON LIVING SYSTEMS. A BIBLIOGRAPHY OF AECL PUBLICATIONS**

Norma J. Hawley Oct. 1980 38 p In ENGLISH; FRENCH summary

(AECL-6797) Avail: NTIS HC A03/MF A01

The bibliography is divided into three topic areas: radiobiology, radiation chemistry, and radiation biochemistry. The living systems are arranged as follows: animals, cellular, human, insects, and subcellular. T.M.

**N82-12760\*** North Carolina Univ., Chapel Hill. Dept. of Biochemistry.

**STUDIES IN ERYTHROPOIESIS: THE INFLUENCE OF THE GLYCOCALYX OF THE RED CELL MEMBRANE Ph.D. Thesis**

M. W. Franco 1980 148 p refs

## N82-12761

(Contracts DE-AS05-76EV-04157; EY-76-S-05-4157)  
(DEB1-030668; DOE/EV-04157/T3) Avail: NTIS  
HC A07/MF A01

The correlation between the removal from the circulation of aged cells and the production of new RBCs was investigated. An erythropoietic influence was associated with the glycocalyx of the erythrocyte membrane. The influencing factor, asialoglycophorin, was masked on the young RBC by an amino ketosugar, sialic acid. During the aging process, an increasing amount of sialic acid is removed from the membrane to expose the underlying erythropoietic message. The amount of erythropoietic activity was directly related to the number of desialated erythrocytes transfused and to the degree of desialation of the transfused erythrocytes. It is shown that asialoglycophorin is an erythrocyte stimulating factor following its isolation from the membrane and subsequent injection into test mice and both mouse and human asialoglycophorin and stimulatory. DOE

**N82-12761#** Australian Radiation Lab., Melbourne.  
**MEASUREMENT OF GONADAL AND BONE-MARROW DOSES FROM DENTAL RADIOGRAPHY**  
S. B. Solomon and N. D. Morris Jun. 1980 30 p  
(ARL/TR-022; ISSN-0157-1400) Avail: NTIS (US Sales Only)  
HC A03/MF A01; DOE Depository Libraries

The method of calculation of the radiation doses to the gonads and to the active bone marrow arising from dental radiography is described. The bone-marrow doses have been calculated using a computer model of X-ray depth doses within the skull for typical dental radiographic examinations as performed in Australia. The ovarian and testicular doses, as a percentage of skin dose have been determined experimentally. The dependence of the gonadal doses on X-ray tube voltage, face to cone distance and direction of the X-ray beam relative to the face is detailed. DOE

**N82-12762#** Australian Radiation Lab., Melbourne.  
**GONADAL DOSES FROM RADIOTHERAPY**  
S. B. Solomon and N. D. Morris Jun. 1980 25 p  
(ARL/TR-020; ISSN-0157-1400) Avail: NTIS (US Sales Only)  
HC A02/MF A01; DOE Depository Libraries

The measurement of scatter factors to the gonads from superficial and deep therapy is detailed and the analytic fits to the experimental data, as a function of field position, field size and beam energy are given. The data used to calculate the gonadal doses from treatments using linear accelerators, teletherapy and sealed sources are described and the analytic fits to the data given. DOE

**N82-12763#** Australian Radiation Lab., Melbourne.  
**GENETIC AND MEAN BONE-MARROW DOSES FROM MEDICAL USE OF UNSEALED RADIOISOTOPES**  
D. W. Keam Jun. 1980 21 p refs  
(ARL/TR-023; ISSN-0157-1400) Avail: NTIS (US Sales Only)  
HC A02/MF A01; DOE Depository Libraries

Annual doses to the Australian population were derived for the year 1970 using results of a survey carried out at that time and published data on doses to individuals resulting from such use. Values of 3.9 and 38 microgray for the annual (per capita) genetic and mean bone marrow doses respectively are reported, which are similar to those reported for other countries at about that time. DOE

**N82-12764#** Australian Radiation Lab., Melbourne.  
**CONTRIBUTIONS TO THE GENETIC AND MEAN BONE-MARROW DOSES OF THE AUSTRALIAN POPULATION FROM RADIOLOGICAL PROCEDURES**  
T. N. Swindon and N. D. Morris Jun. 1980 111 p  
(ARL/TR-017) Avail: NTIS (US Sales Only) HC A06/MF A01;  
DOE Depository Libraries

The results of a national survey of radiological procedures used for diagnosis and therapy in medicine, dentistry, and chiropractic are reviewed. Statistical data for the distribution and frequency of various procedures in Australian hospitals and practices are summarized, together with their associated radiation doses. Annual genetically significant and mean bone-marrow doses to the Australian population arising from these procedures are derived for the survey year of 1970. Values of 176 microgray and 651 microgray for the annual (per capita) genetic and mean bone-marrow doses respectively are reported. These compare closely with corresponding estimates in other countries with similar medical practices to those in Australia. DOE

**N82-12765#** Oak Ridge National Lab., Tenn.  
**OVERVIEW OF THE BIOMEDICAL AND ENVIRONMENTAL PROGRAMS AT THE OAK RIDGE NATIONAL LABORATORY**

H. A. Pfuderer, comp. and J. B. Moody, comp. Jul. 1981  
62 p

(Contract W-7405-eng-26)  
(DEB1-027864; ORNL-5806) Avail: NTIS HC A04/MF A01

Biomedical and environmental research, to provide information on environmental, health, and safety considerations, which can be utilized in the formulation and implementation of energy technology decisions is discussed. Information for the understanding of short term and long term consequences of processes in new energy technologies were researched. The mechanisms responsible for biological and ecological damage caused by substances associated with energy production and repair mechanisms are investigated. DOE

**N82-12766#** Texas A&M Univ., College Station. Dept. of Chemistry, Medical Microbiology and Immunology.  
**IDENTIFICATION AND TOXICITY OF FRACTIONATED-SHALE-OIL COMPONENTS**  
K. Wittnebel, D. C. Shelly, C.-N. Ho, I. M. Warner, and J. M. Quarles 1981 17 p refs  
(Contract DE-AS05-80EV-10404)  
(DEB1-028460; DOE/EV-10404/T1) Avail: NTIS  
HC A02/MF A01

A procedure for the separation and identification of polynuclear aromatic hydrocarbons (PNA's) is presented. This procedure comprises two steps. First, the shale oil is separated into fractions according to ring size on a Chromosorb LC-9 normal phase column. Then each of these fractions are separated into individual components and identified using an analytical reversed-phase Ultrasphere ODS 5 micrometer column. In addition, toxicity studies are carried out on each fraction obtained from the amine column to indicate which class of PNA's warrants special attention and analysis. The results of this approach are reported. T.M.

**N82-12767#** Netherlands Organization for Applied Scientific Research TNO, Delft. Raad voor Gezondheidsresearch TNO.  
**INVENTORY OF MEDICAL TECHNOLOGICAL RESEARCH IN THE NETHERLANDS Annual Report, 1979-1980 [INVENTARISATIE VAN HET MEDISCH-TECHNOLOGISCHE ONDERZOEK IN NEDERLAND 1979-1980]**  
J. G. A. Luijten May 1980 73 p In DUTCH  
Avail: NTIS HC A04/MF A01

An inventory of medical-technological research in the Netherlands during the years 1979 and 1980 is presented. The research projects are listed with title, contact person, year of beginning and termination and number of man years. Author (ESA)

**N82-12768#** National Physical Lab., Teddington (England). Acoustics Unit.  
**THRESHOLDS OF HEARING BY AIR CONDUCTION AND BY BONE CONDUCTION UNDER DIFFERENT MASKING CONDITIONS**  
M. S. Shipton and D. W. Robinson Jun. 1981 46 p refs  
(NPL-Ac-100; ISSN-0143-7143) Avail: NTIS  
HC A03/MF A01

Air and bone conduction threshold determinations for 152 subjects in the age range 16 to 30 years are presented. Bone conduction tests were carried out using a vibrator applied to the left and right mastoid under three conditions at the contralateral ear: unoccluded, masked at 25 dB, and at 40 dB sensation level. By a systematic process of otological classification of the subjects, the bone conduction threshold for normal hearing was estimated with an uncertainty of less than 1 dB and was interpolated for masking noise levels from zero to 40 dB sensation level. Individual air-bone gaps are shown to be widely spread for an otologically normal group, but distributions are normal and have a mean value close to zero. Author (ESA)

**N82-12769#** National Physical Lab., Teddington (England). Acoustics Unit.  
**AN INVESTIGATION OF THE STATUS OF BONE CONDUCTION AUDIOMETER CALIBRATION IN THE NATIONAL HEALTH SERVICE**  
G. R. Torr and L. S. Whittle Jun. 1981 45 p refs  
(NPL-Ac-101; ISSN-0143-7143) Avail: NTIS  
HC A03/MF A01

The accuracy and uniformity achieved in the calibration of bone conduction audiometers used in hospitals were studied. The acceleration output of precalibrated bone vibrator supplied as part of an audit kit was measured. The precalibration of the bone vibrator is on the order of 2 dB at all test frequencies, although the differences between the individual results and precalibration attained 5 dB at extreme frequencies in a few cases. However, differences are substantially reduced by reinterpreting the hospital measurements using determinations of the sensitivities of the artificial mastoids and by correcting the measurements to a common temperature. Author (ESA)

**N82-12770#** Institute for Perception RVO-TNO, Soesterberg (Netherlands).

**THE HEART RATE OF ASPIRANT AIR PILOTS IN A HYPOBARIC CHAMBER**

A. W. K. Gaillard and C. L. Truijens 1979 21 p refs  
(Contract A72/K/070)

(IZF-1979-35; TDCK-73413) Avail: NTIS HC A02/MF A01

Changes in heart rate, caused by stress induced when atmospheric pressure in a hypobaric chamber is suddenly decreased, are studied. The use of heart rate variables as a pilot selection criterion is also considered. Results show that the heart rate measures only differ between a group of experienced subjects and the other groups. No correlations are found between the heart rate measures and personality test scores, which were obtained from questionnaires given directly after stress exposure. Author (ESA)

**N82-12771#** Institute for Perception RVO-TNO, Soesterberg (Netherlands).

**DAMAGE RISK CRITERIA FOR IMPULSE NOISE**

G. F. Smoorenburg 1980 35 p refs Presented at Intern. Symp. on New Perspectives on Noise Induced Hearing Loss, Cazenovia, New York, 15-18 Jun. 1980

(Contract A76/K/103)

(IZF-1980-26; TDCK-75018) Avail: NTIS HC A03/MF A01

Data on temporary threshold shifts (TTS) due to impulse noise exposure are evaluated. Peak levels of the impulses are determined at which only 10% of the people exposed show TTS, two minutes after exposure, of 15 dB or more averaged over the threshold shifts at 1, 2, and 3 kHz (TTS 1, 2, 3 > 15 dB). These peak levels are a function of the number of impulses per exposure times the duration of a single impulse. The result is compared with TTS data on steady noise as a function of exposure duration, and with data on permanent threshold shifts (PTS) induced by impulse and intermittent noise. This suggests that < 10% of the people exposed to impulse noise each working day will develop noise induced PTS 1, 2, 3 of 15 dB or more if the equivalent level of the noise is 85 dB. The hearing loss fence of 15 dB PTS 1, 2, 3 is discussed for loss of speech discrimination in a noisy background and it is shown that a higher fence cannot be allowed. The attenuation from ear plugs is less than laboratory values. Author (ESA)

**N82-12772\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

**PILOT ESTIMATES OF GLIDEPATH AND AIM POINT DURING SIMULATED LANDING APPROACHES**

C. W. Acree, Jr. Nov. 1981 21 p refs

(NASA-TM-81325; A-8717) Avail: NTIS HC A02/MF A01 CSDL 051

Pilot perceptions of glidepath angle and aim point were measured during simulated landings. A fixed-base cockpit simulator was used with video recordings of simulated landing approaches shown on a video projector. Pilots estimated the magnitudes of approach errors during observation without attempting to make corrections. Pilots estimated glidepath angular errors well, but had difficulty estimating aim-point errors. The data make plausible the hypothesis that pilots are little concerned with aim point during most of an approach, concentrating instead on keeping close to the nominal glidepath and trusting this technique to guide them to the proper touchdown point. Author

**N82-12773#** Institute for Perception RVO-TNO, Soesterberg (Netherlands).

**HOW TO DISPLAY DIGITAL SONAR SIGNALS. SOME PRIMARY THRESHOLD MEASUREMENTS**

A. vanMeeteren and A. F. Sanders 1979 20 p refs

(Contract A73/KM/032)

(IZF-1979-16; TDCK-73399) Avail: NTIS HC A02/MF A01

The optimal task division between operator and computer when trying to identify echos in sonar observation of a noisy field is discussed. Confidence ratings defined four criteria, ranging from sure no target to sure target, and results were scored as d values as a measure of detectability at the different criteria. The d values are higher towards the sure target end of the range. There are significant differences between subjects, but none for interactions between subjects and display variables. It is found that at high display thresholds the intensity mode works best, whereas at display the length mode is superior regarding target detection. Author (ESA)

**N82-12774#** Institute for Perception RVO-TNO, Soesterberg (Netherlands).

**CONSPICUITY OF OBSERVATION POSTS AT THE AIR WEAPON FIRING RANGES ON THE VLIHORS AND THE NOORDVAARDER**

J. Boogaard, J. Varkevisser, and J. J. Vos 1979 20 p ref Transl. into ENGLISH of 'Opvallendheid van observatieposten op de schietranges of de Vliehors en de Noordvarder' Soesterberg, Netherlands

(Contract A78/KLu/058)

(IZF-1979-33-E; TDCK-73411) Avail: NTIS HC A02/MF A01

Visibility from the air of observation posts is examined in order to decrease the likelihood of their being mistaken for targets. Subjective assessments by tower personnel and pilots indicate that a yellow/black check pattern has no advantages for recognition. A scale model was used to test other color/pattern combinations and the effect of a marker beacon on the tower. Results show that: (a) visibility is improved by lights of 5 million cd, while higher values cause uncomfortable glare; (b) towers should be painted black; and (c) approach route must be clearly marked. However, tower staff fear that these measures will increase danger by making them too obvious a 'target', especially in poor visibility. Author (ESA)

**N82-12775#** Institute for Perception RVO-TNO, Soesterberg (Netherlands).

**CYBERNETICS AND CAR DRIVING: A MATHEMATICAL (COMPUTER) MODEL FOR THE SYSTEM TO BE CONTROLLED**

G. J. Blaauw 1980 27 p refs

(IZF-1980-4; TDCK-75004) Avail: NTIS HC A03/MF A01

A mathematical representation of the system controlled by a car driver is presented. This system is defined by combinations of lateral and longitudinal vehicle dynamics, course following, and the execution of an arbitrary additional task. A linearized model is developed and implemented in subroutines on a digital computer. The model based on control theory uses state vector notation. The description results in a six-dimensional state vector and involves three lead variables (course of the road, velocity of the lead car and the stimulus of the additional task) and one disturbance variable (side-wind gusts or road irregularities). The routines calculate future values for the course of the road and the velocity of the lead car in order to make anticipation possible by the driver. Driver's actions are modeled by the position of the accelerator, the brake force and the steering wheel angle. Several routines are extended with additional procedures to allow for an independent use in other applications. For example, the mathematical representation of the vehicle dynamics is extended with nonlinear equations to cover the complete range of variables and can be used in specific studies of the effects of vehicle parameters. Author (ESA)

**N82-12776#** Institute for Perception RVO-TNO, Soesterberg (Netherlands).

**CYBERNETICS AND CAR DRIVING: A DRIVER MODEL AND ITS EXPERIMENTAL VALIDATION**

G. J. Blaauw 1980 15 p refs

(IZF-1980-13; TDCK-75012) Avail: NTIS HC A02/MF A01

A linearized mathematical model which describes and predicts driver behavior is introduced. The internal representation consists of an estimation of the state vector describing the system to be controlled. The supervisory structure of the driver is studied by considering lateral and longitudinal control, combined with variations in bandwidth and energy of the lead variables. Car following and course following are included so that driver anticipation can be modeled by the observation of future values of the course of the road and the lead car velocity. A lead variable for the stimulus of an additional task can be included. Model validity is demonstrated by analyzing the effects of variables.

**N82-12777**

(driving experience, system disturbances, etc.) on the model parameters. Author (ESA)

**N82-12777#** Institute for Perception RVO-TNO, Soesterberg (Netherlands).

**LEVELS OF STEERING CONTROL: REPRODUCTION OF STEERING WHEEL MOVEMENTS**

J. Godthelp 1980 36 p refs  
(IZF-1980-16; TDCK-75014) Avail: NTIS HC A03/MF A01

A schematic description of the driving control process using levels of control, i.e., precognitive, pursuit, and compensatory, is presented. The efficiency of the higher levels of control depends on the accuracy of internal information (knowledge of the road, the car, etc.) plus proprioceptive feedback. The sensitivity of the proprioceptive system was analyzed by measuring subjects' accuracy when asked to reproduce steering wheel positions without visual feedback. For discrete positions, standard deviation increases with steering wheel angle amplitude. However, relative errors are greatest with small angles. Steering force reduces the variation in reproduction. For continuous movements, reproductions are less accurate with low movement velocity than for the discrete positions. An additional velocity overshoot occurs. Rapid movements show higher positioning accuracy than slow.

Author (ESA)

**N82-12778#** Institute for Perception RVO-TNO, Soesterberg (Netherlands).

**CYBERNETICS AND CAR DRIVING: PERSPECTIVE PERCEPTION AND THE OUTPUT VECTOR OF THE SYSTEM TO BE CONTROLLED**

G. J. Blaauw 1980 22 p refs  
(IZF-1980-19; TDCK-75008) Avail: NTIS HC A02/MF A01

A sensitivity analysis for the perspective perception of lateral position variations during course following and distance variations during car following is covered. Variations in the curvature of the road followed are also considered via a perspective transformation. The sensitivities are derived for the development of a cybernetical model to describe and predict driver behavior quantitatively. The curvature variations are related to the most substantial element of the lead vector. The sensitivity for lateral position variations distinguishes between guidance features (lane markers, postmounted delineators, public lighting, etc.). The sensitivities for distance variations are related to the angular perception of the lead car dimensions and the road interval between lead car and own vehicle. The derived transformation equations are combined into one display equation which represents the transformation of the variables involved in the system to be controlled and models the output vector of that system as input information for the driver. Author (ESA)

**N82-12779#** Institute for Perception RVO-TNO, Soesterberg (Netherlands).

**THE EFFICIENCY OF DETECTING TRIBAR PATTERNS MODULATED IN RANDOM DOT DENSITY**

R. T. Flaherty (Night Vision and Electro-Optics Labs.) and A. VanMeeteren 1980 15 p refs  
(IZF-1980-25; TDCK-75020) Avail: NTIS HC A02/MF A01

The ability of the visual system to resolve detail, and to integrate information over area in threshold measurements with tribar targets is examined. Frequency-of-seeing curves were measured for the detection of tribar patterns modulated in the density of computer generated random dot distributions. Comparison of actual and ideal results shows that the visual system uses only 22% of the available information in detecting tribar targets. For long presentation times of 1 sec no difference in efficiency is found for targets of 1 deg X 1 deg and 10 deg X 10 deg. However, for short presentation times of 0.2 sec, the efficiency is about 40% lower for the 10 deg targets. This suggests that the field of view for pattern integration in one glimpse is smaller than 10 deg X 10 deg. Contrast sensitivity functions measured with tribar targets comprise a component for spatial integration inversely proportional to spatial frequency.

Author (ESA)

**N82-12780#** Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse (France). Inst. fuer Flugmechanik.

**REVIEW OF HUMAN AND OPERATIONAL FACTORS AFFECTING THE FEASIBILITY OF THE SEE-AND-AVOID CONCEPT**

Otto Weber May 1981 52 p refs

(DFVLR-Mitt-81-13) Avail: NTIS HC A04/MF A01; DFVLR. Cologne DM 12.30

Theoretical analysis and flight test assessments of the see-and-avoid concept of accident prevention are discussed. The international definition of visibility is supplemented by maximum detection range (MDR) and horizontal standard visibility (HSV). The MDR is always significantly lower than the HSV. Representations from design eye reference points show that cockpit visibility is often poor, especially for light, and small jet, aircraft when flying a horizontal turn. The introduction of speed dependent visual flight regulations is recommended. Author (ESA)

**N82-12781** Pennsylvania State Univ., University Park.  
**CLOSE-RANGE CINE-PHOTOGRAMMETRY: A GENERALIZED TECHNIQUE FOR QUANTIFYING GROSS HUMAN MOTION** Ph.D. Thesis

James Stephen Walton 1981 648 p  
Avail: Univ. Microfilms Order No. 8120471

New cinematographic techniques for performing two and three dimensional analyses are described. Transformations between object coordinates and image coordinates were developed. The techniques are similar to those employed in analytical photogrammetry. Applications of the generalized three dimensional technique require information from a minimum of two distinct views. Applications of the generalized planar technique can be made using information from a single camera. A refined version of the generalized three dimensional technique is also described. This corrects for lens distortions and linear film deformations. It is shown that, using object distances of approximately 35 feet, the center of a golf ball can be located to within .1 inch of its true, three dimensional location. The acceleration of the center of mass of a spinning, yet freely falling frampolinist is determined and compared with the acceleration due to gravity. Dissert. Abstr.

**N82-12782\*#** Ohio State Univ., Columbus.  
**AN INVESTIGATION INTO PILOT AND SYSTEM RESPONSE TO CRITICAL IN-FLIGHT EVENTS. VOLUME 1: EXECUTIVE SUMMARY** Final Report

Thomas H. Rockwell and Walter C. Griffin [1981] 199 p refs  
(Contracts NAS2-10047; NAG2-75)  
(NASA-CR-164993) Avail: NTIS HC A09/MF A01 CSCL 05H

Critical in-flight events (CIFE) that threaten the aircraft were studied. The scope of the CIFE was described and defined with emphasis on characterizing event development, detection and assessment; pilot information requirements, sources, acquisition, and interpretation, pilot response options, decision processed, and decision implementation and event outcome. Detailed scenarios were developed for use in simulators and paper and pencil testing for developing relationships between pilot performance and background information as well as for an analysis of pilot reaction decision and feedback processes. Statistical relationships among pilot characteristics and observed responses to CIFE's were developed. R.J.F.

**N82-12783\*#** Ohio State Univ., Columbus.  
**AN INVESTIGATION INTO PILOT AND SYSTEM RESPONSE TO CRITICAL IN-FLIGHT EVENTS. VOLUME 2: APPENDIX**

Thomas H. Rockwell and Walter C. Griffin [1981] 150 p refs  
(Contracts NAS2-10047; NAG2-75)  
(NASA-CR-164994) Avail: NTIS HC A07/MF A01 CSCL 05H

Materials relating to the study of pilot and system response to critical in-flight events (CIFE) are given. An annotated bibliography and a trip summary outline are presented, as are knowledge surveys with accompanying answer keys. Performance profiles of pilots and performance data from the simulations of CIFE's are given. The paper and pencil testing materials are reproduced. Conditions for the use of the additive model are discussed. A master summary of data for the destination diversion scenario is given. An interview with an aircraft mechanic demonstrates the feasibility of system problem diagnosis from a verbal description of symptoms and shows the information seeking and problem solving logic used by an expert to narrow the list of probable causes of aircraft failure. R.J.F.

**N82-12784#** Naval Air Development Center, Warminster, Pa.  
**ANTI-EXPOSURE TECHNOLOGY IDENTIFICATION FOR**

**MISSION SPECIFIC OPERATIONAL REQUIREMENTS Final Report**

Suzanne M. Reeps, David C. Johanson, and Louis J. SantaMaria  
8 Aug. 1981 113 p refs  
(AD-A105070; NADC-81081-60) Avail: NTIS  
HC A06/MF A01 CSCL 06/17

A selected group of anti-exposure garment configurations have been evaluated at the Naval Air Development Center to determine their comparative levels of performance in the areas of mobility/reach, heat stress/comfort, and immersion hypothermia protection. The specific results of these evaluations are reported, as well as a discussion of how the results relate to the U.S. Navy Operational Requirements for cold water exposure protection, as currently specified by the CNO. GRA

**N82-12785#** ILC Industries, Inc., Dover, Del. Protective Equipment Div.

**ZIPPER REAR CLOSURE ENDURANCE TESTING Final Report, 14 Apr. - 14 Jul. 1981**

Charles R. Sandy 14 Jul. 1981 6 p refs  
(Contract DAAK11-79-C-0066)  
(AD-A104732) Avail: NTIS HC A02/MF A01 CSCL 06/17

A manned endurance test program of 22 two hr. tests was conducted to verify the reliability of the DPE Outergarment Zipper Rear Closure developed under task order nine of this contract. Testing indicates that the closure assembly reliably provides a positive seal in the rear of the Outergarment as it is actually worn and used. Author (GRA)

**N82-12786# Systems Technology, Inc., Hawthorne, Calif. USER'S GUIDE TO BIODYN-80: AN INTERACTIVE SOFTWARE PACKAGE FOR MODELING BIODYNAMIC FEEDTHROUGH TO A PILOT'S HANDS, HEAD AND EYES Final Report, Jan. 1979 - Oct. 1980**

Susan A. Riedel, Raymond E. Magdaleno, and Henry R. Jex Jul. 1981 70 p refs  
(Contract F33615-79-C-0519; AF Proj. 2312)  
(AD-A104933; STI-TR-1146-1) Avail: NTIS  
HC A04/MF A01 CSCL 06/6

An interactive computer program (BIODYN-80) for solving the dynamic motion response of seated aircrew (pilots or equipment operators) working in a biodynamic environment (such as vibration or changing levels of acceleration in aircraft, surface vehicles, or motion simulators) is described. The multi-degree-of-freedom, lumped-parameter model includes elements for: pelvis, torso, neck, head, eyes, upper and lower arms, hand-grip and control stick (center-stick with arm rest). The nonlinear equations of motion of the body's main elements are linearized about a general set of body-limb-head postures, ranging from prone, to erect to supine. Typical parameter ranges and sources are given, along with two 'typical' sets: a seated-pilot with center-stick, and a seated produce biomechanical transmissibility files needed for use in the Air Force's PIVIB program for tracking performance estimation. Procedures and examples are given for both a Cyber 175 version and a PDP-10 version. GRA

**N82-12787#** Nederlands Inst. voor Praeventieve Gezondheidszorg TNO, Leiden.

**HUMAN CONTROL AND REGULATION TASKS [MENSEL-IJKE STUUR-EN REGELTAKEN]**

C. L. Ekkers, A. A. F. Brouwers, C. K. Pasmooij, and P. M. deVlaming Delft Netherlands Organization for Applied Scientific Research TNO Sep. 1980 246 p refs In DUTCH  
Avail: NTIS HC A11/MF A01

The effects of technological development, defined as automation, on the nature and quality of human work in industrial process control systems and computer systems were investigated. Twenty four man machine systems with different degrees of automation and complexity were compared for characteristics of technical, organizational and individual tasks. It is noted that sharing of tasks between man and machine is more unfavorable at higher levels of automation. The operator's abilities are only occasionally utilized and the opportunity to do meaningful work is limited. Teamwork is more positive, but it limits the individual operator's autonomy, even more in highly automated systems. In administrative computer systems, the routine nature of the work and its rigid procedures are considered negative. A clear correlation is found between these problems, job satisfaction and sickness rate. Author (ESA)

**N82-12788#** Engins Matra, Velizy (France).  
**METHODICAL STUDY OF THE CONTRIBUTION OF THE**

**HUMAN SYSTEM TO THE INSECURITY OF TECHNOLOGICAL SYSTEMS [ETUDE METHODIQUE DE LA CONTRIBUTION DU SYSTEME HUMAIN A L'INSECURITE DES SYSTEMES TECHNOLOGIQUES]**

J. L. Deschamps 1981 18 p In FRENCH  
Avail: NTIS HC A02/MF A01

The use of probability studies to increase system safety is advocated. The danger of overlooking human error when attributing blame for the failure of a piece of equipment is emphasized. The links between professional competence and physical and mental health are pointed out. It is recommended that serious accidents should be analyzed in terms of: the industry (petrochemical, construction, etc.); production unit (number of employees, foremen, etc.); job description; trades of persons involved; individual characteristics of persons involved (age, education, etc.); and the scenario (time, place, etc.).

Author (ESA)

**N82-12789#** Joint Publications Research Service, Arlington, Va.

**CHINA REPORT: SCIENCE AND TECHNOLOGY, NO. 128**

23 Sep. 1981 49 p Transl. into ENGLISH from various Chinese articles  
(JPRS-79047) Avail: NTIS HC A03/MF A01

The state of the art in science and technology in the Chinese Peoples Republic is reported. Abstracts dealing with the following topics are presented: (1) applied sciences; (2) publications; (3) civil engineering; (4) electronics; (5) geography; (6) internal combustion engine engineering; (7) nuclear physics; (8) petroleum science; (9) solar energy; and (10) transportation modernization. For individual titles, see N82-12790 through N82-12790.

**N82-12790#** Joint Publications Research Service, Arlington, Va.

**EQUIPMENT DESIGN MUST INCORPORATE EASE OF OPERATION**

Xiong Jiayu *In its* China Rept.: Sci. and Technol., No. 128 (JPRS-79047) 23 Sep. 1981 p 1-6 Transl. into ENGLISH from Gongcheng Jixie (Tianjin), no. 6, 1981 p 30-33

Avail: NTIS HC A03/MF A01

Essential factors in the design of construction machines and equipment are: (1) height of operating installation; (2) vision; (3) hearing; and (4) force required for operation. Topics discussed include adaptation to brightness and darkness, color discrimination, auditory threshold, exercise physiology, reaction time and dexterity. E.A.K.

**N82-13058# Naval Air Development Center, Warminster, Pa. THE INTELLIGENT USE OF INTELLIGENT SYSTEMS: PROBLEMS IN ENGINEERING MAN/MACHINE SYMBIOSIS**

J. Hopson, W. Zachary (Analytics, Inc., Willow Grove, Pa.), and N. Lane *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 16 p refs

Avail: NTIS HC A10/MF A01

A methodology to structure the process of designing 'intelligent systems' was generated in the course of several specific projects undertaken to develop such systems for a variety of airborne platforms. The general goals of these projects are to improve system performance by enhancing the effectiveness of information management within the total avionics systems. Results from the studies are summarized and the knowledge gained is related to a systematic design/evaluation approach. A.R.H.

**N82-13062# Naval Air Test Center, Patuxent River, Md. EVALUATION OF A PILOT WORKLOAD ASSESSMENT DEVICE TO TEST ALTERNATE DISPLAY FORMATS AND CONTROL HANDLING QUALITIES**

Samuel G. Schiflett, Paul M. Linton (Naval Air Development Center, Warminster, Pa.), and Ronald J. Spicuzza (Systems Research Labs., Inc., Dayton, Ohio) *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 12 p refs

Avail: NTIS HC A10/MF A01

The utility of a workload assessment device to measure pilot workload for approach and landing formats and control stability variations was tested in a modified NT-33 research aircraft.

## N82-13646

The feasibility of using an item-recognition task as a measure of sensory-response loading and reserve information processing capacity while flying precision approaches was established. Statistical treatment of the data indicates an appreciable increase in reaction time and errors with degraded handling qualities as compared to ground baseline measures and good handling qualities. The preliminary findings also reveal consistent trends toward the availability of more mental reserve capacity when flying predominantly pictorial/symbolic HUD configurations as compared to conventional HUD formats with scales and alphanumerics. A.R.H.

### **N82-13646** Kansas State Univ., Manhattan. **ANALYTICAL DETECTION OF ORGANIC SPECIES BY MEANS OF LASER-INDUCED MULTIPHOTON IONIZATION** Ph.D. Thesis

Richard Kenneth Simon, Jr. 1980 189 p  
Avail: Univ. Microfilms Order No. 8122036

Multiphoton ionization (MP) is spectrometric technique which was developed for the analysis of trace amounts of both atomic and molecules species. The methods is based on two or more photons being absorbed by the analyte which results in the analyte being ionized. The intense photoexcitation of the analysis is achieved by focussing the output of a pulsed tunable dye laser in an ionization chamber. The ionization chamber serves as the analyte reservoir and allows detection of the resulting MP1 current pulse. The non-optical nature of the signal detection makes MP1 a novel spectroscopic technique: no optical collection, dispersion, and/or detection is required; scattered and stray light are irrelevant; vacuum ultraviolet spectroscopy in air possible without special optics. Dissert. Abstr.

### **N82-13647#** Calspan Advanced Technology Center, Buffalo, N.Y.

#### **MITIGATION OF BIOFOULING USING COATINGS** Quarterly Progress Report

A. E. Meyer and R. W. King 22 Jun. 1981 13 p refs  
(Contract DE-AC02-80ER-10766)  
(DE81-027900; DOE/ER-10766/3; QPR-3) Avail: NTIS HC A02/MF A01

Progress is reported in a project in which the objectives are to evaluate benefits associated with control of the surface energetic properties of materials used in heat exchangers, and to identify preferred ranges of these surface conditions that minimize deposits of biological fouling known to deteriorate heat exchange efficiencies in seawater, brackish water and freshwater systems. The technical approach employed uses special diagnostic plates in novel flow cells where fluid flow conditions can be well-controlled, modifying the surface chemistry and surface energy of the plates with very thin coatings and examining the earliest events of biofouling caused by macromolecules and microbial organisms. Information is included on exposure experiments and results and heat exchange experiments. DOE

### **N82-13648** Stanford Univ., Calif. **SUPERCONDUCTING MAGNETOMETRY FOR CARDIOVASCULAR STUDIES AND AN APPLICATION OF ADAPTIVE FILTERING** Ph.D. Thesis

Mark Curtis Leifer 1981 174 p  
Avail: Univ. Microfilms Order No. 8124101

Sensitive magnetic detectors utilizing Superconducting Quantum Interference Devices, studying the cardiovascular system were developed. The theory of magnetic detection of cardiac currents is discussed, and experimental data supporting the validity of the theory is presented. Measurements on both humans and dogs, in both healthy and diseased states, are presented using the technique, which is termed vector magnetocardiography. Performance of the actual device displays significantly improved sensitivity in this frequency range, and the ability to measure currents in intact, in vivo biological fibers. The theoretical operation of a digital self-optimizing filter is reviewed and a four-channel software implementation of the system is presented. The application of the adaptive filter to enhancement of geomagnetic signals for earthquake forecasting is discussed, and the adaptive filter is shown to outperform existing techniques in suppressing noise from geomagnetic records. Dissert. Abstr.

### **N82-13649#** Armed Forces Radiobiology Research Inst., Bethesda, Md. **NEUROTRANSMITTER FUNCTION IN THE BASAL GANG-**

### **LIA AFTER ACUTE AND CHRONIC ETHANOL TREATMENT**

Walter A. Hunt Jul. 1981 10 p refs  
(AD-A103744; AFRRI-SR81-19) Avail: NTIS HC A02/MF A01 CSCL 06/15

Acute and chronic administration of ethanol has multiple effects on several neurotransmitters in the basal ganglia. Dopamine is the transmitter predominantly affected. Acceleration of dopaminergic activity is observed at low doses of ethanol. However, at high doses the reverse is observed. During the ethanol withdrawal syndrome that develops after chronic treatment, dopaminergic responses are reduced, whether from presynaptic or postsynaptic origins. Ethanol induces a variety of alterations in neurotransmitter function as a result of its disruption of membrane structure and associated electrical properties. GRA

### **N82-13650#** Naval Biodynamics Lab., New Orleans, La. **DETERMINATION OF EFFICIENT METHODS OF LIFT BY COMPARING TRAINED AND UNTRAINED MALE AND FEMALE LIFTERS** Final Report

Richard H. Shannon 3 Dec. 1980 141 p refs  
(AD-A100349; NBDL-M004) Avail: NTIS HC A07/MF A01 CSCL 06/14

The effects of sex and training variables during nonrepetitive, short duration lifts in the sagittal plane were analyzed. One half of each sex subsample was part of a lifting training program, while the other half was used as a control group. The effects of body movements by these subjects in the height ranges from the floor to the knuckle and the knuckle to the shoulder were ascertained with 10, 25, 40 pound weight loads. Muscular strain, stroboscopic photography to calculate differences in displacement time vectors, and the force platform to specify force changes at the feet were determined. The various statistical techniques applied were: factor analysis, regression analysis, analysis of variance, t-test and nonparametric statistics. The results are a five factor biomechanical model, regression equations predicting inertial forces at the hands, and significant differences between the untrained and trained conditions, and males and females. It is concluded that manual handling training programs are necessary in the work environment if women are expected to lift loads of approximately 40 pounds. Author

### **N82-13651#** Australian Radiation Lab., Melbourne. **ABSORBED DOSE TO ACTIVE RED BONE MARROW FROM DIAGNOSTIC AND THERAPEUTIC USES OF RADIATION** S. B. Solomon and N. D. Morris Jun. 1980 34 p refs (ARL-TR-021; ISSN-0157-1400) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The method of calculation of the radiation doses to the active bone marrow from diagnostic radiography, fluorescence and radiotherapy is described. The bone marrow dose arising from radiological procedures Australia was determined as part of a survey of population doses. The results of the calculations are compared with the results of other models of bone marrow dose for a number of diagnostic X-ray procedures. DOE

### **N82-13652#** Oak Ridge National Lab., Tenn. **HEALTH AND SAFETY RESEARCH DIVISION** Progress Report. 1 Oct. 1979 - 31 Mar. 1981

Aug. 1981 109 p refs  
(Contract W-7405-eng-26)  
(DE81-026088; ORNL-5750) Avail: NTIS HC A06/MF A01

Progress in health and safety research is reported. A summary of the major fields covered includes: basic research in physical sciences, life sciences research and assessment, and multidisciplinary studies on the impact of alternative energy technology and policy options. E.A.K.

### **N82-13653#** Ingenieurbuero fuer Ergonomie, Munich (West Germany).

#### **INFLUENCE OF SINE, AND RANDOM, WHOLE-BODY VIBRATION ON VISUAL ACUITY [EINFLUSS SINUSFOERMIGER UND REGELLOSER GANZKORPERSCHWINGUNGEN AUF DIE VISUELLE INFORMATIONSAUFNAHME]**

Norbert May Bonn Bundesministerium der Verteidigung 1979 101 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung (BMVg-FBWT-79-17) Avail: NTIS HC A06/MF A01; DOK-ZENTBw, Bonn DM 30

The far, visual acuity of people subjected to vertical whole-body vibration (different vibration types and loads) was

tested. A total of 110 subjects of both sexes, either exposed to sine vibration in the range from 2 to 18 cycles/sec or to random vibrations in the same frequency range, participated. The rms accelerations on the heads of subjects were 0.17, 0.3 and 0.43 m/sec squared. The subjects sat erect on an uncushioned seat, mounted on a hydromechanical vibration apparatus. Results show that relative visual acuity diminishes with sine vibrations while increasing frequency and/or accelerations (from 6% minimum to 37.5 % maximum of visual acuity under static conditions). With random vibrations there is also an acuity decrease although smaller, while increasing the vibration frequency as well as with increasing acceleration load. Author (ESA)

**N82-13654#** Freie Univ., Berlin (West Germany). Physiologisches Inst.

**THE MEASUREMENTS OF FLUID SHIFTS AND OF THE TISSUE COMPLIANCE ALONG BODY AXIS IN MAN Final Report**

Karl Kirsch Bonn Bundesministerium fuer Forschung und Technologie Sep. 1980 41 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie (BMFT-FB-W-80-011; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8,60

Tissue volume changes on different parts of the body were simultaneously measured by ultrasonic techniques in order to monitor the shift of fluid volumes along the body axis. Once fully established, the method could be used for measuring the shift of blood and interstitial fluid from the lower to the cephalic part of the body, occurring under zero-gravity conditions. Proof of principle tests were carried out under orthostatis, immersion and heat exposure conditions were confirmed by post mortem comparisons. By mounting the measuring probe in an airtight chamber, the tissue compliance  $C = dV/dP$  was also determined. The results found are consistent with previous investigations and with clinical tests. Application in space and as a circulation diagnostic method is advocated. Author (ESA)

**N82-13655#** Environmental Protection Agency, Washington, D.C. Dept. of Biology.

**METABOLISM SUMMARIES OF SELECTED HALOGENATED ORGANIC COMPOUNDS IN HUMAN AND ENVIRONMENTAL MEDIA. A LITERATURE SURVEY: FIRST UPDATE Final Report**

Syed M. Naqvi and Marion C. Blois -Dec. 1980- 44 p. refs (PB81-232811; EPA-560/13-79-018) Avail: NTIS HC A03/MF A01 CSCL 06T

Metabolism summaries as well as basic information on the physical properties of 19 halocarbons are presented. Molecular and structural formulas, the Chemical Abstracts Registry number, accepted synonyms, molecular weight, boiling point, and vapor pressure are included. Information on the uptake and retention of the compound, its subsequent distribution and elimination patterns, the identification and observed concentrations of metabolites, and the metabolic pathways involved is provided. S.L.

**N82-13656** California Univ., Los Angeles.

**A MONITOR FOR NONINVASIVE ESTIMATION OF PULMONARY BLOOD FLOW Ph.D. Thesis**

Luigi Arena 1981 224 p  
Avail: Univ. Microfilms Order No. 8122798

The design and the evaluation of a digital based monitoring device implementing a technique for the noninvasive estimation of pulmonary perfusion are described. This technique proved reliable in preliminary off-line experiments, however many engineering questions must be resolved before this principle can be transformed into a clinically useful device. Three main aspects of this study were identified model simulation, development and test of the instrumentation and clinical experiments.

Dissert. Abstr.

**N82-13657** Northeastern Univ., Boston, Mass.

**LINGUISTIC AND HUMAN PERFORMANCE CONSIDERATIONS IN THE DESIGN OF AN ANTICIPATORY COMMUNICATION AID Ph.D. Thesis**

Clinton David Gibler 1981 365 p  
Avail: Univ. Microfilms Order No. 8124891

A communication aid is a device that assists a disabled

person with the generation of messages. A scanning aid presents language elements (e.g., letters, words) in a sequential fashion to accommodate those whose disability does not permit the direct selection of language elements. Anticipatory methods utilize statistical characteristics of language to shorten the average sequential access time to each language element. The study is restricted to those aids having the capacity for English text generation. The research yielded two developments: a small, general purpose dictionary that accounts for a high percentage of a person's vocabulary; and a human performance model that accurately predicts communication rates for the transcription task, given basic human performance data about the user.

Dissert. Abstr.

**N82-13658** Stanford Univ., Calif.

**A SYSTEMS ANALYSIS OF THE MATURATION OF SLEEP USING A SEMI-MARKOV MODEL Ph.D. Thesis**

Thomas Raymond Bowe 1981 122 p  
Avail: Univ. Microfilms Order No. 8124040

An approach to analyze the sleep process in human infants is presented. In particular it formulates phase varying semi-Markov models for infants at 2, 4, 8, 20, 24, 36, and 52 weeks of age. The Bayesian estimation procedure employed allows the uncertainty in the estimated parameters to be quantitized. The parameters of the models represent the basic building blocks of the sleep process and can be used to predict any statistic of interest. The models were used to investigate the rhythmic nature of the sleep process. The concept that sleep develops a periodic tendency was mathematically investigated and defined.

Dissert. Abstr.

**N82-13659** Syracuse Univ., N. Y.

**DEPOSITION OF AEROSOL PARTICLES IN THE HUMAN RESPIRATORY TRACT Ph.D. Thesis**

Shii-Pyng Shiah 1981 192 p  
Avail: Univ. Microfilms Order No. 8123939

The dispersion and deposition of aerosol particles in human lungs are investigated. The development of a three dimensional airway model, the dispersion of half micrometer particles in the respiratory tract, and deposition of aerosol particles in the respiratory tract are studied. A model of the upper tracheobronchial tree is constructed to account for the three dimensional nature of the airway system. A mathematical model is developed for predicting the percentage of inhaled hygroscopic particles which deposit in each generation of the repeatedly bifurcating tubes in an airway tree. A theoretical model of aerosol dispersion in the human lungs is extended to the alveolated regions by considering the expansion and contraction of the alveoli. The percentage of inhaled particles which deposit in each generation of tubes is calculated for all generations reached by the inhaled aerosols.

Dissert. Abstr.

**N82-13660** Northwestern Univ., Evanston, Ill.

**DYNAMIC MEASUREMENT OF HUMAN VERTICAL FUSIONAL RESPONSE Ph.D. Thesis**

Arye Lipa Perlmuter 1981 88 p  
Avail: Univ. Microfilms Order No. 8124975

The response was studied in order to explore the relationship between its sensory and motor components. Two SRI Double Purkinje Image Eyetrackers were used for binocular recordings of eye movements in response to the presentations of vertical disparities. The binocular coordination of vertical fusional responses were studied through the presentations of asymmetrical disparities as well as predictable and unpredictable symmetrical sinusoidal disparities. The motor response to asymmetrical disparity presentation is found to be incomplete, thus allowing for the existence of a significant sensory component. When ramp disparities were presented only the eye whose monocular image moved followed the stimulus closely while the other eye did not move or moved by a small amount.

Dissert. Abstr.

**N82-13661** Stanford Univ., Calif.

**ALGORITHMS FOR IMAGING MYOCARDIAL BLOOD FLOW USING X-RAY COMPUTED TOMOGRAPHY Ph.D. Thesis**

Menahem Nassi-F 1981 136 p  
Avail: Univ. Microfilms Order No. 8124117

Algorithms are proposed to remove degradation of contrast and spatial resolution produced by the motion of the heart in X-ray computed tomography. A mathematical model is derived for regional myocardial blood flow (RMBF) estimation which uses a classical, deterministic formulation to describe tracer dynamics

## N82-13662

in the myocardium. Based upon the perfect mixing assumption, this theory removes the requirement for intra-arterial bolus injection of tracer (diatrizoate radiographic contrast). Regional partition coefficients are estimated, which render absolute RMBF estimates [ml/(min x gr)]. The requirement for curve extrapolation (zeroth and first moment computation) in the presence of recirculation, and the considerable measurement noise which is unaccounted for, are both removed by the proposed alternative stochastic formulation. Dissert. Abstr.

**N82-13662\*#** Ohio State Univ., Columbus. Dept. of Industrial and Systems Engineering.

### **AN INVESTIGATION INTO PILOT AND SYSTEM RESPONSE TO CRITICAL IN-FLIGHT EVENTS, VOLUME 1 Final Report, 27 Oct. 1978 - 26 Jun. 1981**

Thomas H. Rockwell and Walter C. Giffin Jun. 1981 200 p refs 2 Vol.

(Contract NAS2-10047; Grant NAG2-75; RF Proj.

761415/711621; RF Proj. 762501/713447)

(NASA-CR-166243-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 05H

The scope of a critical in-flight event (CIFE) with emphasis on pilot management of available resources is described. Detailed scenarios for both full mission simulation and written testing of pilot responses to CIFE's, and statistical relationships among pilot characteristics and observed responses are developed. A model developed to describe pilot response to CIFE and an analysis of professional flight crews compliance with specified operating procedures and the relationships with in-flight errors are included. S.L.

**N82-13663\*#** Ohio State Univ., Columbus. Dept. of Industrial and Systems Engineering.

### **AN INVESTIGATION INTO PILOT AND SYSTEM RESPONSE TO CRITICAL IN-FLIGHT EVENTS, VOLUME 2 Final Report, 27 Oct. 1978 - 26 Jun. 1981**

Thomas H. Rockwell and Walter C. Giffin Jun. 1981 151 p 2 Vol.

(Contract NAS2-10047; Grant NAG2-75; RF Proj.

761415/711621; RF Proj. 762501/713447)

(NASA-CR-166243-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 05H

Critical in-flight event is studied using mission simulation and written tests of pilot responses. Materials and procedures used in knowledge tests, written tests, and mission simulations are included. S.L.

### **N82-13664\*#** Computer Sciences Corp., Mountain View, Calif. **VISUAL/MOTION CUE MISMATCH IN A COORDINATED ROLL MANEUVER**

Douglas K. Shirachi and Richard S. Shirley May 1981 51 p (Contract NAS2-9741)

(NASA-CR-166259; CSCR-9) Avail: NTIS HC A04/MF A01 CSCL 05H

The effects of bandwidth differences between visual and motion cueing systems on pilot performance for a coordinated roll task were investigated. Visual and motion cue configurations which were acceptable and the effects of reduced motion cue scaling on pilot performance were studied to determine the scale reduction threshold for which pilot performance was significantly different from full scale pilot performance. It is concluded that: (1) the presence or absence of high frequency error information in the visual and/or motion display systems significantly affects pilot performance; and (2) the attenuation of motion scaling while maintaining other display dynamic characteristics constant, affects pilot performance. E.A.K.

**N82-13665\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

### **PROCEEDINGS OF THE SEVENTEENTH ANNUAL CONFERENCE ON MANUAL CONTROL**

15 Oct. 1981 693 p refs Conf. held in Los Angeles, 16-18 Jun. 1981; sponsored by NASA and ONR

(Contract NAS7-100)

(NASA-CR-165005; JPL-Pub-81-95)

Avail: NTIS

HC A99/MF A01 CSCL 05H

Manual control is considered, with concentration on perceptual/cognitive man-machine interaction and interface.

**N82-13666\*#** California Univ., Los Angeles. Brain Research Inst.

## **PUPILLOMETRIC MEASUREMENT OF OPERATOR WORKLOAD**

Jackson Beatty *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 1-6 refs

(Contract N00014-76-C-0616)

Avail: NTIS HC A99/MF A01 CSCL 05/4

Pupillometry as a method of measuring workload is described. Pupillometric measures provide an indication of momentary fluctuations in central nervous system excitability that occur as cognitive operations are performed; the magnitude of these changes may serve as a sensitive indicator of the workload imposed by cognitive tasks. J.D.H.

**N82-13667\*#** Illinois Univ., Champaign. Dept. of Psychology.

### **THE COGNITIVE DEMANDS OF SECOND ORDER MANUAL CONTROL: APPLICATIONS OF THE EVENT RELATED BRAIN POTENTIAL**

Christopher Wickens, Richard Gill, Arthur Kramer, William Ross, and Emanuel Donchin *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 7-16 refs

(Contract F49620-79-C-0233)

Avail: NTIS HC A99/MF A01 CSCL 05H

Three experiments are described in which tracking difficulty is varied in the presence of a covert tone discrimination task. Event related brain potentials (ERPs) elicited by the tones are employed as an index of the resource demands of tracking. The ERP measure reflected the control order variation, and this variable was thereby assumed to compete for perceptual/central processing resources. A fine-grained analysis of the results suggested that the primary demands of second order tracking involve the central processing operations of maintaining a more complex internal model of the dynamic system, rather than the perceptual demands of higher derivative perception. Experiment 3 varied tracking bandwidth in random input tracking, and the ERP was unaffected. Bandwidth was then inferred to compete for response-related processing resources that are independent of the ERP. J.D.H.

**N82-13668\*#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

### **A STUDY ON TASK DIFFICULTY AND ACCELERATION STRESS**

D. W. Repperger and D. B. Rogers *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 17-31 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

The results of two experiments which relate to task difficulty and the effects of environmental stress on tracking performance are discussed and compared to subjective evaluations. The first experiment involved five different sum of sine tracking tasks which humans tracked both in a static condition and under a 5 Gz acceleration stress condition. The second experiment involved similar environmental stress conditions but in this case the tasks were constructed from deterministic functions with specially designed velocity and acceleration profiles. Phase Plane performance analysis was conducted to study potential measures of workload or tracking difficulty. J.D.H.

**N82-13669\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

### **SUBJECTIVE RATING SCALES AS A WORKLOAD**

Kathleen L. Bird (Virginia Polytechnic Inst. and State Univ.) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 33-39 refs

(Contract NAG1-217)

Avail: NTIS HC A99/MF A01 CSCL 05H

A multidimensional bipolar-adjective rating scale is employed as a subjective measure of operator workload in the performance of a one-axis tracking task. The rating scale addressed several dimensions of workload, including cognitive, physical, and perceptual task loading as well as fatigue and stress effects. Eight subjects performed a one-axis tracking task (with six levels of difficulty) and rated these tasks on several workload dimensions. Performance measures were tracking error RMS (root-mean square) and the standard deviation of control stick output. Significant relationships were observed between these performance measures and skill required, task complexity, attention level, task difficulty, task demands, and stress level. Author

**N82-13670\*#** California Univ., Los Angeles.  
**PHYSIOLOGICAL ASSESSMENT OF OPERATOR WORKLOAD DURING MANUAL TRACKING. 1: PUPILLARY RESPONSES**

Quiyan Jiang, Raja Parasuraman, and Jackson Beatty *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 41-46 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

The feasibility of pupillometry as an indicator for assessing operator workload during manual tracking was studied. The mean and maximum pupillary responses of 12 subjects performing tracking tasks with three levels of difficulty (bandwidth of the forcing function were 0.15, 0.30 and 0.50 Hz respectively) were analysed. The results showed that pupillary dilation increased significantly as a function of the tracking difficulty which was reflected by the significant increase of tracking error (RMS). The present study supplies additional evidence that pupillary response is a sensitive and reliable index which may serve as an indicator for assessing operator workload in man-machine systems. Author

**N82-13671\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

**HORIZONTAL CONFLICT RESOLUTION MANEUVERS WITH A COCKPIT DISPLAY OF TRAFFIC INFORMATION**

Everitt Palmer, Sharon Jago, and Myrna DuBord *In* JPL Proc. of the 17th Ann. Conf. on Manual control 15 Oct. 1981 p 51-62 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

Pilot resolution of potential conflicts in the horizontal plane when the only information available on the other aircraft was presented on a Cockpit Display of Traffic Information (CDTI) is investigated. The pilot's task was to assess the situation and if necessary maneuver so as to avoid the other aircraft. No instructions were given on evasive strategy or on what was considered to be an acceptable minimum separation. The results indicate that pilots had a strong bias of turning toward the intruder aircraft in order to pass behind it. In more than 50% of the encounters with a 90 degree crossing angle in which the intruder aircraft was programmed to pass behind the aircraft, the pilots maneuvered so as to pass behind the intruder. This bias was not as strong with the display which showed a prediction of the intruder's relative velocity. The average miss distance for all encounters was about 4500 feet. J.D.H.

**N82-13672\*#** Grumman Aerospace Corp., Bethpage, N.Y.  
**SOME EFFECTS OF FIELD OF VIEW (FOV) AND TARGET SIZE ON LATERAL TRACKING AT HOVER**

Harry T. Breul *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 63-75 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

An exploratory flight-simulator experiment examined the gross effects of several factors potentially important to the design of a visual display system for aiding VTOL pilots in the difficult task of landing on a small sea-control ship. Field of view (FOV) and target size were the primary variables examined for a lateral tracking task in a full motion 5 degree-of-freedom hover simulation. The mean absolute value of tracking error was used to measure tracking performance, and cross spectral transfer function analysis was performed to determine the pilot's ability to generate good open-loop transfer function characteristics as a function of the experimental variables. It was found that FOV and target size can have a large effect on the pilot's ability to generate open-loop gain, and on his tracking performance. J.D.H.

**N82-13673\*#** Linkabit Corp., San Diego, Calif.  
**VIDEO FRAMERATE, RESOLUTION AND GRAYSCALE TRADEOFFS FOR UNDERSEA TELEMANIPULATOR**

Vivek Ranadive and Thomas B. Sheridan *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 77-88 refs Prepared in cooperation with MIT, Cambridge

Avail: NTIS HC A99/MF A01 CSCL 05H

The product of Frame Rate (F) in frames per second, Resolution (R) in total pixels and grayscale in bits (G) equals the transmission band rate in bits per second. Thus for a fixed channel capacity there are tradeoffs between F, R and G in the actual sampling of the picture for a particular manual control task in the present case remote undersea manipulation. A manipulator was used in the MASTER/SLAVE mode to study these tradeoffs. Images were systematically degraded from 28 frames per second, 128 x 128

pixels and 16 levels (4 bits) grayscale, with various FRG combinations constructed from a real-time digitized (charge-injection) video camera. It was found that frame rate, resolution and grayscale could be independently reduced without preventing the operator from accomplishing his/her task. Threshold points were found beyond which degradation would prevent any successful performance. A general conclusion is that a well trained operator can perform familiar remote manipulator tasks with a considerably degrade picture, down to 50 K bits/sec. J.D.H.

**N82-13674\*#** Technion - Israel Inst. of Tech., Haifa.  
**PREDICTOR SYMBOLOLOGY IN COMPUTER-GENERATED PERSPECTIVE DISPLAYS**

Arthur J. Grunwald *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 89-94 ref

(Contract NASw-3302)

Avail: NTIS HC A99/MF A01 CSCL 05H

An advanced display format for the four dimensional commercial aircraft approach-to-landing is evaluated. The desired curved and descending approach path is presented by displaying the perspective image of a tunnel. Attention is focussed on the predictor symbology, superimposed on the tunnel image. A perspective three dimensional predictor symbol, providing future position, as well as future attitude information, is compared with a flat two dimensional version, which only provides the future position. In addition to this, the predictor displays the actual airspeed as well as the desired airspeed, prescribed by the four dimensional path. Results show that the three dimensional predictor symbol outperforms the two dimensional predictor in following the trajectory in a moderate-to-heavy turbulent environment, which is manifested in accurate manual true airspeed control was obtained without affecting the main task performance significantly. Author

**N82-13675\*#** New Mexico Univ., Albuquerque. Dept. of Mechanical Engineering.

**SUPERVISORY CONTROL OF REMOTE MANIPULATION: A PRELIMINARY EVALUATION**

Gregory P. Starr *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 95-107 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

A system for supervisory control is described, and preliminary results are presented. Supervisory control, where control is traded between man and computer, offers benefits in the control of a remote manipulator. The system has the potential to accomplish sophisticated tasks. It is indicated that supervisory control yields lower task completion times and is preferred over manual control. E.A.K.

**N82-13676\*#** California Univ., Los Angeles. Dept. of Engineering Systems.

**RESEARCH ISSUES IN IMPLEMENTING REMOTE PRESENCE IN TELEOPERATOR CONTROL**

Kevin Corker, Andrew H. Mishkin, and John Lyman *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 109-126 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

The concept of remote presence in telemanipulation is presented. A conceptual design of a prototype teleoperator system incorporating remote presence is described. The design is presented in functional terms, sensor, display, and control subsystem. An intermediate environment, in which the human operator is made to feel present, is explicated. The intermediate environment differs from the task environment due to the quantity and type of information presented to an operator and due to scaling factors protecting the operator from the hazards of the task environment. Potential benefits of remote presence systems, both for manipulation and for the study of human cognition and preception are discussed. E.A.K.

**N82-13677\*#** Paris XII Univ., Evry (France).  
**THE PERSISTENCE OF A VISUAL DOMINANCE EFFECT IN A TELEMANIPULATOR TASK: A COMPARISON BETWEEN VISUAL AND ELECTROTACTILE FEEDBACK**

J. P. Gaillard *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 127-138 refs Sponsored in part by Direction de la Recherche des Equipements Techniques

Avail: NTIS HC A99/MF A01 CSCL 05H

The possibility to use an electrotactile stimulation in teleoperation and to observe the interpretation of such information as a feedback to the operator was investigated. It is proposed that visual feedback is more informative than an electrotactile one; and that complex electrotactile feedback slows down both the motor decision and motor response processes, is processed as an all or nothing signal, and bypasses the receptive structure and accesses directly in a working memory where information is sequentially processed and where memory is limited in treatment capacity. The electrotactile stimulation is used as an alerting signal. It is suggested that the visual dominance effect is the result of the advantage of both a transfer function and a sensory memory register where information is pretreated and memorized for a short time. It is found that dividing attention has an effect on the acquisition of the information but not on the subsequent decision processes. E.A.K.

**N82-13678\*#** Oak Ridge National Lab., Tenn. Fuel Recycle Div.

**MAN/MACHINE INTERFACE DEVELOPMENT FOR THE REMOTEX CONCEPT**

J. Garin and M. M. Clarke (Oak Ridge Associated Universities) /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 139-144 refs

(Contract W-7405-eng-26)

Avail: NTIS HC A99/MF A01 CSCL 05H

The development of a man/machine interface system that can be used to remotely control a system composed of a transporter base and a force-reflecting, servocontrolled manipulator is reported. The concept features the incorporation of totally remote operation. A simulator is build to optimize man/machine interface requirements. E.A.K.

**N82-13679\*#** Oak Ridge Associated Universities, Tenn. **IDENTIFICATION OF COGNITIVE FACTORS RELATED TO REMOTE WORK PERFORMANCE USING CLOSED CIRCUIT TV DISPLAYS**

M. M. Clarke and J. Garin (ORNL) /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 145-148 refs

(Contract W-7405-eng-26)

Avail: NTIS HC A99/MF A01 CSCL 05H

Operator perceptual cognitive styles as predictors of remote task performance were identified. Remote tasks which require the use of servo controlled master/slave manipulators and closed circuit television for teleoperator repair and maintenance of nuclear fuel recycling systems are examined. A useful procedure for identifying such perceptual styles is described. E.A.K.

**N82-13680\*#** Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

**SIMPLE GEOMETRIC ALGORITHMS TO AID IN CLEARANCE MANAGEMENT FOR ROBOTIC MECHANISMS**

E. L. Copeland, L. D. Ray, and J. D. Peticolas /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 149-155

Avail: NTIS HC A99/MF A01 CSCL 05H

Global geometric shapes such as lines, planes, circles, spheres, cylinders, and the associated computational algorithms which provide relatively inexpensive estimates of minimum spatial clearance for safe operations were selected. The Space Shuttle, remote manipulator system, and the Power Extension Package are used as an example. Robotic mechanisms operate in quarters limited by external structures and the problem of clearance is often of considerable interest. Safe clearance management is simple and suited to real time calculation, whereas contact prediction requires more precision, sophistication, and computational overhead. E.A.K.

**N82-13681\*#** General Motors Research Labs., Warren, Mich. Engineering Mechanics Dept.

**THE INFLUENCE OF MOTION CUES ON DRIVER-VEHICLE PERFORMANCE IN A SIMULATOR**

Brian S. Repa, Philip M. Leucht, and Walter W. Wierwille (Virginia Polytechnic Inst. and State Univ.) /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 157-169 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

Four different motion base configurations were studied on driving simulator. Differently responding vehicles were simulated

on each motion configurations and the effects of the vehicle characteristics on driver vehicle system performance, driver control activity, and driver opinion ratings of vehicle performance during driving are compared for different motion configurations. Data show that: (1) the effects of changes in vehicle characteristics on the different objective and subjective measures of driver vehicle performance are not disguised by the lack of physical motion; (2) fixed base simulator can be used to draw inferences despite the lack of motion; (3) the presence of motion tends to reduce path keeping errors and driver control activity; (4) roll and yaw motions are recommended because of their marked influence on driver vehicle performance (5) the importance of motion increases as the driving maneuvers become more extreme. E.A.K.

**N82-13682\*#** Lockheed-California Co., Burbank.

**MULTIPLE MAN-MACHINE INTERFACES**

Lillian Stanton and Creighton W. Cook /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 171-186 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

The multiple man machine interfaces inherent in military pilot training, their social implications, and the issue of possible negative feedback were explored. Modern technology has produced machines which can see, hear, and touch with greater accuracy and precision than human beings. Consequently, the military pilot is more a systems manager, often doing battle against a target he never sees. It is concluded that unquantifiable human activity requires motivation that is not intrinsic in a machine. E.A.K.

**N82-13683\*#** Perceptronics, Inc., Woodland Hills, Calif.

**DECISION AIDS FOR AIRBORNE INTERCEPT OPERATIONS IN ADVANCED AIRCRAFTS**

Azad Madni and Amos Freedy /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 187-209 refs

(Contract N62269-79-C-0496)

Avail: NTIS HC A99/MF A01 CSCL 05H

A tactical decision aid (TDA) for the F-14 aircrew, i.e., the naval flight officer and pilot, in conducting a multitarget attack during the performance of a Combat Air Patrol (CAP) role is presented. The TDA employs hierarchical multiattribute utility models for characterizing mission objectives in operationally measurable terms, rule based AI-models for tactical posture selection, and fast time simulation for maneuver consequence prediction. The TDA makes aspect maneuver recommendations, selects and displays the optimum mission posture, evaluates attackable and potentially attackable subsets, and recommends the 'best' attackable subset along with the required course perturbation. E.A.K.

**N82-13684\*#** Systems Technology, Inc., Hawthorne, Calif. **USING REWARDS AND PENALTIES TO OBTAIN DESIRED SUBJECT PERFORMANCE**

Marcia Cook, Henry R. Jex, Anthony C. Stein, and R. Wade Allen /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Dec. 1981 p 211-222 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

Operant conditioning procedures, specifically the use of negative reinforcement, in achieving stable learning behavior is described. The critical tracking test (CTT) a method of detecting human operator impairment was tested. A pass level is set for each subject, based on that subject's asymptotic skill level while sober. It is critical that complete training take place before the individualized pass level is set in order that the impairment can be detected. The results provide a more general basis for the application of reward/penalty structures in manual control research. E.A.K.

**N82-13685\*#** Systems Technology, Inc., Mountain View, Calif. **A COMPARISON OF LANDING MANEUVER PILOTING TECHNIQUE BASED ON MEASUREMENTS MADE IN AN AIRLINE TRAINING SIMULATOR AND IN ACTUAL FLIGHT**

Robert K. Heffley and Ted M. Schulman /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 223-234 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

An emphasis is placed on developing a mathematical model in order to identify useful metrics, quantify piloting technique,

and define simulator fidelity. On the basis of DC-10 flight measurements recorded for 32 pilots, 13 flight-trained and the remainder simulator trained, a revised model of the landing flare is hypothesized which accounts for reduction of sink rate and preference for touchdown point along the runway. The flare maneuver and touchdown point adjustment can be described by a pitch attitude command pilot guidance law consisting of altitude and vertical velocity feedbacks. In flight pilots exhibit a significant vertical velocity feedback which is essential for well controlled sink rate reduction at the desired level of response (bandwidth). In the simulator, however, the vertical velocity feedback appears ineffectual and leads to substantially inferior landing performance. T.M.

**N82-13686\*#** Systems Technology, Inc., Mountain View, Calif.  
**IDENTIFICATION OF MULTILoop PILOT DESCRIBING FUNCTIONS OBTAINED FROM SIMULATED APPROACHES TO AN AIRCRAFT CARRIER**

Wayne F. Jewell /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 239-244 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

Predicted results of a simulation of the pilot's approach control strategy in the presence of pilot remnant are presented. The aircraft dynamics and the turbulence environment are representative of a trainer-type aircraft. The non-intrusive pilot identification program (NIPIP) was used to identify the pilot's control strategy required by this highly-coupled, multiloop control task. The results are presented in terms of frequency responses of the individual elements of the pilot's control strategy and indicate that NIPIP can identify the pilot's describing functions even in the presence of significant amounts of pilot remnant. T.M.

**N82-13687\*#** Douglas Aircraft Co., Inc., Long Beach, Calif.  
**FURTHER TESTS OF A MODEL-BASED SCHEME FOR PREDICTING PILOT OPINION RATINGS FOR LARGE COMMERCIAL TRANSPORTS**

W. W. Rickard and W. H. Levison (Bolt, Beranek and Newman, Inc., Cambridge, Mass.) /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 245-254 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

A methodology was demonstrated for assessing longitudinal-axis handling qualities of transport aircraft on the basis of closed-loop criteria. Six longitudinal-axis approach configurations were studied covering a range of handling quality problems that included the presence of flexible aircraft modes. Using closed-loop performance requirements derived from task analyses and pilot interviews, predictions of performance/workload tradeoffs were obtained using an analytical pilot/vehicle model. A subsequent manned simulation study yielded objective performance measures and Cooper-Harper pilot ratings that were largely consistent with each other and with analytic predictions. T.M.

**N82-13688\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.  
**AN ANALYTICAL APPROACH FOR PREDICTING PILOT INDUCED OSCILLATIONS**

Ronald A. Hess /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 235-269 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

The optimal control model (OCM) of the human pilot is applied to the study of aircraft handling qualities. Attention is focused primarily on longitudinal tasks. The modeling technique differs from previous applications of the OCM in that considerable effort is expended in simplifying the pilot/vehicle analysis. After briefly reviewing the OCM, a technique for modeling the pilot controlling higher order systems is introduced. Following this, a simple criterion or determining the susceptibility of an aircraft to pilot induced oscillations (PIO) is formulated. Finally, a model-based metric for pilot rating prediction is discussed. The resulting modeling procedure provides a relatively simple, yet unified approach to the study of a variety of handling qualities problems. T.M.

**N82-13689\*#** Operations Research, Inc., Bethesda, Md.  
**A MODEL FOR THE SUBMARINE DEPTHKEEPING TEAM**  
 John R. Ware, John F. Best, Pamela J. Bozzi, and David W. Kleinman (Connecticut Univ., Storrs) /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 271-282 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

The most difficult task the depthkeeping team must face occurs during periscope-depth operations during which they may be required to maintain a submarine several hundred feet long within a foot of ordered depth and within one-half degree of ordered pitch. The difficulty is compounded by the facts that wave generated forces are extremely high, depth and pitch signals are very noisy and submarine speed is such that overall dynamics are slow. A mathematical simulation of the depthkeeping team based on the optimal control models is described. A solution of the optimal team control problem with an output control restriction (limited display to each controller) is presented. T.M.

**N82-13690\*#** Analytical Mechanics Associates, Inc., Mountain View, Calif.

**MODELING OF THE AIRCRAFT IN-TRAIL-FOLLOWING TASK DURING PROFILE DESCENT**

T. Goka, J. A. Sorensen, and A. V. Phatak /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 283-294 refs

(Contract NAS1-16135)

Avail: NTIS HC A99/MF A01 CSCL 05H

The cockpit display of traffic information (CDTI) system concepts enable the pilot to observe the surrounding air traffic pattern. The impact of such a system is far reaching in terms of improved safety, pilot and controller workload, and aircraft fuel efficiency. One direct payoff is the ability to distribute the ATC workload to the pilot in such tasks as merging and spacing. The CDTI application of spacing approach aircraft in the terminal area is addressed. In-trail-following/CDTI experiments were performed using realistic cockpit simulators and profile descent approach scenarios. Based on collected experimental simulator data, pilot models were developed which include state estimation, decision making and flight control aspects. These models were coupled with models of aircraft and CDTI equipment to study the dynamic phenomena and stability of strings of aircraft along various approach patterns. T.M.

**N82-13691\*#** Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

**COMPARISON OF CLOSED LOOP MODEL WITH FLIGHT TEST RESULTS**

Frank L. George /in JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 295-300 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

An analytic technique capable of predicting the landing characteristics of proposed aircraft configurations in the early stages of design was developed. In this analysis, a linear pilot-aircraft closed loop model was evaluated using experimental data generated with the NT-33 variable stability in-flight simulator. The pilot dynamics are modeled as inner and outer servo loop closures around aircraft pitch attitude, and altitude rate-of-change respectively. The landing flare maneuver is of particular interest as recent experience with military and other highly augmented vehicles shows this task to be relatively demanding, and potentially a critical design point. A unique feature of the pilot model is the incorporation of an internal model of the pilot's desired flight path for the flare maneuver. T.M.

**N82-13692\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**FUNCTIONAL STRUCTURE AND DYNAMICS OF THE HUMAN NERVOUS SYSTEM**

Joseph A. Lawrence /in its Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 301-304 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

The status of an effort to define the directions needed to take in extending pilot models is reported. These models are needed to perform closed-loop (man-in-the-loop) feedback flight control system designs and to develop cockpit display requirements. The approach taken is to develop a hypothetical working model of the human nervous system by reviewing the current literature in neurology and psychology and to develop a computer model of this hypothetical working model. T.M.

**N82-13693\*#** Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.  
**ON THE USE OF THE OCM'S QUADRATIC OBJECTIVE FUNCTION AS A PILOT RATING METRIC**

## N82-13694

David K. Schmidt *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 305-313 refs

(Grant NAG4-1)

Avail: NTIS HC A99/MF A01 CSCL 05H

A correlation between the magnitude of the quadratic objective function from an optimal control pilot model and the subjective rating of the vehicle and task provides a valuable tool for handling qualities research and flight control synthesis. An analysis of simulation results for fourteen aircraft configurations flight tested earlier was conducted. A fixed set of pilot model parameters, are found for all cases in modeling the simulated regulation task. The agreement obtained between performance statistics is shown and a strong correlation was obtained between the cost function and rating. T.M.

**N82-13694\***# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

### A QUASI-NEWTON PROCEDURE FOR IDENTIFYING PILOT-RELATED PARAMETERS OF THE OPTIMAL CONTROL MODEL

William H. Levison *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 315-328 refs

(Contract F49620-8-C-0073)

Avail: NTIS HC A99/MF A01 CSCL 05H

The development and application of a quasi-Newton gradient search procedure for identifying independent pilot related parameters of the optimal control model for pilot/vehicle systems is reported. A sensitivity analysis procedure which determines whether a given model parameter is required to match a specific experimental result, and which experimentally induced parameter changes are required to account for behavioral and performance differences, is described. Application of the identification scheme to training effects in a manual control task is described. S.L.

**N82-13695\***# Connecticut Univ., Storrs.

### INFORMATION AND DISPLAY REQUIREMENTS FOR AIRCRAFT TERRAIN FOLLOWING

D. L. Kleinman and J. Korn (ALPHATECH, Inc., Burlington, Mass.) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 329-331 refs

(Contract F33615-80-C-0528)

Avail: NTIS HC A99/MF A01 CSCL 05H

The display design procedure for manned vehicle systems, is applied and validated, for a particular scenario. The scenario chosen is that of zero visibility high speed terrain following ( $V = 466$  ft/sec,  $H = 200$  ft) with an A-10 aircraft. The longitudinal (linearized) dynamics are considered. The variations in (command path over) terrain  $\pi(t)$  are modeled as a third order random process. The display design methodology is based on the optimal control model of pilot response, and employs this model in various ways in different phases of the design process. The overall methodology indicates that the design process is intended as a precursor to manned simulation. It provides a rank ordering of candidate displays through a three level process. S.L.

**N82-13696\***# Texas A&M Univ., College Station.

### A DATA COLLECTION SCHEME FOR IDENTIFICATION OF PARAMETERS IN A DRIVER MODEL

B. W. Mooring, M. McDermott, and Je-Mang Su *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 333-343 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

A high gain steering controller to compensate for limitations in a handicapped driver's range of motion is employed when adapting vehicle to his use. A driver/vehicle system can become unstable as vehicle speed is increased, therefore it is desirable to use a computer simulation of the driver/vehicle combination as a design tool to investigate the system response prior to construction of a controller and road testing. Unknown driver parameters must be identified prior to use of the model for system analysis. A means to collect the data necessary for identification of these driver model parameters without extensive instrumentation of a vehicle to measure and record vehicle states is addressed. Initial tests of the procedure identified all of the driver parameters with errors of 6% or less. S.L.

**N82-13697\***# Massachusetts Inst. of Tech., Cambridge, Man-Machine Lab.

### TWO-D RESULTS ON HUMAN OPERATOR PERCEPTION

Alex A. Siapkara (Hellenic Technology Center, Athens) and Thomas B. Sheridan *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 345-359 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

The application of multidimensional scaling methodology in human factors engineering is presented. The nonorthogonality of internally perceived task variables is exhibited for first and second order plants with both dependent and independent task variables. Directions of operator preference are shown for actual performance, pilot opinion rating, and subjective measures of fatigue, adaptability, and system recognition. Improvement of performance in second order systems is exhibited by the use of bang-bang feedback information. Dissimilarity measures for system comparison are suggested in order to account for human operator rotations and subjective sense of time. S.L.

**N82-13698\***# Illinois Univ. at Chicago Circle, Chicago. Coll. of Engineering.

### COMPUTATIONAL PROBLEMS IN AUTOREGRESSIVE MOVING AVERAGE (ARMA) MODELS

Gyan C. Agarwal, Sherin M. Goodarzi, William D. O'Neill, and Gerald L. Gottlieb *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 361-377 refs Prepared in cooperation with Rush Medical Center, Chicago

(Grants NSF ENG-76-08754; NS-12877)

Avail: NTIS HC A99/MF A01 CSCL 05H

The choice of the sampling interval and the selection of the order of the model in time series analysis are considered. Band limited (up to 15 Hz) random torque perturbations are applied to the human ankle joint. The applied torque input, the angular rotation output, and the electromyographic activity using surface electrodes from the extensor and flexor muscles of the ankle joint are recorded. Autoregressive moving average models are developed. A parameter constraining technique is applied to develop more reliable models. The asymptotic behavior of the system must be taken into account during parameter optimization to develop predictive models. S.L.

**N82-13699\***# ALPHATECH, Inc., Burlington, Mass.

### MODELING HUMAN TRACKING ERROR IN SEVERAL DIFFERENT ANTI-TANK SYSTEMS

David L. Kleinman *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 379-392 refs Prepared in cooperation with Connecticut Univ., Storrs

(Contract DAAK11-80-C-0050)

Avail: NTIS HC A99/MF A01 CSCL 05H

An optimal control model for generating time histories of human tracking errors in antitank systems is outlined. Monte Carlo simulations of human operator responses for three Army antitank systems are compared. System/manipulator dependent data comparisons reflecting human operator limitations in perceiving displayed quantities and executing intended control motions are presented. Motor noise parameters are also discussed. M.D.K.

**N82-13700\***# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

### ON THE INTERNAL TARGET MODEL IN A TRACKING TASK

Alper K. Caglayan and Sheldon Baron *In* JPL Proc. of the 17th Conf. on Manual Control 15 Oct. 1981 p 393-397 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

An optimal control model for predicting operator's dynamic responses and errors in target tracking ability is summarized. The model, which predicts asymmetry in the tracking data, is dependent on target maneuvers and trajectories. Gunners perception, decision making, control, and estimate of target positions and velocity related to crossover intervals are discussed. The model provides estimates for means, standard deviations, and variances for variables investigated and for operator estimates of future target positions and velocities. M.D.K.

**N82-13701\***# CAE Electronics Ltd., Montreal (Quebec).

### MULTI-AXIS MANUAL CONTROLLERS: A STATE-OF-THE-

**ART REPORT**

A. Lippay, G. M. McKinnon, and M. L. King *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 401-405

Avail: NTIS HC A99/MF A01 CSCL 05H

A literature search was carried out to examine the feasibility of a six degree of freedom hand controller. Factors addressed included related areas, approaches to manual control, applications of manual controllers, and selected studies of the human neuromuscular system. Results are presented. J.M.S.

**N82-13702\*#** Messerschmidt-Boelkow G.m.b.H., Munich (West Germany).

**THEORETICAL LINEAR APPROACH TO THE COMBINED MAN-MANIPULATOR SYSTEM IN MANUAL CONTROL OF AN AIRCRAFT**

Klaus Brauser *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 407-418 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

An approach to the calculation of the dynamic characteristics of the combined man manipulator system in manual aircraft control was derived from a model of the neuromuscular system. This model combines the neuromuscular properties of man with the physical properties of the manipulator system which is introduced as pilot manipulator model into the manual aircraft control. The assumption of man as a quasilinear and time invariant control operator adapted to operating states, depending on the flight phases, of the control system gives rise to interesting solutions of the frequency domain transfer functions of both the man manipulator system and the closed loop pilot aircraft control system. It is shown that it is necessary to introduce the complete precision pilot manipulator model into the closed loop pilot aircraft transfer function in order to understand the well known handling quality criteria, and to derive these criteria directly from human operator properties. J.M.S.

**N82-13703\*#** MRC Applied Psychology Unit, Cambridge (England).

**THE INFLUENCE OF SHIP MOTION OF MANUAL CONTROL SKILLS**

Peter McLeod, Christopher Poulton, Howard DuRoss (RAE, Farnborough, Engl.), and Wynn Lewis (WSL, Stevenage, Engl.) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 419-430 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

The effects of ship motion on a range of typical manual control skills were examined on the Warren Spring ship motion simulator driven in heave, pitch, and roll by signals taken from the frigate HMS Avenger at 13 m/s (25 knots) into a force 4 wind. The motion produced a vertical r.m.s. acceleration of 0.024g, mostly between 0.1 and 0.3 Hz, with comparatively little pitch or roll. A task involving unsupported arm movements was seriously affected by the motion; a pursuit tracking task showed a reliable decrement although it was still performed reasonably well (pressure and free moving tracking controls were affected equally by the motion); a digit keying task requiring ballistic hand movements was unaffected. There was no evidence that these effects were caused by sea sickness. The differing response to motion of the different tasks, from virtual destruction to no effect, suggests that a major benefit could come from an attempt to design the man/control interface onboard ship around motion resistant tasks. Author

**N82-13704\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

**THE ROLE OF MANIPULATOR CHARACTERISTICS IN SELECTING THE IDEAL EFFECTIVE VEHICLE**

Ronald A. Hess *In* JPL Proc. of the 17th Ann. Conf. Manual Control 15 Oct. 1981 p 431-448 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

A structural model of the human pilot is introduced and discussed. The model is used to provide a rationale for certain nonlinear pilot control behavior such as stick pulsing and serves as a framework for studying aspects of motor skill development. In light of the theoretical background provided by the model, some past empirical pilot response phenomena are analyzed and shown to be attributable to manipulator or control stick characteristics. In particular, some recent problems associated with pilot/vehicle performance in glideslope tracking in short takeoff and landing

(STOL) aircraft are analyzed. The apparent contribution of the cockpit manipulator (throttle) characteristics to these problems are outlined and a solution proposed and evaluated in both simulation and flight test. J.M.S.

**N82-13705\*#** General Dynamics/Pomona, Calif.

**COMPUTER AIDED MANUAL TRACKING**

Yung-Koh Yin and Russell F. Berg *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 449-454 ref

Avail: NTIS HC A99/MF A01 CSCL 05H

A scheme was developed to assist the human operator by augmenting an optic sight manual tracking loop with target rate estimates from a computer control algorithm which can either be a Kalman Filter or an alpha, beta, gamma filter. The idea is for the computer to provide rate tracking while the human operator is responsible for nullifying the tracking error. A simple schematic is shown to illustrate the implementation of this concept. A hybrid real-time man-in-loop simulation was used to compare the tracking performance of the same flight trajectory with or without this form of computer-aided track. Preliminary results show the advantage of computer-aided track against high speed aircraft at close range. However, good tracking before target state estimator maturity becomes more critical for aided track than without. Results are presented for a constant velocity flight trajectory. J.M.S.

**N82-13706\*#** CAE Electronics Ltd., Montreal (Quebec). Human Factors Engineering.

**DESIGN AND DEVELOPMENT OF A SIX DEGREE OF FREEDOM HAND CONTROLLER**

M. L. King, G. M. McKinnon, and A. Lippay *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 455-463

Avail: NTIS HC A99/MF A01 CSCL 05H

The design objectives of a six degree of freedom manual controller are discussed with emphasis on a space environment. Details covered include problems associated with a zero-g environment, the need to accommodate both 'shirt sleeve' and space suited astronauts, the combination of both manipulator operation and spacecraft flight control in a single device, and to accommodate restraints in space. A variable configuration device designed as a development tool in which rotational axes can be moved relative to one another, is described and its limitations discussed. Two additional devices were developed for concept testing. Each device combines the need for good quality with its ability achieve a wide range of adjustments. J.M.S.

**N82-13707\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**EXPERIMENTAL RESULTS WITH A SIX-DEGREE-OF-FREEDOM FORCE-REFLECTING HAND CONTROLLER**

A. K. Bejczy and M. Handlykken (Technical Univ. of Norway, Trondheim) *In its* Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 465-477 refs

(Contract NAS7-100)

Avail: NTIS HC A99/MF A01 CSCL 05H

Control experiments performed using an isotonic joystick connected to a six degree-of-freedom manipulator equipped with a six dimensional force-torque sensor at the base of the manipulator end effector are described. The preliminary control experiments were aimed at the investigation of the human operators' ability to command and control forces in different directions by varying the information conditions and the values of the feedforward and feedback command gains in the bilateral control loop. The main conclusions are: (1) a quantified graphic display of force-torque information can considerably enhance the operator's ability to perform a quantitatively sharp force-torque control, and (2) there seems to be a task dependent optimal combination of the feedforward and feedback command gain values which provide a dynamically smooth and stable bilateral control performance. J.M.S.

**N82-13708\*#** Illinois Univ. at Chicago Circle, Chicago. Bioengineering Program.

**LOAD COMPENSATING REACTIONS TO PERTURBATIONS AT WRIST JOINT IN NORMAL MAN**

R. J. Jaeger, G. C. Agarwell, and G. L. Gottlieb *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 479-501 refs Prepared jointly with Rush Medical Coll.

**N82-13709**

(Grants NSF ENG-76-08754; NIH-NS-00196; NIH-NS-12877)  
Avail: NTIS HC A99/MF A01 CSCL 05H

The electromyographic responses to step torque loads were studied in flexors and extensors at the human wrist. Based on temporal bursting patterns and functional behavior, the response was divided into four temporal components. Two early components, the myotatic (30-60 ms) late myotatic (60-120 ms) appears to be reflex response. The third postmyotatic component (120-200 ms) appear to be a triggered reaction, preceding the fourth, stabilizing component (200-400 ms). A comparison of response at the wrist with similar data at the ankle provides the basis for a generalized classification of the response in various muscles to torque step perturbations. Author

**N82-13709\*#** Southern California Research Inst., Los Angeles.  
**MANUAL CONTROL ANALYSIS OF DRUG EFFECTS ON DRIVING PERFORMANCE**

Alison Smiley, Kenneth Ziedman, and Herbert Moskowitz /*n* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 503-514 refs

(Contract NIDA-271-76-3316)

Avail: NTIS HC A99/MF A01 CSCL 05H

The effects of secobarbital, diazepam, alcohol, and marihuana on car-driver transfer functions obtained using a driving simulator were studied. The first three substances, all CNS depressants, reduced gain, crossover frequency, and coherence which resulted in poorer tracking performance. Marihuana also impaired tracking performance but the only effect on the transfer function parameters was to reduce coherence. Author

**N82-13710\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**PILOT SCANNING PATTERNS WHILE VIEWING COCKPIT DISPLAYS OF TRAFFIC INFORMATION**

Stephen R. Ellis and Lawrence Stark /*n* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 517-524 refs Prepared jointly with California Univ., Berkeley

Avail: NTIS HC A99/MF A01 CSCL 05H

Scanning eye movements of airline pilots were recorded while they judged air traffic situations displayed on cockpit displays of traffic information (CDTI). The observed 1st order transition patterns between points of interest on the display showed reliable deviation from those patterns predicted by the assumption of statistical independence. However, both patterns of transitions correlated quite well with each other. Accordingly, the assumption of independence provided a surprisingly good model of the results. Nevertheless, the deviation between the observed patterns of transition and that based on the assumption of independence was for all subjects in the direction of increased determinism. Thus, the results provide objective evidence consistent with the existence of 'scanpaths' in the data. Author

**N82-13711\*#** California Univ., Berkeley.

**PUPILLOMETRY, A BIOENGINEERING OVERVIEW**

G. Myers, J. Anchetta, B. Hannaford, P. Peng, K. Sherman, L. Stark, F. Sun, and S. Usui /*n* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 525-536 refs Sponsored by NIH

(Contract NCC2-86)

Avail: NTIS HC A99/MF A01 CSCL 05H

The pupillary control system is examined using a microprocessor based integrative pupillometer. The real time software functions of the microprocessor include: data collection, stimulus generation and area to diameter conversion. Results of an analysis of linear and nonlinear phenomena are presented. J.M.S.

**N82-13712\*#** California Univ., Berkeley.

**MODEL SIMULATION STUDIES TO CLARIFY THE EFFECT ON SACCADIC EYE MOVEMENTS OF INITIAL CONDITION VELOCITIES SET BY THE VESTIBULAR OCULAR REFLEX (VOR)**

Moon-Hyon Nam, Jack M. Winters, and Lawrence Stark /*n* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 537-548 refs Sponsored by the Korean Ministry of Education

(Contract NCC2-86)

Avail: NTIS HC A99/MF A01 CSCL 05H

Voluntary active head rotations produced vestibulo-ocular reflex eye movements (VOR) with the subject viewing a fixation target. When this target jumped, the size of the refixation saccades

were a function of the ongoing initial velocity of the eye. Saccades made against the VOR were larger in magnitude. Simulation of a reciprocally innervated model eye movement provided results comparable to the experimental data. Most of the experimental effect appeared to be due to linear summation for saccades of 5 and 10 degree magnitude. For small saccades of 2.5 degrees, peripheral nonlinear interaction of state variables in the neuromuscular plant also played a role as proven by comparable behavior in the simulated model with known controller signals. Author

**N82-13713\*#** California Univ., Berkeley.

**BENEFITS OF DETAILED MODELS OF MUSCLE ACTIVATION AND MECHANICS**

Steven L. Lehman and Lawrence Stark /*n* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 546-556 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

Recent biophysical and physiological studies identified some of the detailed mechanisms involved in excitation-contraction coupling, muscle contraction, and deactivation. Mathematical models incorporating these mechanisms allow independent estimates of key parameters, direct interplay between basic muscle research and the study of motor control, and realistic model behaviors, some of which are not accessible to previous, simpler, models. The existence of previously unmodeled behaviors has important implications for strategies of motor control and identification of neural signals. New developments in the analysis of differential equations make the more detailed models feasible for simulation in realistic experimental situations. Author

**N82-13714\*#** National Aerospace Lab., Amsterdam (Netherlands).

**A MODEL OF THE HUMAN OBSERVER AND DECISION MAKER**

P. H. Wewerinke /*n* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 557-570 refs

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The decision process is described in terms of classical sequential decision theory by considering the hypothesis that an abnormal condition has occurred by means of a generalized likelihood ratio test. For this, a sufficient statistic is provided by the innovation sequence which is the result of the perception an information processing submodel of the human observer. On the basis of only two model parameters, the model predicts the decision speed/accuracy trade-off and various attentional characteristics. A preliminary test of the model for single variable failure detection tasks resulted in a very good fit of the experimental data. In a formal validation program, a variety of multivariable failure detection tasks was investigated and the predictive capability of the model was demonstrated. A.R.H.

**N82-13715\*#** Lockheed Electronics Co., Plainfield, N. J.

**HUMAN SUPERVISION AND MICROPROCESSOR CONTROL OF AN OPTICAL TRACKING SYSTEM**

William J. Bigley and John D. Vandenberg /*n* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 571-582 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

Gunners using small calibre anti-aircraft systems have not been able to track high-speed air targets effectively. Substantial improvement in the accuracy of surface fire against attacking aircraft has been realized through the design of a director-type weapon control system. This system concept frees the gunner to exercise a supervisory/monitoring role while the computer takes over continuous target tracking. This change capitalizes on a key consideration of human factors engineering while increasing system accuracy. The advanced system design, which uses distributed microprocessor control, is discussed at the block diagram level and is contrasted with the previous implementation. Author

**N82-13716\*#** Systems Technology, Inc., Hawthorne, Calif.

**A THEORY OF HUMAN ERROR**

Duane T. McRuer, Warren F. Clement, and R. Wade Allen /*n* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 583-594 refs

(Contract NAS2-10400)

Avail: NTIS HC A99/MF A01 CSCL 05H

Human errors tend to be treated in terms of clinical and

anecdotal descriptions, from which remedial measures are difficult to derive. Correction of the sources of human error requires an attempt to reconstruct underlying and contributing causes of error from the circumstantial causes cited in official investigative reports. A comprehensive analytical theory of the cause-effect relationships governing propagation of human error is indispensable to a reconstruction of the underlying and contributing causes. A validated analytical theory of the input-output behavior of human operators involving manual control, communication, supervisory, and monitoring tasks which are relevant to aviation, maritime, automotive, and process control operations is highlighted. This theory of behavior, both appropriate and inappropriate, provides an insightful basis for investigating, classifying, and quantifying the needed cause-effect relationships governing propagation of human error. A.R.H.

**N82-13717\*#** Systems Technology, Inc., Hawthorne, Calif.  
**STABILITY ANALYSIS OF AUTOMOBILE DRIVER STEERING CONTROL**

R. Wade Allen *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 597-609 refs Sponsored in part by the Ford Motor Co.

Avail: NTIS HC A99/MF A01 CSCL 05H

In steering an automobile, the driver must basically control the direction of the car's trajectory (heading angle) and the lateral deviation of the car relative to a delineated pathway. A previously published linear control model of driver steering behavior which is analyzed from a stability point of view is considered. A simple approximate expression for a stability parameter, phase margin, is derived in terms of various driver and vehicle control parameters, and boundaries for stability are discussed. A field test study is reviewed that includes the measurement of driver steering control parameters. Phase margins derived for a range of vehicle characteristics are found to be generally consistent with known adaptive properties of the human operator. The implications of these results are discussed in terms of driver adaptive behavior. Author

**N82-13718\*#** Systems Technology, Inc., Hawthorne, Calif.  
**DETECTING HUMAN OPERATOR IMPAIRMENT WITH A PSYCHOMOTOR TASK**

R. Wade Allen, Anthony C. Stein, and Henry R. Jex *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 611-625 refs

(Contract DOT-HS-8-02052)

Avail: NTIS HC A99/MF A01 CSCL 05H

Psychomotor tasks have long been used as instruments for measuring human operator behavior and have often been proposed as selection and training devices. The application of the 'Critical-instability Tracking Test' (CTT) in the detection of alcohol impaired human operators is discussed. The detection problem wherein statistical decision theory is used to optimize the test's ability to discriminate impaired operators in the face of inherent variability in human performance is considered. Testing strategy is examined including setting performance criteria levels and determining the number of attempts permitted in order to pass the test. Also, the task's ability to detect operator impairment is compared to performance measures obtained in a driving simulator. A.R.H.

**N82-13719\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**VOICE CONTROL OF THE SPACE SHUTTLE VIDEO SYSTEM**

A. K. Bejczy, R. S. Dotson, J. W. Brown, and J. L. Lewis *In its* Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 627-640 Prepared in cooperation with NASA, Johnson Space Center

(Contract NAS7-100)

Avail: NTIS HC A99/MF A01 CSCL 05H

A pilot voice control system developed at the Jet Propulsion Laboratory (JPL) to test and evaluate the feasibility of controlling the shuttle TV cameras and monitors by voice commands utilizes a commercially available discrete word speech recognizer which can be trained to the individual utterances of each operator. Successful ground tests were conducted using a simulated full-scale space shuttle manipulator. The test configuration involved the berthing, maneuvering and deploying a simulated science payload in the shuttle bay. The handling task typically required 15 to 20 minutes and 60 to 80 commands to 4 TV cameras and 2 TV monitors. The best test runs show 96 to 100 percent voice recognition accuracy. A.R.H.

**N82-13720\*#** Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

**A COMPARISON OF HEAD AND MANUAL CONTROL FOR A POSITION-CONTROL PURSUIT TRACKING TASK**

William H. Levison, Greg L. Zacharias, James L. Porterfield, Donald Monk, and Christopher Arbak *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 641-652 refs Prepared jointly with Aerospace Medical Div., Aerospace Medical Research Labs. (6570th)

Avail: NTIS HC A99/MF A01 CSCL 05H

Head control was compared with manual control in a pursuit tracking task involving proportional controlled-element dynamics. An integrated control/display system was used to explore tracking effectiveness in horizontal and vertical axes tracked singly and concurrently. Compared with manual tracking, head tracking resulted in a 50 percent greater rms error score, lower pilot gain, greater high-frequency phase lag and greater low-frequency remnant. These differences were statistically significant, but differences between horizontal- and vertical-axis tracking and between 1- and 2-axis tracking were generally small and not highly significant. Manual tracking results were matched with the optimal control model using pilot-related parameters typical of those found in previous manual control studies. Head tracking performance was predicted with good accuracy using the manual tracking model plus a model for head/neck response dynamics obtained from the literature. Author

**N82-13721\*#** Tufts Univ., Medford, Mass. Dept. of Engineering Design.

**INTERRUPTION AS A TEST OF THE USER-COMPUTER INTERFACE**

John G. Kreifeldt and Mary E. McCarthy *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 655-667 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

In order to study the effects different logic systems might have on interrupted operation, an algebraic calculator and a reverse polish notation calculator were compared when trained users were interrupted during problem entry. The RPN calculator showed markedly superior resistance to interruption effects compared to the AN calculator although no significant differences were found when the users were not interrupted. Causes and possible remedies for interruption effects are speculated. It is proposed that because interruption is such a common occurrence, it be incorporated into comparative evaluation tests of different logic system and control/display system and that interruption resistance be adopted as a specific design criteria for such design. A.R.H.

**N82-13722\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**A MODEL FOR THE CONTROL MODE MAN-COMPUTER INTERFACE DIALOGUE**

Roy L. Chafin *In its* Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 669-682 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

A four stage model is presented for the control mode man-computer interface dialogue. It consists of context development, semantic development syntactic development, and command execution. Each stage is discussed in terms of the operator skill levels (naive, novice, competent, and expert) and pertinent human factors issues. These issues are human problem solving, human memory, and schemata. The execution stage is discussed in terms of the operators typing skills. This model provides an understanding of the human process in command mode activity for computer systems and a foundation for relating system characteristics to operator characteristics. Author

**N82-13723\*#** Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

**STRUCTURE OF THE KNOWLEDGE BASE FOR AN EXPERT LABELING SYSTEM**

N. S. Rajaram *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 683-688 refs

(Contract NAS9-15800)

Avail: NTIS HC A99/MF A01 CSCL 05H

One of the principal objectives of the NASA AgRISTARS program is the inventory of global crop resources using remotely sensed data gathered by Land Satellites (LANDSAT). A central problem in any such crop inventory procedure is the interpretation

**N82-13724**

of LANDSAT images and identification of parts of each image which are covered by a particular crop of interest. This task of labeling is largely a manual one done by trained human analysts and consequently presents obstacles to the development of totally automated crop inventory systems. However, development in knowledge engineering as well as widespread availability of inexpensive hardware and software for artificial intelligence work offers possibilities for developing expert systems for labeling of crops. Such a knowledge based approach to labeling is presented. Author

**N82-13724#** Anthropology Research Project, Yellow Springs, Ohio.

**ANTHROPOMETRIC SIZING SYSTEMS FOR ARMY WOMEN'S FIELD CLOTHING**

Kathleen Robinette, Thomas Churchill, and John T. McConville  
Natick, Mass. Army Research and Development Lab. Mar. 1981 231 p

(Contract DAAK60-79-C-0097)

(AD-A102104; NATICK-TR-81/026; CEMEL-233) Avail: NTIS HC A11/MF A01 CSCL 05/1

A series of anthropometrically based sizing programs and tariffs for Army women's field clothing are reported are size systems for upper body, lower body and total body garments are included. Sizing tables on which recommended values for some 59 dimensions relevant to garment construction are highlighted for easy identification are presented. Regression equations, rather than more traditional methods, were used to develop the sizing data and supportive material to permit designers to modify suggested dimensional values or to compute alternative sizing programs. A visual index accompanied by measurement descriptions, and bivariate distribution tables on which size categories have been graphically superimposed serve as visual references for users. Author

**N82-13725#** Air Force Human Resources Lab., Brooks AFB, Tex. Manpower and Personnel Div.

**WEIGHTING OF APTITUDE COMPONENTS BASED ON DIFFERENCES IN TECHNICAL SCHOOL DIFFICULTY Interim Report, 1 Jun. 1980 - 1 Apr. 1981**

C. J. Mullins, James A. Earles, and Malcolm Ree Jul. 1981 20 p refs

(AD-A102045; AFHRL-TR-81-19) Avail: NTIS HC A02/MF A01 CSCL 05/9

A method of adjusting technical school grades issued by schools of varying difficulty so that a new criterion is formed with all school grades adjusted to the same metric was evaluated. This new criterion was used to recompute aptitude indexes which were compared with aptitude indexes computed in the conventional manner. It is found that the new aptitude indexes predict school grades in a cross validation sample better than the conventional aptitude indexes. Author

**N82-13726#** Carl-Cranz-Gesellschaft e.V., Brunswick (West Germany). Lehrgangreihe Flugtechnik.

**TAXONOMY OF THE HUMAN FACTORS IN MAN MACHINE SYSTEMS [TAXONOMIE DER HUMANFAKTOREN IN MENSCH-MASCHINE-SYSTEMEN]**

K. Steininger (DFVLR, Hamburg) 1980 30 p refs In GERMAN

Avail: NTIS HC A03/MF A01

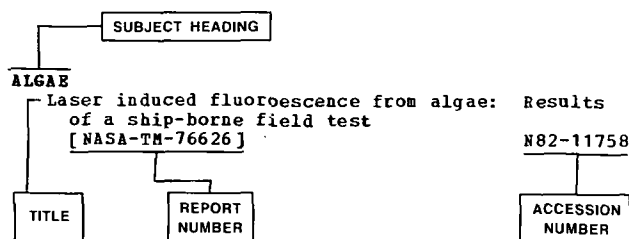
The human factors in man-machine systems are presented in a global model showing the manifold interplay between man, technical system and management. The psychic and social constraints involved are stressed. The nature of human error is also treated by means of a classification and the relation between work load and perceived stress is discussed. On the basis of these classifications, ergonomic methods and concepts for human factor engineering are derived and proposed for further investigations are formulated. Author (ESA)

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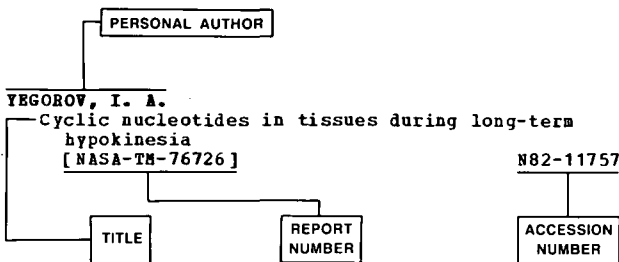
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