NASA SP-7011 (174)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

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(Supplement 174)

DECEMBER 1977

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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IAA (A-10000 Series)	A77-44314—A77-47973

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NASA SP-7011(174)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 174)

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 November 1977 in

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

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 181 reports, articles and other documents announced during November 1977 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

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

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

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

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1977 Supplements.

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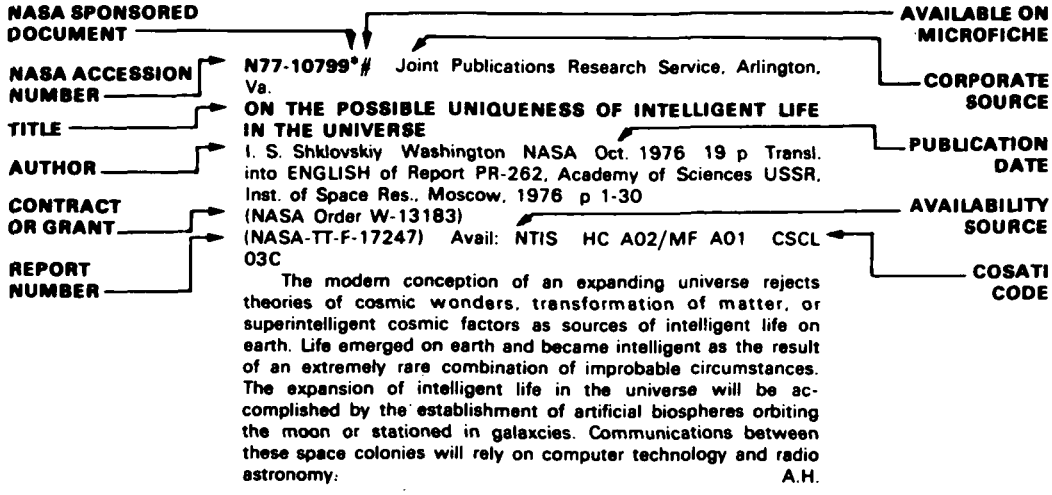

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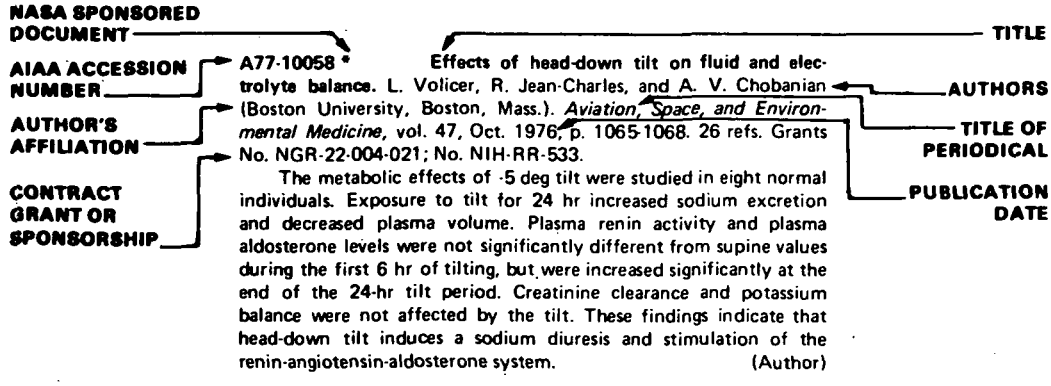

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 174)

DECEMBER 1977

IAA ENTRIES

A77-44338 # **Mathematical simulation for crashworthy aircraft seat design.** D. H. Laananen (Pennsylvania State University, University Park, Pa.). *American Institute of Aeronautics and Astronautics, Aircraft Systems and Technology Meeting, Seattle, Wash., Aug. 22-24, 1977, Paper 77-1250.* 9 p. 15 refs. U.S. Department of Transportation Contract No. FATQNA-3037.

A three-dimensional mathematical model of an aircraft seat, occupant, and restraint system has been developed for use in analysis of light aircraft crashworthiness. The occupant model consists of

In: Electro-optical Systems Design Conference and International Laser Exposition, New York, N.Y., September 14-16, 1976, Proceedings of the Technical Program. Chicago, Industrial and Scientific Conference Management, Inc., 1976, p. 209-217. 26 refs.

The response of the human visual system to image quality is considered in this review of attempts to develop an accurate measure which correlates with subjective impressions of visibility. The application of research results to the prediction of the subjective effects of pictorial noise are examined. Several aspects of visual models are described, including logarithmic brightness, spatial effects, temporal effects, feature detectors, and spatial frequency channels. Attempts to quantitate the visibility of pictorial noise rely on measuring the psychophysical threshold of seeing or the electrophysiological evoked potential. These procedures are described, and applications relevant to the coding picture in the visual domain, image quantizer design, and noise dithering are discussed. M.L.

A77-44341 # **The next step toward total simulation for transitioning air carrier pilots.** G. V. McCulloch (United Air Lines, Inc., Denver, Colo.). *American Institute of Aeronautics and Astronautics, Aircraft Systems and Technology Meeting, Seattle, Wash., Aug. 22-24, 1977, Paper 77-1253.* 15 p. 30 refs.

The paper argues for a reorientation in the approach to airline pilot flight simulator training, a systems approach that blends the disciplines of the practicing aviator, the electronics engineer and the behavioral psychologist into 'the simulation process'. It is asserted that there is insufficient reliable data, concerning the component parts of the simulation process, to prove that present air carrier applications are the lowest cost solutions; or, to effectively take the next step toward total simulation and other flight training economies. It is hypothesized that the substantial cost savings realized through the past use of simulation created an environment in which engineering achievement outstripped demonstrated need, and in which training equipment was relied upon more heavily than training methods. Major simulation areas into which the air carriers should make their own inquiries are suggested and discussed, and a general plan for developing a higher order of reliable data to facilitate cost effective equipment acquisition and use decisions is put forth. A study probing four of the suggested areas, is described. (Author)

A77-44424 **Calcium kinetics in the aorta of spontaneously hypertensive rats.** T. T. Zsoter, C. Wolchinsky, N. F. Henein, and L. C. Ho (Toronto, University, Toronto, Canada). *Cardiovascular Research,* vol. 11, July 1977, p. 353-357. 26 refs. Research supported by the Ontario Heart Foundation.

A77-44425 **Right and left ventricular compliance in the hereditary cardiomyopathy of the Syrian hamster.** A. Mass-Schwartz, R. S. Weinstock, R. L. Wagner, and W. H. Abelmann (Boston City Hospital; Harvard Medical School, Boston, Mass.). *Cardiovascular Research,* vol. 11, July 1977, p. 367-374. 26 refs. Grants No. NIH-HL-10539; No. NIH-HL-5244.

In experiments involving two groups of pre-oedematous cardiomyopathic Syrian hamsters, one group aged 120 d, the other group aged 210 d, ventricular compliance, defined as dV/dP (V = volume, P = pressure), was derived simultaneously for both ventricles from post-mortem pressure-volume curves from 0 to 2.66 kPa (0 to 20 mmHg). Left ventricular tissue elastic modulus, defined as the incremental stress for an increment of strain, was derived from the compliance curves and certain linear dimensions of the heart. At isobaric intervals, compliance did not differ between control and myopathic ventricles. End-diastolic compliance was normal in pre-oedematous hamsters, but was significantly decreased in the oedematous animals. Other results are discussed. M.L.

A77-44454 * # **Noise and vibration ride comfort criteria.** T. K. Dempsey, J. D. Leatherwood, and S. A. Clevenson (NASA, Langley Research Center, Hampton, Va.). *Acoustical Society of America, Meeting, 92nd, San Diego, Calif., Nov. 16-19, 1976, Paper.* 24 p. 16 refs.

A program is underway at Langley Research Center to develop a comprehensive ride quality model based upon the various physical and psychological factors that most affect passenger ride comfort. Two of the most important factors, namely, vibration and noise were studied to (1) determine whether composite or separate noise and vibration criteria are needed for the prediction of ride quality, (2) determine a noise correction for the previously-defined vibration criteria of the ride quality model, (3) assess whether these noise corrections depend on the nature of the vibration stimuli, i.e., deterministic as opposed to random, and (4) specify noise-vibration criteria for this combined environment. The stimuli for the study consisted of octave bands of noise centered at 500 or 2000 Hz and vertical vibrations composed of either 5 Hz sinusoidal vibration or random vibrations centered at 5 Hz and with a 5 Hz bandwidth. The noise stimuli were presented at levels ranging from ambient to 95 dB(A) and the vibrations at levels ranging from 0.02 to 0.13 g-rms. (Author)

A77-44538 **Control theory measures of tracking as indices of attention allocation strategies.** C. D. Wickens (Illinois, University,

Urbana, Ill.) and D. Gopher (Technion - Israel Institute of Technology, Haifa, Israel). *Human Factors*, vol. 19, Aug. 1977, p. 349-365. 23 refs. Contract No. F44620-70-C-0105.

In an intelligent man-machine control system, control theory measures describing the operator's tracking performance can provide useful information concerning an operator's attentional state. This information may be used to implement adaptive aiding procedures. Research is reviewed that relates attentional manipulations to variation in control theory parameters, and an experiment is then described in which 29 subjects performed a tracking task alone, and concurrently with a serial reaction-time task. Within the time-sharing condition, relative priorities between the two tasks were manipulated. The results are interpreted in terms of the separate effects of time-sharing and of priority manipulations upon measures of tracking gain, remnant, time-delay and response 'holds', and the feasibility of on-line measurement of those variables. (Author)

A77-44576 **Shuttle suit shows advances on Apollo.** C. Covault. *Aviation Week and Space Technology*, vol. 107, Aug. 15, 1977, p. 37-40.

Improvements in the astronaut pressure suit and extravehicular life-support systems and associated chestpack/backpack hardware for Shuttle Orbiter over Apollo counterparts are detailed and illustrated. The Orbiter suits will be easier to don and doff (without assistance from other crew members) and easier to move about and work in, on board or outboard. Constant-volume joints, ring-closure joining of the suit two (upper and lower) pieces, integrated ventilation/cooling tubes, microprocessor in the chestpack life support and warning system, and gas separator to eliminate air bubbles from the coolant line are described. Pre-breathing of oxygen to denitrogenate the blood and prevent bends, leak prevention measures, a pressurized ball for rescue and personnel transfer, and suit consumables (oxygen, water) are mentioned. The Orbiter suits will be cheaper, reusable (15-yr lifetime), and adaptable for female astronauts. R.D.V.

A77-44695 **Trends in computer-processed electrocardiograms; Proceedings of the Working Conference, Amsterdam, Netherlands, November 3-5, 1976.** Conference sponsored by the International Federation for Information Processing, Commission of the European Communities, Netherlands Heart Foundation, Health Organization TNO, and Ministry of Public Health and Environmental Hygiene. Edited by J. H. van Bemmel (Vrije Universiteit, Amsterdam, Netherlands) and J. L. Willems (Louvain, Université Catholique, Louvain, Belgium). Amsterdam, North-Holland Publishing Co., 1977. 446 p. $47.40.

Computerized ECG monitoring, computer analysis of rest ECGs, and computer analysis of exercise ECGs are the major headings under which conference contributions are grouped. Floor discussion is reproduced in full. Contributions address such problems as: relationship between surface ECG and specific heart diseases, lead selection, normal variability of patient ECGs and concomitant computer interpretation/classification difficulties, 'overreading' by fully automated systems and advantages of computer-assisted interpretation systems, and ECG programs and data banks. Arrhythmia detection, applications of fuzzy set approaches, specific programs and systems, and comparisons of interpretation of ECGs by expert cardiologists and by computers are covered. R.D.V.

A77-44696 **Molecular evolution.** Edited by F. J. Ayala (California, University, Davis, Calif.). Sunderland, Mass., Sinauer Associates, Inc., 1976. 285 p. $10.00.

Aspects of molecular genetics and evolution are considered, taking into account the characteristics of DNA, the genetic code, the origin of hereditary variation, gene duplications, rearrangements of the genome, genetic variation and evolution, and anagenesis and cladogenesis. Attention is also given to genic variation in natural populations, genetic polymorphism and enzyme function, the determinants of allozyme variation in space and time, genetic strategies of adaptation, organismic and molecular aspects of species formation, genetic differentiation during speciation, the biochemical consequences of speciation in plants, protein sequences in phylogeny, molecular evolutionary clocks, the evolution of genome size, the evolution of repetitive and nonrepetitive DNA, and gene regulation in evolution. G.R.

A77-44716 **Diaphragmatic contraction and the gradient of alveolar expansion in the lateral posture.** C. S. Roussos (McGill University Clinic; Royal Victoria Hospital, Montreal, Canada), R. R. Martin, and L. A. Engel. *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, July 1977, p. 32-38. 17 refs. Research supported by the Medical Research Council of Canada.

A77-44717 **Effects of exercise and eucapnic hyperventilation on bronchial clearance in man.** R. K. Wolff, M. B. Dolovich, G. Obminski, and M. T. Newhouse (St. Joseph's Hospital; McMaster University, Hamilton, Ontario, Canada). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, July 1977, p. 46-50. 20 refs. Research supported by the Ontario Thoracic Society; Medical Research Council Grant No. MA-4265.

A77-44718 **Colonic heating patterns and the variation of thermal resistance among rats.** G. Wright, E. Knecht, and D. Wasserman (U.S. Public Health Service, Center for Disease Control, Cincinnati, Ohio). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, July 1977, p. 59-64 14 refs.

A77-44719 **Ventilatory response to hypoxia in intact cats living at 3,850 m.** S. Lahiri (Pennsylvania, University, Philadelphia, Pa.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, July 1977, p. 114-120. 17 refs. Grants No. PHS-HL-08805; No. PHS-HL-15880.

The reported investigation shows that cats native to a high altitude and sea-level cats respond both to acute hypoxia. However, in high-altitude cats a greater intensity of alveolar hypoxia is needed to produce a similar ventilatory effect. An acute normoxia did not cause a sustained decrease of ventilation in high-altitude cats. Bilateral section of sinus nerves which impaired the carotid chemoreflex abolished the response to acute hypoxia in both groups. G.R.

A77-44720 * **Effects of exercise on fluid exchange and body composition in man during 14-day bed rest.** J. E. Greenleaf, E. M. Bernauer, L. T. Juhos, H. L. Young, J. T. Morse, and R. W. Staley (NASA, Ames Research Center, Laboratory of Human Environmental Physiology, Moffett Field; California, University, Davis, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, July 1977, p. 126-132. 21 refs. Grant No. UCD-205.

A description is presented of an investigation in which body composition, fluid intake, and fluid and electrolyte losses were measured in seven normal, healthy men during three 2-wk bed-rest periods, separated by two 3-wk recovery periods. During bed rest the subjects remained in the horizontal position continuously. During the dietary control periods, body mass decreased significantly with all three regimens, including no exercise, isometric exercise, and isotonic excercise. During bed rest, body mass was essentially unchanged with no exercise, but decreased significantly with isotonic and isometric exercise. With one exception, there were no statistically significant changes in body density, lean body mass, or body fat content by the end of each of the three bed-rest periods. G.R.

A77-44721 * **Skin blood flow and sweating changes following exercise training and heat acclimation.** M. F. Roberts, C. B. Wenger, J. A. J. Stolwijk, and E. R. Nadel (Yale University, New Haven, Conn.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, July 1977, p. 133-137. 14 refs. Grants No. NIH-ES-00123; No. ES-00354; No. NsG-9023.

A77-44722 **Lung recoil and gas trapping during oxygen breathing at low lung volumes.** J. R. Rodarte, L. W. Burgher, R. E. Hyatt, and K. Rehder (Mayo Clinic; Mayo Foundation, Rochester, Minn.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, July 1977, p. 138-143. 12 refs. Grants No. NIH-HL-12229; No. NIH-HL-12090; No. NIH-HL-16726; No. NIH-HL-5930.

A77-44744 **The role of structural redundancy in the perception of visual targets.** R. A. Kinchla (Princeton University, Princeton, N.J.). *Perception and Psychophysics,* vol. 22, no. 1, July 1977, p. 19-30. 27 refs.

Most visual images contain 'gross shapes' which are highly correlated with less perceptable 'details,' e.g., the gross outline of a head and details such as eyes, ears, etc. The role of such structural redundancy in perception is considered both from a 'syntactical' and 'spatial-frequency' view of structure. An experiment is reported and evaluated in terms of a simple mathematical model which allows one to isolate the influence of several factors in the perceptual process, particularly the observer's actual sensitivity to specific details and the influence of the redundant (correlated) information in 'higher order forms.' The basic idea is that one decides whether a particular (target) is present in a briefly presented image by integrating impressions from various parts of the image in a weighted manner, with the weights determined by redundant information in 'higher order forms.' Furthermore, the results are generally consistent with the notion that an increase in the number of attended letters does not reduce the information extracted from each letter. (Author)

A77-44745 **Inhibition between channels selective to contour orientation and wavelength in the human visual system.** W. Lovegrove (Tasmania, University, Hobart, Australia). *Perception and Psychophysics,* vol. 22, no. 1, July 1977, p. 49-53. 27 refs.

Recent studies have demonstrated inhibition between channels selective to contour orientation in the human visual system. On the basis of adaptation studies, it has also been suggested that the human visual system contains channels jointly responsive to both contour orientation and wavelength. The present paper investigates inhibition between such channels. Two experiments demonstrated that, with simultaneous presentation of a center vertical target grating and a concentric surround grating, the threshold and the apparent orientation of the center grating depended on the relative orientations of the two gratings and also on whether they were viewed in the same or in different colored light. Color selectivity in both experiments was found across a wider range of angular separations than has generally been reported for successive presentation of the two stimuli. These results suggest inhibition between channels selective to combinations of contour orientation and wavelength in the human visual system. (Author)

A77-44746 * **Visual evoked potentials and selective attention to points in space.** S. Van Voorhis and S. A. Hillyard (California, University, La Jolla, Calif.). *Perception and Psychophysics,* vol. 22, no. 1, July 1977, p. 54-62. 36 refs. Grants No. NIH-MH-25594-03; No. NGR-05-009-198.

Visual evoked potentials (VEPs) were recorded to sequences of flashes delivered to the right and left visual fields while subjects responded promptly to designated stimuli in one field at a time (focused attention), in both fields at once (divided attention), or to neither field (passive). Three stimulus schedules were used: the first was a replication of a previous study (Eason, Harter, and White, 1969) where left- and right-field flashes were delivered quasi-independently, while in the other two the flashes were delivered to the two fields in random order (Bernoulli sequence). VEPs to attended-field stimuli were enhanced at both occipital (O2) and central (Cz) recording sites under all stimulus sequences, but different components were affected at the two scalp sites. It was suggested that the VEP at O2 may reflect modality-specific processing events, while the response at Cz, like its auditory homologue, may index more general aspects of selective attention. (Author)

A77-44747 **Perceived brightness as a function of flash duration in the peripheral visual field.** N. Osaka (Kyoto University, Kyoto, Japan). *Perception and Psychophysics,* vol. 22, no. 1, July 1977, p. 63-69. 27 refs.

Using a method of direct magnitude estimation, perceived brightness was measured in the dark-adapted eye with brief flashes of varying duration (1-1,000 msec), size (16'-116'), and retinal loci (0 deg-60 deg) for the lower photopic luminance levels covering the range between 8.60 and .86 cd/sq m in steps of .5 log units. Perceived brightness increased as a function of flash duration as well as luminance up to approximately 100 msec, then remained constant above 100 msec. The enhancement of brightness at about a 50-msec flash duration has been observed not in the fovea but in the periphery. Target size also has been found to be effective on brightness. (Author)

A77-44748 **On the locus of visual dominance.** H. E. Egeth and L. C. Sager (Johns Hopkins University, Baltimore, Md.). *Perception and Psychophysics,* vol. 22, no. 1, July 1977, p. 77-86. 27 refs. Navy-supported research; NSF Grant No. BNS-76-01227.

A series of six experiments explored the dominance of vision over audition reported by Colavita (1974). The existence of visual dominance in a paradigm somewhat different from Colavita's was confirmed. Mean reaction time (RT) to a light was found to be faster than to a simultaneously presented tone, even though the stimuli were equated in subjective intensity and even though RT to the tone presented alone was faster than to the light presented alone. Additional experiments showed that when subjects did not have to respond to light, tone RT was equal or faster (intersensory facilitation) when a light was present than when it was not. These findings suggest that sensory or perceptual processing of the tone is not affected by the light, i.e., that visual dominance is nonsensory in locus and depends on the relevance of the light stimulus. (Author)

A77-44771 **Image noise visibility and fidelity criteria.** O. R. Mitchell and E. J. Delp (Purdue University, West Lafayette, Ind.). In: Electro-optical Systems Design Conference and International Laser Exposition, New York, N.Y., September 14-16, 1976, Proceedings of the Technical Program. Chicago, Industrial and Scientific Conference Management, Inc., 1976, p. 209-217. 26 refs.

The response of the human visual system to image quality is considered in this review of attempts to develop an accurate measure which correlates with subjective impressions of visibility. The application of research results to the prediction of the subjective effects of pictorial noise are examined. Several aspects of visual models are described, including logarithmic brightness, spatial effects, temporal effects, feature detectors, and spatial frequency channels. Attempts to quantitate the visibility of pictorial noise rely on measuring the psychophysical threshold of seeing or the electrophysiological evoked potential. These procedures are described, and applications relevant to the coding picture in the visual domain, image quantizer design, and noise dithering are discussed. M.L.

A77-44772 **Human performance and photometric measurement of electrooptical displays.** H. L. Snyder (Virginia Polytechnic Institute and State University, Blacksburg, Va.). In: Electro-optical Systems Design Conference and International Laser Exposition, New York, N.Y., September 14-16, 1976, Proceedings of the

Technical Program. Chicago, Industrial and Scientific Conference Management, Inc., 1976, p. 218-223. 5 refs. Contracts No. F33615-71-C-1739; No. F33615-76-C-5022.

Aspects related to the quantification of the quality of electro-optically displayed images are considered, taking into account the concept of the modulation transfer function area. The accuracy of measurement of the displayed image is of major importance to the quantification of any display. A full appreciation of the quality of the image displayed to the observed requires careful photometric measurement under the actual viewing conditions. The elimination of the raster effect is discussed. G.R.

A77-44920 Polarcardiographic criteria for infarction evaluated by angiocardiography. J. A. Osborne and G. E. Dower (Vancouver General Hospital; British Columbia, University; Shaughnessy Hospital, Vancouver, Canada). *Journal of Electrocardiology*, vol. 10, no. 3, 1977, p. 237-244. 9 refs.

Out of a series of 1000 consecutive patients studied by angiocardiography, two groups were selected on the basis of the probability of having suffered myocardial infarction: an infarction group of 324 cases, and a noninfarction group of 112 cases. Members of the infarction group had complete occlusion of at least one major coronary artery; members of the non-infarction group had less than 50% occlusion in all coronary arteries, normal hemodynamics, and negative histories of infarction. The diagnostic performances of the independently-read 12-lead electrocardiograms (ECGs) and the polar-cardiograms (PCGs) were evaluated in terms of sensitivity, specificity, validity and risk ratio. The performance of the ECG was significantly lower than the PCG. Corresponding figures were 56%, 99%, 67%, and 1.67 for the ECG, and 75%, 91%, 80%, and 2.23 for the PCG. There is a 99.9% probability that the PCG can detect at least 21% more cases of infarction than the ECG can. (Author)

A77-44921 Screening capabilities of the lead I electrocardiogram. A. Djalaly, H. A. Hedayatti, and E. Zeighami (Pahlavi University, Shiraz, Iran). *Journal of Electrocardiology*, vol. 10, no. 3, 1977, p. 245-250. 5 refs.

Single-lead electrocardiogram data, including R-wave amplitudes, T-wave amplitudes, and T-intercepts were obtained from 183 subjects having normal twelve-lead electrocardiograms and showing no evidence of heart disease; these data were compared with findings from 179 subjects who exhibited clinical and electrocardiographic evidence of coronary insufficiency and old myocardial infarctions. Both sets of subjects were derived from a Middle Eastern population. Significant differences in all three single-lead measurements were found between the normal and abnormal groups, with especially marked variations occurring in T-amplitudes and T-intercepts. The diagnostic utility of the single-lead measurements is discussed. In particular, the usefulness of the data in detecting cardiac ischemia is noted. However, the technique may be less sensitive in screening for inferior wall myocardial infarction, right bundle branch block and right ventricle hypertrophy; decreased sensitivity may also occur when the technique is applied to older subjects. J.M.B.

A77-44922 Genesis of body surface potential distribution in right bundle branch block. N. Niimi, S. Sugiyama, M. Wada, J. Sugenoya, H. Oguri, J. Toyama, K. Yamada (Nagoya University, Nagoya, Japan), and M. Okajima (Fujitagakuen University, Toyoake, Japan). *Journal of Electrocardiology*, vol. 10, no. 3, 1977, p. 257-266. 20 refs.

A simulated normal ventricular propagation process and mathematically-reconstructed cardiac maps were used to study the sites of conduction block in the three types (I, II, and III) of right bundle branch block (RBBB) classified by body-surface isopotential maps. When ventricular excitation assumed to be propagated either with or without the Purkinje system was blocked in the main stem of the right bundle branch, the reconstructed maps showed two kinds of patterns in the late stages of excitation, resembling those found in blocks of Types I and II. When the conduction block was located mainly in the Purkinje system of the right ventricular free wall and two assumptions about the propagation process were applied, the reconstructed maps showed patterns resembling either the Type I case (at the late stage of excitation) or the Type III case (at all stages). It is concluded that different ranges and degrees of conduction block associated with abnormal activation of the Purkinje system of the right ventricular free wall may be responsible for clinically-observed RBBB patterns. J.M.B.

A77-44923 Multiple conduction defects with markedly prolonged ventricular depolarization in cardiomyopathy. Z. U. Hassan, M. B. R. Mendoza, W. E. Steinke, and D. B. Propert (U.S. Veterans Administration Hospital; Virginia, Medical College, Richmond, Va.). *Journal of Electrocardiology*, vol. 10, no. 3, 1977, p. 275-278. 7 refs.

Electrophysiologic investigation of a diffuse and bizarre conduction abnormality in a patient with cardiomyopathy revealed profound slowing of the impulse in the right ventricular outflow region. The resultant 220 msec QRS duration is the longest reported in right bundle branch block. (Author)

A77-44933 # Effect of stimulation of hypothalamic structures upon the hypothalamic self-stimulation reaction (Vliianie razdrazheniia gipotalamicheskikh struktur na gipotalamicheskuiu reaktsiiu samostimuliatsii). R. I. Turashvili and N. S. Gedevanishvili (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 86, Apr. 1977, p. 185-187. 5 refs. In Russian.

The effect of stimulation of negative and positive emotional hypothalamic areas upon self-stimulation reactions elicited from lateral and dorsal hypothalamus was studied. It is shown that additional stimulation of hypothalamic negative areas decreases, while additional stimulation of positive areas increases, self-stimulation. A more pronounced increase resulted from additional stimulation of positive points located ipsilaterally to self-stimulating ones in comparison to contralateral positive points. (Author)

A77-44935 # The metabolic adaptation of an organism to muscle activity of increasing intensity (Metabolicheskaia adaptatsiia organizma k myshchnoi deiatel'nosti vozrastaiushchei intensivnosti). R. I. Lenkova and S. V. Usik (Nauchno-Issledovatel'skii Institut Fizicheskoi Kultury, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 63, June 1977, p. 858-863. 19 refs. In Russian.

Adult white rats were forced to swim while carrying loads of 6 to 34% of body weight. Systematically increasing the short-term loads led to the same or more pronounced biochemical adaptive changes than are produced by systematically increasing the duration of loading. Work capacity increased more in the first case than in the second case. The best training results were obtained by increasing fractional loading of near maximal intensity in a step-wise manner. M.L.

A77-44936 # Utilization and restoration of energy sources during muscle activity in conditions of steady-state metabolism (Utilizatsiia i restitutsiia istochnikov energii pri myshechnoi deiatel'nosti v usloviiakh ustoichivnogo sostoianiia metabolizma). A. F. Krasnova, G. I. Samodanova, S. V. Usik, and N. N. Iakovlev (Nauchno-Issledovatel'skii Institut Fizicheskoi Kultury, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 63, June 1977, p. 864-871. 19 refs. In Russian.

A77-44963 # Discrete time modeling of heavy transport plane pilot behavior. D. Cavalli (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). *(Massachusetts Institute of Technology, Annual Conference on Manual Control, Cambridge, Mass., June 15-17, 1977.) ONERA, TP* no. 1977-57, 1977. 16 p.

A digital computer program simulating the reactions of the pilot of a transport aircraft during final descent is described. The model assumes that lateral, longitudinal, and rudder controls, as well as throttle lever and elevator trim controls are in use during the maneuver. Experimental data obtained from monitoring human

pilots during simulated final descents permit formulation of a model decision-making strategy involving nine instrument readings (localized deviation, glide path deviation, roll, pitch, yaw, vertical speed, thrust, altitude, and airspeed). Recognition of a difficulty and the sequence of corrective procedures undertaken are also described. It is concluded that a better information display could significantly decrease the pilot's workload and thus improve flight safety. J.B.M.

A77-45031 # Controlling the motion of a biped walking apparatus (Upravlenie pokhodkoi dvunogogo shagaiushchego apparata). Iu. V. Bolotin and I. V. Novozhilov. *Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela,* May-June 1977, p. 47-52. 5 refs. In Russian.

A control law for the cyclic motion of a biped automaton is derived from the solutions of two problems. The first problem deals with the walking phase where the automaton rests on one leg. The motion of the torso is taken into consideration. The control is formed from the discrepancies between the actual and programmed values of the phase variables. In the second problem, cyclic walk is obtained by considering jointly the successive alternating phases where the automaton rests only on one of its legs. The control of this process is formulated by selecting the point of transfer from one to the other leg. V.P.

A77-45041 # Origination of Korotkov sounds at diastole (O vozniknovenii zvukov Korotkova pri diastole). S. A. Ambartsumian and L. A. Movsisian (Akademiia Nauk Armianskoi SSR, Institut Mekhaniki, Yerevan, Armenian SSR). *Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela,* May-June 1977, p. 141-145. 9 refs. In Russian.

Korotkov sounds at diastole is a phenomenon of dynamic instability of fluid-filled shells, which still lacks a fully satisfactory mechanical model. In the present paper, an attempt is made to interpret the process of instability of the brachial artery, accompanied by nonlinear oscillations at audible frequency. In the analysis, the brachial artery is treated as an isolated elastic homogeneous orthotropic infinite cylindrical shell of constant thickness. V.P.

A77-45229 Sustaining life in a space colony. M. Modell (MIT, Cambridge, Mass.). *Technology Review,* vol. 79, July-Aug. 1977, p. 36-43. 18 refs.

Some approaches to the development of life support systems (LSS) for a large community of people inhabiting a closed-cycle environment over a relatively extended period (space colony) are discussed. Submarine-oriented and spacecraft-oriented biotechnologies are recognized as points of departure for present LSS state of the art. The Soviet Bios-3 experiments are described, and the indigestibility of chlorella algae (by human or beast) noted. Hydroponics and phytotron (plant culture controlled chambers) experiments are described, and recyling problems with inputs (air, potable water, food, wash water, sanitary water) and effluents (waste water, urine, feces, CO2) are examined. Attention is given to major current unknowns in this area: long-term effects of restricted diets, bioconversion of nutrients, toxicology and microbiology of closed environments. R.D.V.

A77-45421 Two-band model of heterochromatic flicker. D. H. Kelly (Stanford Research Institute, Menlo Park, Calif.) and D. van Norren (Centrale Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek, Instituut voor Zintuigfysiologie, Soesterberg, Netherlands). *Optical Society of America, Journal,* vol. 67, Aug. 1977, p. 1081-1091. 17 refs. Research supported by the Nederlandse Organisatie voor Zuiverwetenschappenlijk Onderzoek; Contract No. NIH-EY-01128.

An experimental study of human sensitivity to purely luminous flicker and to purely chromatic (red-green) flicker in a 1.8-deg flicker field is reported. The entire range of red-green balance conditions that could be produced by the experimental apparatus was investigated, including the extreme cases of no red beam and no green beam. Results are evaluated for experiments that involved heterochromatic stimuli, two-frequency measurements, and different backgrounds superimposed on the stimuli. Observed variations in the shape of the temporal response characteristic are discussed, particularly for the cases of silent-green flicker, silent-red flicker, in-phase stimulation, and 10-deg flicker fields. The results obtained are explained in terms of a low-frequency band representing the opponent-color response and a high-frequency band representing the achromatic response, with the two bands responding in various proportions as a function of the red-green stimulus ratio. It is concluded that flicker sensitivity is controlled by the pathways of the proximal retina rather than the temporal characteristics of cone cells. F.G.M.

A77-45463 Life-science experiment in the Spacelab preliminary program ASSESS II (Life-Science-Experiment im Spacelab-Vorprogramm ASSESS II). R. Herrmann, H.-M. Wegmann, and H. Hohlweck (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). *DFVLR-Nachrichten,* July 1977, p. 864-866. In German.

A preliminary Spacelab program related to an airborne science Spacelab experiments system simulation (ASSESS), was conducted jointly by NASA and ESA in California in May 1977. Experiments were carried out on board of an aircraft during nine flights. The experiments included a medical-psychological test concerning the ability of the payload specialists to tolerate stresses under Spacelab-similar conditions. Attention is given to the study of the quality and quantity of sleep with the aid of EEG and EOG tests, the investigation of heart activity by means of an EKG, measurements of the body temperature, and the determination of hormone and electrolyte secretions. G.R.

A77-45478 The organization of human vision for pattern detection and recognition. K. H. Ruddock (Imperial College of Science and Technology, London, England). *Reports on Progress in Physics,* vol. 40, June 1977, p. 603-663. 159 refs.

Anatomical, electrophysiological and psychophysical data concerning visual detection and recognition of spatially structured light stimuli are reviewed and a brief survey is presented of experimental methods by which data are obtained. The studies reviewed give a relatively self-consistent picture of the early stages of visual pattern detection. Superimposed on an ordered mapping of visual space are operational units which detect the existence of elongated features of the retinal image. These mechanisms appear to contribute both to spatial frequency bandwidth-limited threshold detection responses and to psychophysically observed adaptation phenomena. The organization of the later stages of visual processing is relatively unknown, although electrophysiological evidence suggests that different regions of the cortex process different attributes of the retinal image. B.J.

A77-45482 Circulation of cortical and thalamic neuronal activity in wakefulness and in sleep. P. Rinaldi, M. Verzeano (California University, Irvine, Calif.), and G. Juhasz. *Electroencephalography and Clinical Neurophysiology,* vol. 43, Aug. 1977, p. 248-259. 23 refs. Grant No. NIH-NS-07145.

A77-45483 Duration of paradoxical sleep episodes - A quantitative and pattern analysis of reticular multi-unit activity in the cat. J.-C. Lecas (CNRS, Département de Psychophysiologie, Gif-sur-Yvette, Essonne, France). *Electroencephalography and Clinical Neurophysiology,* vol. 43, Aug. 1977, p. 260-269. 23 refs.

A77-45526 * Effect of hypovolemia, infusion, and oral rehydration on plasma electrolytes, ADH, renin activity, and +G/z/ tolerance. J. E. Greenleaf, P. J. Brock, R. F. Haines, S. A. Rositano, L. D. Montgomery, and L. C. Keil (NASA, Ames Research Center,

Moffett Field, Calif.). *(International Astronautical Federation, International Astronautical Congress, 27th, Anaheim, Calif., Oct. 10-16, 1976.) Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 693-700. 26 refs. Grant No. NCA2-OR180-506.

Effects on plasma volume, electrolyte shifts, and +G(z) tolerance induced by: (1) blood withdrawal; (2) blood infusion; and (3) oral fluid intake, were determined at 0.5 G/min in centrifugation tests of six ambulatory male patients, aged 21 to 27 yrs. Hypovolemia induced by withdrawal of 400 ml blood, blood infusion followed by repeated centrifugation, effects of consuming an isotonic drink (0.9% NaCl) to achieve oral rehydration, and donning of red adaptation goggles were studied for effects on acceleration tolerance, pre-acceleration and post-acceleration plasma renin activity (PRA) and plasma vasopressin levels. No significant changes in post-acceleration PRA compared to pre-acceleration PRA were found, and administration of oral rehydration is found as effective as blood replacement in counteracting hypovolemic effects. R.D.V.

A77-45527 Estimations of body composition by various methods. D. A. Clark, T. D. Kay, R. F. Tatsch, and C. F. Theis (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 701-704. 16 refs.

Body composition was measured in 38 young men, all overweight by standard height-weight tables. Techniques were: body volumetry, determination of total body water by tritium dilution, whole body 40-K counting, and anthropometric measurements required for an equation by Wright and Wilmore, the biceps-height formula, and a complex anthropometric model. Body volumeter and total body water dilution results agreed closely. 40-K counts gave lower means for the lean mass (higher means for fat mass and percent body fat), while the Wright-Wilmore equation and complex anthropometric model gave high mean values for lean mass (low means for fat mass and percent body fat). Among the five methods correlation coefficients ranged from 0.81 to 0.94 for lean body mass, from 0.74 to 0.89 for fat mass, and from 0.60 to 0.86 for percent body fat. Although all subjects were overweight, only six (16%) were obese. (Author)

A77-45528 Alterations in brain electrolytes during acceleration in mice. H. A. Schwertner, K. Blum, J. E. Wallace, and J. D. Eubanks (Texas, University, San Antonio, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 705-707. 15 refs. Grant No. AF-AFOSR-71-2075.

Calcium, magnesium, sodium, and potassium levels were determined in brain tissues of mice subjected to gravitational acceleration in the longitudinal direction. Although no significant changes occur in calcium and magnesium levels, potassium levels markedly increase while sodium levels decrease following exposure to 5 and 10 G(z) for 5 min. The electrolyte changes are of long duration and remain for periods greater than 5 h. (Author)

A77-45529 Histopathology of retinal lesions produced by long-term laser exposure. W. D. Gibbons, R. E. Schmidt, and R. G. Allen (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 708-711. 6 refs.

The maculae of rhesus monkeys were exposed for 120/s to Nd-YAG and argon laser radiation at wavelengths of 1060 and 514.5 nm, respectively. Histopathology of lesions associated with a thermal and a nonthermal damage mechanism were compared. Differences were observed for both lesion development and retinal layers affected, depending upon the damage mechanism involved. (Author)

A77-45530 * Behavioral analyses of killifish exposed to weightlessness in the Apollo-Soyuz test project. R. B. Hoffman (NASA, Johnson Space Center, Houston, Tex.), G. A. Salinas, and A. A. Baky (Northrop Services, Inc., Houston, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 712-717. 6 refs.

Two groups of killifish, Fundulus heteroclitus, which were flown aboard Apollo-Soyuz, were subjected to postflight behavioral testing. The first group examined consisted of a graded series of embryos representing key developmental stages at orbital insertion (32-h, 66-h, and 128-h stages; pre-liftoff fertilization times). The tests revealed that the young adults from the flight 32-h stage had a significantly decreased positive geotaxis and increased negative phototaxis when compared with ground controls. These findings suggested a greater sensitization of the least-developed flight stage to post-hatching environmental influences. The second group consisted of 21-d old juveniles which were subjected to light orientation tests soon after recovery. No significant differences were detected. (Author)

A77-45531 Ten-year survey of altitude chamber reactions using the FAA training chamber flight profiles. C. D. Valdez (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 718-721. 6 refs.

The Federal Aviation Administration since 1962 has trained nonmilitary government-employed flightcrews and civilian pilots in aspects of altitude and its effects on the human body. The standard military altitude chamber flight profile was not used and the reasons are explained. Two different chamber profiles were used for a 10-year period and both included a rapid decompression, but the altitudes attained were limited to 25,000 ft (7,620 m) and 29,000 ft (8,839 m). During the 10-year period cited in this report, 4,759 students were exposed to these altitudes and none experienced an evolved gas problem. (Author)

A77-45532 Altitude decompression sickness - Hyperbaric therapy results in 145 cases. J. C. Davis, P. J. Sheffield, L. Schuknecht, R. D. Heimbach, J. M. Dunn, G. Douglas, and G. K. Anderson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 722-730. 36 refs.

Data are presented on numerous cases of altitude decompression sickness, with more detailed histories of nine cases. Failure to resolve upon descent to lower altitudes, and recurrence of symptoms (of bends, chokes, associated skin sensitivity or pain in joints, visual malfunctions, and shock) at ground level, are emphasized. Immediate compression, with the patient placed on intermittent hyperbaric oxygen, is recommended for dealing with persisting manifestations. R.D.V.

A77-45533 Heavy-ion-induced cataractogenesis. C. H. Bonney, D. M. Hunter, G. E. Conley, and K. A. Hardy (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 731-733. 20 refs.

Cataract formation following heavy ion exposure (O IX) was noted in three rhesus monkeys secondary to a study of retinal effects. The pathogenesis of these lens changes follows many, but not all, of the characteristics for 'radiation cataracts'. The ring-shaped opacity was not noted to occur. Posterior capsular changes were noted initially and followed through the formation of a mature cataract. (Author)

A77-45534 * Femur-bending properties as influenced by gravity. II - Ultimate load, moment, and stress for 3-G mice. C. C. Wunder and R. C. Welch (Iowa, University, Iowa City, Iowa). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 734-736. 5 refs. Grant No. NGR-16-001-031.

A77-45535 Selective induction of liver drug-metabolizing enzymes in rats exposed to a 21 ATA He-O2 environment. J. D. Geiger, S. J. Brumleve, J. N. Boelkins, and S. S. Parmar (North Dakota, University, Grand Forks, N. Dak.; King George's Medical College, Lucknow, India). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 737-740. 11 refs. Contract No. N00014-76-C-0219; Grants No. NIH-1-T01-HL-0593; No. PHS-7-R01-DA-01893-01.

A77-45536 **Coordination of the head and eyes in pursuit of predictable and random target motion.** M. Gresty and J. Leech (Medical Research Council, Institute of Neurology, London, England). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 741-744. 9 refs.

Subjects were required to use their head and eyes in pursuit of visual targets which moved randomly or sinusoidally in the horizontal plane. All subjects disliked moving their heads to pursue the random motion, apparently because the motion broke fixation which resulted in a predominance of the vestibulo-ocular compensatory reflex over the smooth pursuit reflex. As a consequence gaze (head plus eye movement) was at times in the opposite direction to the motion of the target. In steady state pursuit of sinusoidal targets, eye movement consisted of a combination of pursuit and vestibulo-ocular reflex eye movements. At frequencies below 0.8 Hz, the vestibular reflex was used at times of minimum target velocity to stabilize fixation whereas during maximum target velocity the head movement was slowed and the smooth pursuit reflex predominated. At 1 Hz and over, there was a failure to suppress the compensatory vestibulo-ocular reflex; however, the saccades of vestibular nystagmus were used to 'catch up' the target. There was a preference not to use the head in predictable pursuit. (Author)

A77-45537 **Evaluation of the hazards of sickle trait in aviation.** J. M. McKenzie (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 753-762. 75 refs.

Contradictory evidence on possible correlation between the sickle trait (sickle cell anemia or presence of sickled erythrocytes in necropsy blood samples) and instances of sudden unexpected death associated with hypoxia and hypoxemia is discussed critically. Other contributing factors acting synergetically with sickle-related hypoxic collapse are sought (chronic disease, pregnancy, trauma, drug or alcohol ingestion). Sickle trait is rejected as a sufficient causal factor in altitude intolerance, and recognized as a possible important factor in the reversibility of hypoxic collapse. Sickle trait is rejected as a basis for aeromedical disqualification. Reports of sickling in cadaver tissues are considered inconclusive evidence for sickle crisis as a primary cause of the death or accident. R.D.V.

A77-45538 * **Coronary heart disease index based on longitudinal electrocardiography.** J. C. Townsend (Catholic University of America, Washington, D.C.) and J. P. Cronin (NASA, Washington, D.C.). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 765-770. 9 refs.

A coronary heart disease index was developed from longitudinal ECG (LCG) tracings to serve as a cardiac health measure in studies of working and, essentially, asymptomatic populations, such as pilots and executives. For a given subject, the index consisted of a composite score based on the presence of LCG aberrations and weighted values previously assigned to them. The index was validated by correlating it with the known presence or absence of CHD as determined by a complete physical examination, including treadmill, resting ECG, and risk factor information. The validating sample consisted of 111 subjects drawn by a stratified-random procedure from 5000 available case histories. The CHD index was found to be significantly more valid as a sole indicator of CHD than the LCG without the use of the index. The index consistently produced higher validity coefficients in identifying CHD than did treadmill testing, resting ECG, or risk factor analysis. (Author)

A77-45539 **Post-mortem blood alcohol in general aviation pilots.** T. C. Brown and J. C. Lane (Department of Transport, Aviation Medicine Branch, Melbourne, Australia). *Aviation, Space, and Environmental Medicine,* vol. 48, Aug. 1977, p. 771-775. 24 refs.

Blood alcohol concentrations are reviewed from a series of 250 consecutive fatal accidents, involving 259 pilots, for the years 1962 through 1975. BACs were obtained in 150 of 213 fatally injured pilots whose bodies were recovered. Positive BACs were 18% of total estimations. Impairment by alcohol was probably a factor in about 9% of accidents in which valid BACs were obtained. These percentages are not significantly different from lumped U.S. data. Comparison with fatal accidents in other modes of personal transportation shows alcohol plays a part in the following descending order: cars in single-vehicle accidents, all cars, motorcycles, general aviation aircraft. (Author)

A77-45593 **Mitral valve closure index - Echocardiographic index of severity of mitral stenosis.** M. F. Shiu (St. Thomas Hospital, London, England). *British Heart Journal,* vol. 39, Aug. 1977, p. 839-843. 12 refs.

A new echocardiographic index of mitral valve diastolic closure, based on the rate of diastolic apposition of the anterior and posterior mitral leaflet echoes, was measured in 40 patients with mitral stenosis. This mitral valve closure index correlated highly significantly with the mitral valve orifice area ($r = 0.87$). Correlation between the diastolic closure rate (based on the EF slope) and the calculated valve area was poor ($r = 0.37$). It is proposed that the mitral valve closure index excludes movement extraneous to the mitral apparatus and expresses the actual rate of valve closure, thus avoiding some of the factors known to contribute to the poor specificity of the diastolic closure rate. The better correlation of the mitral valve closure index with the calculated valve orifice area makes it possible to assess the severity of mitral stenosis by echocardiogram with greater accuracy and confidence. (Author)

A77-45594 **Studies of correlation between progression of coronary artery disease, as assessed by coronary arteriography, left ventricular end-diastolic pressure, ejection fraction, and employability.** S. Nitter-Hauge, K. Noreik, S. Simonsen, O. Storstein, T. Bjorbaek, and A. Steen (University Hospital, Rikshospitalet; Oslo, Universitetet, Oslo, Norway). *British Heart Journal,* vol. 39, Aug. 1977, p. 884-888. 12 refs. Research supported by the Norwegian Council on Cardiovascular Diseases.

A77-45595 **P wave analysis in ischaemic heart disease - An echocardiographic, haemodynamic, and angiographic assessment.** U. R. Shettigar, W. H. Barry, and H. N. Hultgren (U.S. Veterans Administration Hospital, Palo Alto; Stanford University, Stanford, Calif.). *British Heart Journal,* vol. 39, Aug. 1977, p. 894-899. 23 refs. Research supported by the U.S. Veterans Administration Hospital.

Fifty-two men with stable angina pectoris, without associated valvular heart disease or congestive failure, were studied to assess the electrocardiographic P wave abnormalities and their relation to left atrial size, pressure, and left ventricular function. Their mean age was 52 years. Duration of P waves in leads II, III, and aVF and the P terminal force in V1 were examined. Echocardiograms were obtained to assess left atrial size and left atrial-aortic ratio. These measurements were also made in 33 normal subjects. Mean pulmonary artery wedge pressure at rest and exercise, left ventricular asynergy, ejection fraction, and severity of coronary artery disease were determined in all 52 patients. P terminal force more negative than -0.02 mm s was noted in 69 per cent of coronary artery disease patients but in none of the normal subjects. P terminal force correlated with exercise pulmonary artery mean wedge pressure but not with left atrial size. P wave duration in lead II did not correlate with pulmonary artery mean wedge pressure or left atrial size. P terminal force correlated with left ventricular contraction abnormality but not with ejection fraction or number of vessels diseased. (Author)

A77-45596 **Removal of AC interference from the electrocardiogram.** H. Moseley (West of Scotland Health Boards, Glasgow, Scotland) and J. A. Kennedy (Western Infirmary, Glasgow, Scotland). *British Heart Journal,* vol. 39, Aug. 1977, p. 907, 908.

A method is described for the removal of AC interference from the electrocardiogram in monitors which do not have isolated inputs. The patient's leads are connected to an isolation amplifier which provides isolation between the input and the output and has a high common mode rejection ratio. The output from the isolation amplifier is taken to the electrocardiographic monitor. The isolation

amplifier not only provides additional patient safety but also reduces the level of AC interference without interfering with any frequency components in the electrocardiogram. (Author)

A77-45738 * # **Thermoregulatory responses of unanesthetized rats exposed to gravitational fields of 1 to 4 G.** J. M. Horowitz and B. A. Horwitz (California, University, Davis, Calif.). *COSPAR, Plenary Meeting, 20th, Tel Aviv, Israel, June 7-18, 1977, Paper.* 6 p. 8 refs. Grant No. NGR-05-004-099.

A77-45763 # **Radiobiological results from the bacillus subtilis Biostack experiments within the Apollo and the ASTP space flights.** R. Facius, H. Bücker, D. Hildebrand, G. Horneck, G. Höltz, G. Reitz, M. Schäfer, and B. Toth (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Frankfurt, West Germany). *COSPAR, Plenary Meeting, 20th, Tel Aviv, Israel, June 7-18, 1977, Paper.* 6 p. 29 refs.

Results of the bacillus subtilis experiment included in the Apollo-Soyuz test project are discussed, and comparisons with the previous Biostack experiments aboard Apollo 16 and 17 are made. The consequences for biological material of exposure to the heavy and highly-energized ions in cosmic radiation were found to be unclearly defined by the Apollo 16 and 17 tests; spores in the experiments were able to form vegetative outgrowth of normal appearance, but the rate of growth was apparently inhibited. In the third experiment, an increased precision in calculating the impact of hard-component radiation permits a greater degree of confidence in relating the distance from particle trajectory to spore inactivation. Analysis of inactivation rates suggests that a second factor, such as acoustic shock waves or the diffusion of excited molecules from the trajectories of incident particles, may also play a role in the inactivation. J.M.B.

A77-45789 # **Effects of gravitational and magnetic fields on transplanted neuroblastoma vascularity.** S. Batkin and F. L. Tabrah (Hawaii, University, Honolulu, Hawaii). *COSPAR, Plenary Meeting, 20th, Tel Aviv, Israel, June 7-18, 1977, Paper.* 4 p. 13 refs. Research supported by the Eddie Fox Cancer Fund.

Transplanted neuroblastoma was subjected to altered neural influences, gravitational and magnetic field forces, either separately or in combination. A common result was impaired vascularity, and greater extravasation of blood with associated tumor necrosis in the experimental animals. The combination of both hypergravity and A.C. magnetic field was less effective than with either force alone. Tumor cells in vitro exposed to the magnetic field showed no definite growth changes, suggesting an effect of the field forces on the host. Exposure of a unicellular organism, not requiring a host for survival, to a similar magnetic field did result in distinct cell division changes. (Author)

A77-45796 # **Definition of a two-primate biological facility for Spacelab.** P. C. Pesquies, C. L. Milhaud, B. J. Cailler (Centre de Recherches de Médecine Aéronautique, Paris, France), and D. Kaplan (Engins MATRA, S.A., Vélizy-Villacoublay, Yvelines, France). *COSPAR, Plenary Meeting, 20th, Tel Aviv, Israel, June 7-18, 1977, Paper.* 22 p. 29 refs.

A Spacelab facility for studying the effect of space flight on two primates is proposed. Systems involving food and water delivery, blood plasma sampling and blood stream infusion, and urine and feces collection are described. Monitoring and data collection schedules are summarized, and possible experiments are discussed. M.L.

A77-45799 * # **Body composition changes in monkeys during long-term exposure to high acceleration fields.** N. Pace, D. F. Rahlmann, A. M. Kodama (California, University, Berkeley, Calif.), and A. H. Smith (California, University, Davis, Calif.). *COSPAR, Plenary Meeting, 20th, Tel Aviv, Israel, June 7-18, 1977, Paper.* 6 p. 16 refs. Grants No. NGL-05-003-024; No. NGR-05-004-008.

Adult male pig-tailed monkeys, weighing 10-14 kg, were subjected to continuous centrifuging stress for 7 months in acceleration fields up to 2.5 g. In vivo analytical techniques were used to evaluate parameters of body composition, body-fluid distribution, and hematology. Statistically significant losses in total body mass, lean body mass, total body water, extracellular water content and interstitial water content proportional to the level of high g were demonstrated. B.J.

A77-45804 # **Comparative study of lesions in the nervous system related to heavy ions - Accelerator and stratospheric flight research.** C. Nogues, A. Pfister, and R. Kayser. *COSPAR, Plenary Meeting, 20th, Tel Aviv, Israel, June 7-18, 1977, Paper.* 10 p. 6 refs.

The ability of heavy ions to cause neural lesions was studied by subjecting rats to irradiation by a flux of 200 to 300 carbon-12 heavy ions/sq mm. Histological observations of the cerebellum and other parts of the brain by optical and electron microscopy reveal vacuole formation, changes in the cytoplasm of Purkinje and granular cells, and modifications of lysosomes and lipofuscins. The study is intended to help estimate the neural damage caused in humans by exposure to radiation while flying in the stratosphere. M.L.

A77-45839 * # **Effects of experimental hypogravity on peroxidase and cell wall constituents in the dwarf marigold.** S. Siegel, T. Speitel, D. Shiraki, and J. Fukumoto (Hawaii, University, Honolulu, Hawaii). *COSPAR, Plenary Meeting, 20th, Tel Aviv, Israel, June 7-18, 1977, Paper.* 5 p. 10 refs. Contracts No. NAS2-6624; No. NAS2-8687.

Dwarf marigolds grown from seed under experimental hypogravity are modified in lignin content, hemicellulose composition and peroxidase activity. The two conditions used, clinostats and flotation, induced changes differing in magnitude but qualitatively similar. Most responses on clinostats required correction for vertical axis rotational effects, thus limiting the value of these instruments in free-fall simulation. These findings extend earlier observations suggesting that increased peroxidase and decreased lignin are characteristic of growth under experimental hypogravity. (Author)

A77-45855 * # **The roles of body mass and gravity in determining the energy requirements of homoiotherms.** A. H. Smith (California, University, Davis, Calif.). *COSPAR, Plenary Meeting, 20th, Tel Aviv, Israel, June 7-18, 1977, Paper.* 6 p. 17 refs. Grant No. NGR-05-004-008.

Studies by Kleiber and by Brody in the 1930's established the 3/4 power of body weight as the unit of metabolic size for homoiotherms. Later Kleiber conceived of the energy requirement as a composite function, with a thermoregulatory component that is proportional to heat loss, and an antigravity component that is directly proportional to body weight. Maintenance feed requirements (F) have been measured with groups of small animals chronically exposed to several acceleration fields (G). Analysis of the results leads to an arithmetic relationship between the maintenance requirement and acceleration field strength: F sub G = F sub 0 + kG. When the equations are compared for groups of different body size, F sub 0 tends to vary between the 0.4 and 0.5 power of body mass - and k tends to be the same, irrespective of body mass. These findings tend to confirm the Kleiber concept of a composite nature of homoiotherm maintenance requirements. (Author)

A77-45908 **Splanchnic blood flow, O2 consumption, removal of lactate, and output of glucose in highlanders.** A. Capderou, J. Polianski, J. Mensch-Dechene, L. Drouet, G. Antezana, M. Zelter, and A. Lockhart (Instituto Boliviano de Biologia de la Altura, La Paz, Bolivia; Paris XI, Université, Paris, France). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, Aug. 1977, p. 204-210. 50 refs. Research supported by the Instituto Boliviano de Biologia de la Altura and Ministère des Affaires Etrangères.

A77-45909 **Effect of cold and epinephrine on glucose kinetics in dogs.** J. Forichon, M. J. Jomain, G. Dallevet, and Y. Minaire (CNRS, Laboratoire de Thermorégulation, Lyons, France). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, Aug. 1977, p. 230-237. 31 refs. Research supported by the Université de Lyon I and Centre National de la Recherche Scientifique.

A77-45910 **Effect of hyperbaric oxygen exposure on pulmonary clearance of 5-hydroxytryptamine.** E. R. Block and A. B. Fisher (Pennsylvania, University, Philadelphia, Pa.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, Aug. 1977, p. 254-257. 24 refs. Research supported by the U.S. Veterans Administration; Grants No. PHS-HL-15013; No. PHS-HL-15061.

Clearance of 5-hydroxytryptamine (5-HT) by the lungs of normal and vitamin-E deficient rats was evaluated following a 60-min exposure to 100% oxygen at 4 ATA. In control normal rats, fractional clearance of 5-HT was 0.78 plus or minus 0.03; following hyperbaric oxygen exposure, 5-HT clearance was 0.55 plus or minus 0.04. In control vitamin E-deficient rats, 5-HT clearance was 0.85 plus or minus 0.05 and was decreased to 0.46 plus or minus 0.03 following hyperbaric oxygen exposure. The results indicate that depression of pulmonary 5-HT clearance occurs in rats due to hyperoxia and is potentiated by vitamin E deficiency. This represents a reversible alteration of lung function which requires vitamin E for complete recovery. B.J.

A77-45911 **Effects of water immersion on lung volumes - Implications for body composition analysis.** R. N. Girandola, R. A. Wiswell, J. G. Mohler, G. T. Romero, and W. S. Barnes (Southern California, University, Los Angeles, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, Aug. 1977, p. 276-279. 27 refs. Grant No. NIH-RR-07012-09.

A77-45912 **Glycogen, lactate, and alanine changes in muscle fiber types during graded exercise.** K. M. Baldwin, P. J. Campbell, and D. A. Cooke (California, University, Irvine, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, Aug. 1977, p. 288-291. 27 refs. Research supported by the American Heart Association.

A77-45913 **Diaphragmatic function during immersion.** V.-D. Minh, G. F. Dolan, P. G. Linaweaver, P. J. Friedman, R. G. Konopka, and B. B. Brach (California, University; U.S. Navy, School of Medicine and Submarine Development, San Diego, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, Aug. 1977, p. 297-301. 22 refs. Navy Grant No. M-4306-02

A77-45914 **Effect of training on the response of plasma glucagon to exercise.** F. Gyntelberg, M. J. Rennie, R. C. Hickson, and J. O. Holloszy (Washington University, St. Louis, Mo.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, Aug. 1977, p. 302-305. 21 refs.

A77-45915 **Recurrent heat exposure Enzymatic responses in resting and exercising men.** R. P. Francesconi, J. T. Maher, G. D. Bynum, and J. W. Mason (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.; U. S. Army, Walter Reed Army Institute of Research, Washington, D.C.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, Aug. 1977, p. 308-311. 27 refs.

A77-45916 **Hematologic responses to carbon monoxide and altitude - A comparative study.** M. F. Thomas and D. G. Penney (Illinois, University, Chicago, Ill.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 43, Aug. 1977, p. 365-369. 21 refs. Grant No. NIH-HL-16367-01.

Groups of 40- and 90-day-old male albino rats were exposed to 500 ppm CO and simulated altitude (15,000 ft). Resulting hematological changes were monitored after 1 day, 1 wk, 3-4 wk, and 9-11 wk of exposure. It was found that the effects of CO and altitude although similar in several respects (i.e., with regard to hemoglobin concentration, hematocrit ratio, and mean corpuscular hemoglobin concentration) differ with respect to red cell 2,3-diphosphoglycerate. B.J.

A77-45919 # **Participation of erythrocytes in hemocoagulation and fibrinolysis processes in healthy people (Uchast' eritrotsitiv u protsesakh gemokoaguliatsii ta fibrinolizu u zdorovikh osib).** G. O. Bilits'ka and L. P. Musienko (Kiivs'kii Medichnii Institut, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 23, May-June 1977, p. 323-328. 31 refs. In Ukrainian.

The participation of erythrocytes in hemocoagulation and fibrinolysis was studied in 34 healthy people. Some parameters of hemocoagulation and fibrinolysis in plasma were studied with respect to the effects of whole and diluted (1:10) hemolysates of erythrocytes. The ruptured erythrocytes of healthy people are confirmed to contain factors accelerating thromboplastino- and thrombinopoiesis, namely: fibrinogen-like, fibrin-stabilizing and antiheparinic factors; antiplasmins were found in a certain proportion of healthy people. No correlation is observed between the activity of the erythrocytic hemocoagulation and fibrinolysis factors, and the amount of erythrocytes in 1 cu cm of human blood from healthy individuals. A complex system of methods is recommended for studying the coagulating properties of erythrocytes under clinical conditions. (Author)

A77-45920 # **Effect of electric fields of various intensities and with frequencies common in industry on the balance and metabolism of copper, molybdenum and iron in laboratory animals (Vpliv elektrichnogo polia promislovoi chastoti riznoi napruzhenosti na balans i obmin midi, molibdenu ta zaliza v organizmi laboratornikh tvarin).** I. P. Koziarin, I. A. Mikhaliuk, and L. D. Fesenko (Kiivs'kii Medichnii Institut, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 23, May-June 1977, p. 369-373. 6 refs. In Ukrainian.

A77-45921 # **A device for sampling alveolar air (Pristrii dlia vidboru prob al'veoliarnogo povitria).** M. M. Filipov (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 23, May-June 1977, p. 421, 422. 6 refs. In Ukrainian.

A77-46380 # ***Some results of an analysis of the rotation of* the human body in space (Nekotorye rezul'taty issledovaniia vrashcheniia cheloveka v prostranstve).** G. G. Bebenin and Iu. N. Glazkov. *Kosmicheskie Issledovaniia,* vol. 15, July-Aug. 1977, p. 533-539. In Russian.

A dynamic biomechanical model of the human body is proposed for studying the rotational motion of the human body about its center of mass in free space, assuming that the human body is made to rotate solely by moving the arms and legs. In the model proposed, the human body is broken down into an 'immobile' torso (including the head) and mobile extremities (including cameras, tools, or other objects that might be carried at the time). Some results of a computer-aided analysis of the model are discussed. A general approach to the synthesis of the astronauts system of motion control is outlined, where allowance is made for the influence of perturbing motions generated by the extremities. V.P.

A77-46398 * **An ancient divergence among the bacteria.** W. E. Balch, L. J. Magrum, G. E. Fox, R. S. Wolfe, and C. R. Woese (Illinois, University, Urbana, Ill.). *Journal of Molecular Evolution,* vol. 9, Aug. 5, 1977, p. 305-311. 24 refs. NSF Grants No. PCM-74-15227; No. PCM-76-02652; Grants No. NsG-7044; No. PHS-AI-12277.

The 16S ribosomal RNZs from two species of met methanogenic bacteria, the mesophile Methanobacterium ruminantium and the thermophile Methanobacterium thermoautotrophicum, have been characterized in terms of the oligonucleotides produced by digestion with T1 ribonuclease. These two organisms are found to be sufficiently related that they can be considered members of the same genus or family. However, they bear only slight resemblance to 'typical' Procaryotic genera; such as Escherichia, Bacillus and Anacystis. The divergence of the methanogenic bacteria from other bacteria may be the most ancient phylogenetic event yet detected - antedating considerably the divergence of the blue green algal line for example, from the main bacterial line. (Author)

A77-46399 **The role of sulphur in chemical evolution.** F. Raulin and G. Toupance (Paris XII, Université, Créteil, Val-de-Marne, France). *Journal of Molecular Evolution,* vol. 9, Aug. 5, 1977, p. 329-338. 45 refs.

The theory that sulfur may have played an important role, primarily as an energy converter, during the initial stages of chemical evolution is investigated. Astrophysical, geological, and biological data show that sulfur 1) took part in stellar evolution, 2) is now present in large quantities in the earth, 3) plays a crucial role in metabolism. It is suggested that in the form hydrogen sulfide (H2S) the prebiotic formation of several volatile S-containing compounds may have occurred during the gaseous phase of the primitive atmosphere with a molar ratio of approximately 10 to the -2nd. These include thiols, sulfides, with an additional reaction of alkanethiols on malonic nitriles, causing the syntheses of thioethers and iminothioesters. It is felt that a ratio may have been reached which did not inhibit the additional formation of reactive products such as unsaturated nitriles, formed in the absence of H2S. It is posited that iminothioesters (considered the precursors of thioethers) and thioethers were important factors in prebiochemical evolution. S.C.S.

A77-46400 * **A comment on methanogenic bacteria and the primitive ecology.** C. R. Woese (Illinois, University, Urbana, Ill.). *Journal of Molecular Evolution,* vol. 9, Aug. 5, 1977, p. 369-371. 8 refs. NASA-NSF-supported research.

As the phenotype of methanogenic bacteria is suggested to have been one of the major factors creating a dynamic balance between CO2 and CH4 in the primitive atmosphere, these organisms are thought to be very ancient. Their antiquity may be further postulated by comparative characterization of their ribosomal RNA. Accepting this antiquity, it is concluded that a carbon-dioxide-methane cycle, driven by photosynthesis, was the major carbon cycle in primitive ecology, and that photosynthesis and methanogens were thus contemporaneous. S.C.S.

A77-46446 **Control strategies in the eye-head coordination system.** P. Morasso, G. Sandini, V. Tagliasco, and R. Zaccaria (Genova, Università, Genoa, Italy). *IEEE Transactions on Systems, Man, and Cybernetics,* vol. SMC-7, Sept. 1977, p. 639-651. 33 refs. Research supported by the Consiglio Nazionale delle Ricerche.

The aim of this paper is to outline a model of the eye-head system and some of its control strategies. To formulate such a model, the eye-head system was stimulated with random or periodic visual targets. Coupling between the eye and head motor commands was evident in the experiments performed, and this was also found to be the case for acoustic and tactile stimuli. Further experiments were performed to investigate whether the central nervous system (CNS) would be able to overcome the relative lack of flexibility shown by the model of the eye-head control system initially proposed. These experiments, in which it was required to execute independent eye-head movements towards two simultaneous targets (visual and acoustic), showed an impaired performance, indicating that an overcoming action by the CNS is not always possible. The findings are interpreted in terms of an interaction between a 'hardware' low-level controller and a 'software' high-level decisionmaker. (Author)

A77-46549 **A study of the human heart as a multiple dipole source. IV - Left ventricular hypertrophy in the presence of right bundle branch block.** J. H. Holt, Jr., A. C. L. Barnard, and J. O. Kramer, Jr. (Alabama, University; U.S. Veterans Administration Hospital, Birmingham, Ala.). *Circulation,* vol. 56, Sept. 1977, p. 391-394. 14 refs. Research supported by the U.S. Veterans Administration; Grants No. NIH-HE-11310; No. NIH-RR-00145.

This paper deals with the assessment of an advanced electrocardiographic method called multiple dipole (MDECG) used for the determination of left ventricular hypertrophy (LVH) in patients with right bundle branch block (RBBB). Statistics taken from a group of patients and subjects are discussed and compared to corresponding results obtained by the conventional 12-lead ECG method. The results of the study show that the MDECG method diagnoses LVH in the presence of a RBBB with a sensitivity of 93 percent, and a specificity of 96 percent, a significant improvement over the results obtained by the standard ECG method. S.C.S.

A77-46555 # **Some experimental aspects of research on the biomechanics of knees and forearms (Unele aspecte experimentale ale cercetarilor privind biomecanica genunchiului si antebratului).** I. Constantinescu (Bucuresti, Institutul Politehnic, Bucharest, Rumania) and D. Antonescu (Institutul Medico-Farmaceutic, Bucharest, Rumania). *Studii si Cercetari de Mecanica Aplicata,* vol. 36, Jan.-Feb. 1977, p. 129-136. In Rumanian.

Equipment and techniques for carrying out experimental studies of the response of knee ligaments and forearm interosseal membrane to stress are described and discussed. Straingaging fixtures and testing hardware are described and illustrated. The role of the interosseal membrane in limiting pronation/supination movements is investigated. Applications in medicine, in the aerospace and vehicular industries, and in household and sports domains are envisaged. R.D.V.

A77-46593 **An abnormal early diastolic impedance waveform - A predictor of poor prognosis in the cardiac patient.** M. U. Ramos (Boston University, Medical Center, Boston, Mass.). *American Heart Journal,* vol. 94, Sept. 1977, p. 274-281. 14 refs. Research supported by the Bush Foundation.

A retrospective analysis made on 81 patients who were subjected to the new method of non-invasive evaluation of various cardiovascular functions is presented. The procedure of analysis of the patients is described along with a detailed survey and discussion of the results obtained. In 30 of the patients who died, 50 percent showed an unusual early diastolic wave form in the impedance cardiographic tracing. It was concluded that this may be used as a predictor for functional disability or death. S.C.S.

A77-46594 **The electrocardiographic response to maximal treadmill exercise of asymptomatic men with left bundle branch block.** J. E. Whinnery, V. F. Froelicher, Jr., A. J. Stewart, M. R. Longo, Jr., J. H. Triebwasser, and M. C. Lancaster (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *American Heart Journal,* vol. 94, Sept. 1977, p. 316-324. 32 refs.

A77-46595 **Echocardiographic features of combined membranous subaortic stenosis and acquired calcific aortic valvulopathy.** P. G. Hess, N. C. Nanda, J. A. DeWeese, W. C. Reeves, and R. Gramiak (Rochester, University; Strong Memorial Hospital, Rochester, N.Y.). *American Heart Journal,* vol. 94, Sept. 1977, p. 349-352. 10 refs.

A77-46596 **Clinical manifestations of mitral annulus calcification, with emphasis on its echocardiographic features.** I. A. D'Cruz, H. C. Cohen, R. Prabhu, V. Bisla, and G. Glick (Michael Reese Hospital and Medical Center; Chicago, University, Chicago, Ill.). *American Heart Journal,* vol. 94, Sept. 1977, p. 367-377. 36 refs. Research supported by the Sigmund E. Edelstone Heart Fund and Michael Reese Medical Research Institute Council.

A77-46602 **EEG correlates of signal rate, time in task and individual differences in reaction time during a five-stage sustained attention task.** A. Gale, R. Davies, and A. Smallbone (University of Wales Institute of Science and Technology, Cardiff, Wales). *Ergonomics,* vol. 20, July 1977, p. 363-376. 41 refs.

A77-46603 **The influence of 'biorhythm' on accident occurrence and performance.** T. M. Khalil and C. N. Kurucz (Miami, University, Coral Gables, Fla.). *Ergonomics,* vol. 20, July 1977, p. 389-398. 11 refs.

A77-46844 * # **CO2 and humidity removal system for extended Shuttle missions - CO2, H2O, and trace contaminant equilibrium testing.** S. H. Davis (Rice University, Houston, Tex.) and L. D. Kissinger (NASA, Johnson Space Center, Houston, Tex.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-4.* 6 p. Members, $1.50; nonmembers, $3.00.

The equilibrium relationships for the co-adsorption of CO2 and H2O on an amine coated acrylic ester are presented. The equilibrium data collection and reduction techniques are discussed. Based on the equilibrium relationship, other modes of operation of systems containing HS-C are discussed and specific space applications for HS-C are presented. Equilibrium data for 10 compounds which are found as trace contaminants in closed environments are also presented. (Author)

A77-46847 # **Dynamic analysis environmental control systems the 'EASY' way.** A. J. P. Lloyd and V. K. Rajpaul (Boeing Aerospace Co., Seattle, Wash.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-6.* 11 p. Members, $1.50; nonmembers, $3.00. USAF-sponsored research.

The Environmental Control Analysis System (EASY), a computer program for simulating and analyzing the dynamics of complex aircraft cabin environments, is discussed. The program defines a system by specifying the topology of a network of predefined component models. Analysis capabilities include determination of steady-state operating points, nonlinear simulation, generation of linearized models, stability analyses, and optimal linear regulator design. The overall organization of the EASY program is presented, and component models in the program library are described. These include heat exchangers, compressors, turbines, fans, water separators, and dust separators, as well as a number of controllers, such as pressure regulators, flow controllers, water separator anti-ice controls, cabin temperature controllers, cabin pressure controllers, and cooling effect sensors. A simple example showing how systems can be modeled is given. (Author)

A77-46859 * # **A closed life-support system for space colonies.** **R. D. Johnson** (NASA, Ames Research Center, Moffett Field, Calif.), **H. J. Jebens** (Wisconsin, University, Platteville, Wis.), and H. C. Sweet (Florida Technical University, Orlando, Fla.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-18.* 7 p. 13 refs. Members, $1.50; nonmembers, $3.00.

In 1975, a system design study was performed to examine a completely self-contained system for a permanent colony of 10,000 inhabitants in space. Fundamental to this design was the life support system. Since resupply from earth is prohibitive in transportation costs, it was decided to use a closed system with the initial supply of oxygen coming from processing of lunar ores, and the supply of carbon, nitrogen and hydrogen from earth. The problem of life support was treated starting with the nutritional and metabolic requirements for the human population, creating a food and water chain sufficient to supply these demands, adding the additional requirements for the animal and plant sources in the food chain, feeding back useful waste products, supplying water as required from different sources, and closing the loop by processing organic wastes into CO2. This concept places the burden of the system upon plants for O2 generation and waste processing the CO2 generation. (Author)

A77-46860 * # **Development of a three-man preprototype CO2 collection subsystem for spacecraft application.** F. H. Schubert, R. A. Wynveen (Life Systems, Inc., Cleveland, Ohio), P. D. Quattrone (NASA, Ames Research Center, Moffett Field, Calif.), and R. D. Marshall. *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-19.* 8 p. 11 refs. Members, $1.50; nonmembers, $3.00.

Future long-duration manned space missions will require regenerable carbon dioxide (CO2) collection concepts such as the Electrochemical Depolarized CO2 Concentrator (EDC). A three-man-capacity preprototype CO2 Collection Subsystem (CS-3) is being developed for eventual flight demonstration as part of the Air Revitalization System (ARS) of the Regenerative Life Support Evaluation (RLSE) experiment. The CS-3 employs an EDC to concentrate CO2 from the low partial-pressure levels required of spacecraft atmospheres to high partial-pressure levels needed for oxygen (O2) recovery through CO2 reduction processes. The CS-3 is sized to remove a nominal 3.0 kg/day (6.6 lb/day) of the CO2 to maintain the CO2 partial pressure (pCO2) of the cabin atmosphere at 400 Pa (3 mm Hg) or less. This paper presents the preprototype design, configuration, operation, and projected performance characteristics. (Author)

A77-46861 * # **Improved waste water vapor compression distillation technology.** K. L. Johnson (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.), P. P. Nuccio (D.K. Precision, Inc., Franklin, Park, Ill.), and W. F. Reveley (NASA, Johnson Space Center, Houston, Tex.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-20.* 7 p. Members, $1.50; nonmembers, $3.00.

The vapor compression distillation process is a method of recovering potable water from crewman urine in a manned spacecraft or space station. A description is presented of the research and development approach to the solution of the various problems encountered with previous vapor compression distillation units. The design solutions considered are incorporated in the preliminary design of a vapor compression distillation subsystem. The new design concepts are available for integration in the next generation of support systems and, particularly, the regenerative life support evaluation intended for project Spacelab. G.R.

A77-46862 # **Dynamic membrane hyperfiltration wash water recovery.** B. M. Greenough (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.) and R. L. Goldsmith (Abcor, Inc., Wilmington, Mass.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-21.* 11 p. 19 refs. Members, $1.50; nonmembers, $3.00.

Hyperfiltration as a method of recovering wash water in a spacecraft environment has been studied by various investigators. Recent laboratory investigations of a dynamically formed membrane consisting of hydrous Zr(IV) oxide covered with polyacrylic acid have shown promise for providing long term stable performance at pasteurization temperatures. A summary of these recent investigations is presented along with a description of the development program planned to bring the dynamically formed membrane

technology to hardware maturity. Key development areas that are addressed include the multi-tube hyperfiltration module, the high pressure pump, pressure controls, and the disposition of urea and ammonia. (Author)

A77-46864 * # **Food and medical sample freezer kit concept for Shuttle.** R. J. Copeland (Vought Corp., Dallas, Tex.), J. R. Jaax (NASA, Johnson Space Center, Houston, Tex.), and B. W. Proctor (Rockwell International Corp., Space Div., Houston, Tex.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-23.* 9 p. Members, $1.50; nonmembers, $3.00. Contracts No. NAS9-9912; No. NAS9-13965.

A variety of food and storage of samples can be provided by a Space Shuttle Orbiter Freezer Kit. The proposed concept is an integrated package consisting of four -23 C (-10 F) storage compartments and a Stirling cycle refrigeration unit. The Stirling cycle mechanical refrigeration was selected over alternative systems for superior efficiency and safety. The trade-offs and a conceptual design of the system are presented. (Author)

A77-46865 # **The Spacelab Environmental Control/Life Support Subsystem.** J. Spintig and H. Eckert (Dornier System GmbH, Friedrichshafen, West Germany). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-24.* 7 p. Members, $1.50; nonmembers, $3.00.

The Spacelab Environmental Control/Life Support Subsystem (ECLS) is comprised of two major assemblies: the atmosphere storage and control section (ASCS) and the atmosphere revitalization section (ARS). The ASCS furnishes a two-gas atmosphere in the Spacelab cabin compatible with the atmosphere of the orbiter crew compartment. Primary functions provided by the ASCS are: (1) storage and supply of gaseous nitrogen required for leakage makeup and experiment airlock operations, (2) supply of gaseous oxygen transferred from the orbiter and required for metabolic consumption and leakage makeup, and (3) control of the Spacelab cabin total pressure and oxygen partial pressure for an earthlike atmosphere. The ARS maintains a shirtsleeve conditioned environment for the crew and a temperature-controlled atmosphere for avionics equipment and experiments inside the module. Major functions provided by the ARS are: (1) control of cabin temperature and humidity; (2) air ventilation and distribution; (3) carbon dioxide, odor, and trace-contaminant removal; (4) storage of condensate; and (5) avionics and experiment cooling. This paper describes the ECLS hardware design and the subsystem functions; test results are also compared with analyses. (Author)

A77-46866 * # **A Representative Shuttle Environmental Control System.** H. F. Brose, M. D. Stanley (United Technologies Corp., Hamilton Standard Div., Windsor Locks, Conn.), and J. C. LeBlanc (NASA, Johnson Space Center, Houston, Tex.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-25.* 8 p. Members, $1.50; nonmembers, $3.00.

The Representative Shuttle Environmental Control System (RSECS) provides a ground test bed to be used in the early accumulation of component and system operating data, the evaluation of potential system improvements, and possibly the analysis of Shuttle Orbiter test and flight anomalies. Selected components are being subjected to long term tests to determine endurance and corrosion resistance capability prior to Orbiter vehicle experience. Component and system level tests in several cases are being used to support flight certification of Orbiter hardware. These activities are conducted as a development program to allow for timeliness, flexibility, and cost effectiveness not possible in a program burdened by flight documentation and monitoring constraints. (Author)

A77-46867 # **Waste management for Shuttle.** R. W. Murray, J. K. Mangialardi (GE Valley Forge Space Center, Philadelphia, Pa.), O. T. Stoll, and G. E. Bazell (Rockwell International Corp., Space Div., Downey, Calif.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-26.* 6 p. Members, $1.50; nonmembers, $3.00.

The article describes the waste collector subsystem developed for the Shuttle Orbiter which is basically a three-fold operation isolating materials of different contamination levels. Each of the operations is discussed: the wet trash stowage (food bags, tissues, soiled clothing, etc.), the waste collector subsystem operating in four modes for the separate processing of fluid and solid wastes, and the waste water storage tanks of the bellows type. The contingency system is described in detail, along with a brief review of the testing procedures. S.C.S.

A77-46868 * # **The development and testing of a regenerable CO2 and humidity control system for Shuttle.** A. M. Boehm (United Technologies Corp., Hamilton Standard Div., Windsor Locks, Conn.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-27.* 10 p. Members, $1.50; nonmembers, $3.00. Contract No. NAS9-13624.

A regenerable CO2 and humidity control system is presently being developed for potential use on Shuttle as an alternate to the baseline lithium hydroxide (LiOH) system. The system utilizes a sorbent material (designated 'HS-C') to adsorb CO2 and water vapor from the cabin atmosphere and desorb the CO2 and water vapor overboard when exposed to a space vacuum. Continuous operation is achieved by utilizing two beds which are alternately cycled between adsorption and desorption. This paper presents the significant hardware development and test accomplishments of the past year. A half-size breadboard system utilizing a flight configuration canister was successfully performance tested in simulated Shuttle missions. A vacuum desorption test provided considerable insight into the desorption phenomena and allowed a significant reduction of the Shuttle vacuum duct size. The fabrication and testing of a flight prototype canister and flight prototype vacuum valves have proven the feasibility of these full-size, flight-weight components. (Author)

A77-46869 * # **Investigation of low temperature carbon monoxide oxidation catalysts.** R. B. Jagow, T. Katan (Lockheed Missiles and Space Co., Sunnyvale, Calif.), C. D. Ray (NASA, Marshall Space Flight Center, Huntsville, Ala.) and R. A. Lamparter. *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-28.* 17 p. 21 refs. Members, $1.50; nonmembers, $3.00.

Carbon monoxide generation rates related to the use of commerical equipment in Spacelab, added to the normal metabolic and subsystem loads, will produce carbon monoxide levels in excess of the maximum allowable concentration. In connection with the sensitivity of carbon monoxide oxidation catalysts to poisoning at room temperature, catalysts for an oxidation of carbon monoxide at low temperatures have been investigated. It was found that platinum and palladium are the only effective room temperature catalysts which are effective at 333 K. Hopcalite was ineffective at ambient temperatures, but converted CO with 100 percent efficiency at 333 K. Poisoning tests showed the noble metal catalysts to be very sensitive, and Hopcalite to be very resistant to poisoning. G.R.

A77-46871 * # **Development of an advanced combined iodine dispenser/detector.** J. B. Lantz, F. C. Jensen (Life Systems, Inc., Cleveland, Ohio), H. E. Winkler (NASA, Johnson Space Center, Houston, Tex.), and F. A. Schubert. *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-30.* 8 p. 7 refs. Members, $1.50; nonmembers, $3.00.

Injection of iodine into water is widely used to control microbial growth. An entirely automated device for I2 injection has been developed for spacecraft application. Transfer of I2 into the water from a concentrated form is controlled electrochemically via

feedback from an integrated photometric I2 level detector. All components are contained within a package weighing only 1.23 kg (2.7 lb) dry, which occupies only 1213 cu cm (74 cu in) of space, and which has the capacity to iodinate 10,900 kg (24,000 lb) of water of 5 ppm. These features exceed design specifications. The device performed satisfactorily during extended testing at variable water flow rates and temperatures. Designed to meet specifications of the Shuttle Orbiter, the device will find application in the regenerative water systems of advanced spacecraft. (Author)

A77-46872 # **Development of a three-man preprototype Independent Air Revitalization Subsystem /IARS/.** R. D. Marshall, R. R. Woods, T. M. Hallick, and F. H. Schubert (Life Systems, Inc., Cleveland, Ohio). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-31.* 9 p. 13 refs. Members, $1.50; nonmembers, $3.00.

A three-man preprototype Independent Air Revitalization Subsystem (IARS) was developed for eventual flight demonstration for the Regenerative Life Support Evaluation (RLSE) program. The IARS consists of a water vapor electrolysis module (WVEM) to generate oxygen from water vapor contained in the cabin air, and an electrochemical depolarized carbon dioxide concentrator module (EDCM) to remove CO2 from the cabin air. The removal of water vapor from the cabin air results in partial humidity control. The IARS is sized to remove 3.0 kg/d (6.6 lb/day) of CO2 and generate 2.51 kg/d (5.52 lb/day) of O2 to maintain cabin CO2 partial pressure and O2 partial pressure at 400 Pa (3.0 mm Hg) and 22.1 kPa (3.2 psia), respectively. This paper presents the preprototype design, configuration, operation, and projected performance characteristics. (Author)

A77-46873 # **Space station prototype advanced life support system hardware testing.** R. P. Reysa (Boeing Aerospace Co., Houston, Tex.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-32.* 16 p. 10 refs. Members, $1.50; nonmembers, $3.00.

The test facility developed for evaluating the subsystem and integrated system performance of the Space Station Prototype (SSP) Regenerative Environmental Control and Life Support System is described. Included are descriptions of the laboratory set-up, and the subsystems for oxygen generation, CO2 removal, cabin temperature and humidity control, and CO2 reduction. The Atmosphere Revitalization Group (ARG) is discussed in terms of its basic structure, shower facility, and vapor compression distillation. Evaluations of the test results, major problems encountered, and plans for future testing are included. S.C.S.

A77-46875 # **Development status of a preprototype water electrolysis system.** A. C. Erickson and J. H. Russell (General Electric Co., Wilmington, Mass.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-34.* 8 p. Members, $1.50; nonmembers, $3.00.

A preprototype oxygen generation system for NASA's regenerative life support evaluation program is currently being developed by an American company. The system will supply up to 5.44 kg/day of oxygen. The solid polymer electrolyte used is a solid plastic sheet of perfluorinated sulfonic acid polymer about 0.030 cm thick. This polymer, when saturated with water, is an excellent ionic conductor and serves as the only electrolyte required for water electrolysis. There are no free acid or alkaline liquids; water is the only liquid in the system. G.R.

A77-46876 * # **Regenerative Life Support Evaluation.** G. N. Kleiner (United Technologies Corp., Hamilton Standard Div., Windsor Locks, Conn.) and C. D. Thompson (NASA, Johnson Space Center, Houston, Tex.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-35.* 10 p. Members, $1.50; nonmembers, $3.00.

This paper describes the development plan and design concept of the Regenerative Life Support Evaluation (RLSE) planned for flight testing in the European Space Agency Spacelab. The development plan encompasses the ongoing advanced life support subsystem and a systems integration effort to evolve concurrently subsystem concepts that perform their function and can be integrated with other subsystems in a flight demonstration of a regenerative life support system. The design concept for RLSE comprises water-electrolysis O2 generation, electrochemically depolarized CO2 removal, and Sabatier CO2 reduction for atmosphere regeneration, urine vapor-compression distillation, and wash-water hyperfiltration for waste-water recovery. The flight demonstration by RLSE is an important step in qualifying the regenerative concepts for life support in space stations. (Author)

A77-46877 # **Preliminary design of a preprototype Water Quality Monitor.** S. J. West, M. S. Frant, and S. H. Franks (Orion Research, Inc., Cambridge, Mass.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-36.* 6 p. Members, $1.50; nonmembers, $3.00.

As part of the Regenerable Life Support Evaluation (RLSE), which is being carried out at the NASA Johnson Space Center, a four-parameter Water Quality Monitor (WQM) is in the preprototype stage. Utilizing continuous chemical measuring techniques specifically developed for this application, the WQM will determine pH, specific conductance, ammonia concentration, and total organic carbon (TOC) content in water which has been recovered in the RLSE system. Miniature components - valve manifold, peristaltic pump, inorganic carbon stripper, UV oxidation chamber, and sensors - have been designed for zero leakage, minimum volume hold-up, low volume weight and power, and maximum reliability. The system will respond within 5 min. to non-biological contamination of the water and consumes only 150 ml of expendable reagents per day. (Author)

A77-46884 * # **Hollow fiber membranes for advanced life support systems.** G. J. Roebelen, Jr. (United Technologies Corp., Hamilton Standard Div., Windsor Locks, Conn.) and M. J. Lysaght (Amicon Corp., Lexington, Mass.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-43.* 11 p. Members, $1.50; nonmembers, $3.00. Contract No. NAS9-14682.

This paper describes an investigation of the practicability of utilizing hollow fiber membranes in vehicular and portable life support system applications. A preliminary screening of potential advanced life support applications resulted in the selection of five applications for feasibility study and testing. As a result of the feasibility study and testing, three applications, heat rejection, deaeration, and bacteria filtration, were chosen for breadboard development testing. Breadboard hardware has been manufactured and tested, and the physical properties of the three hollow fiber membrane assemblies applicable to use aboard future spacecraft have been characterized. (Author)

A77-46885 * # **Space construction base support requirements for environmental control and life support systems.** R. J. Thiele, T. C. Secord, and G. L. Murphy (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-44.* 10 p. 11 refs. Members, $1.50; nonmembers, $3.00. Contract No. NAS9-14958.

A Space Station analysis study is being performed for NASA which identifies cost-effective Space Station options that can provide a space facility capable of performing space construction, space manufacturing, cosmological research, earth services, and other functions. A space construction base concept for the construction of

large structures, such as those needed to implement satellite solar power for earth usage, will be used as a basis for discussing requirements that impact the design selection, level of integration, and operation of environmental control and life support systems (ECLSS). The space construction base configuration also provides a basic Space Station facility that can accommodate biological manufacturing modules, ultrapure glasses manufacturing modules, and modules for other services in a building-block fashion. Examples of special problems that could dictate hardware required to augment the basic ECLSS for autonomous modules will be highlighted. Additionally, overall intravehicular (IVA) and extravehicular (EVA) activities and requirements that could impact the basic station ECLSS degree of closure are discussed. (Author)

A77-46888 * # **Water and waste water reclamation in a 21st century space colony.** H. J. Jebens (Wisconsin, University, Platteville, Wis.) and R. D. Johnson (NASA, Ames Research Center, Biosystems Div., Moffett Field, Calif.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-47.* 8 p. 27 refs. Members, $1.50; nonmembers, $3.00.

The paper presents the results of research on closed-life support systems initiated during a system design study on space colonization and concentrates on the water and waste water components. Metabolic requirements for the 10,000 inhabitants were supplied by an assumed earth-like diet from an intensive agriculture system. Condensed atmospheric moisture provided a source of potable water and a portion of the irrigation water. Waste water was reclaimed by wet oxidation. The dual-water supply required the condensation of 175 kg/person-day of atmospheric water and the processing of 250 kg/person-day of waste water. (Author)

A77-46891 * # **Wash water reclamation technology for advanced manned spacecraft.** D. F. Putnam (Umpqua Research Co., Myrtle Creek, Ore.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-50.* 9 p. 8 refs. Members, $1.50; nonmembers, $3.00. Contract No. NAS2-8239.

The results of an analytical study and assessment of state-of-the-art wash water reclamation technology for advanced manned spacecraft is presented. All non-phase-change unit operations, unit processes, and subsystems currently under development by NASA are considered. Included among these are: filtration, ultrafiltration, carbon adsorption, ion exchange, chemical pretreatment, reverse osmosis, hyperfiltration, and certain urea removal techniques. Performance data are given together with the projected weights and sizes of key components and subsystems. In the final assessment, a simple multifiltration approach consisting of surface-type cartridge filters, carbon adsorption and ion exchange resins receives the highest rating for six-man orbital missions of up to 10 years in duration. (Author)

A77-46894 * # **A portable personal cooling system for mine rescue operations.** B. Webbon, B. Williams, P. Kirk (NASA, Ames Research Center, Moffett Field, Calif.), W. Elkins (Acurex Corp., Mountain View, Calif.), and R. Stein (U.S. Bureau of Mines, Pittsburgh, Pa.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-53.* 7 p. 12 refs. Members, $1.50; nonmembers, $3.00. Research supported by the U.S. Bureau of Mines.

Design of a portable personal cooling system to reduce physiological stress in high-temperature, high-humidity conditions is discussed. The system, based on technology used in the thermal controls of space suits, employs a combination of head and thoracic insulation and cooling through a heat sink unit. Average metabolic rates, heart rates, rectal temperature increase and sweat loss were monitored for test subjects wearing various configurations of the cooling system, as well as for a control group. The various arrangements of the cooling garment were found to provide significant physiological benefits; however, increases in heat transfer rate of the cooling unit and more effective insulation are suggested to improve the system's function. J.M.B.

A77-46895 * # **Development of a prototype regenerable carbon dioxide absorber for portable life support systems.** M. Onischak and B. Baker (Energy Research Corp., Danbury, Conn.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-54.* 3 p. Members, $1.50; nonmembers, $3.00. Contract No. NAS2-9265.

The design and development of a prototype carbon dioxide absorber using potassium carbonate (K2CO3) is described. Absorbers are constructed of thin, porous sheets of supported K2CO3 that are spirally wound to form a cylindrical reactor. Axial gas passages are formed between the porous sheets by corrugated screen material. Carbon dioxide and water in an enclosed life support system atmosphere react with potassium carbonate to form potassium bicarbonate. The potassium carbonate is regenerated by heating the potassium bicarbonate to 150 C at ambient pressure. The extravehicular mission design conditions are for one man for 8 h. Results are shown for a subunit test module investigating the effects of heat release, length-to-diameter ratio, and active cooling upon performance. The most important effect upon carbon dioxide removal is the temperature of the potassium carbonate. (Author)

A77-46899 * # **Removal of contaminant gases from an electrolytic urine pretreatment process.** G. V. Colombo and D. F. Putnam (Umpqua Research Co., Myrtle Creek, Ore.). *ASME, SAE, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, 7th, San Francisco, Calif., July 11-14, 1977, ASME Paper 77-ENAs-61.* 7 p. Members, $1.50; nonmembers, $3.00. Contract No. NAS9-14217.

The effluent gas stream from an electrolytic urine pretreatment process was analyzed by gas chromatography-mass spectroscopy and wet chemical methods to determine its composition. The major constituents were identified as: hydrogen, carbon dioxide, oxygen, nitrogen, water vapor, and chlorine. The trace impurities were chlorinated light hydrocarbons, and a number of other organic impurities in the low ppm range. Several methods of removing all of the undesirable gases to levels acceptable for return to a space cabin atmosphere were investigated experimentally. A subsystem concept comprised of the following sequential unit processes and operations was successfully demonstrated: (1) raw urine scrubbing, (2) silica gel sorption, (3) dilution with cabin air, and (4) catalytic oxidation. (Author)

A77-47251 **Involvement of cAMP-dependent protein kinase in the regulation of heart contractile force.** S. L. Keely and J. D. Corbin (Vanderbilt University, Nashville, Tenn.). *American Journal of Physiology,* vol. 233, Aug. 1977, p. H269-H275. 39 refs. Grants No. PHS-HL-19181; No. PHS-AM-15988; No. PHS-AM-07462.

A77-47720 # **Determination of intellectual system (Viznachennia intelektual'noi sistemi).** O. A. Bratko and T. Gergei. *Avtomatika,* May-June 1977, p. 64-75. In Ukrainian.

The following terms in models of intelligence are defined: 'artificial' (realized in robots and computers), 'natural' (realized in living beings) and 'social' (arising in the corresponding social structures). The logical interrelation of the notions 'intellect', 'system', 'language', 'information', 'sign model', 'cognition', knowledge' is substantiated. Their definitions as well as those of other notions necessary for substantiating a single approach to a theory of intellectual systems are specified. (Author)

A77-47750 **Local oxygen tension and spike activity of the cerebral grey matter of the rat and its response to short intervals of O2 deficiency or CO2 excess.** H. Metzger and S. Heuber (Hannover, Medizinische Hochschule, Hanover, West Germany). *Pflügers Archiv,* vol. 370, no. 2, 1977, p. 201-209. 36 refs. Research supported by the Deutsche Forschungsgemeinschaft.

A77-47796 **Ultradian rhythms in urine flow in waking humans.** P. Lavie (Aba Khoushy School of Medicine, Haifa, Israel) and D. F. Kripke (California, University, San Diego, Calif.). *Nature*, vol. 269, Sept. 8, 1977, p. 142-144. 13 refs. Research supported by the Israel Center for Psychobiology.

A description is presented of two experiments which demonstrate the existence of waking ultradian rhythms in the flow of urine. One experiment was conducted with eight healthy male college students in the age range from 18 to 20 years. The second experiment involved the employment of 12 healthy male college students in the age range from 19 to 25 years. The accumulation of evidence of ultradian rhythms in multiple organismic processes during both sleep and wakefulness suggest that ultradian rhythms reflect an endogenous 'biological hour' of as yet unknown function and origin, similar to the 20-28-h circadian 'biological day'. G.R.

A77-47872 **Lateral interactions and rod intrusion in color flicker.** M. W. von Grünau (Toronto, University, Toronto, Canada). *Vision Research*, vol. 17, no. 8, 1977, p. 911-915. 10 refs. National Research Council of Canada Grants No. A-0001; No. A-0079.

Two superimposed, counterphased, sinusoidally-modulated light patches of different color show luminance flicker, even after equation of the beam fluxes. The residual flicker can be eliminated only by introducing an extra phase difference between the two lights. It is shown that there exist lateral interactions between the systems that mediate this phase difference and that there is a possible rod intrusion. (Author)

A77-47873 **Accuracy of eye position information for motor control.** R. M. Hansen and A. A. Skavenski (Northeastern University, Boston, Mass.). *Vision Research*, vol. 17, no. 8, 1977, p. 919-926. 18 refs. NSF Grant No. BMS-75-18181; Grants No. NIH-EX-01049; No. NIH-EY-0589.

Two-dimensional eye movements were recorded to show that subjects could return their eyes to a reference position following both saccadic movement and slow-phase vestibular nystagmus, suggesting that eye position was signalled accurately during both movement types and that this signal was closely time-linked to saccades. In addition, this signal could be used by naive subjects for oculomotor control without special training. Finally, subjects could strike blows within a few minutes of arc of a target localized only by eye position information, suggesting that motor systems detect eye position to better than 0.5 deg of arc and that large errors in controlling eye position in the dark could be attributed to poor spatial memory. (Author)

A77-47874 **Some observations on temporal coding of color vision - Psychophysical results.** R. A. Young (New York University, New York, N.Y.). *Vision Research*, vol. 17, no. 8, 1977, p. 957-965. 24 refs. Grant No. NIH-16327.

Direction reversal of Benham's disk changes the observed colors, yet leaves constant the magnitude-frequency spectrum of the stimulus, changing only the phase relations between temporal frequencies. Hence, human color channels must be selectively responsive to stimulus temporal phase information. This question was further tested by applying to the eye electrical stimuli composed of sequences of frequency-modulated corneo-positive and negative pulses, which bypass at least some stages of the light-to-spike transfer function. Stimuli with a fast-slow corneonegative pulse frequency sequence elicited phosphenes in the range of yellow to green for the four subjects tested. Stimuli with a slow-fast sequence elicited red-magenta, again for all four subjects. Conflation of previously-derived Benham's disk-like signals for green-yellow and red-magenta with a published impulse function for the visual system resulted in output functions which were compatible with the frequency-time envelopes of the above electrical signals, providing independent support for the results. (Author)

A77-47875 **Stereopsis with and without monocular contours.** W. Richards (MIT, Cambridge, Mass.). *Vision Research*, vol. 17, no. 8, 1977, p. 967-969. 10 refs. Grants No. AF-AFOSR-82102; No. NIH-83673.

Depth perception elicited from random dot stereograms devoid of monocular cues is severely impaired when compared with similar stereograms that reveal the monocular contours. For transient stimuli, monocular contours appear necessary to elicit a range of depth sensations for different disparities, suggesting that monocular cue analysis is an integral component of the stereomechanism. (Author)

A77-47877 **Keeping up on the ground.** J. M. Rolfe (RAF, Training Command, Brampton, Cumb., England). *Aeronautical Journal*, vol. 81, July 1977, p. 281-292. 32 refs.

The factors influencing the value of flight simulators are discussed in terms of cost effectiveness and the development procedures for a sustained, effective training program. The major problems of simulator fidelity are described, including: (1) the amount of motion necessary to make the simulator effective, (2) difficulties in representing the external visual world (with the descriptions of several existing techniques added), and (3) simulation of other traffic in the environment. Factors used to determine the benefits of simulators are identified, such as cost, risk, ecological considerations, training and cost effectiveness, safety, and technological feasibility. A basic training program is outlined with reference to aids and equipment (wall charts, slides, motion pictures, etc.), and the evaluation of such a program (defining objectives, planning and staff selection, and validation of training procedures). S.C.S.

A77-47878 **Developments in mathematical models of human pilot behaviour /The Twentieth Lanchester Memorial Lecture/.** O. H. Gerlach (Delft, Technische Hogeschool, Delft, Netherlands). *Aeronautical Journal*, vol. 81, July 1977, p. 293-305. 64 refs.

Prospects for developing mathematical models of human pilot behavior for the evaluation of aircraft handling qualities are discussed in terms of their ability to predict and measure physiological and psychological reactions to the pilot workload, such as flight monitoring and decision making. Two engineering models are described and evaluated: the cross-over model and the optimal control model with results showing that both models lack a direct connection with the pilot's subjective opinion of the workload involved in a particular situation. A biomorphic model is proposed for the mathematical description of the internal mental processes of data handling and decision making. It is based on a study of pilot behavior, including: the processing of sensed data, decision making, and the actuation of aircraft controls. The model's sampling process, observation and response models, and control law are discussed. S.C.S.

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STAR ENTRIES

N77-30709*# Kentucky Univ., Lexington. Wenner Gren Research Lab.
EFFECTS OF BACKGROUND GRAVITY STIMULI ON GRAVITY-CONTROLLED BEHAVIOR Final Report, 1 Sep. 1972 - 1 Jan. 1976
D. F. McCoy 1 Jan. 1976 18 p refs
(Grant NGR-18-001-068)
(NASA-CR-153404) Avail: NTIS HC A02/MF A01 CSCL 06C

Physiological and developmental effects of altered gravity were researched. The stimulus properties of gravity have been found to possess reinforcing and aversive properties. Experimental approaches taken, used animals placed into fields of artificial gravity, in the form of parabolic or spiral centrifuges. Gravity preferences were noted and it was concluded that the psychophysics of gravity and background factors which support these behaviors should be further explored. Author

N77-30710*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
APPLICATION OF FIREFLY LUCIFERASE ASSAY FOR ADENOSINE TRIPHOSPHATE (ATP) TO ANTIMICROBIAL DRUG SENSITIVITY TESTING
G. L. Picciolo, S. Tuttle, C. G. Schrock, J. W. Deming, M. Barza, L. Wienstein, and E. W. Chappelle Washington Jul. 1977 161 p refs
(NASA-TN-D-8439; G-7703) Avail: NTIS HC A08/MF A01 CSCL 06C

The development of a rapid method for determining microbial susceptibilities to antibiotics using the firefly luciferase assay for adenosine triphosphate (ATP) is documented. The reduction of bacterial ATP by an antimicrobial agent was determined to be a valid measure of drug effect in most cases. The effect of 12 antibiotics on 8 different bacterial species gave a 94 percent correlation with the standard Kirby-Buer-Agar disc diffusion method. A 93 percent correlation was obtained when the ATP assay method was applied directly to 50 urine specimens from patients with urinary tract infections. Urine samples were centrifuged first to that bacterial pellets could be suspended in broth. No primary isolation or subculturing was required. Mixed cultures in which one species was predominant gave accurate results for the most abundant organism. Since the method is based on an increase in bacterial ATP with time, the presence of leukocytes did not interfere with the interpretation of results. Both the incubation procedure and the ATP assays are compatible with automation. Author

N77-30711 Texas Univ. Health Science Center, Houston.
THE APPLICATION OF PATH ANALYSIS TO THE STUDY OF INTERRELATIONS AMONG COMPONENTS OF THE OXYGEN TRANSPORT SYSTEM IN MAN Ph.D. Thesis
Robert Francis Weisberg 1976 331 p
Avail: Univ. Microfilms Order No. 77-9282

Path coefficient analysis of the oxygen transport system in man was done in order to study the relationship of the variance of a biological system compared to the sum of the variances of its components. The transport system was delineated as a compartmental system, and its physiology was summarized under various conditions including health, hypoxia, training and adaptation to disease. Results show that in a properly functioning system, the sum of the variances of the components of the system, far exceeds the variance of the system itself. Dissert. Abstr.

N77-30712 Pennsylvania Univ., Philadelphia.
INERT GAS TRANSFER IN THE BODY: EXPERIMENTAL STUDY AND PERFUSION/DIFFUSION MODELING OF TRANSCUTANEOUS AND GAS CAVITY EXCHANGE RATES Ph.D. Thesis
Jerry Michael Collins 1976 236 p
Avail: Univ. Microfilms Order No. 77-10149

Flux rates for inert gases were measured in anesthetized pigs. The skin, subcutaneous tissue, and peritoneal cavity were investigated. Inert gas transcutaneous efflux rates were studied as a function of skin temperature on the lower abdominal region. Helium flux seemed to be perfusion limited, suggesting its use as an indicator of skin blood flow rate. Flux rates increased with increasing skin temperature. Dissert. Abstr.

N77-30713 Wayne State Univ., Detroit, Mich.
THE RESPONSE OF SPINE MUSCULATURE DURING +G SUB z ACCELERATION Ph.D. Thesis
Stephen Albert Tennyson 1976 197 p
Avail: Univ. Microfilms Order No. 77-9459

Noise free electromyographic signals were acquired during whole body G(z) acceleration, using canine subjects. Pairs of shielded monopolar needle electrodes were sutured into the semispinalis, erector spinae and multifidus muscles of canines. The dogs were then constrained to sit upright in the seat of vertical accelerator and subjected to +G(z) acceleration in the range of 2 to 5g. Recorded runs yielded evidence of muscle activity in all muscle groups monitored. Dissert. Abstr.

N77-30714*# Kanner (Leo) Associates, Redwood City, Calif.
EVALUATION OF STRESS ON A PILOT DURING AGRICULTURAL FLIGHTS BASED ON PHYSIOLOGICAL STUDIES
L. Markiewicz, D. Koradecka, and M. Konarska Washington NASA Jul. 1977 12 p Transl. into ENGLISH from Tech. Lotnicza i Astronaut. (Poland), v. 31, no. 1, 1976 p 13-16 Transl. was announced as A76-20616
(NASA-TT-F-17445) Avail: NTIS HC A02/MF A01 CSCL 06E

An ergonomic analysis of the development of fatigue in a pilot during agricultural work is presented. Selected indicators of physiological activity during flights on PZL-101 Gawron and An-2 airplanes and Mi-2 and SM-2 helicopters are studied under various flight conditions. Author

N77-30715*# National Aeronautics and Space Administration, Washington, D. C.
PROCEEDINGS OF THE ANNUAL CONFERENCE OF NASA CLINIC DIRECTORS, ENVIRONMENTAL HEALTH OFFICIALS, AND MEDICAL PROGRAM ADVISORS
1975 292 p refs Conf. held at Williamsburg, Va., 18-20 Mar. 1975
(NASA-TM-74848) Avail: NTIS HC A13/MF A01 CSCL 06E

Occupational Medicine and Environmental Health Programs are discussed. Throughout the conference, the employer's responsibility to provide a reasonably safe work environment, is emphasized.

N77-30716*# National Aeronautics and Space Administration, Washington, D. C.
NASA OCCUPATIONAL MEDICINE PROGRAMS: OUR OBLIGATION TO MANAGEMENT
Louis B. Arnoldt and Jean Mockbee *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 1-42

Avail: NTIS HC A13/MF A01 CSCL 06E

Factors to be considered in forming policies for managing NASA's health maintenance program to provide optimum arrangement for quality medical care are discussed. Topics include scheduling routine physical examinations, job related stress, prevalence of chronic diseases, additions to the PROM data system, and disease trends among personnel. A.R.H.

Avail: NTIS HC A13/MF A01 CSCL 06E

The history of measures to control occupational exposure to carcinogenic substances is reviewed. Health hazards associated with exposure to a certain chemical substance must be considered not only from the aspects of its acute or chronic toxicity, but also from its potential to produce tumors (latent effect). There can be no clear distinction between classic toxicity and oncogenesis until the mechanisms of both are completely understood for a given chemical substance. The assessment of carcinogenic potential for a specific substance must include the consideration of published information, monitoring and control data from the affected industry, and the in-depth epidemiologic experience of affected employees. A.R.H.

N77-30717*# National Aeronautics and Space Administration, Washington, D. C.

ENVIRONMENTAL HEALTH TRENDS

Gene Proctor *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 43-60

Avail: NTIS HC A13/MF A01 CSCL 06E

Trends in environmental health listed include: specific health concerns, sources of organic dusts causing pneumonitis, toxic substances lists, criteria documents, and regulatory developments. Author

N77-30718*# Occupational Safety and Health Administration, Washington, D. C. Office of Standards.

CURRENT ASPECTS OF OCCUPATIONAL CHEMICAL CARCINOGENESIS

Donald Lassiter *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 61-74

N77-30719*# Edgewood Arsenal, Aberdeen Proving Ground, Md.

CONCEPTS IN HEALTH EVALUATION OF COMMERCIAL AND INDUSTRIAL CHEMICALS

Bernard P. McNamara *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 75-108 refs

Avail: NTIS HC A13/MF A01 CSCL 06E

A method is described for determining no toxic effect exposure levels based on short-term testing of industrial and commercial chemicals. Procedures for monitoring all organs and body functions for the presence or absence of toxicological effects are demonstrated using various laboratory animals. A.R.H.

N77-30720*# Kettering Memorial Hospital, Dayton, Ohio. Cardiac Diagnostic Laboratory.

EXERCISE STRESS TESTING

Benjamin Schuster *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 109-118

Avail: NTIS HC A13/MF A01 CSCL 06E

Positive maximum stress tests in the management of coronary patients are discussed. It is believed that coronary angiography would be the ultimate test to predict the future of patients with coronary heart disease. Progression of angina, myocardial infarction, and death due to heart disease were analyzed. I.M.

N77-30721*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.

REVIEW OF HEALTH MAINTENANCE PROGRAM FINDINGS, 1960-1974

Edward S. White *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 119-138

Avail: NTIS HC A13/MF A01 CSCL 06E

A preliminary analysis of the employee's examination records of the automated medical data base at the NASA Wallops Flight Center, Va., with an emphasis on the primary mission of the program-the early detection and control of cardiovascular disease, is presented. I.M.

N77-30722*# Catholic Univ. of America, Washington, D. C. Dept. of Psychology and Psychiatry.

BEHAVIOR PATTERNS AND CORONARY HEART DISEASE

John C. Townsend and Jeremiah P. Cronin *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 139-148

Avail: NTIS HC A13/MF A01 CSCL 06E

The relationships between two behavioral patterns, cardiac risk factors, and coronary heart disease are investigated. Risk factors used in the analysis were family history of coronary disease, smoking, cholestorol, obesity, systotic blood pressure, diastolic blood pressure, blood sugar, uric acid, erythrocyte sedimentation rate, and white blood unit. It was found that conventional, non-behvioral pattern risk factors alone were not significantly related to coronary heart disease. I.M.

N77-30723*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

JPL NOISE CONTROL PROGRAM

A. F. Klascius *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 149-158

(Contract NAS7-100)

Avail: NTIS HC A13/MF A01 CSCL 06E

Exposures of personnel to noise pollution at the Jet Propulsion Laboratories, Pasadena, California, were investigated. As a result of the study several protective measures were taken: (1) employees exposed to noise hazards were required to wear ear-protection devices, (2) mufflers and air diversion devices were installed around the wind tunnels; and (3) all personnel that are required to wear ear protection are given annual audimeter tests. I.M.

N77-30724*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

ENVIRONMENTAL HEALTH CONCERNS IN NATURAL AND MAN-MADE ENVIRONMENTS

Charles P. Bergtholdt *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors

Avail: NTIS HC A02/MF A01 CSCL 06E

Industrial hygene and environmental health aspects of ground operation at the Jet Propulsion Laboratory were investigated. Major areas of concern are: (1) toxic substances, (2) noise pollution, (3) electromagnetic radiation; and (4) biohazards and sanitation. Each of these categories are also studied in a closed environment, such as encountered aboard of a spacecraft. I.M.

N77-30725*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE US ENVIRONMENTAL PROTECTION AGENCY NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

Julian Manly Earls *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 167-176 refs

Avail: NTIS HC A13/MF A01 CSCL 06E

An evaluation of the Lewis Research Center's storm, sanitary and industrial sewer systems, in compliance with the Federal Water Pollution Control Act, is presented. The investigation of a proposed sampling and flow measurement system includes cost estimates to meet the Federal and State of Ohio requirements. I.M.

N77-30726*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

NASA LANGLEY PHYSICAL EXAMINATION PROGRAM

Robert L. McArthur *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 177-188

Avail: NTIS HC A02/MF A01 CSCL 06E

A comprehensive survey was made of the NASA Headquarters in the Washington, D. C. area, and medical facilities capable to

provide satisfactory and economical services to employees within a reasonable traveling range. The program to improve medical services is described. I.M.

N77-30727*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ANNUAL HEALTH EXAMINATION PROGRAM, AMES RESEARCH CENTER
Lewis Hughes and Joseph LaDou *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 189-224

(Contract NAS76-28)
Avail: NTIS HC A13/MF A01 CSCL 06E
A cost analysis of a low-volume multiphasic health testing program is presented. The results indicate that unit costs are similar to those of high-volume automated programs. The comparability in unit cost appears to result from the savings in personnel and space requirements of the smaller program as compared with the larger ones. I.M.

N77-30728*# Massachusetts Inst. of Tech., Cambridge.
EVALUATION OF CLASS 2 BIOLOGICAL CABINETS
Richard E. Chamberlin *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 P 225-236

Avail: NTIS HC A13/MF A01 CSCL 06E
Basic investigations, consisting primarily of airflow measurements and visual smoke tests, were made on four commercially available units. The results indicated that performance varied considerably between units. Therefore, it was decided to outline the performance desired and to include in the overall equipment specifications a set of performance tests to assure a clean air safety cabinet with respect to chemical usage. The evaluation was to be based on aerodynamic performance under the various modes of operation. I.M.

N77-30729*# Civil Service Commission, Washington, D.C.
DISABILITY RETIREMENT
Raymond L. Eck *In* NASA Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 237-254

Avail: NTIS HC A13/MF A01 CSCL 06E
Eligibility for disability retirement is discussed. General guidelines and a few standards are given. Usually the same basic medical principles apply to the evaluation of claims for disability retirement as apply to determining medical suitability for initial employment I.M

N77-30730*# Civil Service Commission, Washington, D.C.
MEDICAL SUITABILITY FOR FEDERAL EMPLOYMENT
Raymond L. Eck *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 255-266

Avail: NTIS HC A02/MF A01 CSCL 06E
The medical requirements of the Civil Service Commission in determining employability of applicants for Federal employment are presented. I.M.

N77-30731*# Air Force Radiological Health Lab., Wright-Patterson AFB, Ohio.
A REVIEW OF CURRENT AND PROPOSED STANDARDS FOR OCCUPATIONAL EXPOSURES TO RADIO-FREQUENCY ENERGY
L. T. Odland *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 267-278

Avail: NTIS HC A13/MF A01 CSCL 06E
The essential aspects of an acceptable r-f occupational exposure program are presented. They include exposure limits, surveillance of work environment, medical attention, investigation of accidental overexposures, and documentation of overexposures. Each aspect is briefly discussed. I.M.

N77-30732*# Air Force Radiological Health Lab., Wright-Patterson AFB, Ohio. Radiation Measurements Div.
RADIATION MEASURING INSTRUMENTATION
Harley V. Piltingsrud *In* NASA, Washington Proc. of the Ann. Conf. NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 279-292

Avail: NTIS HC A13/MF A01 CSCL 06E
Four radiation measuring instruments were developed. These are: (1) improved detector probe, (2) neutron spectrometer--dosimeter, (3) portable ultraviolet spectro-radiometer; and (4) pocket ionization chamber radiation dosimeter. A brief description of each of these devices is presented. I.M.

N77-30733*# National Aeronautics and Space Administration, Washington, D. C.
DEVELOPMENT AND APPLICATION OF FUNCTIONAL MANNING STANDARDS IN THE NATIONAL AERONAUTICS AND SPACE AND SPACE ADMINISTRATION
Walter A. Maull *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 293-298
Avail: NTIS HC A13/MF A01 CSCL 06E
Regression analysis was applied to obtain a mathematical equation to determine a workload indicator in relation with the manpower required at the NASA. The equation thus derived was used to construct the requirements tables in the manning standards to improved management methods. Manning standards were discussed at a national conference. I.M.

N77-30734*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HYPERTENSION SCREENING
John M. Foulke *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 299-311
Avail: NTIS HC A13/MF A01 CSCL 06E
An attempt was made to measure the response to an announcement of hypertension screening at the Goddard Space Center, to compare the results to those of previous statistics. Education and patient awareness of the problem were stressed. I.M.

N77-30735*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE APOLLO-SOYUZ TEST PROJECT: MEDICAL REPORT
Arnauld E. Nicogossian, comp. Washington 1977 129 p refs Original contains color illustrations
(NASA-SP-411) Avail: NTIS HC A07/MF A01 CSCL 06E
The results of the clinical aspects as well as the preflight and postflight research studies that were performed on the astronauts are presented. Because of the compromised postflight crew health status, not all postflight research procedures could be accomplished. This compromise was the result of the anomalous entrance of toxic gas into the spacecraft cabin during the earth landing sequence. Despite the exposure, the medical data collected are of sufficient interest to warrant inclusion in this official ASTP Medical Report. Author

N77-30736*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTRA-OCULAR PRESSURE NORMALIZATION APPARATUS Patent Application
Edward F. Baehr, inventor (to NASA) Filed 31 Aug. 1977 10 p
(NASA-Case-LEW-12955-1; US-Patent-Appl-SN-829318) Avail: NTIS HC A02/MF A01 CSCL 06B
A method and apparatus is described for safely reducing abnormally high intra-ocular pressure in an eye during a predetermined time interval. This allows maintenance of normal intraocular pressure during glaucoma surgery. A pressure regulator of the spring-biassed diaphragm type is provided with additional bias by a column of liquid. The height of the column of liquid is selected such that the pressure at a hypodermic needle connected to the output of the pressure regulator is equal to the measured pressure of the eye. The hypodermic needle can

then be safely inserted into the anterior chamber of the eye. Liquid is then bled out of the column to reduce the bias on the diaphragm of the pressure regulator and, consequently, the output pressure of the regulator. This lowering pressure of the regulator also occurs in the eye by means of a small bleed path provided between the pressure regulator and the hypodermic needle.
NASA

N77-30737*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTRA-OCULAR PRESSURE NORMALIZATION TECHNIQUE AND EQUIPMENT Patent Application
William J. McGannon, inventor (to NASA) Filed 31 Aug. 1977 10 p Sponsored by NASA
(NASA-Case-LEW-12723-1; US-Patent-Appl-SN-829317) Avail: NTIS HC A02/MF A01 CSCL 06B

A method and apparatus is described for safely reducing abnormally high intraocular pressure in an eye during a predetermined time interval. This allows maintenance of normal intraocular pressure during glaucoma surgery. A pressure regulator of the spring-biassed diaphragm type is provided with additional bias by a column of liquid. The height of the column of liquid is selected such that the pressure at a hypodermic needle connected to the output of the pressure regulator is equal to the measured pressured of the eye. The hypodermic needle can then by safely inserted into the anterior chamber of the eye. Liquid is then bled out of the column to reduce the bias on the diaphragm of the pressure regulator and, consequently, the output pressure of the regulator. This lowering pressure of the regulator also occurs in the eye by means of a small second bleed path provided between the pressure regulator and the hypodermic needle.
NASA

N77-30738# Army Aeromedical Research Lab., Fort Rucker, Ala.
MEDICAL ASPECTS OF ARMY AVIATION AND AIRBORNE AND GROUND OPERATIONS AFFECTING HEALTH AND EFFICIENCY OF THE SOLDIERS Annual Progress Report, 1 Jul. 1975 - 30 Sep. 1976
Robert W. Bailey Oct. 1976 179 p refs
(DA Proj. 3A7-62758-A-819)
(AD-A039804) Avail: NTIS HC A09/MF A01 CSCL 06/5

It is the mission of this laboratory to conduct fundamental and applied research on the medical aspects of Army aviation, airborne and ground operations that affect the health, welfare and efficiency of the soldier; to perform medical research on visual/auditory functions; man/machine integration; the medical aspects of nonmedical materiel; physiological/psychological response to the operational environments; and military operational training impacts upon ecology. The laboratory provides technical advisory and consultant services to all elements of Department of Defense and other government agencies in support of helicopter, combat crew and airborne medicine. Problems presently being considered range from long-term fundamental research in the areas of vision, hearing loss, communications, and crash protection to the more immediate problems of the environmental characteristics of particular aircraft. GRA

N77-30739# Army Missile Research and Development Command, Redstone Arsenal, Ala. Physical Sciences Directorate.
FUNDAMENTALS IN VISIBILITY
Herbert B. Holl Feb. 1977 56 p refs
(DA Proj. 1L1-61102-AH-49)
(AD-A040836; DRDMI-TR-77-1) Avail: NTIS HC A04/MF A01 CSCL 17/8

It is the purpose of this report to outline research results which define the fundamentals of visibility acuity. The report will deal with the following subjects: visual acuity of the human eye; determination minimum visibility; acuity and sensitivity; visibility of light sources; brightness and illumination of sky and terrain and changes from day to night; the color of skylight; and the variation of visibility during a day. GRA

N77-30740# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
INFLUENCE OF THE JOURNEY'S TIME OF DAY ON THE DE- AND RESYNCHRONIZATION OF THE 24-HOUR RHYTHM OF BODY TEMPERATURE AFTER TRANSATLANTIC FLIGHTS Ph.D. Thesis - Bonn Univ.
Arnold Theodor Sonderfeld 24 Mar. 1977 48 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-420)
(DLR-FB-77-10) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 22.80

The influence of a time-shift of 6 hours on the 24-hour rhythm of body temperature was investigated in a group of eight students in Germany and the U.S.A. by measuring their rectal-temperatures after transatlantic flights. The temperatures were taken continuously over the first six days and on days 8 and 13 after an east-west flight and after a west-east flight. In contrast to previous studies in which the west flight was day-flight, the east flight a night-flight, both flights in this case were day-flights. The time of resynchronization after the east-west flight ran up to seven days, the time after a flight in the opposite direction up to ten days. This result squares with the results gained from previous experiments on day and night flights in so far as an influence of the hour of the day, at which the flight is carried out, is not supposed. Author (ESA)

N77-30741# Naval Postgraduate School, Monterey, Calif.
STRESS DETECTION UTILIZING THE ELECTROENCEPHALOGRAM M.S. Thesis
Harold Jean Fricke, Jr. Mar. 1977 83 p refs
(AD-A039168) Avail: NTIS HC A05/MF A01 CSCL 06/2

A method of stress detection utilizing the electroencephalogram is presented. Limited discussion on nerve cells and some physiological aspects of stress are discussed. Considerable data is presented which supports a stress detection theory. Methods of stress inducement utilized and the conduct of an electroencephalogram are described. GRA

N77-30742# Naval Postgraduate School, Monterey, Calif.
COMPUTER MODELING THE NEUROPHYSIOLOGY OF VISION M.S. Thesis
Seaborn Montgomery McCrory, III Mar. 1977 125 p refs
(AD-A039321) Avail: NTIS HC A06/MF A01 CSCL 06/16

The pertinent points of visual neurophysiology and neuroanatomy are reviewed with particular emphasis on how retinal light distributions result in perceived phenomena. The neural modeling techniques used at the Naval Postgraduate School are described. These stem from a basic model capable of calculating the postsynaptic potential and spike outputs for any sequence of excitatory and inhibitory inputs. More advanced programs model facilitation, fatigue, and narrow band motion detection. The most advanced program models lateral inhibition in an eight neuron linear array. GRA

N77-30743# Pittsburgh Univ., Pa. Graduate School of Public Health.
TOXICITY OF PLASTIC COMBUSTION PRODUCTS. TOXICOLOGICAL METHODOLOGIES TO ASSESS THE RELATIVE HAZARDS OF THERMAL DECOMPOSITION PRODUCTS FROM POLYMERIC MATERIALS Ph.D. Thesis
Craig Stewart Barrow Feb. 1977 313 p refs
(Grant NBS-5-9005)
(PB-267233/5; NBS-GCR-77-85) Avail: NTIS HC A14/MF A01 CSCL 06T

Sensory and pulmonary irritation effects of thermal degradation products from natural and synthetic materials were studied using mice. Mice were used to develop a sensory irritation stress index based on changes in respiratory rate. In addition, acute lethality was obtained. Dose-response curves were generated for decomposition products from Douglas Fir, PVC, flexible polyurethane, teflon, and fiberglas reinforced polyester. Similar data were obtained for CO, CO2, low O2, acrolein, HCl and Cl2. Preliminary studies on the pulmonary effects of combustion products using rabbits are also reported. GRA

N77-30744# New England Medical Center Hospitals, Boston, Mass.
DEVELOPMENT OF A DIFFERENTIAL WHITE CELL COUNT

SYSTEM: TERMINAL PROGRESS REPORT Progress Report, 1 Apr. 1971 - 31 Dec. 1976
Peter W. Neurath May 1977 13 p refs
(Grant PHS-HS-00696)
(PB-268364/7; NCHSR-77/167) Avail: NTIS HC A02/MF A01 CSCL 06L

A high resolution (spatial, intensity and color or wavelength resolution) scanning microscope was built to develop the next generation of pattern recognition algorithms and techniques. A high percentage of white cell counts have been unrealiable due to insufficient training and worker fatigue. An accurate, consistent, 500 cell differential made by a proven machine to which quality control procedures can be applied effectively will make this common test not only less expensive but far more reliable and diagnostically meaningful. GRA

N77-30745# Rochester Univ., N. Y. Dept. of Electrical Engineering.
TISSUE CHARACTERIZATION WITH ULTRASOUND Progress Report, 15 Jun. 1975 - 14 Jun. 1976
Robert C. Waag 1976 163 p refs
(Grant NSF APR-75-14890)
(PB-267397/8; NSF/RA-760407) Avail: NTIS HC A08/MF A01 CSCL 06L

Noninvasive tissue characterization is determined with ultrasound by adapting the concepts used in X-ray diffraction and atmospheric probing with radar. Hardware aquisition and assembly for the collection of ultrasound scattering and optical image data; software development for data acquisition, processing, and display; mathematical analysis of factors influencing measurement of ultrasound scattering by tissue; and correlation studies of ultrasound and optical data are included. GRA

N77-30746# London Univ. (England). Dept. of Thoracic Medicine.
HISTOCOMPATIBILITY ANTIGENS AND THE EVOLUTION OF HYPERSENSITIVITY LUNG DISEASES. (AIM AND METHODOLOGY) Annual Report, Jul. 1976 - May 1977
M. Turner-Warwick May 1977 34 p refs
(Contract N01-HR-6-2935)
(PB-267133/7; NIH-N01-HR-62935-1A) Avail: NTIS HC A03/MF A01 CSCL 06E

The background to the investigation of histocompatibility antigens in diseases of the chest in which hypersensitivity may be important is discussed. The diseases to be studied are asthma, sarcoidosis, extrinsic allergic alveolitis and cryptogenis fibrosing alveolitis. The basic design of the study is an analysis of families, and of groups of patients defined by stringent clinical criteria, correlating with immunological markers where possible. The aims of the project are restated and the clinical and laboratory methods described. An account of the families and groups studied so far is given. GRA

N77-30747*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MODEL OF AIRCRAFT NOISE ADAPTATION
Thomas K. Dempsey, Glynn D. Coates (Old Dominion Univ.), and Jimmy M. Cawthorn Jul. 1977 63 p
(NASA-TM-74052) Avail: NTIS HC A04/MF A01 CSCL 05H

Development of an aircraft noise adaptation model, which would account for much of the variability in the responses of subjects participating in human response to noise experiments, was studied. A description of the model development is presented. The principal concept of the model, was the determination of an aircraft adaptation level which represents an annoyance calibration for each individual. Results showed a direct correlation between noise level of the stimuli and annoyance reactions. Attitude-personality variables were found to account for varying annoyance judgements. Author

N77-30748# Aston Univ., Birmingham (England).
HUMAN RELIABILITY IN COMPLEX SYSTEMS: AN OVERVIEW
D. E. Embrey Jul. 1976 85 p refs Sponsored by UKAEA
(NCSR-R-10) Avail: NTIS (US Sales only) HC A05/MF A01

The main conceptual background underlying the areas of human reliability and human error is analyzed. The concept of error is examined and generalized to that of human reliability, and some of the practical and methodological difficulties of reconciling the different standpoints of the human factors specialist and the engineer are explored. Following a survey of general reviews available on human reliability, quantitative techniques for prediction of human reliability are considered. An in-depth critical analysis of the various quantitative methods is presented, together with the data bank requirements for human reliability prediction. Reliability considerations in process control and nuclear plant, and also areas of design, maintenance, testing and emergency situations are discussed. The effects of stress on human reliability are analyzed and methods of mimimizing these effects discussed. ERA

N77-30749* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
ROTATIONAL JOINT ASSEMBLY FOR THE PROSTHETIC LEG Patent
Lester J. Owens and William C. Jones, inventors (to NASA) Issued 2 Aug. 1977 5 p Filed 30 Jul. 1976 Supersedes N77-15618 (15 - 06, p 0786)
(NASA-Case-KSC-11004-1; US-Patent-4,038,705; US-Patent-Appl-SN-710032; US-Patent-Class-3-2; US-Patent-Class-3-21) Avail: US Patent Office CSCL 06D

A rotational joint assembly for a prosthetic leg has been devised, which enables an artificial foot to rotate slightly when a person is walking, running or turning. The prosthetic leg includes upper and lower tubular members with the rotational joint assembly interposed between them. The assembly includes a restrainer mechanism which consists of a pivotably mounted paddle element. This device applies limiting force to control the rotation of the foot and also restores torque to return the foot back to its initial position.
Official Gazette of the U.S. Patent Office

N77-30750*# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
A TRADE-OFF ANALYSIS DESIGN TOOL. AIRCRAFT INTERIOR NOISE-MOTION/PASSENGER SATISFACTION MODEL Final Report
I. D. Jacobson Sep. 1977 213 p refs
(Grant NsG-1180)
(NASA-CR-154807; UVA/528120/ESS77/103) Avail: NTIS HC A10/MF A01 CSCL 05E

A design tool was developed to enhance aircraft passenger satisfaction. The effect of aircraft interior motion and noise on passenger comfort and satisfaction was modelled. Effects of individual aircraft noise sources were accounted for, and the impact of noise on passenger activities and noise levels to safeguard passenger hearing were investigated. The motion noise effect models provide a means for tradeoff analyses between noise and motion variables, and also provide a framework for optimizing noise reduction among noise sources. Data for the models were collected onboard commercial aircraft flights and specially scheduled tests. Author

N77-30751*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN IMPROVED CONTROLLER ARM FOR A REMOTELY RELATED SLAVE ARM Patent Application
J. Kenneth Salisbury, Jr., inventor (to NASA) (Stanford Univ., Calif.) Filed 19 Aug. 1977 26 p Sponsored by NASA
(NASA-Case-ARC-11052-1; US-Patent-Appl-SN-826202) Avail: NTIS HC A03/MF A01 CSCL 05H

A segmented controller arm, configured and dimensioned to form a miniature kinematic replica of a remotely related slave arm is outlined. The arm includes a plurality of joints for affording segments of the arm simultaneous angular displacement, a plurality of position sensing devices, and a control signal circuit for generating control signals. The arm is characterized by a plurality of yokes, supported for angular displacement about a pair of orthogonally related axes and counterbalanced against gravitation by a cantilevered mass. The controller arm may be released without introducing unwanted motion in the slave arm, resulting from gravitation of segments of the master arm. NASA

N77-30752# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A VISUALLY-COUPLED AIRBORNE SYSTEMS SIMULATOR (VCASS): AN APPROACH TO VISUAL SIMULATION

Dean F. Kocian 1977 11 p Presented at the Image Conf. Phoenix, Ariz., 17-18 May 1977

(AD-A039999; AMRL-TR-77-31) Avail: NTIS HC A02/MF A01 CSCL 09/3

This paper describes a new approach to solving the visual presentation problems of aircraft simulators by using visually coupled systems (VCS). For many years it has been the mission of this laboratory to optimize the visual interface of crew members to advanced weapon systems. This mission has been primarily pursued in two areas: (1) the establishment of control/display engineering criteria; and (2) the prototyping of advanced concepts for control and display interface. An important part of fulfilling this mission has been the development of VCS components which includes head position sensing systems or helmet mounted sights (HMS), eye position sensing systems (EPS) and helmet mounted displays (HMD). The author believes that the unique capabilities of a visually-coupled system (VCS combination of a helmet-mounted sight and helmet-mounted display) can meet the simulation requirements as well as improve upon existing ground based simulation techniques. GRA

N77-30753# Navy Clothing and Textile Research Unit, Natick, Mass.

ONE-SIZE SLUSH-MOLDED POLYVINYL CHLORIDE COVER FOR THE NAVY MALE SERVICE COMBINATION CAP FRAME Technical Report, Jul. 1975 - Apr. 1976

Albert J. Chaiken Mar. 1977 7 p

(AD-A039508; NCTRF-TR-125; Rept-11-76) Avail: NTIS HC A02/MF A01 CSCL 06/17

The Navy Clothing and Textile Research Facility NCTRF is service testing one-size, stretchable, slush-molded, white plastic covers for the standard Navy service combination cap for men, to ascertain user acceptability of design, material and sizing. Initial response by test participants has revealed that the molded item appears to have merit as a suitable replacement for the standard 13 sizes of cotton cap covers currently worn by Naval Personnel. However, it appears that two sizes of this molded cover will be required, because subjects with small head sizes found the item too large. Author (GRA)

N77-30754# Army Aeromedical Research Lab., Fort Rucker, Ala.

AEROMEDICAL EVALUATION OF THE ARMY MOLECULAR SIEVE OXYGEN GENERATOR AMSOG SYSTEMS

Frank S. Pettyjohn, Roderick J. McNeil, Lloyd A. Akers, George P. Rice, and Charles F. Piper Mar. 1977 27 p

(AD-A039855; USAARL-77-10) Avail: NTIS HC A03/MF A01 CSCL 01/3

Molecular sieve technology has been considered as an alternative source of oxygen for US Army operational fixed and rotary wing aircraft. With the constraints of weight, size, and electrical power, the Army molecular sieve oxygen generator (AMSOG) appeared to meet operational needs. Initial design was predicated on direct replacement of current oxygen equipment for the two man crew OV-1 Mohawk surveillance aircraft. Initial bench and hypobaric chamber testing demonstrates a capability to provide 90-94% oxygen at sea level using engine bleed or compressed air at 40 PSIG, 20 to 22 liters per minute (LPM), normal temperature 70 F, pressure 760 Torr, dry (NTPD). Ninety-four percent (94%) oxygen is expected to support both physiologic needs and provide denitrogenation capabilities for US Army aircrew. Argon is concentrated to levels of 6-8% and is considered to be low; however, physiologic effects have not been fully defined. In-flight studies and toxicology evaluation are continuing. Author (GRA)

N77-30755# Navy Clothing and Textile Research Unit, Natick, Mass.

EVALUATION OF A VORTEX TUBE COOLER Final Technical Report

Arthur H. Chadwick Apr. 1977 19 p

(AD-A039708; NCTRF-TR-126) Avail: NTIS HC A02/MF A01 CSCL 13/1

The Navy Clothing and Textile Research Facility (NCTRF) tested a commercial vortex tube cooler for personnel air conditioning to accumulate data for possible future applications. The vortex cooler had six interchangeable nozzles which allowed various cold flow ranges from 7 to 24 cubic feet per minute. The unit was tested in each configuration to determine the various available flows and temperatures. When the unit was supplied with air at a nominal 95 psig, its temperature fell 40, 49, 51, 56, 47, and 52 F with flows of 21, 16, 12, 9, 8, and 7 cubic feet per minute, respectively, at sea level pressures. Based on the amount of cooling available, only the first four configurations would provide ample cooling for suited personnel. Author (GRA)

N77-30756# Southwest Research Inst., San Antonio, Tex.

SAFETY HELMET PERFORMANCE INVESTIGATION, VOLUME 2 Final Report, 1 Nov. 1974 - 1 Mar. 1975

T. D. Dunham, A. Nagy, and S. B. Hugg May 1977 314 p refs

(Contract DOT-HS-4-00802)

(PB-267553/6; SwRI-02-3820-Vol-2; DOT-HS-802378-Vol-2) Avail: NTIS HC A14/MF A01 CSCL 06Q

Best available helmets to meet the head injury criterion proposed in the motorcycle helmet notice of September 1974 are outlined. Motorcycle headform sizes A, B, C, and D were evaluated. These data indicated that the dimensions of size C headforms were not within acceptable tolerance and recommendations were made to require that these tolerances be met. GRA

N77-30757+ Advisory Group for Aerospace Research and Development, Paris (France).

HUMAN FACTORS TOPICS IN FLIGHT SIMULATION: AN ANNOTATED BIBLIOGRAPHY

S. Hunter (RAF Inst. of Aviation Med.), A. J. Gundry (RAF Inst. of Aviation Med.), and J. M. Rolfe (RAF Inst. of Aviation Med.) Jun. 1977 142 p refs

(AGARD-R-656; ISBN-92-835-1246-4) Avail: NTIS HC A07

This bibliography contains 504 references, with summaries, to reports concerned with human factors topics in flight simulation. Reports dealing solely with the engineering aspects of flight simulation have been excluded, unless they contain items of human interest. The bibliography, covering the years 1940 to 1976, is mainly comprised of English-language reports and contain no reference to classified material. Author

N77-31764# Rochester Univ., N. Y. Dept. of Microbiology.

THE PHYSIOLOGICAL BASES FOR MICROBIAL BAROTOLERANCE Annual Report

Robert E. Marquis 31 Mar. 1977 36 p refs

(Contract N00014-75-C-0634)

(AD-A037840; TR-5) Avail: NTIS HC A03/MF A01 CSCL 06/19

Investigations during the past year of the effects of high-pressure narcotic gases have confirmed previous reports of inhibition of microbial growth and differentiation. Spore germination was found to be somewhat more sensitive than was growth, and for example, germination of Bacillus cereus spores could be completely suppressed by only 10 atmospheres of nitrous oxide, compared with some 25 atmospheres required for 50% inhibition of growth of Streptococcus faecalis. High-pressure helium at 24 to 41 atmospheres was found to act oppositely in that it stimulated streptococcal growth and replication. Helium did act to enhance the narcotic potential of nitrous oxide and to increase oxygen toxicity. The oxygen pressure required for 50% growth inhibition was about 25 atmospheres, approximately the pressure of nitrous oxide required for the same effect. However, long-term exposure to oxygen resulted in cell death, while similar exposure to nitrous oxide resulted in no killing. GRA

N77-31766# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

TOXIC HAZARDS TESTS FOR VEHICLES AND OTHER EQUIPMENT Final Report

17 Jan. 1977 26 p refs Supersedes MTP-2-2-614

(AD-A040542; TOP-2-2-614; MTP-2-2-614) Avail: NTIS HC A03/MF A01 CSCL 13/6

This report provides test operating procedures for measuring carbon monoxide and other toxic gas concentrations produced during the operation of military vehicles and accessories, including the firing of armament. It includes measurements in work areas where engines and engine-driven equipment are operated, and describes equipment and instrumentation, standards for exposure limits, and physiological effects of exposures. It includes measurements of gases during: vehicle tests with engines and other fuel-burning accessories operating, firing tests of vehicle-mounted weapons, firing tests of vehicular weapons in test chambers, and operation of miscellaneous engine-driven equipment such as generators and compressors. GRA

N77-31767# Human Engineering Labs., Aberdeen Proving Ground, Md.

A PROPOSAL FOR EVALUATING HUMAN EXPOSURE TO CARBON MONOXIDE CONTAMINATION IN MILITARY VEHICLES Final Report

Seymour Steinberg and Gerald D. Nielsen Mar. 1977 28 p refs

(AD-A040799; HEL-TM-11-77) Avail: NTIS HC A03/MF A01 CSCL 06/10

Presently, the Army evaluates the severity of CO toxic hazard to weapon system crews by applying the same Occupational Health and Safety Administration (OSHA) standards used when evaluating toxic hazard to the industrial/civilian community. A more realistic method of evaluation for Army personnel is proposed which accounts for the CO actually inspired by the exposed individual by predicting the carboxyhemoglobin (COHb) in the blood at any time during and subsequent to the exposure. The prediction (calculated by an empirical equation) is based upon knowledge of the ambient CO concentration, the duration of the exposure and the physical exertion of the exposed person. COHb blood content is closely related to the medical effects of CO exposure and is the prime basis for both the evaluation procedure and the standard proposed in this report. Additional subjects discussed in this report include the chronology of civilian and military standards and limits governing CO exposure, the test requirements including details which are necessary to implement the proposed evaluation method and suggested areas for future research for reducing CO exposure and potentially improving vehicle design. Also included is an example which applies the COHb equation (for predicting COHb blood content) to some hypothetical data. GRA

N77-31768# Technology, Inc., San Antonio, Tex.

EVALUATION OF NON-INVASIVE PHYSIOLOGIC MEASUREMENT TECHNIQUES Final Report, Oct. 1974 - Oct. 1975

Norma D. Miller Dec. 1976 258 p refs

(Contract F41609-75-C-0011; AF Proj. 7930)

(AD-A041242; SAM-TR-76-34) Avail: NTIS HC A12/MF A01 CSCL 06/2

This report is based on a search of the scientific literature for relevant non-invasive techniques for monitoring physiologic responses to high sustained -Gz (HSG). Specifically, techniques are described and evaluated as to their potential for providing rapid and reliable measures of respiratory, cardiovascular, metabolic, sensory and cerebral functions in human centrifugation studies. The evaluation ratings reflect the criteria of accuracy, stability, and sensitivity of the recording instrumentation as well as the directness of the measurement technique and resistance to contamination from artifacts from ambient or physiologic noise. GRA

N77-31769# Saint Louis Univ., Mo. Dept. of Physiology.

THE INVESTIGATION OF METABOLIC AND CARDIOVASCULAR RESPONSES TO FATIGUING STATIC EFFORT Final Scientific Report, Jun. 1972 - Jul. 1976

A. R. Lind, H. Barcroft, J. S. Petrofsky, J. Rinehart, and T. E. Dahms Jul. 1976 305 p refs

(Grant AF-AFOSR-2362-72; AF Proj. 9777)

(AD-A037975; AFOSR-77-0312TR) Avail: NTIS HC A14/MF A01 CSCL 06/19

The research reported covers several approaches to the problem of isometric fatigue based on the working hypothesis that muscular fatigue is metabolic in nature. Obtained data support several important conclusions--at tensions of 70 percent maximum voluntary contraction fatigue is metabolic while at lower tensions some degree of transmission failure occurs, the integrated electromyogram per se is not a good measure of muscular fatigue but the frequency of the power spectrum may be; fatigue induced by isometric contractions is peripheral and does not involve central nervous fatigue. GRA

N77-31770# Ohio State Univ., Columbus. Dept. of Aeronautical and Astronautical Engineering.

CARDIOVASCULAR, RENAL AND RESPIRATORY EFFECTS OF HIGH INTENSITY, INTERMEDIATE DURATION, LOW FREQUENCY VIBRATION Interim Report, 1 Jul. 1975 - 30 Jun. 1976

Robert M. Nerem, Robert L. Hamlin, and George M. Pantalos 31 Jul. 1976 23 p

(Grant AF-AFOSR-2526-73; AF Proj. 9777)

(AD-A037978; AFOSR-77-0319TR; IR-3) Avail: NTIS HC A02/MF A01 CSCL 06/19

A research program on the influence of high intensity, intermediate duration, low-frequency wholebody vibration on the cardiovascular, renal and respiratory systems is described. During the period 1 July 1975 to 30 June 1976, emphasis was placed on the in vitro study of the transport of C14-4-cholesterol between blood and the arterial wall in the presence of oscillatory flow conditions. In addition, a previous in vivo investigation of I(131)-albumin transport in the aorta was extended to include measurements during vibration at 6 and 14 Hz. These in vivo studies indicate an enhancement of albumin uptake during vibration in the dog aorta. The in vivo data are consistent with in vitro data and the concept of a shear-dependent transport process. Continuing in vivo studies are being carried out to measure aortic pressure and velocity waveforms. GRA

N77-31771# Naval Aerospace Medical Research Lab., Pensacola, Fla.

VISUAL COUNTERACTION OF NAUSEOGENIC AND DISORIENTING EFFECTS OF SOME WHOLE-BODY MOTIONS: A PROPOSED MECHANISM Interim Report

Fred E. Guedry, Jr. 16 Feb. 1977 20 p refs

(MF51524004)

(AD-A038767; NAMRL-1232) Avail: NTIS HC A02/MF A01 CSCL 06/19

It has been indicated that the nauseogenic and disorienting effects of several kinds of provocative motion stimuli can be ameliorated by visual reference to the Earth. The purpose of the present experiment is to investigate a hypothesis concerning the mechanism of this beneficial effect. The results demonstrate that the aftereffects of large-field optokinetic stimulation can nullify the nauseogenic and disorienting effects of Coriolis cross-coupled vestibular stimuli. It is hypothesized that large-field optokinetic stimulation in a particular head plane modifies activity in the vestibular nuclei as though the semicircular canals in that plane had been stimulated. GRA

N77-31772# Mayo Foundation, Rochester, Minn. Dept. of Physiology and Biophysics.

PROTECTION OF THE CARDIOPULMONARY SYSTEMS AGAINST THE INJURIOUS EFFECTS OF ACCELERATION Final Scientific Report, 1 Jul. 1971 - 30 Jun. 1976

E. H. Wood and P. A. Chevalier Aug. 1976 106 p refs

(Contract F44620-71-C-0069; AF Proj. 9777)

(AD-A038014; AFOSR-77-0316TR) Avail: NTIS HC A06/MF A01 CSCL 06/19

The investigators have developed a single source computerized X-ray fluoroscopic system for three-dimensional reconstruction and display of moving organs, particularly the heart, lungs and circulation which provide the potential for studies in intact animals and humans of the dynamic anatomy and associated functions of moving organs in ways never before achievable. For example, these techniques can be used with the subjects in a variety of positions, such as prone, supine, right and left lateral decubitus, and under conditions of increased gravitational-inertial stress such as might be experienced in aerial combat maneuvers. This

allows investigations of the relationships of the dynamic three-dimensional structural geometry to the physical and biochemical functions of both moving and stationary organ systems. GRA

N77-31773# California Univ., Davis.
SYSTEMS ANALYSIS OF PHYSIOLOGICAL PERFORMANCE RELATED TO STRESSES SUCH AS THOSE EXPERIENCED IN HIGH PERFORMANCE AIRCRAFT Final Scientific Report, 1 Oct. 1971 - 30 Sep. 1976
Richard F. Walters 31 Dec. 1976 42 p refs
(Contract F44620-72-C-0011)
(AD-A038187; AFOSR-77-0318TR) Avail: NTIS HC A03/MF A02 CSCL 06/19

A final summary of contract work performed during the five year period October 1, 1972 through September 30, 1976 is presented. Results of the contract include significant findings in information systems technology, physiology of exercise, and instrumentation associated with human subject experiments in human physical performance. Author (GRA)

N77-31774# Occupational Safety and Health Administration, Washington, D. C.
INORGANIC LEAD
28 Feb. 1977 132 p refs
(PB-266162/7; OSHA-EIS-77-0218-D) Avail: NTIS HC A07/MF A01 CSCL 06J

OSHA proposes to regulate employee exposure to lead by limiting the exposure to an eight hour time weighted average concentration of 100 micrograms of lead per cubic meter of air. The proposal provides for the determination of employee exposure, methods of compliance, personal protective equipment and clothing, training, medical surveillance, and recordkeeping. A beneficial impact on the workplace environment is that there should be a general improvement in the health of workers. GRA

N77-31775# Mount Sinai Medical Center, Miami Beach, Fla. Div. of Pulmonary Diseases.
EFFECTS OF G-INDUCED STRESS ON PULMONARY CIRCULATION Final Report, 21 Dec. 1973 - 15 May 1975
Marvin A. Sackner and Adam Wanner Dec. 1976 79 p refs
(Contract F41609-74-C-0011)
(AD-A040109; SAM-TR-76-28) Avail: NTIS HC A05/MF A01 CSCL 06/19

These studies evaluated pulmonary circulation under mild gravitational stresses, such as water immersion and passive tilt to the upright position. They extended previous observations that the standard USAF anti-G suit might be more efficient if inflated from below upwards, rather than from the abdominal bladder. A modified anti-G suit was designed with pressure switches that enabled sequential filling from below upward. Utilizing the rebreathing technique previously developed for pulmonary circulatory parameters the authors measured the effects on pulmonary circulatory parameters of water immersion to the neck (NI). They demonstrated that, in the seated subject, such NI caused a significant increase in pulmonary capillary blood flow and diffusing capacity which persisted throughout the 4-hr immersion period. The lack of change in pulmonary tissue volume suggested that the central vascular engorgement so induced is not accompanied by extravasation of fluid into the pulmonary interstitial space. The study thus supports the concept that, in the seated subject, the renal or hormonal effects of NI are mediated by a redistribution of blood volume, with a resultant central hypervolemia. GRA

N77-31776# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
IMPLEMENTATION OF A METHOD TO DETECT THE SINGLE VISUAL EVOKED RESPONSE M.S. Thesis
Charles E. Macomber Jan. 1977 59 p refs
(AD-A039756; AFIT/GE/EE/77-1) Avail: NTIS HC A04/MF A01 CSCL 06/2

The visually evoked response (VER) is one neural response to an external event. Although, with computer averaging techniques the evoked response to a particular stimulus is readily available, there are anticipated applications which require detection of the VER after a single stimulus presentation. The approach in this report is based on the similarity of the problem to that of radar detection in which a known signal is buried in noise. Using discrete Fourier transform and other digital signal processing techniques, a filter matched to the VER template was computed and implemented on a digital computer. Computation of the matched filter required an estimate of the noise power spectrum, where the noise in this case is the on-going electrical activity of the brain. Results indicate that the matched filter will detect the single evoked response. However, the false alarm rate is high. GRA

N77-31777# Naval Postgraduate School, Monterey, Calif.
DISSECTION AND ANALYSIS OF ELECTROENCEPHALOGRAMS OF SUBJECTS DOING A SIMULATED PILOT'S TASK M.S. Thesis
Daniel Floyd Lashbrook Mar. 1977 69 p refs
(AD-A039925) Avail: NTIS HC A04/MF A01 CSCL 06/5

A method for dissecting and analyzing electroencephalograms for the presence of any distinctive characteristics is presented. Data are presented which strongly indicate the presence of a preferred frequency, in the 70 - 95 Hz range, that is a characteristic of the performance of a simulated pilot's task. A conclusive test for the presence of wideband noise in the EEG is presented with data to show that wideband noise is characteristic of myograms. EEGs taken from two closely spaced electrodes located over the motor and premotor areas of the cortex show that tegules in the 70 - 95 Hz band are not simultaneous with tegules of any other band, except by chance. Author (GRA)

N77-31778# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.
CRITERIA FOR A RECOMMENDED STANDARD: OCCUPATIONAL EXPOSURE TO ALLYL CHLORIDE
Sep. 1976 99 p refs
(PB-267071/9; DHEW/PUB/NIOSH-76/204; NIOSH-76/204) Avail: NTIS HC A05/MF A01 CSCL 06J

Provisions are included for sampling, collection, analysis, pre-employment medical examination, periodic examinations, first-aid, medical records, labeling and posting, personal protective equipment (respiratory protection including respirator requirements, eye protection and skin protection), informing employees, emergency procedures involving allyl chloride, control of airborne allyl chloride storage, handling and general work practices, waste disposal, confined spaces, sanitation, monitoring and recordkeeping. Criteria include the purpose of the standards, and biologic effects of exposure. GRA

N77-31779# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.
CRITERIA FOR A RECOMMENDED STANDARD: OCCUPATIONAL EXPOSURE TO ACETYLENE
Jul. 1976 96 p refs
(PB-267068/5; DHEW/PUB/NIOSH-76/195) Avail: NTIS HC A05/MF A01 CSCL 06J

Recommendations are given for an occupational exposure standard for acetylene. Sections include recommendations for an acetylene standard based on environmental, medical, labeling and posting, and other factors; biologic effects of exposure dealing with extent of exposure, historical reports, effects on humans, epidemiologic studies, animal toxicity, correlation of exposure and effect, and carcinogenicity, mutagenicity, and teratogenicity; environmental data; development of a standard; work practices; and research needs. GRA

N77-31780# Naval Training Analysis and Evaluation Group, Orlando, Fla.
ACADEMIC ATTRITION FROM NAVY TECHNICAL TRAINING CLASS A SCHOOL COURSES Final Report, Nov. 1976 - Jun. 1977
Morris G. Middleton, William C. Rankin, Eric K. Green, and Clarence J. Papetti Jul. 1977 59 p refs
(TAEG-47) Avail: NTIS HC A04/MF A01

Attrition of enlisted personnel during first tour enlistment, a major concern in the all volunteer U.S. Navy, is discussed. Attrition from the A school training environment was perceived to be a part of the overall attrition problem. An investigation of 147 AI and A3 Navy courses was done to identify factors associated with academic attrition, and to determine the overall and course specific costs of academic attrition. Work was also done to identify the extent and pattern of attrition in class AI and A3 courses and to suggest corrective courses of action for monitoring, controlling, or reducing academic attrition. Author

N77-31781# Yale Univ., New Haven, Conn. Dept. of Psychology.
VERBAL FLUENCY AND THE LANGUAGE-BOUND EFFECT
Ruth S. Day May 1977 50 p refs
(Contract N00014-75-C-0967; NR Proj. 154-378)
(AD-A040830; TR-1) Avail: NTIS HC A03/MF A01 CSCL 05/10

Individuals previously identified as language-bound (LB) and language- optional (LO) participated in a series of experiments designed to study verbal fluency. The two groups showed a striking similarity in the number of responses they produced for categories with constraints at various levels (word form, word content, sentence, interpretation). This similarity occurred for both written and oral modes of response, and over a wide range of time intervals. Other types of measures, however, suggested that the form(s) in which a given category can be represented affected the ease with which the two groups produced their responses. LBs had more difficulty with categories that lent themselves readily to a spatial representation, while LOs had more difficulty with a cateogry based on phonetic constraints. The results were considered in terms of their implications for the LB phenomenon as well as general approaches to the study of verbal fluency. GRA

N77-31782# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
FEASIBILITY STUDY TO PREDICT COMBAT EFFECTIVENESS FOR SELECTED MILITARY ROLES: FIGHTER PILOT EFFECTIVENESS Final Report, 1 Feb. 1976 - 30 Apr. 1977
Edward W. Youngling, Sheldon H. Levine, John B. Mocharnuk, and Louise M. Weston 29 Apr. 1977 404 p refs
(Contract MDA903-76-C-0169)
(AD-A041650; MDC-E1634) Avail: NTIS HC A18/MF A01 CSCL 05/9

This study focuses upon enhancing the U.S. record of air-to-air combat kills through more stringent and comprehensive selection procedures. Specifically, it presents empirical evidence which demonstrates that a program can be developed to select pilots who will be effective in air-to-air combat. Developing such a selection program involves a job analysis of the fighter pilot task, the generation of testable trait hypotheses, the development of predictor variables and peacetime and combat criteria, and validation and cross validation during peacetime and during combat. Forty-five factors were identified only 10 of which are adequately evaluated within a current U.S. military selection program upon initial entrance into pilot training. Assessment of the 35 untapped factors is within technological reach; in fact, many of these factors can be assessed by tests which are presently available. GRA

N77-31783# Advisory Group for Aerospace Research and Development, Paris (France).
THE PSYCHO-PATHOLOGY OF THE STUDENT PILOT AND MEDICO-PSYCHOLOGICAL MONITORING IN THE FLYING SCHOOL
J. R. Galle-Tessoneau (Centre Medical de Psychologie Clinique de l'Armee de l'Air, Paris) Aug. 1977 45 p refs
(AGARD-AG-227; ISBN-92-835-0201-9) Avail: NTIS HC A03/MF A01

The practice of medicine among the population of young student pilots is discussed in terms of interest for the young doctor. It is suggested that the going beyond the affected organ, the 'symptom presented', tries to understand the whole of the personality he is examining. The medical manifestatiens most often encountered with student pilots are reviewed. Author

N77-31784* Nebraska Univ., Lincoln. Dept. of Engineering Mechanics.
ANALYSIS AND DESIGN OF A PROTO-TYPE TRIPLE-AXIS-COMMON-PIVOT-ARM-WRIST TO BE EVALUATED ON ESAM AND P-FMA. PHASE 1 Final Report
Leender Kersten Aug. 1977 118 p
(Contract NAS8-31897)
(NASA-CR-150375) Avail: Issuing Activity CSCL 05H

The performance characteristics and requirements are described for an arm/wrist assembly of a manipulator whose drive system uses a backdriveable gear train allowing for a 20.5 N-m (15 ft lb) torque delivery in each of the joint movements. Topics discussed include materials and weight specifications, sizing of various gear sets, a mathematical model for thermal analysis, and purchased components and vendors. Detail and assembly drawings of the components are presented along with the computer program use for thermal analysis. A.R.H.

N77-31785*# Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences.
VALIDATION OF THE PASSENGER RIDE QUALITY APPARATUS (PRQA) FOR SIMULATION OF AIRCRAFT MOTIONS FOR RIDE-QUALITY RESEARCH
William B. Bigler, II Apr. 1977 69 p refs
(Grant NGR-47-005-181)
(NASA-CR-154892; UVA/528060/ESS77/108) Avail: NTIS HC A04/MF A01 CSCL 05H

The NASA passenger ride quality apparatus (PRQA), a ground based motion simulator, was compared to the total in flight simulator (TIFS). Tests were made on PRQA with varying stimuli: motions only; motions and noise; motions, noise, and visual; and motions and visual. Regression equations for the tests were obtained and subsequent t-testing of the slopes indicated that ground based simulator tests produced comfort change rates similar to actual flight data. It was recommended that PRQA be used in the ride quality program for aircraft and that it be validated for other transportation modes. Author

N77-31786*# Ionics, Inc., Watertown, Mass.
WATER VAPOR DIFFUSION MEMBRANE DEVELOPMENT Final Report
Michael K. Tan 26 Jul. 1977 65 p
(Contract NAS2-7651)
(NASA-CR-152037) Avail: NTIS HC A04/MF A01 CSCL 06K

An application of the water vapor diffusion technique is examined whereby the permeated water vapor is vented to space vacuum to alleviate on-board waste storage and provide supplemental cooling. The work reported herein deals primarily with the vapor diffusion-heat rejection (VD-HR) as it applies to the Space Shuttle. A stack configuration was selected, designed and fabricated. An asymmetric cellulose acetate membrane, used in reverse osmosis application was selected and a special spacer was designed to enhance mixing and promote mass transfer. A skid-mount unit was assembled from components used in the bench unit although no attempt was made to render it flight-suitable. The operating conditions of the VD-HR were examined and defined and a 60-day continuous test was carried out. The membranes performed very well throughout the test; no membrane rupture and no unusual flux decay was observed. In addition, a tentative design for a flight-suitable VD-HR unit was made. Author

N77-31787*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SEAT CUSHION TO PROVIDE REALISTIC ACCELERATION CUES FOR AIRCRAFT SIMULATOR PILOTS Patent Application
Billy R. Ashworth, inventor (to NASA) Filed 31 Aug. 1977 14 p
(NASA-Case-LAR-12149-1; US-Patent-Appl-SN-829314) Avail: NTIS HC A02/MF A01 CSCL 05H

A seat cushion for providing realistic acceleration cues to an aircraft simulator pilot was developed. A plurality of contiguous seat cushion compartments, each including a pressure controllec air cell with a noncompressible surface underneath, were provided Means were available for initially controlling the air pressure ir. the air cells to allow the tuberosities of the simulator pilot to touch the noncompressible surface and thus begin to compress the flesh near these areas. During a simulated flight means were provided for controlling the air pressure in the cells to simulate the events that occur in a seat cushion during actual flight.
NASA

N77-31789# Navy Experimental Diving Unit, Panama City, Fla.
MK 12 SSDS AIR MODE TECHNICAL EVALUATION T/S 203 Final Report
B. A. Ridgewell 6 Jul. 1976 62 p refs
(AD-A039607; NEDU-4-76) Avail: NTIS HC A04/MF A01 CSCL 06/17

Summary of the Technical Evaluation Testing of the MK 12 Surface Supported Diving System, air mode. Compares required characteristcs and operational parameters with test results. Concludes that the system is ready for Operational Evaluation.
Author (GRA)

N77-31790# Aerospace Systems, Inc., Burlington, Mass.
PILOT MODELING FOR MANNED SIMULATION. VOLUME 2: PROGRAM PIREP USER MANUAL Final Report, Apr. 1975 - Feb. 1976
Kristine M. Doyle and William C. Hoffman Dec. 1976 52 p refs
(Contract F33615-75-C-3069)
(AD-A040416; ASI-TR-76-29-Vol-2; AFFDL-TR-76-124-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 05/8

A digital computer program (PIREP) has been developed to implement the extended optimal control pilot model discussed in Volume I. The user manual describes the program organization, presents the input formats and program options, provides general comments to assist the user, and presents results for a sample run. The program is written entirely in FORTRAN IV, for operation on the Wright-Patterson computer facility. Author (GRA)

N77-31790# Army Aeromedical Research Lab., Fort Rucker, Ala.
MEASUREMENT OF AVIATOR VISUAL PERFORMANCE AND WORKLOAD DURING HELICOPTER OPERATIONS Final Report
Ronald R. Simmons, Kent A. Kimball, and Jamie J. Diaz Dec. 1976 37 p refs
(AD-A035757; USAARL-77-4) Avail: NTIS HC A03/MF A01 CSCL 06/16

This report was initiated to review the techniques and modifications developed by the U.S. Army Aeromedical Research Laboratory for assessing visual performance/workload of pilots during helicopter operations. Although the corneal reflection techniques for gathering eye movement data is not new, innovative modifications had to be developed to permit accurate data collection in this flight environment. This study reports on these techniques, modifications, and applications. Author (GRA)

N77-31791# Hughes Aircraft Co., Culver City, Calif. Display Systems and Human Factors Dept.
CREW SIZE EVALUATION FOR TACTICAL ALL-WEATHER STRIKE AIRCRAFT Final Technical Report
M. L. Hershberger, L. A. Scanlan, and D. W. Craig Wright-Patterson AFB, Ohio AFAL Apr. 1977 88 p refs
(Contract F33615-75-C-1126)
(AD-A041675; HAC-D4163; HAC-P76-48R; AFAL-TR-76-79) Avail: NTIS HC A05/MF A01 CSCL 05/9

This research and development obtained significant information necessary to assess the requirements for one- versus two-man aircraft in air-to-ground strike missions using synthetic aperture radar (SAR). A real-time man-in-the-loop simulation was conducted in which one- and two-man TAC crews performed aircraft flight control, aircraft systems management, communications, threat detection, countermeasures, and SAR target acquisition tasks. Threat detection and response tasks were employed to vary crew workload and to create inside-cockpit and outside-cockpit visual tasks. A shallow interdiction air-to-ground strike mission with ingress to enemy territory, penetration of enemy territory, and SAR tactical target acquisition phases were simulated. One and two-man aircrew flight control performance, threat detection and response, and SAR target acquisition performance were measured. In general, two-man crews were superior to one-man crews at aircraft flight control, outside-cockpit threat detection, and SAR target acquisition tasks. The dominant superiority of two-man crews, however, was for outside-cockpit threat detection. A major advantage for a two-place SAR air-to-ground strike aircraft, therefore, is the improved visual surveillance achieved with two crewmen and the resulting increased survivability when over hostile enemy territory. The detailed simulation procedures and results of this work and the implications to advanced synthetic aperture radar airborne strike systems are discussed in the report. GRA

N77-31792# Navy Experimental Diving Unit, Panama City, Fla.
EVALUATION OF JIM: A ONE-ATMOSPHERE DIVING SUIT Final Report
Robert C. Carter, Jr. Jul. 1976 17 p
(AD-A039608; NEDU-5-76) Avail: NTIS HC A02/MF A01 CSCL 06/17

The atmospheric diving suit (ADS) 'JIM' was evaluated at the Navy Experimental Diving Unit during a two-week period in June, 1975. The suit was shown to meet many of the expectations that the manufacturer had for it. It could keep an aquanaut dry at one atmosphere while he worked in water to depths of 1000 FSW GRA

N77-31793# Naval Weapons Center, China Lake, Calif.
EXPERIMENTS WITH COLOR CODING ON TELEVISION Cockpit Instrumentation Study Report, Feb. - Oct. 1976
Jan. 1977 23 p refs
(AD-A040415; NWC-TP-5952) Avail: NTIS HC A02/MF A01 CSCL 01/4

Three experiments were conducted to investigate the effectiveness of color in a potential cockpit application. The experiments measured the subjects ability to monitor random malfunction indications, shown in either color-coded, single color, or black-and-white conditions on simulated engine management displays. The subjects were simultaneously engaged in a dynamic target detection task on an adjacent display during the monitoring task. Ambient illumination color and subject experience were additional variables. The results show that response time on the target detection task was faster when the engine display was color-coded than when it was black-and-white. Time to report malfunctions was slower with red or green monochrome displays than with the other colors. The response time in reporting malfunctions on the black-and-white display was not affected by the choice of color on the adjacent display. Finally, performance on target detection and malfunction reporting was not affected by ambient illumination or the experience of the subjects.
Author (GRA)

N77-31794# Naval Air Development Center, Warminster, Pa. Crew Systems Dept.
A COMPARATIVE EVALUATION OF THE APH-6D, HGU-35/P (LOW PRESSURE), HGU-36/P (HIGH PRESSURE), VTAS 2 AND VTAS 3 HELMET SYSTEMS ON THE DYNAMIC FLIGHT SIMULATOR
Robert Z. Snyder 30 Dec. 1976 67 p
(AD-A040927; NADC-75195-40) Avail: NTIS HC A04/MF A01 CSCL 15/5

Pilots flying high performance aircraft under sustained acceleration in an ACM (Air Combat Maneuver) have been exposed to an additional stress imposed upon them by their heavy, unstable helmet and its related oxygen mask. A newly developed lightweight mold-in-place helmet with an integrated oxygen mask system was dynamically tested on the Naval Air Development Center (NAVAIRDEVCEN) human centrifuge in a simulated ACM acceleration profile. Four pilots, each wearing three variations

of the prototype helmet, were exposed to a peak of 6 Gz in 10 seconds, held for approximately 4 seconds, returned to 2 Gz, then built up to 4 Gz in 10 seconds, held for approximately 4 seconds and then returned to a plateau of either 3 Gz or 1 Gz for a total time of 4 minutes. Performance measurements were made during the plateaus. The pilots used the APH-6 single visor helmet as a standard for the conventional HGU-35/P helmet and a VTAS-II helmet (lightweight, mold-in-place helmet assembly using an A-13A oxygen mask and an add-on VTAS electronic/optical system) as a standard of comparison for the VTAS-III (an HGU-35/P integrated oxygen mask system and an integrated VTAS electronic/optical system). Based upon a perfect score of 100, the overall evaluation of the helmets tested scored as follows: APH-6 (57.5), VTAS-II (46), HGU-35P High Pressure (79), HGU-35 Low Pressure (77.5), and the VTAS-III (71).

Author (GRA)

N77-31795# Naval Postgraduate School, Monterey, Calif.
METHODOLOGY FOR IDENTIFYING AND QUANTIFYING THE CRITICALITY OF HUMAN FACTORS DEFICIENCIES IN NAVAL AIRCRAFT COCKPITS M.S. Thesis
James Francis Mowbray Mar. 1977 134 p refs
(AD-A040201) Avail: NTIS HC A07/MF A01 CSCL 05/5

Human factors and system safety engineering concepts frequently have not been incorporated in the design of U.S. Navy aircraft cockpits. The relationship of human factors cockpit deficiencies to pilot error and operator inefficiency is examined and the need for a comprehensive data base of these deficiencies is demonstrated. A questionnaire was designed and developed to collect the required data from the operators of naval aircraft. Results from administering the questionnaire to a number of subjects substantiate the validity of the method for gathering the human factors deficiency data. Recommendations are made for expanding the data collection to a Navy-wide basis.

Author (GRA)

N77-31796# Perceptronics, Inc., Woodland Hills, Calif.
MAN-MACHINE COMMUNICATION IN COMPUTER-AIDED REMOTE MANIPULATION Technical Report, 2 Feb. 1976 - 1 Feb. 1977
Barry L. Berson, William H. Crooks, Efraim Shaket, and Gerson Weltman 1 Mar. 1977 120 p refs
(Contract N00014-76-C-0603)
(AD-A040217; PATR-1034-77-3/1) Avail: NTIS HC A06/MF A01 CSCL 05/8

Automated Remote Manipulation is both an area of great practical utility for Navy Undersea Operations, and a prime example of new type of man-machine interaction in which the human operator must supervise and control a complex and adaptive man-computer system. This report presents the results of an experimental study focusing on man-machine communication with computer-aided manipulators. This report describes (1) underwater manipulator functions and operator performance requirements in remote manipulation, (2) the development of a theoretical man-machine communication model based on procedural sets, and (3) an experimental investigation on the effect of several elementary computer aiding techniques on the ability of trained operators to perform selected remote manipulation tasks. The results of the experimental investigation indicated that computer aiding can significantly decrease task performance times for a number of remote manipulation tasks. Computer aiding in the form of resolved motion and automated control significantly reduced the times required to perform valve turning and ring manipulation tasks. The results also indicated that if higher-level aiding schemes are to be effective in terms of improving man-machine performance, the design of the communications language and interface must be carefully designed to maintain the communication goals of naturalness, simplicity and understandability.

Author (GRA)

N77-31797# Dayton Univ. Research Inst., Ohio. Research Inst.
BIOMECHANICS AND ANTHROPOMETRY FOR COCKPIT AND EQUIPMENT DESIGN Final Report, 1 Dec. 1975 - 31 Dec. 1976
Susan M. Evans, Martin Himes, and Paul E. Kikta Mar. 1976 92 p refs
(Contract F33615-75-C-5092)
(AD-A037020; UDRI-TR-76-85; AMRL-TR-77-7) Avail: NTIS HC A05/MF A01 CSCL 06/14

This report describes enhancements made to the AMRL COMBIMAN (COMputerized BIOmechanical MAN-model) program in the areas of man-model link-system and enfleshment characteristics, and in the area of additional functions or options made available to the user of the interactive graphics computer program of COMBIMAN. These new functions include obtaining hard-copy plots of the man-model and workstation as displayed on the Cathode Ray Tube (CRT), and obtaining visibility plots of the workstation boundary. The report also documents technical procedures followed in readying the AMRL HERCULES (Human Engineering Research to Cull Efficient Strength) Lab for measuring strength capabilities of seated operators, and the procedures established for running the subjects and gathering the data. The last area covered in this report is the development of programs and the manipulation of anthropometric data used in the analysis of human size variability data.

GRA

N77-31798# Pennsylvania State Univ., State College. Environmental Acoustics Lab.
A REAL-EAR FIELD METHOD FOR THE MEASUREMENT OF THE NOISE ATTENUATION OF INSERT-TYPE HEARING PROTECTORS
P. L. Michael, R. L. Kerlin, G. R. Bienvenue, J. H. Prout, and J. I. Shampan Jun. 1976 171 p refs
(Contract CDC-99-74-63)
(PB-267419/0; DHEW/PUB/NIOSH-76/181; NIOSH-76/181) Avail: NTIS HC A08/MF A01 CSCL 06Q

A method is developed for measuring the real-ear noise attenuation of insert-type hearing protectives worn in work places. The method involves the use of a circumaural headphone set comprising a muff-type hearing protector fitted with earphone drivers, tested and used to measure noise attenuation for five models of insert-type hearing protectors. Statistical analysis shows strong correlations between the attenuation data measured by the field method and standard-method procedures for all nine one-third-octave-band test signals. General recommendations of a measurement procedure are given for the field method. The method is intended primarily as a technique for documenting the variability of hearing protector performance in the work place.

GRA

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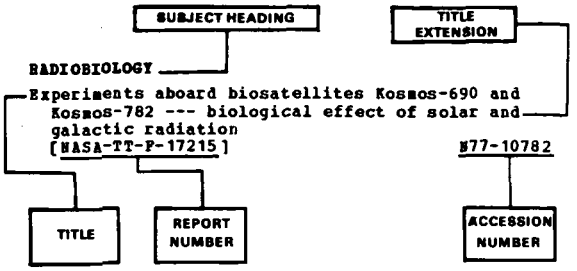

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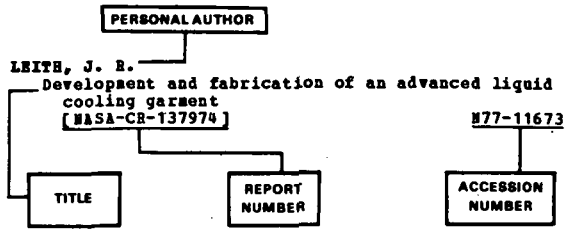

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