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A Continuing Bibliography with Indexes

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NASA SP-7011(285)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 285)

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 May 1986 in

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

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 319 reports, articles and other documents announced during May 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

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

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

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

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 285)

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LIFE SCIENCES (GENERAL)

Includes genetics.

A86-23225
INDIRECT OBSERVATION BY C-13 NMR SPECTROSCOPY OF A NOVEL CO2 FIXATION PATHWAY IN METHANOGENS
J. N. S. EVANS, C. J. TOLMAN, and M. F. ROBERTS (MIT, Cambridge, MA) Science (ISSN 0036-8075), vol. 231, Jan. 31, 1986, p. 488-491. Research supported by the Gas Research Institute. refs
(Contract NIH-RR-00995; NSF C-670)

A86-23311* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INCREASED GLUCONEOGENESIS IN RATS EXPOSED TO HYPER-G STRESS
B. C. DALIGCON, J. OYAMA, and K. HANNAK (NASA, Ames Research Center, Moffett Field, CA) Life Sciences (ISSN 0024-3205), vol. 37, no. 3, 1985, p. 235-241. refs

The effect of gluconeogenesis on the levels of plasma glucose and liver glycogen was studied in rats exposed to hyper-G stress. Incorporation of lactate, alanine, or glycerol, labeled with C-14, into plasma glucose and liver glycogen was measured in rats centrifuged at 3.1 G for 0.25, 0.50, and 1.0-hr periods, and was compared to noncentrifuged controls injected with appropriate glycogen precursors. It was found that exposure to G-stress leads to increased incorporation from all three substrates into both plasma glucose and liver glycogen. These early incorporation increases were blocked upon pre-G administration of 5-methoxyindole-2-carboxylic acid, a gluconeogenesis inhibitor, or propanolol, a beta-adrenergic blocker, as well as by adrenodemedullation. Results indicate that the rapid rise in plasma glucose, as well as in liver glycogen in rats exposed to hyper-G stress is due to an increased rate of gluconeogenesis, and that epinephrine, released in response to hyper-G-induced activation of the sympathetic-adrenal system, plays a dominant role during the early stages of hyper-G stress. I.S.

A86-23490
MORPHOLOGICAL CHANGES IN SOME INTERNAL ORGANS OF GUINEA PIGS DUE TO THE EFFECT OF A CONSTANT ELECTROMAGNETIC FIELD [MORFOLOGICHESKIE IZMENENIIA NEKOTORYKH VNUTRENNIKH ORGANOV MORSKIKH SVINOK POD VOZDEISTVIEM POSTOIANNOGO ELEKTROMAGNITNOGO POLIA]
R. V. KAPANADZE, D. D. TVILDIANI, Z. B. TSAGARELI, N. G. GORDADZE, T. G. GAPRINDASHVILI (AN GSSR, Nauchno-Issledovatel'skii Institut Eksperimental'noi Morfologii, Tbilisi; Nauchno-Issledovatel'skii Institut Kardiologii, Georgian SSR) et al. Akademiia Nauk Gruzinskoi SSR, Soobshcheniia (ISSN 0132-1447), vol. 119, July 1985, p. 189-192. In Russian. refs

A86-23491
MECHANISM OF NORADRENALINE EFFECT ON THE SKIN THERMORECEPTORS [O MEKHANIZME DEISTVIIA NORADRENALINA NA KOZHNYE TERMORETSEPTORY]
T. V. KOZYREVA and I. N. SINDAROVSKAIA (Institut Klinicheskoi i Eksperimental'noi Meditsiny, Novosibirsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Nov. 1985, p. 1344-1350. In Russian. refs

Skin surface and intradermal temperatures, rectal temperature, and oxygen consumption were recorded continuously in cold-adapted and nonadapted rats following the injection of noradenaline by either intraperitoneal or intraarterial routes. Among the measured parameters, only the intradermal temperature response depended upon the route of administration: intraperitoneal injection caused, after a short latent period, an increase in temperature, whereas interaarterial administration led to a decrease in temperature, followed by a gradual increase. All other measured parameters have displayed increases after either type of injection, and in the cold-adapted animals, all noradrenaline-effected changes were enhanced compared to nonadapted animals. Injections of noradrenaline by either route were shown earlier (Kosyreva, 1984) to equally activate skin cold receptors, indicating by this uniformity that their activation was independent of the capillary tonus, which causes the observed intradermal temperature changes. A mechanism of direct hormonal activation of the receptor membranes is suggested. I.S.

A86-23492
EFFECT OF HYPEROXIC GAS MIXTURES ON OXYGEN MASS TRANSFER THROUGH THE HEMATOPARENCHYMATOUS BARRIER [VLIIANIE GIPEROKSICHESKIKH GAZOVYKH SMESEI NA MASOPERENOS KISLORODA CHEREZ GEMOTOPARENKHIMATOZNYI BAR'ER]
V. A. BEREZOVSKII and V. I. NOSAR (AN USSR, Institut Fiziologii, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Nov. 1985, p. 1403-1407. In Russian. refs

The effect of inhaling oxygen-enriched gas mixtures, containing 80 pct O2 and 20 pct of either N2 or He, on the oxygen permeability through the blood-tissue barrier was studied in rabbits under local anesthesia. Hind-limb arterial and venous oxygen pressures, O2 pressure in the muscle tissue, and other parameters of O2 blood-tissue permeability were measured before and after application of the hyperoxic mixtures. Inhalation of either hyperoxic mixture was found to cause a drop of O2 transport to about one-fifth of the control values, indicating that the hyperoxia per se evokes a protective reaction against hyperoxygenation. I.S.

A86-23493
INTERACTION OF THE THERMORECEPTOR AND VESTIBULAR SIGNALS IN THE REGULATION OF THE ACTIVITY OF FLEXOR AND EXTENSOR MOTOR NUCLEI DURING COLD TREMORS [VZAIMODEISTVIE TERMORETSEPTIVNOI I VESTIBULIARNOI SIGNALIZATSII V REGULIATSII AKTIVNOSTI FLEKSORNOGO I EKSTENZORNOGO DVIGATEL'NYKH IADER VO VREMIA KHOLODOVOGO TREMORA]
IU. V. LUPANDIN and G. I. KUZMINA (Petrozavodskii Gosudarstvennyi Universitet, Petrozavodsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Nov. 1985, p. 1433-1438. In Russian. refs

A86-23553* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION LIFE SCIENCES GUIDELINES FOR NONHUMAN EXPERIMENT ACCOMMODATION
R. ARNO (NASA, Ames Research Center, Moffett Field, CA) and J. HILCHEY (NASA, Marshall Space Flight Center, Huntsville, AL) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 13 p. refs
(SAE PAPER 851370)

Life scientists will utilize one of four habitable modules which constitute the initial Space Station configuration. This module will be initially employed for studies related to nonhuman and human life sciences. At a later date, a new module, devoted entirely to nonhuman life sciences will be launched. This report presents a description of the characteristics of a Space Station laboratory facility from the standpoint of nonhuman research requirements. Attention is given to the science rationale for experiments which support applied medical research and basic gravitational biology, mission profiles and typical equipment and subsystem descriptions, issues associated with the accommodation of nonhuman life sciences on the Space Station, and conceptual designs for the initial operational capability configuration and later Space Station life-sciences research facilities. G.R.

A86-23568
SIMULATION MODEL FOR PLANT GROWTH IN CONTROLLED ENVIRONMENT SYSTEMS
D. C. RAPER, JR. and M. WANN (North Carolina State University, Raleigh) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 7 p. refs
(SAE PAPER 85-1390)

The development of a model which will assist in the designing of a crop production system is discussed. The utilization of the abstraction hierarchy theory of Mesrovic et al., (1970) to define the level of hierarchy for a crop production system is studied. The deterministic model for plant growth, which was developed, describes the growth of plants subjected to various environment conditions. The model analyzes the processes of: (1) photosynthetically active radiation, (2) translocation between carbohydrate pools in leaves, stems, and roots, (3) flow of energy and carbon, and (4) aging of tissues. The effect of temperature on photosynthesis, respiration, aging, and growth rates, and the translocation coefficients is investigated. The applications of nonlinear differential equations to the flow of energy and carbon, and of experimental data to the translocation coefficients and aging rates are examined. The structure of the model provides the capacity for interpolating among the levels within a crop production system of a controlled ecological life support system. I.F.

A86-23572
THE C23A SYSTEM, AN EXAMPLE OF QUANTITATIVE CONTROL OF PLANT GROWTH ASSOCIATED WITH A DATA BASE
M. ANDRE, A. DAGUENET, D. MASSIMINO, and A. GERBAUD (CEA, Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les-Durance, France) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 12 p. refs
(SAE PAPER 851395)

The C23A (Chambres de Culture Automatique en Atmospheres Artificielles) system which is used for the controlled study of plant physiology is described. The modular plant growth chambers and instruments for the study of canopies, isolated plants with a separate root compartment, and acquatic plants are examined. The uses of a mass spectrometer and a CO2 infrared analyzer to monitor shoot and root atmospheres, and of a chemical autoanalyzer to calculate uptake rates for elements are analyzed. The microprocessors, central computer, and satellite microcomputers of the computer system control the culture chambers and measuring systems, provide visual or graphical control, and store all data in short- and long-term files. Examples of experimental studies conducted in the C23A system evaluating the photosynthesis and photorespiration of various plants are presented. I.F.

A86-23574
DESCRIPTION OF CONCEPT AND FIRST FEASIBILITY TEST RESULTS OF A LIFE SUPPORT SUBSYSTEM OF THE BOTANY FACILITY BASED ON WATER RECLAMATION
H. R. LOESER (ERNO Raumfahrttechnik GmbH, Bremen, West Germany) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 14 p.
(SAE PAPER 851397)

A water reclamation module which controls the temperature and humidity of the air within the Botany Facility is proposed. The water reclamation process is achieved by condensation with a heat pump and capillary transport of the condensate back into the soil of the plant growth chamber. An analysis is conducted to calculate the circulation flow rates and specific power consumption. The design of a prototype water reclamation module which utilizes a Peltrier element and a condenser/wick assembly to return elements to the soil and the experimental conditions are described. The module is evaluated in terms of condensation rate and condensor temperature as a function of the cold side mass of flow rate; the water reclamation process proves applicable for the Botany Facility. I.F.

A86-23996
MOLECULAR ARCHAEOLOGY OF THE MITOCHONDRIAL GENOME
R. OBAR (Boston University, MA) and J. GREEN (Tennessee, University, Knoxville) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 3, 1985, p. 243-251. refs
(Contract NSF PCM-82-03004)

A stepwise model for the net transfer of nucleic acid sequences between nonhomologous genomes has been developed. This model is then used to explain the two major patterns in the evolutionary history of mitochondrial genomes: the gross reduction of the number of genes, and the subsequent acquisition of introns. Author

A86-23997
A MULTIVARIATE STUDY OF THE RELATIONSHIP BETWEEN THE GENETIC CODE AND THE PHYSICAL-CHEMICAL PROPERTIES OF AMINO ACIDS
M. SJOSTROM and S. WOLD (Umea Universitet, Sweden) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 3, 1985, p. 272-277. Research supported by the Naturvetenskapliga Forskningsradet. refs

A86-23998* Indiana Univ., Bloomington.
SEQUENCE OF THE 16S RRNA GENE FROM THE THERMOACIDOPHILIC ARCHAEBACTERIUM SULFOLOBUS SOLFATARICUS AND ITS EVOLUTIONARY IMPLICATIONS
G. J. OLSEN, N. R. PACE (Indiana University, Bloomington), M. NUELL, B. P. KAINE, R. GUPTA (Illinois, University, Urbana) et al. Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 4, 1985, p. 301-307. refs
(Contract NIH-GM-34527; NSG-7044)

A86-23999
SEQUENCE DIVERGENCE OF AN ARCHAEBACTERIAL GENE CLONED FROM A MESOPHILIC AND A THERMOPHILIC METHANOGEN
P. T. HAMILTON and J. N. REEVE (Ohio State University, Columbus) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 4, 1985, p. 351-360. Research supported by the Gas Research Institute. refs
(Contract DE-AC02-81ER-10945; EPA-CR-810340)

A86-24000* California Univ., Berkeley.
A CHANGE IN THE GENETIC CODE IN MYCOPLASMA CAPRICOLUM
T. H. JUKES (California, University, Berkeley) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 4, 1985, p. 361, 362. refs
(Contract NGR-05-003-460)

Mycoplasma capricolum was previously found to use UGA instead of UGG as its codon for tryptophan and to contain 75 percent A + T in its DNA. The codon change could have been due to mutational pressure to replace C + G by A + T, resulting in the replacement of UGA stop codons by UAA, change of the anticodon in tryptophan tRNA from CCA to UCA, and replacement of UGG tryptophan codons by UGA. None of these changes should have been deleterious. Author

A86-24136
METABOLIC ASPECTS OF THE PROBLEM OF STRESS IN SPACE FLIGHT [METABOLICHESKIE ASPEKTY PROBLEMY STRESSA V KOSMICHESKOM POLETE]
R. A. TIGRANIAN Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 52), 1985, 224 p. In Russian. refs

The character of the possible stress response to space flight is examined along with the nature of adaptation to this type of stress. Data are presented on changes of stress indicators (catecholamines, hormones, peptides, polyamines, enzymes, lipids, etc.) in various organs and tissues of rats on prolonged space flights (18.5-22 days) on the Cosmos biosatellites. In particular, the combined effect of weightlessness and ionizing radiation was studied on Cosmos-690, and the effect of weightlessness and artificial gravity was studied on Cosmos-936. Stress-response mechanisms associated with prolonged stay in weightlessness are considered along with the subsequent readaptation to terrestrial gravity. B.J.

A86-24144
IONIZING RADIATION AND BLOOD VESSELS [IONIZIRUIUSHCHIE IZLUCHENIIA I KROVENOSNYE SOSUDY]
E. I. VOROBEV and R. P. STEPANOV Moscow, Energoatomizdat, 1985, 296 p. In Russian. refs

Results of clinical and experimental studies on the effects of ionizing radiation on the vascular system are presented. Effects of low-level chronic exposure, and both short-term and delayed effects of radiation therapy are discussed, including organ-specific, as well as general, vascular and hemodynamic changes. Laboratory studies of primary and secondary effects of radiation on the aortal and capillary endothelia are reported, and the processes of intracellular and tissue repair in the capillary endothelium are described. Special attention is paid to studies concerned with the prevention and treatment of radiation sickness. I.S.

A86-24308
HOW DOES SKELETAL MUSCLE EFFECTIVELY FUNCTION BOTH IN THE CASE OF POSTURE MAINTENANCE AND TWITCH MOVEMENTS? [ZA SCHET CHEGO SKELETNAIA MYSHTSA EFFEKTIVNO RABOTAET KAK PRI PODDERZHANII POZY, TAK I V FIZICHESKIKH DVIZHENIIAKH]
V. S. GURFINKEL and IU. S. LEVIK (AN SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 285, no. 5, 1985, p. 1241-1245. In Russian. refs

Experiments were conducted in which electric stimuli were used to simulate pulsed sequences of motor unit under the twitch and tonic activity of muscles. The results indicate that skeletal muscle functions effectively in both postural and twitch modes not only because of the presence of fast and slow fibers, but also because the contractile properties of one and the same fibers can change. B.J.

A86-24309
ANTISTRESS EFFECT OF 1-CHLORMETHYLSILITRANE [ANTISTRESSNYI EFFEKT 1-KHLORMETILSILATRANA]
V. V. MALYSHEV, T. P. DVORETSKAIA, V. B. KAZIMIROVSKAIA, N. S. KAMENEVA, E. IU. SMAKOLINA (Irkutskii Gosudarstvennyi Meditsinskii Institut; AN SSSR, Institut Organicheskoi Khimii, Irkutsk, USSR) et al. Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 285, no. 5, 1985, p. 1249-1251. In Russian. refs

The effect of 1-chlormethylsilitrane (1-CMS) on the development of emotional stress was studied in 80 white male rats. Results indicate that a preliminary administration of 1-CMS prevents the stress activation of the adrenergic and hypophyseal-adrenal systems, i.e., this drug has powerful antistress effect. It is concluded that the further study of the adaptogenic properties of silicon compounds is of interest in connection with the production of stress-preventing drugs. B.J.

A86-24323
THE TRYPTOPHANYL-TRNA SYNTHETASES FROM EUROCARYOTES, PROCARYOTES, AND ARCHEBACTERIA HAVE A COMMON ANTIGENIC DETERMINANT [TRIPTOFANIL-TRNK-SINTETAZY EUKARIOT, PROKARIOT I ARKHEBAKTERII IMEIUT OBSHCHUIU ANTIGENNUIU DETERMINANTU]
T. A. ZARGAROVA, S. F. BERESTEN, O. O. FAVOROVA, and L. L. KISELEV (AN SSSR, Institut Molekuliarnoi Biologii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 285, no. 6, 1985, p. 1484-1486. In Russian. refs

A86-24368
HYPNOGENIC ACTIVITY OF A CYCLIC STRUCTURAL ANALOG OF DELTA-SLEEP-INDUCING PEPTIDE [GIPNOGENNAIA AKTIVNOST' TSIKLICHESKOGO STRUKTURNOGO ANALOGA DEL'TA-SON-INDUTSIRUIUSHCHEGO PEPTIDA]
V. M. KOVALZON (AN SSSR, Institut Evoliutsionnoi Morfologii i Ekologii Zhivotnykh, Moscow, USSR) and I. I. MIKHALEVA (AN SSSR, Institut Bioorganicheskoi Khimii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 286, no. 1, 1986, p. 230-232. In Russian. refs

It is shown that a cyclic analog of delta-sleep-inducing peptide (DSIP) has the same hypnogenic effect on rabbits in the case of central administration as linear analogs that are stable with respect to aminopeptidases. This is evidently due to two factors: (1) a heightened stability of the cyclic analog with respect to proteolysis, and (2) an adequate conformational structure. This supports the hypothesis that the quasi-cyclic conformation of DSIP participates in the regulation of the sleep-wakefulness cycle. B.J.

A86-24422
POSTRADIATION DISORDERS OF PERIPHERAL-NERVE REGENERATION AND THE ROLE OF FREE-RADICAL OXIDATION PRODUCTS IN THE APPEARANCE OF THESE DISORDERS [POSTRADIATSIONNYE NARUSHENIIA REGENERATSII PERIFERICHESKOGO NERVA I ROL' PRODUKTOV SVOBODNORADIKAL'NOGO OKISLENIIA V IKH VOZNIKNOVENII]
V. N. RADLINSKAIA, I. A. ZHUTAEV, V. N. BOBYREV, and O. N. VOSKRESENSKII (Poltavskii Meditsinskii Stomatologicheskii Institut, Poltava, Ukrainian SSR) Radiobiologiia (ISSN 0033-8192), vol. 25, Nov.-Dec. 1985, p. 728-732. In Russian. refs

The effect of local unilateral gamma-radiation and of alimentary antioxidant deficiency on nerve regeneration was studied in guinea pigs subjected to bilateral severance of sciatic nerves and maintained on either regular (i.e., antioxidant-supplemented) or antioxidant-free diet for 80 days prior to irradiation. All irradiated animals exhibited peroxidation syndrome, manifested by the appearance of free-radical oxidation products in blood components, as well as morphological abnormalities in the irradiated regenerating nerve (short and/or abnormally-shaped axons, and demyelination). In the antioxidant-deficient animals the extents of both peroxidation syndrome and morphological abnormalities were enhanced. Moreover, the nerve regeneration was now observed in both irradiated and contralateral sciatic nerves. I.S.

A86-24423
MECHANISM OF CIRCULATORY DISORDERS IN ANIMALS SUBJECTED TO HIGH-DOSE IRRADIATION [K MEKHANIZMU RASSTROISTV KROVOOBRASHCHENIIA U ZHIVOTNYKH, OBLUCHENNYKH V BOL'SHIKH DOZAKH]
T. D. POZHARISSKAIA, T. P. VASILEVA, E. N. SOKOLOVA, and I. I. ALEKSEEVA (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, Nov.-Dec. 1985, p. 763-767. In Russian. refs

The effect of lethal doses of gamma-radiation on the vascular system of dogs and rats was studied by monitoring postradiation changes in blood-cell count and morphology, blood coagulation indices, and the rate of peripheral blood flow. A single radiation dose (of 180 gR for rats and in the 18-145 gR range for dogs) led to the abrupt and sharp decline of white blood cell count, which was accompanied by multiple hemorrhages in the intestinal mucosa, the brain stem, and cerebral membranes, and by the appearance of disseminated intravascular hypercoagulation. The rate of capillary circulation (in the rat appendix) was found to decrease to one-half to one-quarter of the original rate. The significance of the early onset of hypercoagulation in clinical manifestations of intestinal and cerebral forms of acute radiation sickness is discussed. I.S.

A86-24424
EVALUATION OF RADIATION-INDUCED DAMAGE IN THE ERYTHROCYTE MEMBRANES OF RATS AND DOGS ACCORDING TO CHANGES IN THE ERYTHROCYTE SEDIMENTATION BEHAVIOR [OTSENKA RADIATSIONNYKH POVREZHDENII MEMBRAN ERITROTSITOV PO IZMENENIIU IKH SEDIMENTATSIONNYKH SVOISTV U KRYS I SOBAK]
V. F. MIKHAILOV and L. A. POTEMKIN (Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, Nov.-Dec. 1985, p. 784-786. In Russian.

A86-24425
EFFECT OF NONIONIZING MICROWAVE RADIATION ON THE AUTOIMMUNE REACTIONS AND ANTIGENIC STRUCTURE OF SERUM PROTEINS [VLIIANIE NEIONIZIRUIUSHEI MIKROVOLNOVOI RADIATSII NA AUTOIMMUNNYE REAKTSII I ANTIGENNUIU STRUKTURU SYVOROTOCHNYKH BELKOV]
G. I. VINOGRADOV, G. V. BATANOV, G. M. NAUMENKO, A. D. LEVIN, and S. I. TRIFONOV (Nauchno-Issledovatel'skii Institut Obshchei i Kommunal'noi Gigieny, Kiev, Ukrainian SSR) Radiobiologiia (ISSN 0033-8192), vol. 25, Nov.-Dec. 1985, p. 840-843. In Russian. refs

A86-24610#
THE LIFE SCIENCES ON BOARD OF SPACELAB D1 [DIE LEBENSWISSENSCHAFTEN AN BORD VON SPACELAB D1]
S. PAECH Luft- und Raumfahrt (ISSN 0173-6264), vol. 6, 4th Quarter, 1985, p. 106, 108-110. In German.

During the last few years, it was realized that a study of the effects of weightlessness can be of fundamental importance even in the area of biology, taking into account biological organisms from a cell to a human being. This importance is related to the fact that only experiments under conditions of weightlessness can provide information of an indirect nature regarding the mechanisms by which gravity affects biological organisms. For this reason, biological experiments of very different chracteristics formed a part of the D1 mission. The most important of these experiments are discussed, taking into account studies involving cells and other microorganisms, hatching experiments concerning frogs and flies, the effects of weightlessness on germinating plants, questions regarding the control of the transport of hormones during cell growth in plants by gravity, the behavior of the human body during the transition to weightlessness conditions, and functional disturbances caused by conditions of weightlessness. G.R.

A86-25659* Washington Univ., St. Louis, Mo.
EFFECT OF ROTOPOSITIONING ON THE GROWTH AND MATURATION OF MANDIBULAR BONE IN IMMOBILIZED RHESUS MONKEYS
D. J. SIMMONS, C. PARVIN, K. C. SMITH, P. FRANCE (Washington University, St. Louis, MO; USAF, Aerosspace Medical Research Laboratories, Wright-Patterson AFB, OH), and L. KAZARIAN Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 157-161. refs
(Contract NAGW-301)

The rates of bone formation and mineralization in the mandibular cortex of juvenile Rhesus monkeys exposed to immobilization/rotopositioning are evaluated. The monkeys were restrained in a supine position and rotated 90 deg every 30 minutes through a full 360 deg for 14 days. The microscopic distribution of mineral densities in osteonal bone and the porosity of cortical bone are studied using microradiographs, and osteon closure rates are assessed using tetracycline labeling; normal distributions of osteons of different mineral density and cortical bone porosity values are observed. It is concluded that 14 days of immobilization/rotopositioning did not cause abnormal changes in osteon mineralization, cortical porosity, and osteon closure rates. I.F.

A86-25660* Louisville Univ., Ky.
THYMIC INVOLUTION IN THE SUSPENDED RAT - ADRENAL HYPERTROPHY AND GLUCOCORTICOID RECEPTOR CONTENT
J. M. STEFFEN and X. J. MUSACCHIA (Louisville, University, KY) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 162-167. refs
(Contract NSG-2325; NAGW-70)

The relationship between thymic involution and adrenal hypertrophy is studied. The thymus, adrenal glands, and tissue water content are evaluated in male Sprague rats suspended in antiorthostatic (AO) or orthostatic (O) positions. A 50 percent decrease in the wet weight of the thymus and hypertrophy of the adrenal glands are observed during the seven days of AO suspension. After seven days of recovery the thymus weight is increased to control level; however, the hypertrophy of the adrenal glands remains unchanged. Thymic and renal responses in O postioned rats are similar to AO reactions. Thymic glucocorticoid (GC) receptor concentrations in the rats are analyzed; a 20 percent decrease in GC receptor site concentration, which is related to thymic involution, is detected in both AO and O rats. It is concluded that there is a temporal correlation between thymic involution and adrenal hypertrophy, which is not affected by AO positioning, and thymic involution is not associated with an increased sensitivity to GC. I.F.

A86-26180
PERMANENT DISTORTION OF POSITIONAL SYSTEM OF XENOPUS EMBRYO BY BRIEF EARLY PERTURBATION IN GRAVITY
J. COOKE (National Institute for Medical Research, London, England) Nature (ISSN 0028-0836), vol. 319, Jan. 2, 1986, p. 60-63. refs

N86-18949*# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 3 Final Report
L. R. HOOKE, ed., M. RADTKE, ed., V. GARSHNEK, ed., J. E. ROWE, ed., and R. TEETER, ed. Dec. 1985 102 p
(Contract NASW-3676)
(NASA-CR-3922(03); NAS 1.26:3922(03)) Avail: NTIS HC A06/MF A01 CSCL 06B

This is the third issue of NASA's USSR Space Life Sciences Digest. Abstracts are included for 46 Soviet periodical articles in 20 areas of aerospace medicine and space biology and published in Russian during the second third of 1985. Selected articles are illustrated with figures and tables from the original. In addition, translated introductions and tables of contents for seven Russian books on six topics related to NASA's life science concerns are

presented. Areas covered are adaptation, biospherics, body fluids, botany, cardiovascular and respiratory systems, endocrinology, exobiology, gravitational biology, habitability and environmental effects, health and medical treatment, immunology, life support systems, metabolism, microbiology, musculoskeletal system; neurophysiology, nutrition, perception, personnel selection, psychology, radiobiology, and space physiology. Two book reviews translated from the Russian are included and lists of additional relevant titles available in English with pertinent ordering information are given. Author

N86-18950*# National Aeronautics and Space Administration, Washington, D.C.
SUMMARIES OF 1984-85 NASA SPACE-GRAVITATIONAL BIOLOGY ACCOMPLISHMENTS
T. W. HALSTEAD, comp., F. R. DUTCHER, comp. (George Washington Univ., Washington, D.C.), and L. G. PLEASANT, comp. (George Washington Univ., Washington, D.C.) Dec. 1985 135 p refs
(Contract NASW-3165)
(NASA-TM-88379; NAS 1.15:88379) Avail: NTIS HC A07/MF A01 CSCL 06B

Individual technical summaries of research projects of NASA's Space/Gravitational Biology Program are presented. The summaries for each project include a description of the research, a listing of the accomplishments, and an explanation of the significance of the accomplishments. Bibliographies for each project are also included. Author

N86-18951# Army Medical Research Inst. of Infectious Diseases, Fort Detrick, Md.
METABOLISM OF T-2 MYCOTOXIN BY CULTURED CELLS
L. R. TRUSAL 18 Sep. 1985 20 p
(Contract DA PROJ. 3M1-61102-BS-12)
(AD-A159678; AD-E801193) Avail: NTIS HC A02/MF A01 CSCL 06T

T-2 mycotoxin is a small (i.e. 466 daltons), non-protein toxin. We studied its metabolism in Chinese hamster ovary (CHO) cells, African green monkey kidney (VERO) cells, human fibroblasts, and L-cells. Confluent cells were exposed to (3H)-T-2(0.01 micrograms/ml) for 1 hr at 37 C. CHO and VERO cells metabolized T-2 a greater extent than the other two cell types. In CHO, fibroblast and L-cells, the major metabolite was HT-2 toxin while, in VERO cells, an unknown metabolite, more polar than T-2, was the major metabolite. Cell and media extracts of CHO and VERO cells revealed smaller amounts of T-2 triol, T-2 tetraol and several unknowns. In both cell types, metabolites were detected in labeled media by 1 hr and in increasing amounts in unlabeled media by 4 hr. Under the above conditions, 37 to 58% of the radioactivity remained as T-2 toxin after 4 hr in both cell types. The data suggest that some cultured cell lines possess enzyme systems capable of limited metabolism of T-2 mycotoxin to a variety of known and as yet unidentified metabolites. GRA

N86-18952# OPTRA, Inc., Peabody, Mass.
RAPID IDENTIFICATION OF MICRO-ORGANISMS Final Report, 5 Apr. 1982 - 31 May 1985
M. HERCHER, K. MEAD, and H. M. SHAPIRO 26 Aug. 1985 27 p
(Contract DAAG29-82-C-0011)
(AD-A159945; ARO-18828.2-LS-S) Avail: NTIS HC A03/MF A01 CSCL 06M

Flow cytometric parameters for the rapid identification of micro-organisms have been investigated. These include fluorescent and incident light scatter signals indicative for: (1) cell size, (2) cell structure, (3) DNA content, (4) RNA content, (5) total protein, (6) surface antigens, (7) intracellular enzyme, activity and 8) viability (by membrane potential criteria). Several simplified instrumentation techniques for flow cytometry were also successfully explored. GRA

N86-18953# State Univ. of New York, Brooklyn.
IMMUNOMODULATION BY PROTEINS OF BORDETELLA PERTUSSIS Annual Report, No. 1, 1 Aug. 1984 - 31 Jul. 1985
B. M. SULTZER and J. P. CRAIG 30 Aug. 1985 11 p
(Contract N00014-84-K-0693)
(AD-A160078) Avail: NTIS HC A02/MF A01 CSCL 06E

A selected number of immunobiologically active polypeptides have been found to be closely associated with, but separable from the lipopolysaccharide endotoxin (LPS) in the outer membrane of Gram-negative bacteria. Initially these endotoxin associated proteins (EP) from Bordetella pertussis, Salmonella typhi and Vibrio cholerae were found to enhance the immune response to cholera enterotoxin after immunization with cholera toxiod. At the cellular level, B. pertussis EP (PEP) is a mitogen and polyclonal activator of antibody producing B-lymphocytes of C3H/HeJ mouse lymphocytes which are unresponsive to LPS. PEP can adjuvant in vitro the production of IgM antibody to cholera toxin and sheep erythrocytes by mouse splenic lymphocytes. In control experiments we have shown that the activity of PEP cannot be neutralized by the cationic polypeptide polymyxin B which specifically neutralizes the lipid A component of LPS that is responsible for the simulating properties of LPS. In addition, our tests indicate PEP does not contain any detectable lymphocytosis promoting factor (LPF) activity. Preliminary experiments have shown that extracts of B. pertussis which contain both LPS and associated proteins are protective in the standard mouse model used for testing the efficacy pertussis vaccines. GRA

N86-18954# Minnesota Univ., Minneapolis.
MOLECULAR APPROACHES TO SELECTIVE IMMUNIZATION Final Report, 15 Oct. 1984 - 31 Jul. 1985
F. H. BACH 30 Sep. 1985 6 p
(Contract N00014-85-K-0004)
(AD-A160141) Avail: NTIS HC A02/MF A01 CSCL 06A

The sequence polymorphism underlying T lymphocyte recognition as related to the DR alpha beta dimer has been studied using cDNA libraries. DR beta genes form homozygous typing cells expressing the same serologically-defined DR antigen but differing in their Dw subtype, have allowed the pinpointing of single amino acid differences underlying this allotypic variation in some combinations, and two to three amino acid differences in others. Author (GRA)

N86-18955# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
MAGNETIC-FIELD HAZARDS BIBLIOGRAPHY, 2ND EDITION
D. H. SLINEY and R. BISHOP Sep. 1985 31 p
(AD-A160154) Avail: NTIS HC A03/MF A01 CSCL 20C

The purpose of this bibliography was to prepare in the interest of providing a source of references for those interested in the biological effects and the evaluation of hazards associated with magnetic fields. This is the second published edition of Magnetic-Fields Hazards Bibliography. The 364 references are divided into groups as shown in the Table of contents: measurement techniques, environmental levels, and applications in sciences and industry, biological studies at the molecular, cellular and subvertebrate level, biological studies: vertebrates, and biological studies: man and neural effects. GRA

N86-18956# Minnesota Univ., Minneapolis.
SEQUENCE POLYMORPHISM OF HLA-DR BETA 1 ALLELES RELATING TO T CELL-RECOGNIZED DETERMINANTS
J. S. CAIRNS, J. M. CURTSINGER, C. A. DAHL, S. FREEMAN, and B. J. ALTER 1985 14 p
(Contract N00014-85-K-0004; PHS-AI-17687; PHS-AI-18326; PHS-AI-19007)
(AD-A160237) Avail: NTIS HC A02/MF A01 CSCL 06C

HLA class II molecules are a highly polymorphic family of dimeric cell surface proteins primarily involved in regulating T cell responses to extrinsic antigens. To define regions of class II molecules involved in T cell recognition, we have compared sequences of three HLA-DR Beta cDNA clones obtained from cells that all express the same serologically defined determinants but differ in

terms of T cell-recognized specificities. The comparisons indicate that very few (one to four) nucleotides differ between what are almost certainly alleles of the DR beta 1 Locus. All differences were in the first domain of the molecule and all localized to a region from amino acids 71-86. Since all differences were found only in this region of the molecules, and since DR alpha chains seem to be relatively nonpolymorphic, these positions in the DR beta chain must play a major role in influencing T cell recognition of the DR molecule. Serological and molecular cloning experiments have shown that there are three families of class II molecules within the HLA complex, termed DP, DQ, and DR. For the DR4-DRw53 haplotype which we have studied, within the DR family, one alpha and three complete beta genes are known; one beta gene is a pseudogene. At least two DR alpha beta dimers are expressed. GRA

N86-18957# North Dakota State Univ., Fargo. Dept. of Zoology.

IDENTIFICATION AND QUANTIFICATION OF THE WATER-SOLUBLE COMPONENTS OF JP-4 AND A DETERMINATION OF THEIR BIOLOGICAL EFFECTS UPON SELECTED FRESHWATER ORGANISMS Final Technical Report, 30 Sep. 1978 - 27 Feb. 1984

J. D. BRAMMER and R. L. PUYEAR 1 Jul. 1985 14 p
(Contract AF-AFOSR-3709-78)
(AD-A160271; AFOSR-85-0743TR) Avail: NTIS HC A02/MF A01 CSCL 07C

This final technical report includes a brief summary of research performed, results obtained, graduate students supported and theses written. One paper published was of a technical nature and describes the use of reverse-phase C-18 minicolumns for concentrating water soluble hydrocarbons derived from JP-4 jet fuel. Another technical paper using the same technique as the first was used to concentrate water soluble hydrocarbons produced by running an outboard motor in water. Analytical methods used for hydrocarbon separation and identification was GC, GC/MS and HPLC. The toxicity of toluene on the fathead minnow was the basis of three papers and a Ph.D. Thesis. It was found that the embryo was as sensitive to toluene than was the protolarvae or adult fish. This was determined using 96-hr LC50 tests. An MS thesis was written on the effects of toluene on gill structure in the fathead minnow adult. Little effect of toluene on gill structure was noted. A comparative study on the effects of administration of benzene, toluene and xylene isomeres on their in vitro metabolism and various drug metabolizing enzymes in rat liver, and the covalent binding of toluene to rat liver microsomes has resulted in one Ph.D. Thesis and the preparation of three manuscripts for publication. GRA

N86-18958# Massachusetts Inst. of Tech., Cambridge. Lab. of Neuroendocrine Regulation.

USE OF TYROSINE OR FOODS TO AMPLIFY CATECHOLAMINE RELEASE Interim Technical Report, 30 Sep. 1983 - 29 Sep. 1984

R. J. WURTMAN 12 Jun. 1985 13 p
(Contract AF-AFOSR-0366-83)
(AD-A160274; AFOSR-85-0742TR) Avail: NTIS HC A02/MF A01 CSCL 06A

An experimental system using rat caudate slices was used to measure the effects of tyrosine on neuronal activity. Studies demonstrated the importance of adequate tyrosine in sustaining dopamine release and provide the first evidence that when sufficient experimental tyrosine is not provided, its level within catecholaminergic nerve terminals actually declines. The data suggest that when a group of such neurons undergoes sustained activity, its requirements for tyrosine increase dramatically. In such circumstances, normal levels of plasma tyrosine may be in adequate to sustain function. Author (GRA)

N86-18959# Armed Forces Radiobiology Research Inst., Bethesda, Md.

HEMATOPOIESIS IN CONVENTIONAL MICE AFTER WOUND TRAUMA

G. D. LEDNEY, L. K. STEEL, H. M. GELSTON, JR., W. E. JACKSON, III, and E. D. EXUM 1985 5 p
(AD-A160436; AFRRI-SR85-23) Avail: NTIS HC A02/MF A01 CSCL 06E

Macrophages, granulocytes, and platelets serve in wound debridement, bacterial neutralization, and homeostasis. Replacement of such cells may involve perturbations in the clonogenic cell populations responsible for replenishing specific adult cell populations. For example, the human blood granulocyte progenitor cell compartment is increased following abdominal hysterectomy. In mice, skin wound trauma produced changes in the proliferative cell compartments of the hematopoietic tissues 24 hrs after injury. In this study we report: (1)some of our findings on the hematopoietic clonogenic cell changes in conventional mice after trauma, and (2) circulating substances which may mediate these changes. GRA

N86-19825# New Mexico Univ., Albuquerque. School of Medicine.

ULTRASENSITIVE DETECTION OF CHEMICAL SUBSTANCES Quarterly Report, 1 Jun. - 31 Aug. 1985

R. G. DEAN 31 Aug. 1985 4 p
(Contract N00014-82-K-0680; ARPA ORDER 4507)
(AD-A159996) Avail: NTIS HC A02/MF A01 CSCL 06A

In this reporting period we have continued to characterize monoclonal antibodies against ADhE-DFP. We have focused attention three monoclonals of interest. These are the V-16 antibody described in our previous report and two additional antibodies designated V-18 and D11B. The V-16 antibody demonstrates higher activity against AChE-DFP conjugate than against AChE alone. The V-18 and D11B antibodies showed higher activity against AChE than against the conjugate. In addition, the D11B antibody blocks AChE enzymatic activity in the Elman assay. Further study showed that these antibodies exhibit a different response to AChE-DFP conjugates on the basis that the AChE ages or loses and isopropoxy residue. The resulting phosphate diester has a charge, at normal pH, on oxygen. GRA

N86-19826# Massachusetts Univ., Worcester. Dept. of Medicine.

POTENTIAL FOR CROSS-REACTIVE PROTECTION USING PEPTIDES AND ADJUVANTS OR CARRIER MOLECULES Annual Report, 1 May 1984 - 30 Apr. 1985

F. A. ENNIS 1 Oct. 1985 8 p
(Contract N00014-83-K-0357; RR0-401)
(AD-A160360) Avail: NTIS HC A02/MF A01 CSCL 06E

We have demonstrated that a conserved portion of the HA2 subunit on the influenza virus hemagglutinin can induce a cytotoxic T lymphocyte response. This is a major development since it raises the possibility that this type of peptide could be used to provide protection that would be cross-reactive among influenza virus strains. The peptide we used was produced in E. coli using recombinant DNA techniques for the expression of segments of influenza viral genome. The molecule which stimulates this H-2 restricted cytotoxic T lymphocyte response is a fusion protein of the HA2 subunit of H1 virus (A/PR/8/34 H1N1), and the induced lymphocytes kill target cells infected with strains of influenza A virus possessing the H1 hemagglutinin irregardless of the years isolated (e.g. 1934, 1978), the results indicate that the HA2 subunit is a candidate for cross-reactive protection because there are substantial published data indicating that influenza virus induced cytotoxic T lymphocytes (Tc) are protective in challenged recipients. GRA

N86-19827# Texas Univ., Dallas. Center for Communication Disorders.
THE EFFECT OF IMPULSE INTENSITY AND THE NUMBER OF IMPULSES ON HEARING AND COCHLEAR PATHOLOGY IN THE CHINCHILLA
J. H. PATTERSON, JR., I. M. LOMBA-GAUTIER, and D. L. CURD Jun. 1985 191 p
(Contract DAMD17-80-C-0109; DA PROJ. 3F1-62777-A-878)
(AD-A161230; USAARL-85-3) Avail: NTIS HC A09/MF A01
CSCL 06S

Forty-one chinchillas, divided into seven groups, were exposed to 1, 10, or 100 noise impulses having peak intensities of 131 dB, 135 dB, 139 dB or 147 dB. Hearing thresholds were measured in each animal prior to exposure using an avoidance conditioning procedure. Threshold shifts were monitored at regular intervals over a 30 day postexposure period. A surface preparation of the cochlear sensory epithelia was performed approximately 90 days after exposure. There was generally an orderly relaxation between the amount of permanent threshold shift and the severity of exposure, and a general agreement between averaged histological data and the audiometric data. Detailed relations between temporary and permanent threshold shift, cochlear pathology, and exposure variables are discussed, as are the implications of these data to the development of exposure criteria. All tabulated individual animal data, averaged group data, and individual cochleograms are presented in Appendixes A through D. GRA

N86-19828# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
2 Jan. 1986 108 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-86-001) Avail: NTIS HC A06

A literature survey of life sciences, biomedical sciences, and behavioral sciences in the U.S.S.R. is presented. Some areas covered are agrotechnology, biochemistry, biophysics, biotechnology, environmental protection, epidemiology, food technology, genetics, human factors and immunology. Other areas are laser effects, medicine, microbiology, pharmacology and toxicology, physiology, public health and radiation biology.

N86-19829# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF EFFECTS OF MICROBIOLOGICAL MEANS OF PLANT PROTECTION ON ORGANISM
I. A. IVANOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 1-9 2 Jan. 1986 refs Transl. into ENGLISH from Izvestiya Akademii Nauk Latviyskoy SSR (Riga, USSR), no. 6, Jun. 1985 p 76-81
Avail: NTIS HC A06

The microbiological method of combatting pests is very promising, which is explained by the ever growing interest in it in many countries. Nevertheless, before permitting the use of microbiological agents, it is necessary to thoroughly study the characteristics of microorganisms artificially introduced into the environment. Therefore, studying the effects of biological means of protecting agricultural crops on man and warm blooded animals is of scientific and practical interest. This emphasizes the importance of the correct approach to normalizing microbe preparations, which is of great importance not only from the point of view of hygiene and occupational pathology, but also of environmental protection. These effects of microorganisms on man and the environment are studied. Author

N86-19831# Joint Publications Research Service, Arlington, Va.
MICELLAR ENZYMOLOGY Abstract Only
K. MARTINEK, A. V. LEVASHOV, N. L. KLYACHKO, Y. L. KHMELNITSKIY, and I. V. BEREZIN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 11 2 Jan. 1986 Transl. into ENGLISH from Biologicheskiye Membrany (Moscow, USSR), v. 2, no. 7, Jul. 1985 p 669-695
Avail: NTIS HC A06

In nature, enzymes function primarily in complex ensembles involving lipids, proteins, polysacchardies and other molecular components in solutions in which water is not the only dominant component. Enzyme catalysis therefore occurs in a microheterogeneous medium in which water acts as a regulator, determining the supermolecular structure of the catalytic reactor. Possible experimental methods of modeling the enzyme functions under such conditions are discussed, with particular attention given to such systems as proteolipid complexes and enzymes in organic solvents solubilized with phospholipids or detergents. The tasks of micellar enzymology are formulated and its relationship to membranology is discussed. The tasks include the study of the catalytic properties of solubilized enzymes as a function of degree of hydration; use of natural lipids as micelle forming components, allowing study of the mechanisms of regulation of lipid dependent enzymes; study of the interaction of enzymes in substrates insoluble in water; investigation of the dynamics of enzyme processes under conditions such that the substrate is distributed between water and organic solvents; study of cryoenzymatic processes occurring below the freezing point of water; and modeling of elementary biomembrane structure fragments with hydrated associations of protein and amphiphilic compound molecules. Author

N86-19838# Joint Publications Research Service, Arlington, Va.
LIGHT INDUCED DAMAGE TO ERYTHROCYTE MEMBRANE SENSITIZED BY TETRASULFOPHENYL PORPHIN
A. V. VOROBEY, T. N. VADETSKAYA, G. D. YEGOROVA, and Y. A. CHERNITSKIY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 54-57 2 Jan. 1986 refs Transl. into ENGLISH from Vestsi Akademii Navuk BSSR: Seriya Biyalahichnykh Navuk (Minsk, USSR), no. 4, Jul. - Aug. 1985 p 103-105
Avail: NTIS HC A06

In recent times researchers have displayed a great interest in the possibility of using porphyrins for the diagnosis and photoradiation therapy of malignant neoplasmas. At the same time, there is great optimism regarding the use of hydrophilic porphyrins also. In order to devise effective methods of photoradiation therapy, it is necessary to investigate the mechanism of the photosensitized forms of cell damage. One of the basic targets of such damage is the cell membrane. The structural-functional changes in the erythrocyte membrane were studied by irradiating a suspension of erythrocyte shadows with red laser light in the presence of the hydrophilic porphyrin methyl-tetra(n-sulfophenyl)porphin. The photodamage to the lipids was determined from the accumulation of the products of their peroxidation. The photodamage to the proteins from the formation of crosslinks of the polypeptide membranes. The photodamage to the functional properties of the membrane was evaluated on the basis of the reduction of their permeability barrier, and by the inhibition of the transportation of glucose and pyruvate. Author

N86-19839# Joint Publications Research Service, Arlington, Va.
COVALENT CROSSLINKS BETWEEN FILAMENTS IN DNA INDUCED BY LASER Abstract Only
G. B. ZAVILGELSKIY, G. G. GURZADYAN, and D. N. NIKOGOSYAN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 58 2 Jan. 1986 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 568-570
Avail: NTIS HC A06

A study was made of the formation of covalent crosslinks and local denatured sectors in DNA under the influence of picosecond pulses of UV laser radiation. The kinetics of formation of these

defects were studied by a fluorescent method using acridine orange dye, which forms complexes with DNA. Radiation at 266 nm was used with a pulse repetition frequency of 0.3 Hz, pulse length 30 ps, intensity 10 to the 11th power to 10 to the 14th power W/sq m. The molecular weight of the phage C DNA used in the studies was about 4 X 10 to the 7th power daltons, diluted in the phosphate buffer pH 7.2 to a concentration of 15 micrograms/ml. The quantum yield of crosslinks is about 1.0 X .000001 over the entire range of intensities of -.1 to 10 to the 11th power W/sq m. At intensities of over 10 to the 11th power sq m. the quantum yield of crosslinks increases by an order of magnitude, to 1.0 X .00001 at 4.10 to the 13th power W/sq m. Author

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-22996*# McGill Univ., Montreal (Quebec).
CANADIAN MEDICAL EXPERIMENTS ON SHUTTLE FLIGHT 41-G
D. G. D. WATT (McGill University, Montreal, Canada), K. E. MONEY, R. L. BONDAR, R. B. THIRSK, M. GARNEAU (National Research Council of Canada, Space Technology Program Office, Ottawa) et al. (CASI, Canadian Conference on Astronautics, 3rd, Ottawa, Canada, Apr. 23, 24, 1985) Canadian Aeronautics and Space Journal (ISSN 0008-2821), vol. 31, Sept. 1985, p. 215-226. Research supported by the Medical Research Council, National Research Council of Canada, Department of National Defence, and NASA. refs

During the 41-G mission, two payload specialist astronauts took part in six Canadian medical experiments designed to measure how the human nervous system adapts to weightlessness, and how this might contribute to space motion sickness. Similar tests conducted pre-flight provided base-line data, and post-flight experiments examined re-adaptation to the ground. No changes were detected in the vestibulo-ocular reflex during this 8-day mission. Pronounced proprioceptive illusions were experienced, especially immediately post-flight. Tactile acuity was normal in the fingers and toes, but the ability to judge limb position was degraded. Estimates of the locations of familiar targets were grossly distorted in the absence of vision. There were no differences in taste thresholds or olfaction. Despite pre-flight tests showing unusual susceptibility to motion sickness, the Canadian payload specialist turned out to be less susceptible than normal on-orbit. Re-adaptation to the normal gravity environment occurred within the first day after landing. Author

A86-23494
MEDICAL CONTROL OF THE AIRCREW DURING A RETRAINING PROCESS [MEDITSINSKOE OBESPECHENIE POLETOV V PROTSESSE PEREUCHIVANIIA LETCHIKOV]
V. I. ZORILE and V. N. IGNATKIN Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Sept. 1985, p. 51-54. In Russian.

The process of retraining aircrews for operating new aircraft and combat equipment includes three stages: the preparatory, the learning, and the assimilation stages. Various elements of the preparatory and learning stages of retraining, including physical and psychophysiological criteria used in personnel selection, and the psychophysiological and physical preparatory regimens, are discussed. Special consideration is given to monitoring newly appearing preflight reactions (elevations in heart beat and respiration rates or body temperature), some of which might point to an oncoming disease or to nonadherence to the preflight regimen. The assimilation stage of the retraining process is characterized by steadily increasing rate in acquiring new sensorimotor habits, but this stage also requires continuous maintenance of the preflight and rest regimens. The length of periods between two flights is important: long (7-10 days) interruptions have a detrimental effect on the assimilation process. I.S.

A86-23495
METHODS OF REGULATING THE ADAPTATION AND RESISTANCE PROCESSES IN NAVY PERSONNEL [PUTI I SPOSOBY UPRAVLENIIA ADAPTATSIONNYM PROTSESSOM I REZISTENTNOST'IU ORGANIZMA MORIAKOV]
V. S. NOVIKOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Sept. 1985, p. 54-56. In Russian. refs

Three methods designed to raise the adaptability and resistance of an organism to stressful situations are described. The training method includes nonspecific and specific regimens. While the nonspecific regimen is designed to improve the subject's homeostasis by exercise, enhanced vitamin intakes and other means, the specific regimen consists in exposing the subject to gradually increasing doses of stress situations analogous to the ones that he is trained for. The pharmacological method involves drug-induced changes in the central nervous system, raising the resistance thresholds to particular stressors. Finally, the psychological method is aimed at training the will-power, increasing motivation level, and developing the sense of meaningfulness of the stress-producing activity. I.S.

A86-23502* Management and Technical Services Co., Houston, Tex.
HUMAN PHYSIOLOGICAL ADAPTATION TO EXTENDED SPACE FLIGHT AND ITS IMPLICATIONS FOR SPACE STATION
F. A. KUTYNA (GE Management and Technical Services Co., Houston, TX) and W. H. SHUMATE (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 8 p. refs
(Contract NAS9-17133)
(SAE PAPER 851311)

Current work evaluating short-term space flight physiological data on the homeostatic changes due to weightlessness is presented as a means of anticipating Space Station long-term effects. An integrated systems analysis of current data shows a vestibulo-sensory adaptation within days; a loss of body mass, fluids, and electrolytes, stabilizing in a month; and a loss in red cell mass over a month. But bone demineralization which did not level off is seen as the biggest concern. Computer algorithms have been developed to simulate the human adaptation to weightlessness. So far these paradigms have been backed up by flight data and it is hoped that they will provide valuable information for future Space Station design. A series of explanatory schematics is attached. R.R.

A86-23503
HEALTH MAINTENANCE AND HUMAN PRODUCTIVITY IN THE SPACE STATION ERA
R. M. FARRELL AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 7 p. refs
(SAE PAPER 85-1312)

Health maintenance points for extended stays in space are presented, with emphasis on efectively and efficiently minimizing cardiovascular and musculoskeletal adaptations to weightlessness while maximizing the individual's productivity. Simulation of 1-g forces as provided by the Soviet 'penguin' constant-loading suit does not prevent the cardiovascular deconditining resulting from the shift of blood and lymph from the lower to the upper half of the body. Alleviation of such a shift of fluids is accomplished by the lower body negative pressure (LBNP) apparatus used for this purpose aboard Skylab. An ambulator LBNP suite is being developed to enable multiple use of the astronaut's time. Examples are given of devices for cardiovascular conditioning (the zero-g bicycle ergometer and the zero-g treadmill) and for larger muscle group conditioning (skiing and climbing simulators) for projected Space Station design. To minimize boredom as a negative psychological factor in conditioning, the development of zero-g

sports using existing equipment is envisioned. A comprehensive diagram on Space Station elements affecting productivity is included. R.R.

A86-23504* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHYSIOLOGICAL CONSIDERATIONS FOR EVA IN THE SPACE STATION ERA
D. J. HORRIGAN, JR., J. M. WALIGORA, and D. S. NACHTWEY (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 7 p. refs
(SAE PAPER 851313)

The physiological parameters that will affect EMU design and operational scheduling for the Space Station Program are discussed. The system must be designed to safely and effectively handle the increased frequency of extravehicular activity projected for longer flight periods than in the past. In order to minimize the risk of decompression sickness a proper combination of equilibration time to cabin pressure, suit pressure, and prebreathing denitrogenation, is necessary. Effective thermal exchange is projected to be automatically controlled and to have an 8-hr 1000 BTU/hr capability. Physiological changes due to adaptation to weightlessness must be considered in scheduling for their impact on performance/fatigue and in coping with motion sickness. Radiation protection to the limit of 80 rad/quarter must be achieved by scheduling to avoid periodic proton and solar flare exposure, and by additional EMU shielding. Additional EMU considerations are the control of microorganisms and the higher pressure requirement for emergency O2 purge. R.R.

A86-23525
TISSUE GAS BUBBLE DYNAMICS DURING HYPOBARIC EXPOSURES
M. GERNHARDT (Oceaneering International, Inc., Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 9 p. refs
(SAE PAPER 851337)

A mathematical model has been developed which describes the growth of an extravascular gas bubble in hyper and hypobaric environments. The model accounts for diffusion of inert gas across the tissue/bubble interface, tissue elasticity, gas solubility and diffusivity, surface tension and a perfusion limited inert gas transport to the tissue. Using this model, the dynamics of bubble growth can be predicted over a wide range of complex hypobaric exposures including decompressions and recompressions. The model can also account for oxygen breathing and switching inert gases during the exposure phase. Author

A86-24135
MATHEMATICAL MODELS OF THE EFFECT OF GRAVITATION ON LUNG FUNCTIONS [MATEMATICHESKIE MODELI DEISTVIIA GRAVITATSII NA FUNKTSII LEGKIKH]
A. I. DIACHENKO and V. G. SHABELNIKOV Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 51), 1985, 280 p. In Russian. refs

Theoretical conceptions and experimental data underlying the mathematical description of human lung functions are systematically described. Detailed attention is given to the derivation of equations of lung gas exchange, respiratory biomechanics, gas mixing in the respiratory pathways, the distribution of inhaled air, and blood flow between lung sections. The mathematical models obtained are used to analyze the effect of changes in gravity, posture, and other dynamic factors on ventilation, blood circulation, and gas exchange. Particular emphasis is placed on the regional irregularity and dynamics of the lung function. B.J.

A86-24307
NEURONS AS DETECTORS OF ERRORS IN THE SUBCORTICAL STRUCTURES OF THE HUMAN BRAIN [NEIRONY-DETEKTORY OSHIBOK V PODKORKOVYKH STRUKTURAKH MOZGA CHELOVEKA]
N. P. BEKHTEREVA, IU. D. KROPOTOV, and V. A. PONOMAREV (Nauchno-Issledovatel'skii Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 285, no. 5, 1985, p. 1233-1235. In Russian. refs

An experimental study has demonstrated that neurons of the human brain can react selectively to changes in discharge frequency when a task is performed erroneously. The error-detection capability is possessed by neurons of the pale globe and the ventrolateral nucleus of the visual tuber, structures that participate both in the processing of sensory information and in the provision of speech motor activity. B.J.

A86-24442
ABSORPTION OF MILLIMETER WAVES BY HUMAN BEINGS AND ITS BIOLOGICAL IMPLICATIONS
O. P. GANDHI and A. RIAZI (Utah, University, Salt Lake City) IEEE Transactions on Microwave Theory and Techniques (ISSN 0018-9480), vol. MTT-34, Feb. 1986, p. 228-235. USAF-supported research. refs

Aspects of the biological implications of millimeter wave radiation for human beings are discussed. The power densities likely to be encountered close to radiators in the 30-300 GHz frequency band are examined. The millimeter wave absorption efficiency of the human body with and without clothing is described, and the possibility of 90-95 percent coupling efficiency with clothing acting as an impedance matching transformer is addressed. The possibility of very high rates of energy deposition in the skin due to submillimeter depths of penetration is considered. The potential effect of millimeter wave absorption on human eyes, with particular emphasis on the cornea, in which high rates of energy deposition are encountered, are discussed. Hearing sensations produced by millimeter waves and thermal sensations by millimeter wave irradiation are addressed. C.D.

A86-24501
CLINICAL AND PSYCHOLOGICAL SURVEILLANCE OF STUDENT PILOTS AT THE BEGINNING OF TRAINING [LA SURVEILLANCE CLINIQUE ET PSYCHOLOGIQUE DES ELEVES-PILOTES EN ECOLE DE DEBUT]
G. DESMARIS (Armee de l'Air, Base Aerienne 709, France) and J. PLESANT (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 207-212. In French.

The physical and psychological observations which flight surgeons must make of students at the schools for military pilots during training are outlined. The students, in addition to classroom instruction, ground training and flight training, are evaluated for aptitudes for the various branches of the French Air Force in which they will serve, whether helicopter, transport of fighter aircraft duty. The motivation level of each student is assessed, and the flight surgeons must monitor the psychological evolution of the students as they go through flight training, especially in high performance jets. The majority of students who wash out do so in the early days, either voluntarily, because of medical reasons or because they do not display the skills or appreciation of flight safety required. The latter is of particular importance during formation flying. Some of the students are temporarily suspended if they have colds which affect their Eustachian tubes, a condition which calls for automatic grounding. A particular responsibility that the flight surgeon has is to recommend temporary grounding to offset fatigue, although the student may be apprehensive of interrupting a scheduled flight test. M.S.K.

A86-24502
CLINICAL PROBLEMS ENCOUNTERED BY A SQUADRON FLIGHT SURGEON [PROBLEMES CLINIQUES POSES PAR LA MEDECINE D'ESCADRE DE CHASSE]
O. MONTAUT (Armee de l'Air, Base Aerienne 112, Reims, France) (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 212-214. In French.

The primary mission of a flight surgeon is to recognize clinical symptoms which, when exhibited by pilots, may compromise flight safety. Symptoms are more readily observed if the doctor increases the number of person-to-person contacts with pilots outside of the infirmary. It is the doctor who may be able to note certain symptoms which can lead to treatment which will permit a pilot to keep flying. A case study is noted wherein a pilot who crashed over Chad walked out of the desert. Later, he became subject to anxiety attacks so intense while flying that only an intense effort of the will would allow him to retain control of his hands. A period of several months rest, with some medications, was sufficient to allow a return to flight duty. A further service during Operation Manta is described, wherein the doctor provided extensive lessons to pilots regarding the avoidance of numerous tropical diseases, any of which could have rendered them unfit for flight duty. In any case, the doctor can formulate and articulate a course of action which will be acceptable to the pilot and to the commandant. M.S.K.

A86-24503
CLINICAL PROBLEMS POSED BY THE MEDICAL SURVEILLANCE OF PILOTS EXPOSED TO HIGH LEVELS OF ACCELERATION [PROBLEMES CLINIQUES POSES PAR LA SURVEILLANCE MEDICALE DES PILOTES SOUMIS ADES ACCELERATIONS ELEVEES]
(Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 215-220. In French.

The speed and maneuverability of modern jet fighters exposes pilots to g-forces which exceed the envelope of human endurance. The accelerations occur in linear, radial, angular and combined forms. Their effects are progressive as acceleration increases, moving from heaviness of the limbs and head to grey vision, to loss of vision, and finally to loss of consciousness. The debilities are accompanied by tachycardia, ECG anomalies and modification of the breathing rate. Beyond 5.5 g's the heart cannot pump sufficient blood to the brain, leading to unconsciousness if the acceleration lasts long enough. Anti-g suits that exert pressure on the lower extremities somewhat ameliorate the problem by forcing blood to the brain. However, fighters such as the Mirage can withstand 9 g turning loads in maneuvers, e.g., to avoid IR-seeking air-to-air missiles. As has been found with the F-16 pilots, high-g maneuvers can physically harm the pilot through hyperextension of the neck. The flight surgeon's role is to assist in developing new anti-g protection methods and to monitor pilot health, particularly to ensure that fatigue effects do not exacerbate the dangers of high-g flying. Teaching the M1, M2 and L1 maneuvers is also beneficial, especially if a centrifuge is available so that each pilot can determine which techniques are effective and perfect their implementation. M.S.K.

A86-24504
OPHTHALMOLOGICAL PROBLEMS LINKED TO HELICOPTER FLIGHT [PROBLEMES OPHTALMOLOGIQUES LIES AU VOL SUR HELICOPTERE]
Y. RODALLEC (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 221-225. In French. refs

Military helicopter pilots flying low-level missions encounter dangers from obstacles and power lines, along with visual hallucinations due to fatigue or myopia. Corrective lenses can ameliorate the myopia in daylight, but pilots selected for night flight should not be subject to the refractive problems caused by myopia. The vibrational environment of helicopter flight causes lesions in the retinae of pilots. Also, the diet of helicopter pilots in training is usually nutritionally deficient and meals are eaten hurriedly to meet schedules, occasionally leading to hypertension and/or diabetes, both of which can cause degenerative ocular lesions and myopia. It is necessary, therefore, to throughly examine pilot candidates to detect those who will not be fit for flight duty in the future. Some drugs enhance the production of visual purple and retard vision fading, and wearing red glasses aids in night vision adaptation. Protective lenses can also shield against the vision loss from bright lights and explosions, although layered lenses can also multiply the number of photons which reach the eye to enhance night vision. It may be better for the pilot to watch the desired scenes on a CRT. Wearing an apparatus which transmits IR images increases night vision, provided that sufficient training is given to correctly perceive relief. Several vision-enhancing techniques which may be used in the future are discussed. M.S.K.

A86-24505
A NEW TEST OF THE COLOR VISION OF PROFESSIONALS [UN NOUVEAU TEST DE CAPACITE CHROMATIQUE PROFESSIONNELLE]
P. J. MANENT, M. MAILLE, and J. C. BALLION (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 225-228. In French.

Military technical personnel, whether pilots, mariners or technicians must have a minimal amount of color vision for discerning, e.g., among the images on a display screen or among color-coded wires. The two standard tests used for French military personnel do not last sufficiently long and are not thorough enough to determine if candidate personnel possess the capacities for distinguishing among the colors which are germane to the professions for which they are training. A new test is described which satisfies the requirement. Standard military Telecom 112 PVC pairs cable contains 10 differently-colored wires wrapped in black PVC protection. Technician candidates with partial color blindness are required to identify the colored wires twice in random order. The technique was tested using subjects known to have five different types of red-green color blindness. The examiner observed closely to determine if the subjects hesitated at all in identifying individual colors. The test proved an effective means for determining if the candidates were capable of specific types of work, thus allowing some candidates to proceed on to the training of their choice. M.S.K.

A86-24506
RECURRENT SERIOUS OTITIS IN A RECONNAISSANCE PILOT - THE CONSEQUENCES FOR HIS CAREER [OTITE SEREUSE RECIDIVANTE CHEZ UN PILOTE TE RECONNAISSANCE CONSEQUENCES SUR LA CARRIERE DE L'INTERESSE]
J. H. BLONS (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 231, 232. In French.

A86-24507
A COLD THYROID NODULE - STATISTICAL DATA AND AERONAUTICAL APTITUDE [LE NODULE FROID ISOLE DU CORPS THYROIDE - DONNEES STATISTIQUES ET APTITUDE AERONAUTIQUE]
H. LIENHART, F. P. DOUCET, J. P. E. COHAT, M. P. ILLE (Centre Principal d'Expertise Medicale du Personnel Navigant, Paris, France), J. F. GOUTEYRON (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) et al. (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 233-237. In French. refs

Statistical data are given for the diagnosis and prognosis of 110 sole cold thyroid nodules removed surgically from the necks of 140 military and civilian pilots. The nodules were discovered

over a period of 6 years by neck examinations of the pilots during routine physical examinations. Subsequent identification of the condition was done through thyroid scintography. Of the 110 nodules removed, 3 (2.72 percent) proved cancerous. The detection of the nodules removes the pilots from flight duty. After successful surgery, the pilots return to restricted duty until no evidence of cancer is found in return visits, at which time they return to full flight fitness. If cancer is found, then the pilots cannot fly until the condition is found to not return after repeated visits. M.S.K.

A86-24509
GASTRIC AND DUODENAL ULCERS AND THE FLIGHT FITNESS OF PILOTS [LA MALADIE ULCEREUSE GASTRO-DUODENALE ET L'APTITUDE DANS LE PERSONNEL NAVIGANT]
J. P. BURLATON, J. P. GOURBAT, N. GUERMAZI, G. LEGUAY, and A. SEIGNEURIC (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 239-243. In French. refs

The medical view of the effects of gastric and duodenal ulcers (GDU) on the flight fitness of pilots is discussed. Statistical studies have shown that the frequency of occurrence in pilots is equivalent to that of the general population. Only two cases of GDU have led to a medically ordered removal from flight duty in the past 24 years in France. For civilian pilots applying for a license, a year must have elapsed since reporting any symptoms from a GDU. Military pilots cannot fly with a GDU condition or detection of any precursor conditions of a GDU. However, it is noted that military pilots often return to flight duty before a year has passed with no symptoms of GDU. The normal sequence of treatment of ulcers and reexaminations to ensure that healing is progressing is traced, noting that it is often a psychologist's judgment that determines when a patient is cured because it is anxiety which is most responsible for the onset and continuance of GDU. Pharmacological approaches to treating GDU are described, along with surgical intervention to close the lesions accompanying the disease.
M.S.K.

A86-24510
MITRAL VALVE PROLAPSE IN A YOUNG PERSON - AN ESTIMATION OF THE RISK OF ARRHYTHMIA - THE IMPACT ON THE FLIGHT FITNESS OF A PILOT [LE PROLAPSUS VALVULAIRE MITRAL DU SUJET JEUNE - ESTIMATION DU RISQUE DE TROUBLE RYTHMIQUE - INCIDENCE SUR L'APTITUDE DU PERSONNEL NAVIGANT]
J. P. GOURBAT, J. P. BURLATON, N. GUERMAZI, G. LEGUAY, and A. SEIGNEURIC (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 244-246. In French. refs

A86-24511
ISCHEMIC CARDIOPATHOLOGY IN PILOTS - THE RISK, THE METHODS OF DETECTION AND PREVENTION [CARDIOPATHIES ISCHEMIQUES ET PERSONNEL NAVIGANT - RISQUE, MOYENS DE DEPISTAGE ET DE PREVENTION]
A. G. DIDIER, H. P. ILLE, N. D. ALLEGRINI, C. M. MAUREL, and C. M. THOMAS (Centre Principal d'Expertise Medicale du Personnel Navigant, Paris, France) (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 246-250. In French. refs

Cardiac ischemia is a principal cause of death in humans over 40 years of age and a principal reason for removing pilots from flight duty. The rate of ocurrence among French military pilots over the period 1982-84 was 4.3/1000, less than the rate of occurrence in the general population. The main symptoms are anginal pain, infarctions and death. A 2 year study done of 1080 military pilots over 39 years old covered such factors such as smoking, systolic arterial pressure, cholesterol level and the severity of diabetes. The study was performed to identify, if possible, the risk of ischemia relative to the conditions monitored. A numerical model derived from the data showed that the risk of ischemia is related to the magnitudes of each of the assumed predisposing conditions. The data, when compared to the population of pilots studied, indicates that 5 percent of the population was a risk of an ischemic attack in the following year. However, the duration of the study is not considered sufficient to make truly quantitative predictions. M.S.K.

A86-24512
MECHANICAL SOLID VIBRATIONS [LES VIBRATIONS MECANIQUES SOLIDIENNES]
J. POIRIER (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 255-263. In French. refs

The physics of mechanical vibrations and their effects on the human body are discussed. There are four types of vibrations: sinusoidal, periodic, random and transitory. They are described terms of frequency, amplitude, displacement, acceleration and variations. In a vehicle, vibrations impart longitudinal, transversal and lateral accelerations to the human body, which can be considered as three primitive masses in a mass-spring system: the head, thorax and the lower extremities. Each primitive mass has a separate resonance frequency, as does the heart (4-8 Hz). The perception of vibration is dependent on numerous factors, and the speed and amplitude of vibrations determine whether or not and where, given individual variations, damage may be done to the human exposed to the vibrations. Various symptoms and debilities that can be caused by vibrations are identified and discussed, along with treatments to either cure or ameliorate the physical effects. M.S.K.

A86-25653
PROTEINURIA IN FIGHTER PILOTS AFTER HIGH +GZ EXPOSURE
H. NODDELAND, K. MYHRE, H. T. ANDERSEN (Institute of Aviation Medicine, Oslo, Norway), and U. I. BALLDIN (Karolinska Institutet; Forvarets Forskningsanstalt, Stockholm, Sweden) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 122-125. refs

Exposure to high gravitational forces acting along the body axis towards the feet (+Gz) causes considerable strain on several organ systems, including the kidneys. During +Gz tolerance studies without anti-G suits, significant amounts of protein and hyaline casts were found in 17 of 20 fighter pilots after centrifugation. The G load alternated between 3.5 and 5.5 G. Mean time in the centrifuge was 15 min. For comparison another group of 19 fighter pilots is examined after air combat maneuver training with anti-G suits. None showed proteinuria. The proteinuria most likely indicates a severely depressed renal blood flow during centrifugation.
Author

A86-25656* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AROUSAL AND STABILITY - THE EFFECTS OF FIVE NEW SYMPATHOMIMETIC DRUGS SUGGEST A NEW PRINCIPLE FOR THE PREVENTION OF SPACE MOTION SICKNESS
R. L. KOHL (NASA, Johnson Space Center; Universities Space Research Association, Houston, TX), D. S. CALKINS (NASA, Johnson Space Center; Technology Inc., Houston, TX), and A. J. MANDELL (California, University, La Jolla) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 137-143. refs

Sympathomimetic agents are frequent components in antimotion-sickness drug combinations because of their usefulness in counteracting the sedation caused by stressful motion or resulting from the administration of other antimotion-sickness drugs. The noradrenergic neurochemistry of the brain's arousal-attentional systems prompted us to evaluate the efficacy of five new sympathomimetic drugs and to further define the role of arousal in susceptibility to motion. Subjects were orally administered methamphetamine (20 mg), phenmetrazine (25 mg), phentermine

(37.5 mg), methylphenidate (20 mg), or pemoline (75 mg) 2 h prior to taking a Staircase Profile Test. All of the drugs increased resistance to stressful coriolis stimulation by 80-120 percent. Methylphenidate and pemoline showed fewer side effects. These findings, interpreted in conjunction with the documented inefficacy of most anticholinergic and antihistaminergic drugs tested to date, suggest that sympathomimetic drugs or a generalized state of arousal can inhibit the development of motion sickness. Author

A86-25658
ON THE USE OF A BUBBLE FORMATION MODEL TO CALCULATE DIVING TABLES
D. E. YOUNT and D. C. HOFFMAN (Hawaii, University, Honolulu) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 149-156. Research sponsored by the University of Hawaii. refs
(Contract NOAA-NA-81AAD00070)

The development of a set of air diving tables from a varying-permeability model (VPM) is examined. The computational algorithm and nucleation parameters for the calculation of the diving tables are described. The computed values are compared with tables from the US and British Navies; decompression profiles, no-stop thresholds, saturation dives, and total ascent times are evaluated. It is observed that the current diving tables show irregularities; however, the tables developed with the VPM are self-consistent, and are accurately interpolated and extrapolated. I.F.

A86-25661
ORTHOSTATIC TOLERANCE OF NORMAL INDIANS AND THOSE WITH SUSPECTED ABNORMAL CARDIOVASCULAR REFLEX STATUS
M. B. DIKSHIT, P. K. BANERJEE, and P. L. N. RAO (Indian Air Force, Institute of Aviation Medicine, Bangalore, India) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 168-173. refs

There were 143 healthy Indian males subjected to 70 deg head-up tilt for 20 min on 166 occasions to evaluate their cardiovascular response. They responded with a significant rise in heart rate, diastolic pressure, and mean arterial pressure. Pulse pressure fell significantly. Heart rate and diastolic pressure during the tilt were significantly (p less than 0.05) and positively correlated to the height of the subjects. None of the subjects had syncope, which has been reported in normal individuals elsewhere. Of the 57 subjects with suspected abnormality of the cardiovascular reflex status, who were also investigated by the tilt test, 13 (22.8 percent) developed various degrees of orthostatic intolerance. Of these 13 subjects, 10 had had syncope in the past. In view of these observations, it is concluded that 70 deg head-up tilt is an important clinicophysiological investigation in the assessment of subjects with a suspected abnormality of their cardiovascular reflex status. Author

A86-25662
ANABOLIC STEROIDS AS A COUNTERMEASURE AGAINST BONE DEMINERALIZATION DURING SPACE FLIGHT
P. C. STEPANIAK, J. J. FURST, and D. WOODARD (Wright State University, Dayton, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 174-178. refs

The bone mineral content, hormonal, and histological changes which were observed on Apollo, Skylab, and Salyut/Soyuz flights, and in-laboratory experiments are described. The uses of dietary modifications, exercise programs, and pharmacologic preparations to stabilize bones and prevent the mobilization of Ca, in order to facilitate long term space habitation, are discussed. The influences of anabolic steroids on the retention of N, Ca, and P are analyzed; the negative effects of anabolic drugs are studied. I.F.

A86-26026
VISUAL DISTORTION - THE CORRELATION MODEL
R. S. KENNEDY (Essex Corp., Orlando, FL), K. S. BERBAUM (Iowa, University, Iowa City), and L. H. FRANK (Virginia Polytechnic Institute and State University, Blacksburg) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 189-194. refs
(SAE PAPER 841595)

The perceptual conflict theory states that any stimulus which causes a decorrelation of sensory channels initiates the firing of the chemoreceptor trigger zone, causing the appearance of motion sickness symptoms. A correlation version of the cue conflict theory is presented, together with the working assumptions with respect to perception conflict and the principles involved in the adaptation process. The elements of conflict, salience, and adaptation are discussed in the framework of the correlation model. The model is then applied to the phenomenon of visual distortion. Finally, a neural correlation process is suggested, in which the cerebellum acts as an executor and coordinator of the neurons involved in the correlation process. I.S.

N86-18960* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 279)
Jan. 1986 69 p
(NASA-SP-7011(279); NAS 1.20:7011(279)) Avail: NTIS HC $8.00 CSCL 06E

This bibliography lists 175 reports, articles, and other documents introduced into the NASA scientific and technical information system in December 1985. Author

N86-18961# School of Aerospace Medicine, Brooks AFB, Tex.
NIGHT VISION MANUAL FOR THE FLIGHT SURGEON Special Report, Mar. 1984 - Aug. 1985
T. J. TREDICI and R. E. MILLER, II Aug. 1985 45 p
(Contract AF PROJ. 775-5)
(AD-A159720; USAFSAM-SR-85-3) Avail: NTIS HC A03/MF A01 CSCL 17H

The Ophthalmology Branch, at the USAF School of Aerospace Medicine, has initiated a program to extensively study night visual performance. Some of the objectives of this program are to develop a simple, rapid, and accurate night vision screening device; establish norms for flying personnel; evaluate training and enhancement techniques; determine the effects of various nutrients and drugs; and investigate image-intensifying devices--i.e., night vision goggles (NVG). An additional objective is to update the educational level of USAF flight surgeons, base optometrists, and ophthamologists about the aeromedical aspects of night vision and the new NVG technology. This manual was designed to provide useful information to the medical personnels that provide direct support to operational units. GRA

N86-18962# Oak Ridge National Lab., Tenn. Biology Div.
CHEMICAL CHARACTERIZATION AND TOXICOLOGIC EVALUATION OF AIRBORNE MIXTURES: TUMORIGENICITY STUDIES OF DIESEL FUEL-2, RED SMOKE DYE AND VIOLET SMOKE DYES IN THE SENCAR MOUSE SKIN TUMORIGENESIS BIOASSAY SYSTEM Final Technical Report, 1982 - 1983
T. J. SLAGA, L. L. TRIPLETT, and R. J. M. FRY Sep. 1985 29 p
(Contract DE-AC05-84OR21400; DA PROJ. 3E1-61102-BS-04)
(AD-A159728; ORNL/TM-9752) Avail: NTIS HC A03/MF A01 CSCL 06T

The tumorigencities of Diesel Fuel-2, Red Smoke Dye and Violet Smoke Dye were tested in the SENCAR Mouse Skin Bioassay System. The Diesel Fuel-2 gave a significant tumor response when tested as a tumor promoter but negative results when tested as a complete carcinogen. There were no tumor responses to either the Red or Violet Smoke Dyes when tested as complete carcinogens. Although a few tumors occurred in the Red and

Violet Smoke Dye tumor initiation studies, the response was not significantly different from that of the controls. GRA

N86-18963# Retina Foundation, Boston, Mass. Eye Research Inst.
EYE MOVEMENTS AND SPATIAL PATTERN VISION Annual Report, 1 Feb. 1984 - 31 Jan. 1985
L. E. AREND 28 Feb. 1985 25 p
(Contract F49620-83-C-0052)
(AD-A160408; AFOSR-85-0741TR) Avail: NTIS HC A02/MF A01 CSCL 06P

Low contrast, low spatial frequency luminance sawtooth patterns look like luminance staircases, with no brightness changes over the shallower luminance slope. Brightness measurements at corresponding points in different cycles of these patterns showed substantial illusory brightness differences. Other measurements showed that the illusion is not confined to strictly subthreshold luminance gradients, but occur with slightly suprathreshold gradients as well. In models which attempt to explain these illusions the visual system integrates over the thresholded gradient of the stimulus distribution. The integration encounters problems due to curl introduced by the nonlinear threshold operator. Brightness measurements indicated that these problems have a visual counterpart, further support for the models. Several new illusions were found to result from this nonlinear threshold for spatial gradient. Inconsistencies in the spatial integrals performed by the visual system result in multistable brightness perceptions for some patterns. GRA

N86-18964# Human Engineering Labs., Aberdeen Proving Ground, Md.
PRACTICAL APPLICATION OF BASIC RESEARCH ON IMPULSE NOISE HAZARD Final Report
G. R. PRICE Jan. 1985 12 p
(AD-A160432; HEL-TM-1-85) Avail: NTIS HC A02/MF A01 CSCL 06S

To assess impulse noise hazard accurately, procedures should be based on the physiological mechanisms underlying hearing loss. Information from basic research studies is relevant in three areas. First, there is a spectrally dependent critical level above which loss mechanisms change from amode that is probably metabolically based to one that is mechanically based. Stimulation at and above this second mode should be avoided. Second, in spite of the regulatory trend ignoring the time pattern of stimulation, studies continue to indicate at that intermittency ameliorates the effect of noise, producing less effect for a given amount of energy in the exposure. Lastly, a variety of sources can be interpreted as indicating that meters designed to rate hazard should have: a rise-time capability in the vicinity of 20 microseconds; a dynamic range of over 100 dB; and employ a frequency weighting function such as A-weighting, although the shape is not critical due to the relatively sharp tuning of the ear and the generally flat noise spectra commonly encountered in the work place. GRA

N86-18965# Army Research Inst. of Environmental Medicine, Natick, Mass.
PREDICTION MODELING OF PHYSIOLOGICAL RESPONSES AND HUMAN PERFORMANCE IN THE HEAT
K. B. PANDOLF, L. A. STROSCHEIN, L. L. DROLET, R. R. GONZALEZ, and M. N. SAWKA Sep. 1985 29 p
(Contract DA PROJ. 3E1-62777-A-879)
(AD-A160513; USARIEM-M-1/86) Avail: NTIS HC A03/MF A01 CSCL 06S

Over the last two decades, the Military Ergonomics Division of the US Army Research Institute of Environmental Medicine has been establishing the data base and developing a series of predictive equations for deep body temperature, heart rate and sweat loss responses of clothed soldiers performing physical work at various environmental extremes. This document describes the attempt to program these predictive equations on various desk top and hand held calculators with the express purpose of developing a comprehensive heat stress model for predicting soldier performance to work, clothing and the environment. This model deals with the interaction of various multi-disciplinary factors such as: (1) the theoretical physics of heat transfer, (2) the biophysics of clothing, (3) the physiology of metabolic heat production, distribution and elimination, and (4) related meteorological considerations. The primary physiological inputs are deep body (rectal) temperature and sweat loss while the predicted outputs are the expected physical work-rest cycle, the maximum single physical work time if appropriate, and the associated water requirements. This document presents the mathematical basis employed in the development of the various individual predictive equations of our heat stress model. In addition, our current heat stress prediction model as programmed on the HP 41 CV is discussed from the standpoint of proprietary in meeting the Army's needs and therefore assisting in military mission accomplishment. GRA

N86-18966# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
THE BEGINNINGS OF AIRBORNE WEIGHTLESSNESS RESEARCH Final Report
H. J. VONBECKH Jan. 1985 67 p
(AD-A160575; NADC-85016-60) Avail: NTIS HC A04/MF A01 CSCL 06S

After World War II an increasing number of aeromedical investigators became interested in the medical problems of space flight, particularly its most challenging aspect: weightlessness. Until 1950 their efforts remained limited to theoretical deliberations and predictions. Beginning in the early fifties, however, researchers began actively to experiment with weightlessness aboard aircraft in vertical diving flights and later by flying Keplerian parabolic trajectories. H.J. von Beckh made the first weightlessness experiments in aircraft with humans and test animals (water turtles) which were published at the 4th International Astronautical Congress in Zurich and in the Journal of Aviation Medicine. Von Beckh's experiments showed that the subjects during weightlessness had by no means a strong fall reflex, as predicted by Haber and Gerathewohl in their theoretical paper, in which they evoked the Weber-Fechner Law. The disorientation and lack of neuromuscular coordination occurs only in the first seconds of weightlessness. Later, the control of the vision sense makes aiming movement possible. The incidence of motion sickness was moderate in the weightlessness flights with the Fighter aircraft Fiat G55 and the F 94 C, because the subjects were tied down in the seat and avoided head movements. Later, in the flights with the cargo aircraft C 131, the incidence was considerably higher, because the subjects could move freely and were even allowed to make somersaults, In a later paper (1959) von Beckh showed that weightlessness decreases the acceleration tolerance. This was reconfirmed many years later when the astronauts suffered orthostatic hypotension after their return to the Earth. GRA

N86-18967# Army Research Inst. of Environmental Medicine, Natick, Mass.
FACTORS WHICH ALTER HUMAN PHYSIOLOGICAL RESPONSES DURING EXERCISE-HEAT ACCLIMATION
K. B. PANDOLF, M. N. SAWKA, and Y. SHAPIRO Sep. 1985 22 p
(AD-A160580; USARIEM-M-41/85) Avail: NTIS HC A02/MF A01 CSCL 06N

Researchers generally agree that high aerobic fitness achieved through physical training will reduce the physiological strain to exercise in the heat, but does not replace the benefits of an exercise-heat acclimation program. In addition, high aerobic fitness is hypothesized as a major factor in the small decay and rapid re-acclimation of individuals after they ceased exercising in hot environments. However, recent work from our laboratory suggests that improved aerobic fitness by physical training must be associated with significant elevations in core temperature during the training process in order to improve exercise-heat tolerance. Two recent studies comparing men and women with similar aerobic fitness indicate no major physiological differences between genders in both humid and dry heat for cardiovascular and thermoregulatory responses to these environments either before or after acclimation.

Our laboratory has reported that after exercise-heat acclimation under wet conditions (mild or hot), females tolerate the heat in a more efficient fashion than males while under hot-dry conditions males seem to be at some physiological advantage. Even fewer studies are reported which evaluate physiological differences in heat tolerance to exercise in relation to age. In general, exercise-heat tolerance is reduced in pre-pubertal children (boys and girls) and older adults (men and women) compared to young men and women. However, aerobically fit older adults seem to have far fewer decrements in the performance of exercise in the heat than less fit older adults. GRA

N86-18968# Minnesota Univ., Minneapolis.
DNA AND PROTEIN STUDIES OF HLA CLASS 2 MOLECULES: THEIR RELATIONSHIP TO T CELL RECOGNITION
M. SEGALL, J. S. CAIRNS, C. A. DAHL, J. M. CURTSINGER, and S. FREEMAN 1985 29 p
(Contract N00014-85-K-0004; PHS-AM-31342)
(AD-A160704) Avail: NTIS HC A03/MF A01 CSCL 06A

The HLA-D region, encoding class 2 antigens, was first defined based on studies of mixed leukocyte culture (MLC) (Bain, et al. 1964; Bach and Hirschhorn, 1964). In our studies with colleagues (Amos and Bach, 1968; Bach et al., 1969), we were able to suggest that a genetic region encoding molecules that stimulate proliferation in MLC may be linked to, but separate from, the HLA-A and -B loci, i.e., a region such as HLA-D; definitive studies in this regard (Yunis and Amos, 1971) established the existence of the HLA-D region. Great advances have been made in our understanding of this region in recent years utilizing both the tools of molecular genetics and studies of proteins encoded by HLA-D genes. A critical bridge that has not yet been completed concerns the relationship of class II genes and protein products to determinants recognized by T lymphocytes, i.e., the cells responding in MLC. Although the emphasis in this review will be on studies of proteins and of DNA, an introduction to this article also includes our current state of knowledge regarding definition of class II products with T lymphocytes. The inclusion in this volume of several articles on the same topic allows a measure of comfort with such an approach. GRA

N86-18969# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
GLUCOCORTICOID ANTAGONISM BY ENDOTOXIN: BIOLOGICAL EFFECTS DURING STRESS AND BASIS FOR INHIBITION OF PHOSPHOENOLPYRUVATE CARBOXYKINASE M.S. Thesis
W. B. HUFF Aug. 1985 133 p
(AD-A160740; AFIT/CI/NR-85-116T) Avail: NTIS HC A07/MF A01 CSCL 06T

Bacterial endotoxins produce a variety of pathophysiologic effects by inducing the release of humoral factors from cells of the reticuloendothelial system, primarily macrophages. This study focusses on one particular factor, glucocorticoid antagonizing factor (GAF). Antagonism was augmented when mice were subjected to conditions of stress where adrenoglucocorticoids are necessary for survival. Mice were sensitized to both toxic endotoxin and irradiated detoxified endotoxin during the stress of cold, heat, and tourniquet shock. Endotoxin, as well as detoxified endotoxin, induced the release of GAF from cells of the RES. Treatment of mice with this GAF-rich serum also resulted in their sensitization to stress. Survival of LPS-poisoned animals subjected to stress could be improved when exogenous hydrocortisone was given prior to the administration of exogenous GAF-rich serum or prior to the release of endogenous GAF in response to endotoxin. Naloxone, a B-endorphin antagonist, failed to increase the survival rate of animals under the experimental conditions investigated. GRA

N86-18970# Army Research Inst. of Environmental Medicine, Natick, Mass.
PLATELET-ENDOTHELIAL FUNCTION IN RELATION TO ENVIRONMENTAL TEMPERATURE Final Report, 1 May 1982 - 1 Mar. 1984
S. P. BRUTTIG, G. D. DRAPER, and M. P. HAMLET Mar. 1984 28 p
(Contract DA PROJ. 3E1-61101-BS-10)
(AD-A160744; USARIEM-T-6/84) Avail: NTIS HC A03/MF A01 CSCL 06E

Thromboembolic phenomena are commonly observed in frostbite injury to the microvasculature. Large blood vessel endothelium was used to assess any alterations in platelet-endothelial interaction resulting from low environmental temperatures. Media from bovine endothelial cells (37, 24, 4C) did not cause or enhance platelet aggregation. Yet ADP (120 micrometers) stimulated aggregation of all platelet samples. Bovine and porcine endothelial cells were incubated at 37, 24, 4, and 0.5 C with homologous platelets suspended in Tyrodes at 37, 24, 4, and 0.5 C with homologous platelets suspended in Tyrodes buffer plus albumin, and the rate of ADP-stimulated platelet aggregation was compared with control platelets. Bovine venous endothelial cells (at 37 C) inhibited platelet aggregation more strongly than aortic endothelial cells. This inhibition was blocked by aspirin (7 mM) and was independent of environmental temperature. Porcine endothelial cells also inhibited platelet aggregation. This inhibition (maximal at 37 C) was significantly attenuated by temperatures or = 24 C. A significant loss of inhibition of platelet aggregation could lower the threshold at which parenchymally-derived nucleotides or other substances from damaged cells can cause aggregation. Thus, in porcine endothelial cells bovine endothelial cells, a possible mechanism for the thromboembolic action of cold is suggested. Author (GRA)

N86-18971# New York Blood Center, N.Y.
THE PRODUCTION OF RHO(D) NEGATIVE ERYTHROCYTES Annual Report, 1 Jul. 1984 - 30 Jun. 1985
J. GOLDSTEIN 24 Jun. 1985 8 p
(Contract N00014-84-C-0543)
(AD-A160775; AD-E401375) Avail: NTIS HC A02/MF A01 CSCL 06A

Attempts are being made to modify or destroy the Rh (D) antigen under conditions which will produce Rh negative erythrocytes of transfusable quality. To this end the effects of various lipase and membrane perturbants are being examined. Isolation and biochemical characterization of the D antigen is also being undertaken in order to gather information which will help formulate ways of modifying its expression. GRA

N86-18972# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN EXPERIMENTAL TRIAL TO TEST THE EFFICACY OF TEMAZEPAM TO INDUCE SLEEP AND IMPROVE SUBSEQUENT PERFORMANCE DURING PARTIAL SLEEP DEPRIVATION AND CIRCADIAN RHYTHM DESYNCHRONOSIS M.S. Thesis
J. E. MCGHEE Jun. 1985 58 p
(AD-A160795; AFIT/CI/NR-85-126T) Avail: NTIS HC A04/MF A01 CSCL 06O

This thesis presents a strategy for reducing jet lag induced performance degradations by resetting rhythms during prolonged rapid transmeridian flight is studied. Thirty-four aircrew member passengers on a C-141 flight were given temazepam or placebo during the flight from Oklahoma to Saudi Arabia for induction of sleep in a period compatible with sleep cycle at the destination, but out-of-sync with previous patterns set at home station, Mental performance and circadian rhythm patterns were tested per-flight, inflight and post-flight by several measurements including a computerized performance battery. The results indicated that in the temazepam group performance was improved to near baseline levels. The restorative power of temazepam induced sleep during a period of partial sleep deprivation and temazepam's ability to reset circadian rhythms prior to arrival in the new time zone were demonstrated. GRA

N86-18973# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A STUDY OF THE FLIGHT ENVIRONMENT COMPONENT OF AIRCREW FATIGUE IN STUDENT NAVIGATORS M.S. Thesis
D. R. DOUVILLE Jun. 1985 66 p
(AD-A160796; AFIT/CI/NR-85-128T) Avail: NTIS HC A04/MF A01 CSCL 06S

One approach to understanding the causes of aircrew fatigue is to devide them into: (1) those related to the unique demands of aircrew tasks or workload, and (2) those related to the unique environment of flight. The pilot not only has to navigate, make radio calls and negotiate instrument landings, but he must do it all in a noisy, vibrating, constantly moving environment. Most studies in aircrew fatigue focus on the workload part of the equation. The study described in this proposal is an attempt to define that part of aircrew fatigue which is due to the flight environment. It also attempts to determine changes in body chemistry produced by the flight environment which might be associated with aircrew fatigue. Navigator students in training at Mather Air Force Base, California fly training missions of similar duration and quality in T-43 aircraft and ground simulators. The difference in fatigue and body chemistries after flights in these two settings represent that which is due to the difference in environments. Using student navigators as subjects, blood samples would be taken before and after: (1) a five hour T-43 (Boeing 737) flight, and (2) a five hour ground simulator mission. Changes in a panel of 26 blood chemistries (including plasma osmolality and carboxyhemoglobin) for each setting would be compared for significant differences. Fatigue would be assessed in each setting using: (1) a subjective fatigue questionnaire, (2) hours of sleep following the mission, and (3) performance (academaic score). GRA

N86-18974# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
SOME NONOCCUPATIONAL ASPECTS OF SENSORINEURAL LOSS OF HEARING ACUITY: A PROPOSED DESIGN FOR STUDY M.S. Thesis
T. VARLEY Jun. 1985 42 p
(AD-A160799; AFIT/CI/NR-85-127T) Avail: NTIS HC A03/MF A01 CSCL 06S

Although the adverse effects of occupationally associated noise on hearing have been well documented, review of the recent literature revealed few studies which have carefully measured the role of nonoccupational loud sound in sensorineural hearing loss. This thesis will measure the strength of association of sensorineural deafness and avocational noise by calculating the odds ratio in a case-comparison design. The prevalence of avocational loud noise activities of a group of 200 cases diagnosed as having sensorineural deafness at retirement from the United States Air Force will be compared with the prevalence of avocational loud noise activities of a group of nondeaf Air Force retirees who have been matched for age, service occupation, family history of hearing loss, personal history of hearing loss and known causes of otic dysfunction. Limitations of the study and anticipated results are discussed. GRA

N86-18975# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A PROPOSAL FOR A LONGITUDINAL STUDY TO ASSESS THE HAZARDS OF RADIATION IN SPACE FLIGHT M.S. Thesis
G. I. REEVES Jun. 1985 47 p
(AD-A160801; AFIT/CI/NR-85-125T) Avail: NTIS HC A03/MF A01 CSCL 06E

This thesis involves the establishment of a registry of all United States astronuats, past and future, plus nonastronaut controls. The registry will record the incidences of malignant neoplastic disease and diabetes mellitus, and the space radiation exposure received. Data will be carefully analyzed to see if there is a dose-related increase in these diseases related to the exposure to ionizing radiation, with an eventual goal of establishing reliable risk estimates related to dose received. The history of cancer related to radiation exposure is summarized, and the space radiation environment briefly described. Physiological changes accompanying space flight and their potential effects on radiation tolerance and carcinogenesis are discussed. The reasons why data from animal experiments and human occupational, medical, and nuclear weapon exposure cannot be extrapolated to the long term health risks of astronauts are discussed at length, and the study instruments for establishing a long term descriptive surveillance study are described. Author (GRA)

N86-18976# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A MODEL OF INHALED GAS AND VAPOR TRANSPORT IN THE HUMAN LUNG Ph.D. Thesis
M. L. SHELLEY 1985 134 p
(AD-A160829; AFIT/CI/NR-85-143D) Avail: NTIS HC A07/MF A01 CSCL 06P

The transport of inhaled gas or vapor in the human lung is theoretically modeled to determine the fraction of inhaled gas or vapor absorbed through the bronchial walls in the conductive zone and the fraction entering alveolated space and undergoing blood/gas exchange. An iterative-analytical approach is used, rather than a numerical one, to generate a large amount of data over a wide range of gas or vapor solubilities and diffusivities. The model applies to gases or vapors of low solubility. Simple analytical expressions are fitted to model results, expressing fractional bronchial absorption and alveolar uptake in terms of gas or vapor solubility and diffusivity. Typical physiological parameters are assumed and only physical properties of the gas or vapor are required for input. Methods are presented which allow estimation of these input values. GRA

N86-18977# Naval Health Research Center, San Diego, Calif.
REVIEW OF DUODENAL AND GASTRIC ULCER Final Report
F. C. GARLAND and E. D. GORHAM Mar. 1985 23 p
(AD-A160919; NAVHLTHRSCHC-85-9) Avail: NTIS HC A02/MF A01 CSCL 06E

Duodenal and gastric ulcer are chronic often recurring conditions that in the past were grouped together as peptic ulcer. Many diverse environmental and genetic factors, which create an imbalance between secretion of acid and pepsin by the stomach and the resistance of the gastrointestinal mucosa may lead to the development of a duodenal or gastric ulcer. Incidence trends and risk factors for these two diseases are different. Reported mortality and hospitalization rates declined markedly for duodenal ulcer from 1970 to 1978, but remained relatively stable for gastric ulcer over the same time period. Recent changes in treatment and diagnosis may account for much of this decline. Several environmental factors associated with duodenal or gastric ulcer have been identified. The principal risk factor for duodenal ulcer is cigarette smoking. Less certain associations with diet, emotional stress, coffee consumption, and occupation have also been reported. Risk of gastric ulcer is also increased by cigarette smoking. Aspirin use, however, is the strongest reported rick factor for gastric ulcer. Uncertain associations between gastric ulcer and alcohol consumption have also been reported. Separate familiar aggregation of duodenal and gastric ulcer indicates that genetic mechanisms leading to the development of these diseases are also distinct. Inheritance patterns for hyperpepsinogenemia I, the Zollinger-Ellison syndrome and several other genetic conditions predisposing to the development of either duodenal or gastric ulcer have been described. GRA

N86-18978# Pennsylvania Univ., Philadelphia. Cerebrovascular Research Center.
DETERMINATION OF THE LUMPED CONSTANT AND THE KINETIC CONSTANTS FOR DEOXYGLUCOSE AND FLUORODEOXYGLUCOSE IN MAN
J. H. GREENBERG, M. REIVICH, A. ALAVI, A. WOLF, J. FOWLER, J. RUSSELL, C. ARNETT, R. R. MACGREGOR, C. Y. SHIUE, and H. ATKINS 1985 2 p Presented at the 12th International Symposium on Cerebral Blood Flow and Metabolism, Lund, Sweden, 16 Jun. 1985 Prepared in cooperation with Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(DE86-000317; BNL-36937; CONF-8506187-2) Avail: NTIS HC A02/MF A01

If both the time course of the arterial plasma radionuclide concentration and the brain tissue radionuclide concentrations are known, it is possible to calculate the kinetic constants (k1*, k2*, k3*, k4*) of the glucose analogue. In a series of male subjects, arterial blood samples were obtained at frequent intervals immediately following the bolus administration of F-18-FDG and then at less frequent intervals for up to 5 hours after the radionuclide administration. The tissue time course was obtained by making positron emission tomographic scans every three minutes for 30 minutes and then at less frequent intervals for 5 hours. These images were used to construct the time course of (18)F activity in gray and white matter structures. Using these values for the lumped constants and the kinetic constants, the values obtained for the global metabolic rate for glucose in two series of young male subjects were 4.99 + or - 0.23 and 5.55 + or - 0.37 mg/100 g/min when C-11-DG and F-18-FDG were used as tracers respectively. DOE

N86-18979# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
FIRST GERMAN SPACELAB MISSIONS, NO. 6 [ERSTE DEUTSCHE SPACELAB-MISSION]
Aug. 1985 9 p In GERMAN
Avail: NTIS HC A02/MF A01

The German Spacelab Mission D1 crew; D1 scientific investigations of weightlessness and microgravity effects on fluids, cell functions and development processes, and human body; navigation; crew training (simulation and flight program); and commercial spin-offs of space flights are discussed.
Author (ESA)

N86-19832# Joint Publications Research Service, Arlington, Va.
FLUORESCENT-POLARIZATION PROPERTIES OF CHROMOPHORES OF WATER-SOLUBLE PROTEINS OF NORMAL AND CATARACTAL HUMAN LENS
T. V. BIRICH, N. I. POZNYAK, N. A. PROKOSHINA, and S. N. CHERENKEVICH *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 21-24 2 Jan. 1986 refs Transl. into ENGLISH from Doklady Akademii Nauk BSSR (Minsk, USSR), v. 29, no. 8, Aug. 1985 p 757-759
Avail: NTIS HC A06

The fluorescent properties, including the lifetime of the excited state of the molecules and the degree of polarization of fluorescence of the water soluble proteins of the normal and cataractal human lens cortex and nucleus are studied. The water soluble fraction of the proteins of the lens cortex and nucleus obtained after homogenization in physiological solution and subsequent centrifuging at 6000 g for 20 min. was also studied. All the studies were done at room temperature. The spectral fluorescent properties including the fluorescence lifetime and polarization of water soluble cortex and nucleus proteins are found to be different in normal and cataractal human lenses. The origin of chromophores which are emitted in the visible spectral range and the modification of protein structure are associated with the formation of intra- and intermolecular covalent bonds in proteins.
Author

N86-19833# Joint Publications Research Service, Arlington, Va.
ELEMENT ANALYSIS OF SCLEROTIC FORMATIONS OF MAJOR BLOOD VESSELS BY LASER MASS SPECTROMETRY Abstract Only
G. G. ARABIDZE, S. M. BURKITBAYEV, Y. A. BYKOVSKIY, A. I. KUTSENKO, I. D. LAPTEV, E. A. MANYKIN, Y. A. PETRENKO, and V. T. TIMOSHIN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 29 2 Jan. 1986 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 655-660
Avail: NTIS HC A06

The element and isotope composition as well as changes in natural propagation of isotopes of elements in sclerotic (plaque) formations developing on the walls of the blood vessels in atherosclerosis is studied by laser mass spectrometry. Sections of sclerotic arteries in various stages of development of atherosclerosis were studied. Before placement in the ion source chamber, the specimens were dewatered with 10% formalin solution and by exposure to various concentration of tartaric acid, then dried at 37 C and atmospheric pressure. Experiments showed that atherosclerotic plaque consists of 12 to 16 elements. The total content of isotopes of the macrocomponents was determined mathematically. Significant changes in the content of trace elements were observed in various stages of vascular damage, anomalous disorders in the natural distribution of isotopes of oxygen, silicon, magnesium and calcium were observed in various stages on the development of atherosclerosis. Author

N86-19834# Joint Publications Research Service, Arlington, Va.
CLINICO-EPIDEMIOLOGICAL CHARACTERISTICS OF Q FEVER IN CARPATHIAN FOOTHILLS
A. A. SUKHOPYATKINA, O. S. BAT, A. V. LEVITSKAYA, and V. G. POTAPOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 34-36 2 Jan. 1986 refs Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, April 1985 p 80-81
Avail: NTIS HC A06

The polymorphism and relative lack of severity of the clinical course of Q fever, as well as the multiplicity of ways of its transmission, lead to a situation in which this disease can go unrecognized. In connection with this, deeper study of the characteristics of its epidemiology are making it possible to establish the presence of natural and anthropurgic foci of this infection. The epidemiological investigation of Q fever was begun in 1975 and have continued to study the infection of the population. In 1975 blood serum from 216 individuals was studied in a complement fixation test with Coxiella burnetii, with negative results. In 1976, 2.1 percent of those examined were found to have a complement-binding antibody to C, burnetti in titers of 1:10 to 1:80. It was established that in one of the rayons of the oblast there existed an active anthropurgic focus of Q fever, manifested by group illness of the personnel working on dairy farms. The source of the infection for people was cattle, and the main method of transmission of the infection was aerogenic. A higher rate of infection by Q fever was observed among workers in livestock raising farms and meat combines. Author

N86-19835# Joint Publications Research Service, Arlington, Va.
EPIDEMIOLOGICAL SUPERVISION OF POLIOMYELITIS
Y. I. VASERIN, L. V. VASERIN, R. G. VLASOVA, R. G. BALAKIREVA, S. F. ZAKIROVA, N. V. PATSUK, and N. Y. VENEDIKTOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 37-42 2 Jan. 1986 refs Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 81-85
Avail: NTIS HC A06

The events of the last decade have shown that under conditions of mass vaccination various regions of our country record isolated cases and outbreaks of poliomyelitis. A thorough description has been made of a period of epidemic increase in the rate of poliomyelitis in Sverdlovsk in 1969 to 1972, when epidemiological,

virological, and serological methods were used to establish the polio virus etiology of most of the cases of paretic diseases. Some conclusions reached because of this monitoring are: (1) under conditions of mass vaccination, sporadic cases of poliomyelitis can be observed among inoculated children; (2) development of a program of epidemiological supervision of poliomyelitis for each administrative region has been proven necessary; and (3) epidemiological supervision of poliomyelitis should provide for early and complete discovery of all cases of the infection, regardless of the severity of the illness, analysis of the quality of vaccination, and determination of the immune status of the population of children and the characteristics of circulation of polio viruses. Author

N86-19837# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF REACTOGENIC AND ANTIGENIC ACTIVITY OF CHROMATOGRAPHICALLY PURIFIED, CONCENTRATED AND INACTIVATED DRY VACCINE AGAINST TICK BORNE ENCEPHALITIS Abstract Only
O. V. POPOV, A. A. SUMAROKOV, R. Y. SHKOLNIK, L. B. ELBERT, M. S. VOROBYEVA, G. L. KRUTYANSKAYA, A. V. RAZGULYAYEVA, and M. N. RASSHCHEPKINA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 51-52 2 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 6, Jun. 1985 p 34-39
Avail: NTIS HC A06

It is shown that the new concentrated chromatographically-pure (CCP) vaccine against tick borne encephalitis (TBE) had moderate reactivity in doses of 0.5 and 1 ml. A direct relationship was established between the frequency and intensity of postvaccination reactions of the vaccinated individuals and the dose. The highest indices of reactivity in individuals treated with CCP vaccine were noted after the first vaccination. CCP vaccine has high antigenic activity: virus-neutralizing antibodies are found in twice vaccinated individuals in 97 to 100% and antigen agglutinations in 75 and 91% respectively. This vaccine should be used for primary vaccination against TBE using two 0.5 ml injections 6 months apart. Author

N86-19840# Joint Publications Research Service, Arlington, Va.
EXHIBITS CONCERNING SPARING MEDICINE AT ZDRAVOOKHRANENIYE-85 AT MOSCOW Abstract Only
Y. PONARINA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 59-60 2 Jan. 1986 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 3 Aug. 1985 p 4
Avail: NTIS HC A06

Exhibits concerning sparing therapy, displayed in Moscow, are listed and described briefly. The Delta-102 relieves pain without use of other analgesics by preventing pain impulses from entering the brain and by inciting release of endorphin. Akma magnets are helpful in alleviating migraine, toothache, sciatica, insomnia and can be used to assist efforts to stop smoking. The patients themselves fasten the magnets to acupuncture points. The Ritm EKG device takes readings from 64 points rather than the usual six and the data obtained are processed and displayed automatically. The comprehensive, automatic, republic system for mass physical examinations Kasmon employs electronic devices to allow one physician and 10 nurses to examine 13,000 patients. The Kardiolayn device can be used to monitor physical parameters of patients after release by their physician. Other exhibits demonstrated surgical procedures employed to perform unique eye surgery procedures, the use of plasma jet scalpels and a method of kidney stone treatment by shock waves in which the patient is subjected to shock waves after precise location of the stone and immersion in water. Author

N86-19841# Joint Publications Research Service, Arlington, Va.
MAGNETS AND SURGICAL PROCEDURES
V. SARELYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 62-63 2 Jan. 1986 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 23 Aug. 1985 p 3
Avail: NTIS HC A06

The work of physicists, who are creating miniature magnets with great magnetic force, has permitted the widespread use of magnets in surgery. The development and introduction into clinical practice of new operations for diseases of the gastrointestinal tract and malformations of the thorax using original magnetic and mechanical systems is discussed. A multitude of different magnetic structures were specifically created for various operations. A new direction in surgery has been established. Some 5000 operations have been performed with very positive results. Author

N86-19843# Joint Publications Research Service, Arlington, Va.
THERMOVISUAL INDICATORS OF BRAIN RESPONSE TO VISUAL STIMULI Abstract Only
I. A. SHEVELEV, Y. N. TSYKALOV, A. M. GORBACH, K. P. BUDKO, and G. A. SHARAYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 75 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 538-543 Original language document was announced in IAA as A86-10695
Avail: NTIS HC A06

A noninvasive thermovisual method was used to detect thermal reaction in the occitoparietal area of human brain cortex to stimulation of the eye with light from a photostimulator. The temporal, spatial, and temperature characteristics of the thermal effect were obtained by use of the AGA-780 thermovisor connected to a computer system. Possible mechanisms of the interrelationship between the visual stimuli and the thermal reaction of the human brain are discussed. I.S.

N86-19844# Joint Publications Research Service, Arlington, Va.
NEURONAL RESPONSE AND EVOKED POTENTIALS IN SUBCORTICAL FORMATIONS IN VISUAL PERCEPTION. PART 1: PROBLEM FORMULATION AND PRINCIPLES OF SOLUTION Abstract Only
Y. D. KROPOTOV and V. A. PONOMAREV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 75-76 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 563-575 Original language document was announced in IAA as A86-10696
Avail: NTIS HC A06

The problems of study the neurophysiological processes taking place during visual perception are discussed, including the methods used and the results obtained. The effects of visual stimuli on neuronal impulses and evoked potentials were registered in patients during functional diagnoses with the use of implanted electrodes. It was demonstrated that the processes of visual perception induce neuronal activity in the nuclei of the thalamus and striopallidal system. The nature of these reactions depends on the type of activity initiated by the visual stimuli. A system of psychological tests is proposed for the analysis of characteristic responses in the human brain to somatosensory features of visual stimuli. I.S.

N86-19845# Joint Publications Research Service, Arlington, Va.
RESPIRATORY FUNCTION IN INHABITANTS OF NORTHEASTERN USSR Abstract Only
L. N. MATVEYEV, A. G. MARACHEV, A. N. KOZIN, S. A. KHARKOV, and I. Z. SHERES *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 77-78 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 634-640
Avail: NTIS HC A06

Respiratory function analysis was conducted on 246 inhabitants of northeastern USSR with a mean stay of 9.40 + or - 0.43 years in the region, and 90 newcomers to the area from Moscow. The study groups consisted of both men and women with an

average age for the cohort of 31.4 + or - 0.51 years. The long term residents of the Northeast presented with inferior pulmonary function status in comparison with the newcomers, the deterioration consisting predominantly of inferior gas-exchange parameters and reduction by a third in pulmonary reserve. Maximum gas exchange after 15 years in the northeast was reduced by 45.4% below that seen for the newcomers, and by 27.6% in comparison with immigrants with a 5 year stay. The corresponding reductions in the pulmonary reserve capacity were 45.4 and 20.3%, respectively. The morphological basis of respiratory deterioration in the long term residents of the Soviet northeast was ascribed to marked hypertrophy and hyperplasia of the seromucous glands and the increase in the percentage of goblet cells. Author

N86-19846# Joint Publications Research Service, Arlington, Va.
EFFECTS OF 24 H SLEEP DEPRIVATION ON BIOGENIC AMINE METABOLISM Abstract Only
T. D. BOLSHSKOVA, S. A. MESHCHERYAKOVA, V. F. TYABENKOVA, N. I. ROMANOVA, Y. I. LEVIN, and I. G. DALLAKYAN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 78-79 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 652-656
Avail: NTIS HC A06

An analysis was conducted on the effects of 24 h sleep deprivation on the metabolism of catecholamines, histamine and serotonin and the completion of recovery after a night's sleep. Measurements of the blood and urine levels of the metabolites in question were conducted on ten healthy males ranging in age from 22 to 27 years. Sleep deprivation of the specified duration resulted in enhanced production and secretion of the biogenic amines, as evidence by elevated urinary levels. In addition, psychological tests during that time showed a positive correlation between changes in the metabolism of the biogenic amines and behavioral performance. Comparison of blood and urine levels demonstrated that the latter status provided a more reliable indication of histamine status. It was also noteworthy that serotonin levels were most refractory to recovery after sleep deprivation, and the connection between depressed levels of serotonin and mental depression after repeated bouts of sleeplessness appears to establish a direct metabolic relationship. Author

N86-19847# Joint Publications Research Service, Arlington, Va.
VISUAL FORM PERCEPTION FROM HALFTONE IMAGES Abstract Only
A. M. KUPERMAN and A. B. KRAVTSOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 79 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 687-689
Avail: NTIS HC A06

Two subjects were employed in an experiment designed to test visual form perception from halftone images and evaluate the importance of orientation selective mechanisms in this function. Analysis of the resultant data indicated that the threshold time limit for perception of the volume parameter from halftone images is on the order of 70 to 180 msec, and depends on the mutal orientation of the test and masking meshwork stimuli to one another. The latency increases with orthogonal orientation. The data were interpreted to indicate that orientational and spatial frequency selective mechanisms are involved in surface form perception from halftone images. These mechanisms can be differentiated into local factors involving evaluation of intensity gradient of the test image, i.e., orientation of the normal to the surface, and nonlocal factors concerned with analysis of contour boundary characteristics. Author

N86-19848# Joint Publications Research Service, Arlington, Va.
PROBLEM OF BIOLOGICAL CLOCKS: NEW DATA ON CIRCADIAN CHANGES IN STATUS OF HUMAN ORGANISM Abstract Only
L. Y. GLYBIN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 80 2 Jan. 1986 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 717-720
Avail: NTIS HC A06

A possible biochemical mechanism has been suggested for endogenous intracellular clocks, suggesting that the biological clock is not a simple two phase day and night clock, but rather a more complex sequence of circadian changes. Results are summarized in a statistical analysis of the circadian rhythm of processes of morbidity, childbirth, domestic injury, traffic accidents and death due to certain diseases. The major result is that various physiological indices of the human body change during the course of the day in a quite complex manner with a regular sequence of phases of increased and decreased intensity of the processes studied. The picture was found to be the same in terms of local time regardless of season of year, latitude or location. Five periods of elevated physiological tone were observed (at 5-6, 11-12, 16-17, 20-21 and 24-1 o'clock) with an equal number of decreases (at 2-3, 9-10, 14-15, 18-19 and 22-23 o'clock). Author

N86-19849# Joint Publications Research Service, Arlington, Va.
ENHANCEMENT OF SOMNIFEROUS EFFECTS OF THERMAL PULSATION BY SIMULTANEOUS APPLICATION TO TWO REFLEXOGENIC ZONES Abstract Only
V. A. LIKHTENSHTEYN and T. M. MUGUTDINOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (PRS-UBB-86-001) p 80 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 689-691
Avail: NTIS HC A06

The somniferous effectiveness of simultaneous application of thermal pulses of two reflexogenic zones was tested on 33 healthy young adults, and compared with the results obtained when only the standard zone (nasolabial) or an adjunct zone (paraumbilical abdominal area) were stimulated. Depth of induced sleep was monitored by EEG. The results demonstrated that sleep induction was most effective when the two zones were simultaneously activated by thermal pulses, with 78.8% of the subjects reaching stage 2 sleep in 9.1 min on the average. In this mode only 6.1% of the subjects failed to respond. Stimulation of only the primary nasolabial zone resulted in 60.7% of the subjects entering stage 2 sleep in 12.7 min, while 15.1% failed to respond at all. Stimulation of the paraumbilical alone was least effective, with 36.3% of the subjects failing to respond and only 20.6% reaching stage 2 in 16.8 min. Author

N86-19850* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 281)
Feb. 1986 60 p
(NASA-SP-7011(281); NAS 1.21:7011(281)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 153 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1986. Author

N86-19851 Marquette Univ., Milwaukee, Wis.
MUSCLE FATIGUE: PHYSIOLOGICAL AND BIOCHEMICAL STUDIES Ph.D. Thesis
J. P. TROUP 1985 139 p
Avail: Univ. Microfilms Order No. DA8516286

The purpose of this study was to examine the etiology of muscle fatigue in fast and slow skeletal muscles giving particular interest to the relationship of H + ion and muscle contractile properties. A further objective as to evaluate to what extent endurance and spring exercise training protects against the development of fatigue. Endurance exercise involved running 1.2 mph at a 15% grade 2

hours per day, 5 days per week for 10 weeks. The spring training program consisted of 6 sprints of 4.5 minute duration at 40 m.min-1 and 15% slope with 2.5 minute rest intervals performanced 5 days per week for six weeks. Muscle fatigue was produced in the predominantly type 1 Soleus, the type 2A and 2B extensor digitorum longus and the type 2B superficial region of the vastus lateralis by electrical stimulation in vitro at 22 C. Muscles were stimulated at 45 trains.min-1 for 1, 5 or 10 minutes. In both training modalities, train tension decreased faster in controls compared to the exercise trained group. This suggested that exercise training leads to a delay in the development of fatigue being most pronounced following a regimen of spring training. Dissert. Abstr.

N86-19852 Harvard Univ., Cambridge, Mass.
LUMINANCE AND CHROMATICITY SIGNAL PROCESSING IN THE HUMAN VISUAL SYSTEM Ph.D. Thesis
G. R. COLE 1985 154 p
Avail: Univ. Microfilms Order No. DA8520180

Luminance (Lum) and Chromatic (Chr) detection mechanisms were revealed with a 1 deg 200 ms test flash presented upon a uniform 6.2 deg yellow field of 3000 td. The test could have any direction in the (L,M) cone quantal catch space. All stimulus components were narrow-band, produced with a 8-channel Maxwellian view optical system. Using pedestals which were flashed coincident in space and time with the test, subthreshold masking and facilitation was obtained for Lum tests upon Lum pedestals and Chr tests upon Chr pedestals. Further increases in the pedestal strength beyond threshold, yielded facilitation independent of the sign of the test and pedestal, followed by a Weberian rise in threshold. Suprathreshold +/- Lum pedestals facilitated the detection of +/- Chr tests (+Chr = green; -Chr = red) by 2 to 3 fold. The facilitation was still apparent for tests and pedestals which were tilted away from the nominal Chr and Lum directions respectively. The results are discussed in terms of spatio-temporal uncertainty and edge effects. Dissert. Abstr.

N86-19853 Minnesota Univ., Minneapolis.
RESTING METABOLIC RATE IN MEN FOLLOWING PROLONGED TREADMILL EXERCISE Ph.D. Thesis
G. R. SHAW 1985 162 p
Avail: Univ. Microfilms Order No. DA8519297

Previous studies have suggested that the resting metabolic rate (RMR) may be elevated for several hours following prolonged exercise and thus contribute significantly to 24-hour energy expenditure. The metabolic responses of 8 men (4 trained runners and 4 sedentary men) were studied during and after treadmill exercise. Each subject was studied on 8 different days: 3 control days (no exercise), 3 days following 45 min of exercise, and 2 days following 90 min of exercise. The trained subjects' exercise intensities averaged 78% and 61% of their maximal oxygen consumption during the 45 min and 90 min exercise bouts, respectively. Corresponding values for the sedentary men were 57% and 46%. Oxygen consumption (VO sub 2), minute ventilation (V sub e), and heart rate (HR) gradually increased during 45 and 90 min of constant-load exercise regardless of training status It is concluded that the total post-exercise increase in energy expenditure following 45 or 90 min of treadmill exercise was at most 4 to 8% of the cost of exercise itself. Dissert. Abstr.

N86-19854 Research Inst. of National Defence, Stockholm (Sweden).
THE ELEVENTH ANNUAL MEETING OF THE EUROPEAN UNDERSEA BIOMEDICAL SOCIETY (EUBS) ON DIVING AND HYPERBARIC MEDICINE
H. OERNHAGEN, ed. and A. L. CARLSSON, ed. Aug. 1985 274 p refs Meeting held in Goetborg, Sweden, 21-23 Aug. 1985
(FOA-C-50021-H1; ISSN-0347-7665) Avail: Issuing Activity

Thermocontrol and pressure effects on divers; pulmonary function during diving and hyperbaric conditions; effects of hydrostatic pressure and gases; and decompression sickness are discussed.

N86-19855 Texas Univ., Austin.
DIVER RESPONSE TO HOT WATER LOSS AT DEPTHS GREATER THAN 300 METERS: EXPERIMENTAL OBSERVATIONS AND THEORETICAL INTERPRETATION
E. H. WISSLER and A. PASCHE *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 7-14 Aug. 1985 refs
Avail: Issuing Activity

A mathematical model for simulating human thermal response to exercise and environmental stress is used to analyze experimental data obtained from 2 series of 350 m dives conducted in hyperbaric chambers. When divers wearing standard hot water suits were subjected to brief intervals without flow, they became uncomfortable and began to shiver within a few minutes. The physiological basis for this response and its consequences are discussed. It is concluded that nonuniform distribution of water within the suit, leakage of hot water from the suit at the wrists and ankles, and flushing of cold water into the suit around the hands and feet during a hot water cut are the primary causes of diver discomfort and shivering. Author (ESA)

N86-19856 Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Underwater Technology.
THE EFFECTS OF THE INSULATION PROPERTIES OF DIFFERENT DRY SUIT SYSTEMS ON THE DIVER'S HEAT BALANCE AND COMFORT DURING DIVING TO 50 M
D. E. WARKANDER, P. A. TRAEFF, and G. O. DAHLBAECK *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 17-32 Aug. 1985 refs
Avail: Issuing Activity

A method for quantifying thermal comfort during diving was tested during diving at 5 and 40 m using suits with and without passive insulation. Calculations of the insulation of a suit system were based on measurements of changes in body temperature, mean skin temperature, respiratory heat loss, and metabolism. Metabolism was measured with a technique based on argon dilution and mass spectrometry. Insulation values in the range of 0.10 to 0.15 K/(W/sq m) are measured for the suits, and are considered by divers to yield adequate thermal comfort. Author (ESA)

N86-19857 Bergen Univ. (Norway). Dept. of Chemistry.
A STUDY OF HUMAN LYMPHOCYTE MORPHOLOGY FROM THE PERIPHERAL CIRCULATION AFTER HYPERBARIC EXPOSURE
J. A. PACIOREK *In* Research Inst. of National Defence The 11th Annual Meeting of the Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 33-43 Aug. 1985 refs
Avail: Issuing Activity

Scanning electron microscopy preparation of peripheral blood lymphocytes obtained from divers at the end of a deep dive in whole blood or in separated mononuclear cell fractions, demonstrate membrane changes in those samples that were air dried. Critical point drying of preparations prevents lymphocyte surface morphology collapse. Membrane binding studies indicated that between 24.5% of peripheral mature B and T cells binding sites are compromised after in vitro hyperbaric treatment. In vitro comparison of pre and post pressure stressed cells shows that inappropriate decompression procedures cause damage to the cytoskeletal matrix, with topographical alteration of membrane and antigenic sites. Author (ESA)

N86-19858 Tromsoe Univ. (Norway). Inst. of Medical Biology.
ENHANCEMENT OF PSEUDOMONAS AERUGINOSA VIRULENCE BY HYPERBARIC ATMOSPHERE CONDITIONS
B. P. BERDAL and A. R. EEGAARD *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 45-54 Aug. 1985 refs Prepared in cooperation with Norwegian Defence Microbiological Lab., Oslo
Avail: Issuing Activity

Factors associated with Pseudomonas aeruginosa virulence (bacterial adhesion to human cells in culture, production of exotoxin A, and the activity of extracellular and cell-wall bound proteolytic enzymes) were measured under diving conditions. Toxin production remains undisturbed, but bacterial adhesion and an extracellural proteolytic, elastase-like activity increase. The enhanced adhesion associated with pressure increase is statistically significant for the assayed P. aeruginosa strains. Adhesion is much higher at 37 C than at 22 C. The hyperbaric pressure effect is significant at the higher temperature only. Observations correlate well with reports of external ear canal infections in divers and whirl-pool bathers. Enhanced bacterial adhesion under favorable atmosphere/temperature conditions could be a general phenomenon for the P. aeruginosa bacterial group.
Author (ESA)

N86-19859 Admiralty Research Establishment, Gosport (England). Physiological Lab.
SOME DOMINANT FREQUENCIES OF POSTURAL TREMOR ARE LOWER AT 31 BAR
D. J. HARRIS and Z. TOROK *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 55-65 Aug. 1985 refs
Avail: Issuing Activity

To test the hypothesis that the center frequencies of tremor bands are slightly lower at pressure as a consequence of slowed muscle contraction, tremor was studied during a heliox dive to 31 bar. Spectral analysis reveals that the power summed for the 6 to 13 Hz and 13 to 40 Hz bands in the finger increases 2 to 6 and 1.6 to 3.5 fold respectively, while hand tremor power increases from 1 to 6.6 fold. Center frequencies of all hand tremor peaks, (neurological and mechanical in origin) are reduced at pressure by 0.67 to 1.28 Hz. The results support the proposition that reflex and muscle factors play a role in causing or modulating tremor in the high pressure nervous syndrome. Author (ESA)

N86-19860 Karolinska Inst., Stockholm (Sweden). Dept. of Aerospace and Environmental Medicine.
LUNG VOLUMES AND DYNAMIC COMPLIANCE DURING IMMERSION AND OXYGEN BREATHING
R. BAER, G. O. DAHLBAECK, and U. I. BALLDIN *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 67-69 Aug. 1985 refs Prepared in cooperation with Chalmers Univ. of Technology, Goeteborg, Sweden
Avail: Issuing Activity

The pulmonary mechanics and the time course of lung vital capacity (VC) reductions during immersion and oxygen breathing were investigated using 8 healthy male scuba-divers (mean age 24 yr, range 18 to 30 yr) with body plethysmographic techniques and simultaneous esophageal pressure recordings. The reductions in VC and the symptoms of airway irritation after immersion and oxygen breathing confirm suggestions that this reduction is mainly due to pulmonary absorption atelectasis formation caused by an elevated diaphragm and blood pooling in the thorax, creating closed off basal lung regions. However, the small reductions in residual lung capacity and dynamic compliance during 30 min immersion conditions, while breathing oxygen as well as air, might be explained by an increased lung interstitial fluid interfering with the gas volumes in the lung. Author (ESA)

N86-19861 Norwegian Underwater Technology Center Ltd., Laksevaag.
EFFECTS OF DRY AND HUMIDIFIED BREATHING GAS (AIR) AT 37 C ON PULMONARY FUNCTION IN HYPERBARIC CONDITIONS
I. ROENNESTAD *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 71-79 Aug. 1985 refs
Avail: Issuing Activity

The effects of breathing humidified air were studied using 7 subjects performing a standard workload task at 1.17, 3.75, and 5.98 bar simulated depths and at the surface. Exposure to humidified breathing gas causes no change in any of the pulmonary function parameters. There are significant decreases in the pulmonary function parameters after exposure to dry breathing gas at 5.98 bar compared to 1.17 bar. At 1.17 bar mean mid expiratory flow (MMEF) is reduced to 94.5 % of the pre-exposure value, while MMEF at 5.98 bar is reduced to 77 % of the pre-exposure value. Data for humidified breathing gas at 5.98 bar are similar to those at 1.17 bar. Changes are probably due to an obstruction in the distal airways. The origin of the obstruction is unknown. It is concluded that humidification of dry breathing gas has an increasingly positive effect with depth on the pulmonary function of the diver. Author (ESA)

N86-19862 Research Inst. of National Defence, Haarsfjaerden (Sweden).
LUNG RUPTURE AS A COMPLICATION IN FREE ESCAPE
C. LINDEMARK (Submarine Medical Section, Karlskrona, Sweden) and J. ADOLFSON *In its* The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 81-84 Aug. 1985 refs
Avail: Issuing Activity

In 104,200 free escapes performed by 9,253 trainess in submarine warfare, 63 cases (frequency of 0.7 %) of lung rupture were observed. Mediastinal emphysema is found in 36 of the cases and pneumothorax in 4 by X-ray examination. Symptoms to be recompressed are thoracic sensations, cerebral symptoms, unconsciousness, subcutanous emphysema, bloody frothy sputum, auscultory crepitations, submucous emphysema and shortness of breath. It is uncommon that people trained in free ascent suffer from lung rupture. It is suggested that training in free ascent in a tank with maximum possibilities of rescue is a way to avoid severe diving accidents in the open sea. Author (ESA)

N86-19863 Institut National de la Sante et de la Recherche Medicale, Paris (France). Div. d'Exploration Fonctionnelle des Sportifs.
COMPARISON OF BRADYCARDIA BREATH-HOLD ON DIVERS AND NONDIVERS: ITS IMPORTANCE FOR THE CAPACITY VISIT OF DIVERS
D. LAPIERRE, F. FRIEMEL, M. P. CURRALADAS, C. LARGER, and G. CANNET *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 87-92 Aug. 1985 refs
Avail: Issuing Activity

Bradycardia during apneas with face-immersion was tested with 12 divers and 12 nondivers. No statistically significant difference between the two groups as to the average length of breath hold and the frequency of appearance of the electrocardiographic changes is found. Breathing with face immerged (FI) cardia during apnea is significant for nondivers, FI or not. For divers, bradycardia is significant only with FI. The differences in the amplitude of bradycardia between the two groups are not statistically significant. The apnea-training of divers may reduce the parasympathetic sensitivity of the heart. During the capacity visit for candidate divers, the parasympathetic response of the subject should be tested by making him carry out an apnea. Author (ESA)

N86-19864 Red Cross Hospital, Barcelona (Spain). Centre de Recuperations i d'Investigations Submarines.
EXPLAINING THE UNEXPLAINED DYSBARIC SPORT DIVING ACCIDENTS
X. LOPEZ-ALTIMIRAS, J. PALOMER, J. BORRAS, and J. DESOLA-ALA *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 93-98 Aug. 1985
Avail: Issuing Activity

A total of 181 dysbaric sports diving accident case files were analyzed, and cases where adequate decompression procedures were followed were studied. The patients' personal data (age, physical condition, and background) diving instruction (experience and previous dysbaric disorders), the data which preceeded the dive (continued or successive dives, sailing, previous traveling) and the technical characteristics of the dive itself (exercise at depth, cold water, fatigue) were investigated. Exercise, advanced age, and negligence in applying safety factors are the reasons of the majority of the unexplained accidents. Author (ESA)

N86-19865 Research Inst. of National Defence, Stockholm (Sweden).
AN ATTEMPT TO COUNTERACT NITROGEN NARCOSIS BY NALOXONE ADMINISTRATION
M. H. LINER, O. EIKEN, M. GENNSER, H. ROECKERT, and H. OERNHAGEN *In its* The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 99-104 Aug. 1985 refs Prepared in cooperation with Chalmers Univ. of Technology, Goeteborg, Sweden, and Karolinska Inst., Stockholm, Swedennst. Natl. Defence
Avail: Issuing Activity

In order to evaluate the effect of naloxone (a specific opiate antagonist) on nitrogen narcosis, 8 healthy subjects were exposed to 8.5 ATA air on 2 occasions in a dry chamber. The degree of nitrogen narcosis was assessed by measurement of body sway motion, four-choice visual response time, and paced auditory serial addition test. The subjects assessed perceived degree of narcosis using the Borg category scale. Tests were performed pre and post-dive, and at bottom depth before and after drug administration. Each subject received naloxone (0.02 mg/kg bw) or placebo on separate dives. Drugs were administered intravenously in a double-blind random fashion. At 8.5 ATA performance decreases in all tests indicating nitrogen narcosis. Neither naloxone nor placebo affect performance at pressure. Results suggest that naloxone does not reverse the effects of excessive nitrogen partial pressure on body sway, and psychomotor and cognitive functions.
Author (ESA)

N86-19866 London Univ. (England). Dept. of Chemical Pathology.
ELEVATIONS OF PLASMA ENDOTOXIN LEVELS AND LYSOSOMAL ENZYME ACTIVITIES IN DIVERS DURING A SIMULATED CHAMBER DIVE TO 300 MSW
D. R. DORAN, Z. TOROK (Admiralty Research Establishment, Gosport, England), M. P. GARRARD (Admiralty Research Establishment, Gosport, England), and L. CHAUDRY *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 107-112 Aug. 1985 refs Sponsored by UK Ministry of Defence Procurement Executive
Avail: Issuing Activity

Bacterial endotoxin levels were measured in blood samples taken from 3 men during a simulated chamber dive to 300 msw. Plasma concentrations rise in all 3 men from insignificant pre-dive values to reach levels 10 times the upper limit of normal by the end of compression. The elevations persist well on into the decompression phase. Significant elevations of activities of acid phosphatase and Beta glucuronidase are noted, paralleling the rise in endotoxins. Such lysosomal enzyme activity increases are known to accompany endotoxaemia. The effect of hyperbaric exposure upon the efficiency of destruction of endotoxin by the liver, and/or direct effect of compression upon leakage of endotoxin from the gut are discussed. Author (ESA)

N86-19867 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Dept. of Underwater Medicine.
HIGH PRESSURE OXYGEN (OHP) INDUCED INCREASE OF SERUM PROLACTIN IS NOT DUE TO A DOPAMINE (DA)-RECEPTOR BLOCKADE
G. ATHANASSENAS, R. KAISER, H. SCHLEBUSCH (Bonn Univ., West Germany), and R. BERGER *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 113-120 Aug. 1985 refs
Avail: Issuing Activity

A significant increase of serum prolactin (PRL) levels was found after breathing 100% O2 in a simulated depth of 18m, compared to normoxic breathing under the same conditions. In order to distinguish between a decrease of dopamine (DA) and a blockade of the DA post-synaptic receptor, bromocriptine (BRC) a known DA agonist, was administered in a double blind experiment. Eleven male divers participated in 4 series of simulated dives to 18 m breathing 100% O2 in 2 dives (1 with and 1 without BRC administration), and breathing a normoxic mixture in the 2 others (1 with and 1 without BRC administration). It is found that the increase of serum PRL under high pressure oxygen is suspended after BRC administration, suggesting that PRL increase is due to a decrease of DA rather than to a blockade of the post-synaptic DA receptor. Author (ESA)

N86-19868 Royal Netherlands Navy, The Hague. Diving Medical Centre.
EFFECTS OF INTERMITTENT EXPOSURE TO HYPEROXIA IN OPERATIONAL DIVING
W. STERK (Vriens Diving Co.) and L. M. SCHRIER *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 123-131 Aug. 1985 refs
Avail: Issuing Activity

Two groups of 6 divers were exposed to hyperoxic mixtures during 3 no-stop dives of 2 hr duration per day, interrupted by 1 hr surface intervals breathing air, 5 days per week. Group 1 was exposed to 600 cumulative pulmonary toxicity dose (CPTD) and group 2 to 800 CPTD per day. Results show a chronic oxygen toxicity syndrome consisting of symptoms as fatigue, headache, dizziness, and paraesthesia. Most characteristic is a feeling of numbness in fingers and toes. It is uncertain whether these symptoms are of central or peripheral origin. It is concluded that daily exposure to 600 CPTD or more is not safe on a working week basis and as a schedule as in the experiment.
Author (ESA)

N86-19869 Bergen Univ. (Norway). Dept. of Physiology.
INCREASED INOTROPI OF THE HEART IN NORMOXIC HYPERBARIC ATMOSPHERE
L. B. STUHR, A. ASK, and I. TYSSEBOTN *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 133-138 Aug. 1985 refs
Avail: Issuing Activity

Cardiac activity of rats in a hyperbaric chamber was studied. A micromanometer independent of saline filled catheters was introduced into the left ventricular heart chamber of anesthetized subjects. Intraventricular pressure and velocity of ventricular pressure increase and decrease were measured in control and during 15 min elevated ambient pressure to 5 bar by He and N2 and 15 min after decompression. The mean arterial pressure and pulse pressure were recorded by a saline filled catheter in aorta via a femoral artery. Elevated ambient pressure (5 Bar) by N2 and He in a normoxic atmosphere increases the inotropi but does not influence the chronotropi and mean arterial pressure. It is suggested that the rat heart has to use a greater force and velocity of contraction to pump the same amount of blood at 5 bar.
Author (ESA)

N86-19870 Institut za Pomorsku Medicina, Split (Yugoslavia).
HYBERBARIC OXYGEN IN THE TREATMENT OF BELL'S PALSY
R. GORAN, D. PETAR, G. STRACIMIR, and K. HASAN *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 139-146 Aug. 1985 refs
Avail: Issuing Activity

Twenty patients with Bell's palsy detected 7.6 days previously on average (no longer than 15 days) were treated by hyperbaric oxygen (HBO) at 2.8 bars for 60 min twice a day. A few days after the beginning of the therapy (mean 5.5. days) all but 1 improved and all but 1 healed completely in 17 to 21 days (mean 14.6). In one case decompression rather than HBO was indicated but subject having refused surgery joined oxygen treated group. At admission all patients presented complete paralysis with NET differing 3.5 mA. During therapy none of them developed signs of electrodegeneration. Comparing outcome of Bell's palsy under HBO to the one under medicamentous therapy or spontaneous evolution, *HBO cases heal quicker and with no sequella.* Author (ESA)

N86-19871 Istanbul Medical Faculty (Turkey). Underwater Medicine Section.
A SURVEY OF ASEPTIC BONE NEGROSIS IN TURKISH SPONGE DIVERS, INTERIM REPORT
M. CIMSIT, C. BABUNA, A. KARACALLIK, G. VARAN, Z. KARAGUELLE, B. ACUNAS, and N. YUEZBASLOGLU *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 147-157 Aug. 1985 refs
Avail: Issuing Activity

Physical examinations, blood and urine analyses, and radiological examinations of divers were completed. They were all actively diving on air. Mean age was 26.1 yr with a range of 19 to 35. The mean years of diving experience was 4.3. The average depth of diving was 35.4 m. Six divers had decompression sickness (DCS). Although aseptic bone necrosis is not found necessarily related with DCS, all cases with DCS have lesions of aseptic bone necrosis; 3 of the 21 divers are free of lesions and 4 have cystic changes and translucent areas in their coracoid process and fibula. Findings indicate a very high incidence of dysbaric osteonecrosis. Eighteen divers have lesions. Humerus is the primary site of affection. All these findings indicate that the high incidence of aseptic bone necrosis among Turkish sponge divers is related to diving habits. Author (ESA)

N86-19872 Slotervaartziekenhuis, Amsterdam (Netherlands).
EARLY DETECTION AND TREATMENT OF AVASCULAR BONE NECROSIS IN DIVERS
R. M. KUIPERS, G. H. C. SCHARDIJN, D. M. A. AGENANT, C. A. HOEFNAGEL, and K. J. HAMELYNCK *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 159-164 Aug. 1985 refs
Avail: Issuing Activity

Dysbaric osteonecrosis diagnosis in divers is discussed. Four weeks after a decompression accident the first signs can be found by a diphosphonate bone-scan. An X-ray investigation is usually positive at a later stage of the disease (1 yr) but the best moment of treatment is gone. If a bone lesion is suspected on clinical examination and bone scintigraphy, further confirmation by intramedullary pressure and phlebography should be performed. In case of a high pressure and a venous stases, a core biopsy with intraossal decompression is indicated. The results of a local treatment of the necrotic part of head in early cases of femoral head necrosis are good, and less disabling than a hip arthrodesis or total hip replacement in cases of bone necrosis with secondary arthrosis. Author (ESA)

N86-19873 Chalmers Univ. of Technology, Goeteborg (Sweden). Lab. of Oral Biology.
ORAL CHANGES IN DIVERS WORKING WITH ELECTRICAL EQUIPMENT UNDER WATER
T. OERTENDAHL *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 165-171 Aug. 1985 refs
Avail: Issuing Activity

An inquiry study among professional commercial divers revealed that 55% complained of a metallic taste, strictly related to their work with electrical equipment under water. A clinical study was performed to see if the metallic taste reflected any clinical alteration. Divers who worked with electrical equipment under water have a significantly more unfavorable clinical appearance of their dental amalgams, in relation to a control group. The metallic taste is probably due to potential alterations in the mouth provoked by increasing humidity in diving suits when operating electrical welding machines. Author (ESA)

N86-19874 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Dept. of Underwater Medicine.
HYGIENIC ASPECTS OF WATER SUPPLY FOR CHAMBER SANITARY FACILITIES, CHANGES OF DIVERS' BACTERIAL MOUTH FLORA AND EFFECTIVENESS OF EAR PROPHYLAXIS IN SATURATION DIVES
R. KAISER, L. KRIZEK (Bonn Univ., West Germany), M. EXNER (Bonn Univ., West Germany), and L. VOGT *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 173-178 Aug. 1985
Avail: Issuing Activity

In the first of two 230 m saturation dives a continuous spreading and increase of Pseudomonas aeruginosa (mainly PMA 4) was observed inside the chamber although a strict daily disinfection routine was followed. Beginning between day 3 and 5, PMA 4 is observed in all divers. Technical modifications to the water sypply system and the use of a H2O2 based disinfectant markedly improve microbiological water quality and reduce bacterial colonization of the divers in the second dive. For ear prophylaxis (5 min twice daily) 70% ethanol or AL-acetate/acetic acid was used. No case of manifest otitis externa occurs. Author (ESA)

N86-19875 Bergen Univ. (Norway). Inst. of Physiological Psychology.
PSYCHOLOGICAL AND PHYSIOLOGICAL STRESS REACTIONS AMONG SPORTS DIVER-STUDENTS
A. JENSEN, R. VAERNES, and K. T. STOKKE *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 179-189 Aug. 1985 refs Sponsored in cooperation with Norwegian Underwater Technology Center and National Hospital of Norway
Avail: Issuing Activity

The existence of a significant activation or stress to perform emergency procedures in water, and coping throughout dive training were studied. Pre and post activation on dives 1 and 6 were measured (5 m depth). Correlations between endocrine reactions, subjective fear rating, frequency of symptoms postdive and personality were obtained. There is a significant activation to the sea dive. However, students either really cope with the environment, or show a very large change in endocrine status. There are broad individual variations regarding coping throughout training. As found among navy divers loss of coping is related to high defense strategies. Author (ESA)

N86-19876 Hamilton Research Ltd., Tarrytown, N.Y.
REPETITIVE DECOMPRESSION TABLES FOR NO-STOP EXCURSIONS FROM SATURATION
R. W. HAMILTON and D. J. KENYON *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 191-198 Aug. 1985 refs Sponsored by NOAA and the Dept. of Commerce
Avail: Issuing Activity

The classical gas loading method for calculating repetitive tables was used to calculate many sequences of excursions separated by various surface or habitat intervals. These were done for different excursion storage depths, vertical excursion distances, and interdive intervals. The allowable bottom time may be shorter for the second dive and even shorter for subsequent excursions. For a given depth-time combination the required adjustment is determined almost entirely by its order in the sequence and the duration of its preceeding interdive interval; the tables use these factors rather than repetitive groups. A linear interpolation method is used to account for excursions that use less than the total allowable time. Author (ESA)

N86-19877 Copenhagen Univ. (Denmark).
EXCURSION LIMITS IN SHALLOW WATER HELIOX SATURATION DIVING
J. MADSEN *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 199-201 Aug. 1985 refs
Avail: Issuing Activity

Discrepancies between experimental results on which tables for unlimited duration excursions from shallow heliox saturation are calculated are noted. Reasons for the discrepancies, and their significance for diving safety are discussed. Discrepancies may be due to the differences between experiment designs, particularly populations tested. Author (ESA)

N86-19878 Duesseldorf Univ. (West Germany). Inst. fuer Biophysik und Elektronenmikroskopie.
WET CHAMBER DIVES TO TEST ALGORITHMS FOR ELECTRONIC DECOMPRESSIOMETERS
M. HAHN, P. HAMPE (DFVLR, Cologne, West Germany), and S. JOHN (Deutsche Lebensrettungsgesellschaft, Berlin, West Germany) *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 203-211 Aug. 1985 refs
Avail: Issuing Activity

Wet chamber dives, simulating nonrectangular profiles and repetitive diving common in sports-diving, were performed to test a decompression model and supersaturation tolerances used in an electronic decompressiometer. Ultrasonic Doppler bubble measurements were made during test-dives. Occurrence of type 1 decompression sickness and peculiarities in the bubble history suggest that denitrification is delayed by decompression stress. Author (ESA)

N86-19879 Saitama Univ., Urawa (Japan). Dept. of Hygiene.
AN APPRAISAL OF DIVE PROFILES IN SHELLFISH DIVERS WITH REFERENCE TO THE RISK OF DECOMPRESSION SICKNESS
I. NASHIMOTO, K. KOBAYASHI, and Y. GOTOH *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 213-219 Aug. 1985 refs
Avail: Issuing Activity

The dive profiles of six helmet shellfish divers were recorded and venous gas emboli (VGE) of divers after surfacing were monitored. Theoretical tissue nitrogen pressure (TNP) and decompression thresholds (DTHs) were calculated. Dive depth was 16 to 36 m, bottom time 16 to 36 min, and total ascent time 16 to 29 min. The first decompression stop was usually taken at 20 m, the second at 10 to 5 m. Constant fluctuations in diving depth were seen at the bottom. At each decompression stop the diver moved up and down within a range of 2 to 6 m. Grade 2 VGE is detected among 3 divers after surfacing from the second dive. No DCS is observed. With few exceptions, their empirical decompression profiles do not exceed the DTHs. This may be related to the reduced risks of DCS. Author (ESA)

N86-19880 Royal Norwegian Navy, Haakonsvern. Bureau of Ships.
ALTERNATIVES TO STANDARD AIR TABLES
A. J. ARNTZEN *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 221-228 Aug. 1985 refs
Avail: Issuing Activity

Diving companies used an empirically modified surface decompression table with nitrox. This combination gives very long bottom times compared to standard air tables. Experience from several thousand dives (salvage and construction) proves that bends frequency is satisfactory. Evaluation of 2662 dive reports shows that the procedures are safe enough to be recommended for official use, with minor modifications. Author (ESA)

N86-19881 Compagnie Maritime d'Expertises, Marseille (France).
THE INFLUENCE OF INDIVIDUAL FACTORS IN MAN ON BUBBLE FORMATION IN AIR DIVING DECOMPRESSION
M. CARLIOZ, M. COMET, and B. GARDETTE *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 229-239 Aug. 1985 refs
Avail: Issuing Activity

The influence of biometric factors on decompression was studied in 78 air dives of 78 male subjects at 24 m 90 min bottom time, 30 m 80 min, and 51 m 40 min. Results show that factors which influence individual susceptibility to eliminate gas as bubbles, and consequently to pathological risk, are age, weight, and fat tissue. The statistical results were extended to 133 unit air chamber dives. The correlation coefficients are: 0.45 for age, 0.32 for fat tissue, and 0.28 for weight. Thus, there is not a sole determining factor but it appears that the sum of these 3 factors (age + weight + fat tissue : $r = 0.52$) induces pathogenic bubble formation during decompression. Author (ESA)

N86-19882 Direction des Constructions et Armes Navales, Toulon (France). Centre d'Etudes et de Recherches Techniques Sous-Marines.
ULTRASONIC DETECTION OF CIRCULATING BUBBLES IN EWES EXPOSED TO SIMULATED DIVES DEEPER THAN 800 MSW UNDER ISOBARIC CONDITIONS AND WITH UNCHANGED GAS MIXTURES
G. MASUREL, J. HEE, L. GIACOMONI, and R. GUILLERM *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 241-246 Aug. 1985 refs
Avail: Issuing Activity

As part of a study intended for the in vivo checking of blood gases in animals exposed to high pressures, ewes were exposed to simulated saturation dives with heliox under normoxic conditions at depths between 800 and 1000 msw. Circulating bubbles are reported during the simulated dives and during stops at the bottom, although conditions were isobaric, and the gas mixture was not changed. Author (ESA)

N86-19883 Red Cross Hospital, Barcelona (Spain). Centre de Recuperacio i de Investigacions Submarines.
LESS BUBBLE FORMATION IN WOMEN DIVERS
J. DESOLA-ALA and G. MASUREL *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 247-256 Aug. 1985 refs Prepared in cooperation with Direction des Constructions et Armes Navales, Toulon, France
Avail: Issuing Activity

Nine couples (1 man, 1 woman) performed identical dives at depths varying from 40 to 50 msw during enough time to produce a residual nitrogen coefficient L according to US Navy decompression tables. Circulating bubbles in the precardial region were determined immediately after the dive and every 30 min during 2.5 hr. Seven men produce detectable bubble degrees in at least one observation, while only three women do so. The men show a higher number of positive determinations and higher degrees of circulating bubbles. No correlation with individual or technical factors can be clearly signaled as responsible for these variations. It is suggested that women divers produce a less bubble degree than men, and their proneness to decompression sickness is related to other physiological factors. Author (ESA)

N86-19884 Japan Marine Science and Technology Center, Tokyo. Dept. of Undersea Science and Technology.
EFFECT OF LOW AND HIGH ENVIRONMENTAL TEMPERATURES ON DECOMPRESSION SICKNESS IN THE AGING RAT
Y. TAYA, F. SHIDARA, Y. MIZYSHIMA, M. NAKANO, N. NARAKI, K. TAKAO, and K. SEKI *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 257-261 Aug. 1985 refs
Avail: Issuing Activity

The combined effects of aging and environmental temperature on decompression sickness incidence in male and female rats (10, 36, and 60 weeks old) in a compression chamber pressurized with air to 11 bar in 10 min were studied. Temperature was controlled at 20 and 30 C, and freely ventilated. Following a 40 min stop at 11 bar, the rats were decompressed in stages, and fatality ratio observed. The results demonstrate a significant relationship (at 0.01%) between aging and fatality ratio; fatality ratio increases under low environmental temperature compared to high environmental temperature. There is little gender effect on fatality. Author (ESA)

N86-19885*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CUTTING HEAD FOR ULTRASONIC LITHOTRIPSY Patent Application
E. D. ANGULUO and R. GOODFRIEND, inventors (to NASA) 30 Oct. 1985 10 p
(NASA-CASE-GSC-12944-1; NAS 1.71:GSC-12944-1; US-PATENT-APPL-SN-793006) Avail: NTIS HC A02/MF A01 CSCL 06E

A cutting head for attachment to the end of the wire probe of an ultrasonic kidney stone disintegration instrument is described. The cutting head has a plurality of circumferentially arranged teeth formed at one end thereof to provide a cup shaped receptacle for kidney stones encountered during the disintegration procedure. An integral reduced diameter collar diminishes stress points in the wire and reduce breakage thereof. NASA

N86-19886*# California State Coll., Bakersfield.
GENERAL AUTOMATIC COMPONENTS OF MOTION SICKNESS
S. SUTER, W. B. TOSCANO, J. KAMIYA, and K. NAIFEH 1985 37 p refs Prepared in cooperation with California Univ., San Francisco
(Contract NCC2-115)
(NASA-CR-176516; NAS 1.26:176516) Avail: NTIS HC A03/MF A01 CSCL 06S

A body of investigations performed in support of experiments aboard the space shuttle, and designed to counteract the symptoms of Space Adapatation Syndrome, which resemble those of motion sickness on Earth is reviewed. For these supporting studies, the automatic manifestations of earth-based motion sickness was examined. Heart rate, respiration rate, finger pulse volume and basal skin resistance were measured on 127 men and women before, during and after exposure to nauseogenic rotating chair tests. Significant changes in all autonomic responses were observed across the tests. Significant differences in autonomic responses among groups divided according to motion sickness susceptibility were also observed. Results suggest that the examination of autonomic responses as an objective indicator of motion sickness malaise is warranted and may contribute to the overall understanding of the syndrome on Earth and in Space. Author

N86-19887# Massachusetts Univ., Amherst. Dept. of Psychology.
BIOLOGICAL INVESTIGATIONS OF ADAPTIVE NETWORKS. NEURONAL CONTROL OF CONDITIONED RESPONDING Annual Technical Repor, 30 Apr. 1984 - 20 May 1985
J. W. MOORE 20 May 1985 26 p
(Contract AF-AFOSR-0215-83)
(AD-A160345; AFOSR-85-0746TR; ATR-2) Avail: NTIS HC A03/MF A01 CSCL 06P

Neurobiological investigations of adaptive neural networks were conducted using the classically conditioned nictitating membrane response (NM CR) of rabbit, a widely used model system for studies of learning. One experimental approach involved recording from single brain neurons from awake, behaving animals for the purpose of determining the loci and characteristics of neurons with activity correlated with the NM CR or its inhibition. A second approach involved the use of discrete brain lesions that selectively eliminate the NM CR while at the same time sparing the basic reflex pathway. A third approach employed fiber-tracing anatomical techniques designed to clarify the inter-connectivity among brain regions essential for the NM CR. These regions include discrete portions of the cerebellum and brain stem. Information from physiological studies has been incorporated into mathematical models of learning used by adaptive network researchers, and anatomical findings have guided the development of related neuronal models. GRA

N86-19888# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A STUDY OF PATIENT'S SELF-IMAGE DURING ORTHODONTIC TREATMENT M.S. Thesis
B. B. JACOBUS, JR. Jun. 1985 126 p
(AD-A160751; AFIT/CI/NR-85-117T) Avail: NTIS HC A07/MF A01 CSCL 05J

There has been little research done that has attempted to study the patient's self-image and record what changes occur with a correction of the patient's malocclusion through orthodontic treatment. A study was done to determine what changes occur in the orthodontic patient's self-image during orthodontic treatment. A questionnaire requiring responses pertaining to self-image was distributed to three hundred sixty 11 to 19-year old patients in various phases of pre-treatment and retention. The data was collected and statistically analyzed. Variables of age, sex, and time in treatment were examined. Findings indicated a definite positive effect upon the orthodontic patient's self-image. Significant differences in response levels of different age groups, time in treatment groups and males and females were found. The effects

on self-image were the largest during the first year of active treatment and remained at a higher level throughout treatment. The positive self-image levels continued through the retention phase of treatment. GRA

N86-19889# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
IN VITRO COMPARISON OF ZINC PHOSPHATE AND GLASS IONOMERS ABILITY TO INHIBIT DECALCIFICATION UNDER AND ADJACENT TO ORTHODONTIC BANDS M.S. Thesis
D. J. COPENHAVER Aug. 1985 60 p
(AD-A160881; AFIT/CI/NR-85-141T) Avail: NTIS HC A04/MF A01 CSCL 06E

Forty sets of impacted third molar teeth were banded with custom fitted bands and cycled in a latic acid solution for four weeks. This solution simulates an environment that would be found only in patients with the worst oral hygiene. Each set was from the same patient. Visual, spectrophotometric and pH testing were done on the sample sets. All area not banded showed significant decalcification after four weeks in the 0.10 M latic acid solution. The teeth banded with glass ionomer cement showed significantly more calcium was present in solution in the zinc phosphate cemented sample solutions also confirmed were more Ca(++) ions in solution. The evidence suggest that glass ionomer cement protects the tooth surfaces from decalcification under and adjacent to orthodontic bands significantly better than zinc phosphate cements. Further study on solubility and setting time of this new glass ionomer cement is necessary before routine clinical use can be considered. Author (GRA)

N86-19890# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
PASSING SCORES FOR THE FAA ATCS COLOR VISION TEST
J. J. CONVEY Aug. 1985 19 p
(AD-A160889; DOT/FAA-AM-85-7) Avail: NTIS HC A02/MF A01 CSCL 06P

In response to recommendations from the Office of Personnel Management for measures of normal color vision that reflects as closely as possible the functional color vision requirements for an air traffic controller (Christup, 1981), subtests which simulated ATC tasks were developed in three content areas: (1) aircraft colors for fuselage and lights, (2) color weather radar displays, and (3) navigational chart terrain elevations. Pickrel and Convey (1983) performed an item analysis on these subtests using data obtained from 41 persons with normal color vision as determined by their performance on the Pseudoisochromatic Plates Test (PIP) from the American Optical Corporation and 22 persons with defective color vision according to the PIP. The item parameters and the internal consistency reliability estimates obtained were satisfactory. GRA

N86-19891# Naval Health Research Center, San Diego, Calif.
ASSESSING THE HEALTH RISKS OF CARRIER LANDINGS IN US NAVY PILOTS Interim Report
A. HOIBERG and R. G. BURR Jul. 1985 12 p
(AD-A160928; AD-F630624; NAVHLTHRSCHC-85-24) Avail: NTIS HC A02/MF A01 CSCL 01B

Landing an airplane on an aircraft carrier is one of the most demanding and complex tasks required of Navy pilots. Heart rate values in pilots increase during flight, especially during landings and launch. Because of the hazards involved, carrier landings might have an impact on the health of Navy pilots. This study was designed to determine whether or not carrier landings adversely affected the health of Navy pilots. The objective was to compare the hospitalization and mortality rates of helicopter pilots and fixed-wing pilots who had considerable carrier landing experience with a control group of pilots who had little, if any, carrier landing experience. Results of comparisons across carrier landing exposure groups revealed no significantly higher total hospitalization rate of any one of the three groups. GRA

N86-19892# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
INVESTIGATION OF THE METHOD TO DETERMINE CARBOXYHAEMOGLOBIN IN BLOOD
D. M. KANE Aug. 1985 66 p
(AD-A161061; DCIEM-85-R-32) Avail: NTIS HC A04/MF A01 CSCL 06A

The current method for determining blood carboxyhemoglobin concentration by gaschromatography has been critically evaluated and compared to spectrophotometric analysis methods. The major sources of bias in the method accuracy have been found to be in the measurement of blood volume and in the separate determination of total hemoglobin concentration in the blood. The method is estimated to have a coefficient of variation of 6.2% over the range of 0.5 to 20 vol % COHb. Standardization procedures which have been examined are the use of a 500 ppm carbon monoxide in nitrogen gas mixture and carbon monoxide-saturated blood solutions as external standards. Also, methods of saturating blood with carbon monoxide have been examined, with the use of an impinger or tonometer held at 37 C giving the most effective results. Studies of long-term storage of carbon monoxide blood have been carried out and have revealed that the concentration remains stable for up to nine days if the blood is stored anaerobically at refrigerator temperatures. Blood containing 10% or less carboxyhemoglobin has been found to be stable up to 60 days. GRA

N86-19893# Naval Submarine Medical Research Lab., Groton, Conn.
BODY WEIGHT CHANGES BEFORE AND AFTER SUBMARINE PATROLS Interim Report
K. R. BONDI and A. N. BEARE 25 Sep. 1985 9 p
(AD-A161144; NSMRL-1062) Avail: NTIS HC A02/MF A01 CSCL 06P

Analysis of pre- and post-patrol body weight of 670 men from the crews of seven submarines showed that 32% of the men gained weight, 52% lost, and the 12% did not change. From the magnitude of individual weight losses, it was inferred that as many as a third of the men may have been actively dieting. These data do not support the widespread belief that men tend to gain weight during submarine patrols. Author (GRA)

N86-19894# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ABSORPTION OF BENZENE THROUGH HUMAN SKIN
J. HANKE, T. DUTKIEWICZ, and J. PIOTROWSKI 28 Oct. 1985 22 p Transl. into ENGLISH from Medycyna Pracy (Poland), v. 12, no. 5, 1981 p 413-426
(AD-A161157; FTD-ID(RS)T-0395-85) Avail: NTIS HC A02/MF A01 CSCL 06T

As a result of the proliferation of benzene solutions in several production technologies and of leading to prolonged exposure poisonings, the question of absorption through the skin has re-emerged with respect to the direction of preventive measures and the necessity to clarify the observed clinical signs of absorption. The absorption of benzene through the skin in men in experimental conditions was examined. The liquid benzene was absorbed with the velocity about 0,4 mg/sq cm/hour; the absorption of the benzene vapors was insignificant and it did not exceed 1 per cent of that absorbed throughout the respiratory ways in the same conditions. The study was based on the determination of phenol contents in urine and on the new direct chemical method for the designation of skin absorption of benzene, this method was described in the paper. The authors concluded that the absorption of benzene through the skin must not be neglected. GRA

N86-19895# Naval Postgraduate School, Monterey, Calif.
EXAMINATION OF RETINAL PATTERN THRESHOLD LEVELS AND THEIR POSSIBLE EFFECT ON COMPUTER ACCESS CONTROL MECHANISMS M.S. Thesis
D. K. HELLE Sep. 1985 48 p
(AD-A161213) Avail: NTIS HC A03/MF A01 CSCL 06B

The advent of multi-programming and the proliferation of shared computer systems has increased the need for greater computer security. Computer security can be segmented into six categories: physical, hardware, software, personnel, communications and procedures. Embedded into software security are those features which protect the system against both unauthorized access and denial of service of authorized users. Another term for this is access control. Access control mechanisms verify an individual's identity via three distinct methods: (1) something an individual knows, (2) something an individual possesses or (3) something about the individual. One device which keys on something about the individual is a retinal scan system. This system utilizes the retinal blood vessel pattern as a unique identifier. This thesis studies one such retinal pattern recognition device. For the purposes of this study, an experiment was designed and conducted which determined the reliability of this system as a function of various tolerance levels, as well as its applicability as a computer systems access control mechanism. The Eye Dentify 7.5 system proved to be a fairly expensive, highly reliable access control device. Its probability for false recognitions is far better than most other known devices. It can be used as a physical access device at virtually any military installation where access devices are used. GRA

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BEHAVIORAL SCIENCES

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

A86-23705
EFFECT OF WORKLOAD ON THE AUDITORY EVOKED BRAINSTEM RESPONSE
K. GILLILAND (Oklahoma, University, Norman), C. SHINGLEDECKER (USAF, Workload and Ergonomics Branch, Wright-Patterson AFB, OH), G. WILSON, and K. PEIO (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 37-39. refs

The purpose of this study was to explore the effect of workload level of a grammatical reasoning task on the auditory brainstem evoked response. Ten male subjects were administered three difficulty levels of a grammatical reasoning task. Brainstem evoked responses were recorded before and after the randomly presented workload conditions, as well as during each workload condition. The results revealed a consistent increase in Wave VI latency during all workload conditions, but no apparent differentiation between workload conditions. Post-test brainstem measures revealed that latency of Wave VI did not recover to pre-test baseline levels. Author

A86-23709* Old Dominion Univ., Norfolk, Va.
THE EFFECTS OF SIMULATOR AND AIRCRAFT MOTION ON EYE SCAN BEHAVIOR
J. R. COMSTOCK, JR. (Old Dominion University, Norfolk, VA) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 128-132. refs
(Contract NGT-47-003-800)

In a series of three experiments on the effects on eye-scan behavior of both simuator and aircraft motion, the sensitivity of an oculometric measure to motion effects was demonstrated. 'Fixation time', defined as the time the eyes spend at a particular location before moving on (saccade) to another fixation point, was found to be sensitive to motion effects in each of the experiments conducted. The results of the present study support the hypothesis that motion serves an alerting function, providing a 'cue' or 'clue' to the pilot that 'something happened'. The results do not support the hypothesis that direction of motion is conveyed through the type of motion information employed in these experiments. Author

A86-23715
AN EVALUATION OF AVIATOR TRAINING ABILITY REQUIREMENTS SCALE RATINGS
D. M. MCANULTY and D. H. JONES (Anacapa Sciences, Inc., Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 356-360. Army-supported research. refs

It is pointed out that the ability requirements approach to job analysis has been effectively employed in a wide range of occupational specialities. This approach is based on the premise that a job can be described in terms of abilities required to perform the tasks associated with the job. The usefulness of the ability requirements approach has been repeatedly demonstrated. A recurrent problem, however, is related to the generally low level of agreement among raters with respect to the ratings. Thus, it has been found that 16 to 25 raters must be considered to obtain average ratings which are consistent. The present paper is concerned with ability requirements analyses limited to the instrument phase of Army helicopter training. Attention is given to details regarding the method, psychometric analyses, ratings transformation and evaluation, and a factor analysis of the normalized task-ability ratings. G.R.

A86-23716
AN EXAMINATION OF ABILITY REQUIREMENTS FOR VARIOUS ROTARY WING MISSIONS
D. H. JONES and D. M. MCANULTY (Anacapa Sciences, Inc., Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 361-365. refs

The increasing specialization of rotary wing missions and aircraft has led to a reanalysis of traditional strategies for assigning student aviators to one of four rotary wing missions, including cargo, utility, aeroscout, or attack. The present paper has the objective to present analyses of data, originally compiled by Myers et al. (1982), which suggest that ability requirements for the four missions are indistinguishable when the most demanding mission tasks are included in the basis of comparison. G.R.

A86-23717
PRODUCTIVITY AND DIFFICULTY AS NEW CRITERIA FOR VALIDATING AVIATOR SELECTION TESTS
B. D. SHIPLEY, JR. (U.S. Army, Research Institute, Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 366-369. refs

The U.S. Army Research Institute is conducting research to improve the quality of the Army's aviator selection testing program. The research is motivated by increasing costs of training and by changing aviator ability requirements due to advanced aircraft and modern tactics. This paper describes the development of a new criterion variable to support the testing improvement research. Author

A86-23718
RETENTION OF HELICOPTER FLIGHT SKILLS - IS THERE A 'CRITICAL PERIOD' FOR PROFICIENCY LOSS?
J. W. RUFFNER, D. T. WICK (Anacapa Sciences, Inc., Fort Rucker, AL), and W. R. BICKLEY (U.S. Army, Research Institute, Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 370-374. Army-supported research. refs

The maintenance of the flight proficiency of aviators represents a vital problem for Army aviation. Ruffner and Bickley (1983) conducted an investigation of the loss of helicopter contact flight skills over a six-month period during which active duty Army aviators did not fly. According to the results of this study, there was no significant loss in flight proficiency during the six-month period. The present paper reports data which extend the findings of Ruffner and Bickley to no-flying periods longer than six months. The conclusions about the retention of helicopter contact flight skills are discussed. There is little significant proficiency loss in either psychomotor or procedural tasks for as many as six months of no flying. There is a significant decrease in proficiency for aviators who have not flown for one year. The rate of proficiency loss is greater for no flying periods between six months and one year than for periods of no flying greater than one year. G.R.

A86-23719
CONSERVING INSTRUCTIONAL TRAINING RESOURCES THROUGH USE OF THE PERSONALIZED SYSTEM OF INSTRUCTION
D. T. WICK, J. W. RUFFNER (Anacapa Sciences, Inc., Fort Rucker, AL), and W. R. BICKLEY (U.S. Army, Research Institute, Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 375-378. Army-supported research.

In connection with the Individual Ready Reserve (IRR) program, a need exists to develop a training program to be used by units commanders to retrain IRR aviators effectively and efficiently. In response to this need, the Army Research Institute Field Unit developed a standardized training program designed to retrain IRR aviators following varying periods of not flying with the active Army. However, it was found, that according to this program, instructor pilots (IPs) had to spend an unacceptable large amount of time with academic portions. The present paper reports research which was undertaken to develop and to evaluate a revised program that would minimize the time IPs would have to devote to academic training. G.R.

A86-23720
USE OF A SIGNAL DETECTION PARADIGM TO ASSESS SUBJECTIVE INTERSECTION POINTS IN A TARGET LOCATION TASK
W. R. ENGELMAN, M. J. PATTERSON, and G. M. CORSO (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 380-382. refs

Numerous tasks require individuals to assess whether two or more moving points are on a collision path. However, evidence available, on decision making in spatial manipulation tasks, is lacking. This study attempted to assess individual's ability to determine the point of intersection between two cursors. The distance between a specified target and the actual intersection point (2 levels), and the extrapolation distance (2 levels) was varied. Using a signal detection paradigm, measures of sensitivity (d') and decision criterion (B) were obtained. Therefore, 2 x 2 within subjects design was employed. Results indicated that distance between the target and actual intersection point had the greatest effects on sensitvity, while extrapolation distance differences were minimal. Conclusions based on the results are limited due to poor subject performance. Author

A86-23721
THE DETECTION AND IDENTIFICATION OF PICTORIAL CHANGES BETWEEN SUCCESSIVE PRESENTATIONS
M. S. WOGALTER (Rice University, Houston, TX) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 388-392.

In research on picture recognition, much attention has been given to the ability to recognize a picture as identical or different from a previously presented picture. The present paper is concerned with an investigation which utilizes a task which required the processing of meaningful visual information contained in a complex scene. Then the subject is required to notice and identify a change in a subsequent examination of the scene. Three experiments are discussed. The experiments show that an advantage of additions over deletions occurred only for pattern changes and not for object changes. G.R.

A86-23722
DOES LOCATION CUEING INCREASE THE EFFICIENCY OF THE EARLY STAGES OF PERCEPTUAL PROCESSING?
L. A. ANDERSON, D. M. LANE, and J. A. KLEISS (Rice University, Houston, TX) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 393-397. refs

If the location in which a visual stimulus is to be presented is precued, the speed or accuracy of the response to the stimulus is increased. This finding has generally been taken as evidence that cueing speeds up perceptual processing at an early stage. According to Duncan (1981), who assumes two levels of processing, position cueing facililitates selection from the first level to the second level but does not affect first level processing. The present paper reports experiments which employ a logic similar to that used by Sternberg (1969) in his additive factors method to distinguish between these possibilities. The experiments employed a discrimination task in which the subjects were to determine as quickly and as accurately as possible which of two stimuli had been presented. The obtained results contradict the hypothesis that spatial cueing affects the early stages of perceptual processing. G.R.

A86-23726* Illinois Univ., Urbana.
WHY DO PERFORMANCE AND SUBJECTIVE WORKLOAD MEASURES DISSOCIATE?
Y.-Y. YEH and C. D. WICKENS (Illinois, University, Urbana) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 504-508. NASA-supported research. refs

A set of three experiments are described that examine the sources of information processing that produce a dissociation between subjective workload measures and performance. The results support a theory of the dissociation. Subjective measures are driven more by the number of tasks currently performed. Subjective measures are also less sensitive to resource competition than performance measures are. Factors that demand more resource investment improve performance, but these factors also increase subjective ratings of workload. Author

A86-23727
ACQUISITION OF PERCEPTUAL-MOTOR SKILL - ADAPTIVE AND PART-WHOLE TRAINING
A. M. MANE (Illinois, University, Urbana) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 522-526. refs

The effectiveness of two training methods was investigated in the training of a complex perceptual-motor skill. Subjects learned how to play a computer controlled video-game. In adaptive training, pacing of the game elements was the adaptive variable. In the part training condition subjects received training in four subtasks which were designed to train specific elements of the skill

necessary for the performance of the task. A comparison of training time as well as performance at fixed time points against a control group indicated that the training manipulations were effective. The part training method was clearly the best. The adaptive training method yielded mixed results. However, some support for the effectiveness of the method was observed. The results are discussed in terms of the principles for design of training devices and programs. Author

A86-23730
THE EFFECTS OF AERIAL PERSPECTIVE ON ALTITUDE ESTIMATION
M. J. PATTERSON and E. J. RINALDUCCI (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 542-544. refs

In the context of an increasing interest in the use of simulations as training devices for a greater variety of flight tasks, there is a need for the development of effective methodologies to evaluate the visual displays within a simulator. The cues utilized by pilots in the maintenance of altitude have been examined. One visual cue potentially available within a flight setting is related to the aerial perspective. Aerial perspective can be defined as a haze, which, due to particulates suspended in the atmosphere, attenuates hue and contrast. This phenomenon results in the blurring of subjects with increases in distance. Rock (1975) has suggested that aerial perspective may not in fact be used as an independent cue for depth. Nelson and Ritchie (1976) have studied the contribution of aerial perspective to the determination of depth. The present investigation represents an extension of the earlier studies. The results suggest that the ability to estimate altitude using different levels of aerial perspective is related to the degree of previous flight experience. G.R.

A86-23731
THE OPTIMUM PRESENTATION OF COGNITIVE TRAINING DURING A FLIGHT TRAINING PROGRAM
B. A. SMITH (Seville Training Systems Corp., Pensacola, FL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 620-624. Research supported by the Seville Training Systems Corp. refs

Four groups of subjects (N = 8 in each group) were presented training, based on the cognitive aspects of a basic flight maneuver, at different times during the acquisition of the motor skills needed to perform that maneuver. Results indicate that the performance of the group that received extensive cognitive training prior to attempting the associated motor skills was significantly better (p less than .05) than the groups that received the same cognitive training interspersed during the initial learning of the motor skills. This was true even when the interspersed training was preceded by extensive cognitive pretraining. Results also show that cognitive training interspersed with motor skill learning produced a deterioration in performance as the performance of the two groups receiving the training was below that of the control group which received no cognitive training whatsoever. Transfer of training to a similar maneuver indicated that the groups that were initially trained using extensive cognitive pretraining performed significantly better than the groups that received only interspersed cognitive training and the control group. Author

A86-23732
PERSONALITY DIFFERENCES AS A MODERATOR OF MENTAL WORKLOAD BEHAVIOR - MENTAL WORKLOAD PERFORMANCE AND STRAIN REACTIONS AS A FUNCTION OF COGNITIVE COMPLEXITY
M. M. ROBERTSON (Southern California, University, Los Angeles, CA) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 690-694. refs

A86-23733* Maryland Univ., Baltimore.
EVENT-RELATED POTENTIAL INDICES OF WORKLOAD IN A SINGLE TASK PARADIGM
R. L. HORST, R. C. MUNSON (ARD Corp., Columbia, MD), and D. S. RUCHKIN (Maryland, University, Baltimore) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 727-731. refs
(Contract NAS1-17576)

Many previous studies of both behavioral and physiological correlates of cognitive workload have burdened subjects with a contrived secondary task in order to assess the workload of a primary task. The present study investigated event-related potential (ERP) indices of workload in a single task paradigm. Subjects monitored changing digital readouts for values that went 'out-of-bounds'. The amplitude of a long-latency positivity in the ERPs elicited by readout changes increased with the number of readouts being monitored. This effect of workload on ERPs is reported, along with plans for additional analyses to address theoretical implications. Author

A86-23739
OPERATOR LOADING EFFECTS IN A SIMULATED TACTICAL DECISION-MAKING PROBLEM
S. G. HUTCHINS, F. L. GREITZER, and R. T. KELLY (U.S. Navy, Personnel Research and Development Center, San Diego, CA) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 879-883. refs

The objective of this effort was to explore the nature of the degradation in performance, in a military command and control environment, when human capacity limits are exceeded. In dual-task situations, operators were able to perform a primary anti-war warfare task with little degradation but at the expense of the concurrent task. However, a distinction should be made between an operator's rate of output and the quality of performance. Few operators ever used strategies that would minimize overall threat. Thus, in high-density situations, operators may be highly productive but decidedly suboptimal. Use of decision aids in this critical area may be very effective. Author

A86-23745* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFLIGHT EVALUATION OF FOUR MEASURES OF PILOT WORKLOAD
S. G. HART (NASA, Ames Research Center, Moffett Field, CA), J. R. HAUSER (Ford Aerospace and Communications Corp., Sunnyvale, CA), and P. T. LESTER (San Jose State University, CA) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 945-949. refs

Four measures of pilot workload were tested in the NASA C-141 Kuiper Airborne Observatory. The measured included a communications analysis, subjective ratings of workload, subjective ratings of additional factors related to workload, and heart rate. Data were collected for 11 flights, each of which lasted approximately seven hours. Heart rate was found to be significantly higher for the pilot who was flying than for the pilot who was not flying and it varied significantly across flight segments, peaking during landing and take off, particularly for the pilot in the left seat who was resonsible for aircraft control. For both left and right seats, the subjective assessment of stress rather than the subjective assessment of workload was significantly correlated with variation in heart rate. Frequencies of different types of communications varied significantly across segments of flight, however, they were not correlated with subjective ratings of workload. There was a significant difference between the left and right seats in the types of activities that contributed to their workload, however, workload was considered to be equivalent for the two. Author

A86-23749
PART-TRAINING STRATEGIES IN SIMULATED CARRIER LANDING FINAL APPROACH TRAINING
D. C. WIGHTMAN (U.S. Navy, Naval Training Equipment Center, Orlando, FL) and G. LINTERN (Essex Corp., Orlando, FL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 1013-1017. refs

A transfer-of-training investigation of part-task training was conducted at the Navy's Visual Technology Research Simulator (VTRS). A task segmentation strategy (backward chaining) and a task simplification strategy (enhancement of the simulated aircraft's response to throttle adjustments) were tested. In addition, the subjects' motor-skill aptitude was assessed. Training under backward chaining produced better transfer to the criterion task than an equal number of training trails on the criterion task itself. An aptitude-by-treatment interaction indicated that the backward chaining method of training was particularly advantageous for low-aptitude subjects. The simplification strategy did not appear to enhance transfer. Author

A86-23772
SOME PROBLEMS IN FLIGHT MECHANICS WITH RESPECT TO FLIGHT SAFETY [NEKTERE OTAZKY MECHANIKY LETU VE VZTAHU K BEZPECNOSTI LETANI]
R. ORLITA Zpravodaj VZLU (ISSN 0044-5355), no. 5, 1985, p. 341-344. In Czech. refs

The role of human factors in flight-safety assurance is examined. It is noted that the adequate theoretical training of pilots is a significant component of accident prevention. B.J.

A86-24324
PERCEPTUAL-MOTOR COORDINATION AND ADAPTATION DURING LOCOMOTION - DETERMINANTS OF PRISM ADAPTATION IN HALL EXPOSURE
G. M. REDDING (Illinois State University, Normal) and B. WALLACE (Cleveland State University, OH) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 4, Oct. 1985, p. 320-330. refs (Contract NIH-1-RO3-MH-34383)

In the present examination of prismatic displacement adaptation under conditions involving locomotion in a hallway exposure, total prism adaptation was in general inversely related to the presence or absence of mental arithmetic, and the relative magnitude of visual proprioreceptive shift depended on the availability of visible sound sources. The results obtained are consistent with a model assuming that local adaptive response depends on the available capacity for establishing and maintaining coordinative linkage between discordant systems. By contrast, locus or adaptive recalibration depends on the direction of these coordinative linkages, discordance, and adaptation occurring in the guided system(s). O.C.

A86-24325
DUAL HEMISPHERIC PROCESSING IN A LETTER MATCHING TASK
J. CONEY (Murdoch University, Australia) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 4, Oct. 1985, p. 331-342. refs

An investigation is made of the claim that performance on recognition, detection, and matching tasks can be enhanced if stimuli are projected to both sides of the visual field rather than only to one, due to the distribution of perceptual processing between the hemispheres. In the present series of three experiments, it was noted that while lateral interference between adjacent stimuli was implicated, a strong residual effect ascribable to hemispheric mechanisms remained. A model based on parallel hemispheric decision processes appears to furnish a better account of the data than one based on the notion of distributed perceptual processing. O.C.

A86-24508
SOME PSYCHOLOGICAL ASPECTS OF AIR SICKNESS [QUELQUES REMARQUES SUR LES ASPECTS PSYCHOLOGIQUES DES MALAISES EN VOL]
J. R. GALLE-TESSONNEAU (Armee de l'Air, Centre Medical de Psychologie Clinique, Paris, France) and G. SOLIGNAC (Hopitaux des Armees; Centre Principal d'Expertise Medicale du Personnel Navigant, Paris, France) (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 237-239. In French.

Various psychological aspects of air sickness among pilots are discussed from the point of view of the doctor. The main concern of air sickness is its effect on the neuro-sensorial capacities and the alertness of a pilot, and therefore flight safety. A difficulty arises in that the symptoms are not the same and are not experienced equally by all pilots, and because some pilots do not report bouts of illness to avoid being declared unfit for flight duty. When a pilot does report a problem, the tendency is for the pilot to discount the seriousness of the symptoms. However, pilots often retain significant levels of anxiety at having experienced air sickness, and must be thoroughly convinced that the factors which brought on the sensations have been 'cured' and can be explained causally in clear and definite terms. If the onset of air sickeness corresponds with emotional trauma in a pilot's life, then the pilot must be reassigned or removed from flight duty entirely if the emotional charge persists. The psychiatric goal, in the latter case, is to help the pilot accept a compromise situation which will permit going on with his life. M.S.K.

A86-25654
THE FLIGHT SURGEON AND PSYCHIATRY - INTEREST AND SKILLS
R. J. URSANO (Uniformed Services University of the Health Sciences, Bethesda, MD) and W. G. JACKSON, JR. (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 126-130. refs

The effects of age, experience, and flight medicine training status on the attitude and psychiatric skills of the nonpsychiatrist flight surgeon are examined. Interest in psychiatry, self-assessed ability of psychiatric skill, and education needs are measured in 170 USAF physicians using multi-dimensional contingency tables and linear regression models. The data reveal that age and experience do not affect interest in psychiatry; however, training status has a negative impact on the physician's interest. Psychiatric skills are related to training status, age, and experience; the older fully-trained physician has more interest and knowledge in psychiatry. A need for further education is observed in physicians in-training but is unaffected by age and experience. I.F.

A86-25655
FLYING AND DANGER, JOY AND FEAR
D. R. JONES (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 131-136.

The emotional roots which motiviate a person to become a flier or to develop an anxiety about flying are discussed. Reasons for choosing a flying career and their effect on a person's motivation to fly are described. The knowledge and experience required by a flight surgeon in order to evaluate and treat fliers who experience fear of flying are examined; examples of fliers who develop phobias, psychosomatic symptoms, or a loss of self-confidence are presented. I.F.

A86-26011* Arizona State Univ., Tempe.
SUBJECTIVE WORKLOAD AND INDIVIDUAL DIFFERENCES IN INFORMATION PROCESSING ABILITIES
D. L. DAMOS (Arizona State University, Tempe) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 71-74. refs
(Contract NCC2-202)
(SAE PAPER 841491)

This paper describes several experiments examining the source of individual differences in the experience of mental workload. Three sources of such differences were examined: information processing abilities, timesharing abilities, and personality traits/behavior patterns. On the whole, there was little evidence that individual differences in information processing abilities or timesharing abilities are related to perceived differences in mental workload. However, individuals with strong Type A coronary prone behavior patterns differed in both single- and multiple-task performance from individuals who showed little evidence of such a pattern. Additionally, individuals with a strong Type A pattern showed some dissociation between objective performance and the experience of mental workload. Author

A86-26013
THE TRAINING AND CERTIFICATION OF THE GENERAL AVIATION PILOT
J. M. KOONCE (Massachusetts, University, Amherst) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 87-91. refs
(SAE PAPER 841468)

Some accident statistics of general aviation are presented, as well as training and certification processes of the general aviation pilots. The rate of fatal accidents per million of miles is 0.128 in general aviation, as compared to 0.013 for air carriers. The reasons for this relatively poor safety performance are discussed, the low admission standards for the students and the lack of standardization of the flight instructors given among the primary causes. Other contributing factors are thought to be acquisition of certain habits (such as not using the check list before each flight) and poor judgment, (together with the lack of training in judgment and lack of its definition in the test guides), as well as inadequate biennial flight review (BFR) testing. Tightening up of the BFRs and a requirement to identify the pilots who have failed a BFR test are among the recommended measures. I.S.

A86-26019* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF DIGITAL ALTIMETRY ON PILOT WORKLOAD
R. L. HARRIS, SR. (NASA, Langley Research Center, Hampton, VA) and B. J. GLOVER (Kentron International, Inc., Hampton, VA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 131-136. Previously announced in STAR as N86-13892.
(SAE PAPER 841489)

A series of VOR-DME instrument landing approaches was flown in the DC-9 full-workload simulator to compare pilot performance, scan behavior, and workload when using a computer-drum-pointer altimeter (CDPA) and a digital altimeter (DA). Six pilots executed two sets of instrument landing approaches, with a CDPA on one set and a DA on the other set. Pilot scanning parameters, flight performance, and subjective opinion data were evaluated. It is found that the processes of gathering information from the CDPA and the DA are different. The DA requires a higher mental workload than the CDPA for a VOR-DME type landing approach. Mental processing of altitude information after transitioning back to the attitude indicator is more evident with the DA than with the CDPA. E.A.K.

A86-26024
THE DECISION TO FLY
A. F. ZELLER IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 169-176.
(SAE PAPER 841613)

The decision to fly and the capacity to carry a flight to a successful termination involves a wide spectrum of background determinants. These range from considerations of the pilot as a physical being with specific potentials and limitations of body structure, mental ability and emotional capacities to the adequacy of learning related to a specific performance and the character and condition of the aircraft. Specific factors relevant to each of these categories is discussed including the psycho-social, physiological and pathological. Crucial to success is the pilot's self-critical judgement. There is a necessary tension between the ongoing activity of carrying out a positive decision to fly and the requirements for continual assessment of the situation. Author

A86-26033* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PREPARING FOR THE UNEXPECTED - A PSYCHOLOGIST'S CASE FOR IMPROVED TRAINING
H. C. FOUSHEE (NASA, Ames Research Center, Moffett Field, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 249-254.

In the procedures designed to minimize human errors that lead to aircraft incidents, the improved human factor engineering and automation approaches must be supplemented by new training methods. Changes are suggested in the preprogrammed training principles which are currently based almost exclusively on the procedures-oriented environment, with insufficient training for cognitive processing and awareness. Use of the Line-Oriented Flight Training procedure, in which a training simulator is supplemented by a highly structured script or scenario to simulate the total line operational environment for the purpose of simultaneously training the entire flight crew, offers one way of providing pilots and other crewmembers with the experience of dealing with unexpected or stressful events. Of primary importance is maximal coordination between the aircraft captain and other crewmembers during the flight, which puts emphasis on the importance of teamwork and personal relations among all other crewmembers. The current FARs governing training and proficiency will have to be modified to accommodate new training appoaches. I.S.

A86-26293
THE EFFECTS OF THE CONTRAST, SPATIAL FREQUENCY, AND TEMPORAL FREQUENCY OF A SURROUNDING FIELD UPON THE DETECTION THRESHOLDS OF GRATINGS
A. BOWLING (Monash University, Clayton, Australia) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 387-391. refs

Three experiments, in which the temporal and spatial characteristics of square-wave gratings surrounding a central test field were varied, are reported. The detection thresholds of 1-sec presentations of a 5-Hz counterphase flickering .5-cycle/deg (cpd) sinusoidal grating were measured under the different surround conditions. Threshold was found to increase with increasing surround contrast, and to be confined to surround spatial frequencies of 2 cpd and below. Maximum threshold elevation occurred with surround drift frequencies at about 8 Hz, irrespective of spatial frequency. It was concluded that the surround effect is probably due to an inhibitory interaction between transient-type mechanisms in the central visual field and the periphery. Author

A86-26294
SENSITIVITY TO PHASE DISTORTIONS IN CENTRAL AND PERIPHERAL VISION
L. O. HARVEY, JR., I. RENTSCHLER, and C. WEISS (Muenchen, Universitaet, Munich, West Germany) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 392-396. Research supported by the Fraunhofer-Gesellschaft and Alexander von Humboldt Stiftung. refs
(Contract NIH-RR-07013-78)

Sensitivity to phase quantization of a two-dimensional random texture pattern was determined for central and peripheral vision, using the phase-quantization paradigm of Caelli and Bevan (1982). The random texture was quantized with two-octave-wide bands centered on spatial frequencies of 2, 4, 8, and 16 cycles per degree (cpd). Six phase-distorted versions of the original texture were prepared for each of these bands, and the amount of stimulus contrast required for threshold discrimination between the original and the phase-distorted textures for each stimulus pair was determined at two exposure durations, 125 and 1000 msec. Maximum sensitivity to phase quantization was found in the 4 cpd spatial frequency band. Increasing the duration of exposure increased sensitivity. Compared with foveal viewing, a pronounced loss of sensitivity to phase quantization was found with 2 deg peripheral viewing. I.S.

A86-26295
SUPRATHRESHOLD CONTRAST PERCEPTION AS A FUNCTION OF SPATIAL FREQUENCY
P. C. QUINN (Brown University, Providence, RI) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 408-414. refs
(Contract NIH-EY-03524)

The effect of spatial frequency on the functional relationship between perceived contrast and physical contrast (particularly on the effect on the exponent of the function) was examined after controlling possible artifactual effects such as the failure to account for range and stimulus repetition effects and the contrast threshold difference. Using a modulus-free version of magnitude estimation, judgments of perceived contrast were obtained from 7 subjects at spatial frequencies of 0.75, 4, 15, and 18 cycles per degree. When the data were fit with a threshold-corrected power function, an increase in the exponent of the perceived physical contrast function was observed at both low and high spatial frequencies, relative to a middle spatial frequency. The results agree with the study of Franzen and Berkley, (1975) and are in contrast to that of Gottesman et al. (1981). I.S.

A86-26296
OVERALL SIMILARITY AND THE IDENTIFICATION OF SEPARABLE-DIMENSION STIMULI - A CHOICE MODEL ANALYSIS
R. NOSOFSKY (Indiana University, Bloomington) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 415-432. refs
(Contract NSF BNS-80-26656; NIH-MH-37208; NIH-RR-07031)

Various restricted versions of the similarity choice model (Luce, 1963; Shepard, 1957) were used to analyze data on identification by two subjects of a set of perceptually confusable stimuli varying along two continuous, separable dimensions. In the main model version, application of the multidimensional scaling approach to modeling similarity yielded excellent quantitative accounts of the data. A surprising result was that the Euclidean metric provided a far better description of psychological distance relationships than the city-block metric, a finding that contrasts with all previous conclusions regarding the appropriate Minkowski r-metric for separable-dimension stimuli. Possible reasons for this discrepancy were considered, examining Shepard's (1964) seminal study in depth. I.S.

A86-26297
A PURELY CENTRAL MOVEMENT AFTEREFFECT INDUCED BY BINOCULAR VIEWING OF DYNAMIC VISUAL NOISE
Y. Y. ZEEVI (MIT, Cambridge, MA) and G. A. GERI (Dayton, University, Williams AFB, AZ) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 433-437. refs
(Contract F33615-81-K-0011)

Observers viewed dynamic visual noise binocularly with a neutral density filter placed over the right eye. Twelve of 13 observers perceived depth and coherent motion of two counterdirectional distributions of dot-planes. Three of the 12 observers saw one plane as much more distinct than the others; thus, for those observers, that dot-plane could be used as a form-free central movement stimulus. Sudden removal of the neutral density filter resulted in a short-lived movement aftereffect (MAE). The magnitude of the purely central MAE, unlike those of classical MAEs, was independent of both the magnitude and the time spent viewing the inducing movement. These results suggest a distinction between the purely central MAE reported here and the central (binocular) MAEs induced by stimulus movement on the retina. Author

A86-26298
SUPPRESSION OF VISIBLE PERSISTENCE IN APPARENT MOTION
J. H. HOGBEN (Western Australia, University, Nedlands, Australia) and V. DI LOLLO (Alberta, University, Edmonton, Canada) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 450-460. refs
(Contract NSERC-A-6592)

Moving stimuli produce less smear than would be expected on the basis of visible persistence lasting 100-150 msec. Two experiments examined the duration of smear as a function of background luminance, target velocity, and duration of the display. It was found that smear decreased as background luminance increased, smear increased with velocity, and, as display duration increased from 10 to 160 msec, duration of smear first increased and then decreased. Alternative explanations of the results are considered. It is suggested that smear is actively suppressed by stimulus-initiated inhibitory processes. Author

N86-18980# Naval Aerospace Medical Research Lab., Pensacola, Fla.
A COMPARISON OF DICHOTIC LISTENING TASK SCORING METHODS
G. R. GRIFFIN and J. D. MOSKO Mar. 1985 18 p
(Contract M00-96)
(AD-A159920; NAMRL-SR-85-4) Avail: NTIS HC A02/MF A01 CSCL 05J

In a recent evaluation of two dichotic listening tasks (DLTs) as predictors of performance in Naval Aviation Undergraduate Pilot Training, results based on one of five scoring methods were presented. The purpose of this report is to provide DLT performance scores using all five scoring methods for comparative purposes to determine the scoring system most economical and efficient for automated scoring and, most sensitive to individual and mean differences. Five scoring methods are described which vary primarily in their treatments of errors, and in their consideration of the importance of sequence effects. Five independent analyses of previously reported data were performed. Results were nearly invariant across all five methods; i.e., intercorrelations among scores across scoring techniques exceeded 0.90. Two of the scoring methods are recommended for purposes of standardizing future analyses of DLT performance, one because of its simplicity and ease of application and the other, because it may have greater sensitivity to differences in individual performance. GRA

N86-18981# Naval Submarine Medical Research Lab., Groton, Conn.
THE EFFECTS OF BIMODAL PRESENTATION OF STIMULI AND NOISE ON TARGET DETECTION Interim Report
L. J. LEWANDOWSKI and D. A. KOBUS 1 Aug. 1985 13 p
(AD-A160122; NSMRL-1058) Avail: NTIS HC A02/MF A01
CSCL 17D

Twenty men are presented background noise and target stimuli in either the visual or auditory modality, or in both at once. Auditory and visual detection thresholds were lowest when functionally redundant targets were presented simultaneously in both modalities. It appeared that two redundant signals collectively improved sensitivity and reduced uncertainty regarding a choice response, thus enabling a reduction in detection threshold. Detection threshold to a single target was not negatively affected when attention was divided between two modalities and noise presented in both. The finding of improved detection in each modality of the bimodal condition is consistent with the coactivation explanation of bimodal facilitation and supports the advantage of a bimodal input approach in tasks such as sonar, radar, and air traffic control. GRA

N86-18982# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
PHYSICAL FITNESS AS A MODERATOR OF COGNITIVE WORK CAPACITY AND FATIGUE ONSET UNDER SUSTAINED COMBAT-LIKE OPERATIONS Technical Report, Aug. 1982 - Mar. 1983
R. J. PLEBAN, D. A. THOMAS, and H. L. THOMPSON Jun. 1985 20 p
(Contract DA PROJ. 2Q1-62717-A-790)
(AD-A160417; ARI-TR-687) Avail: NTIS HC A02/MF A01
CSCL 06N

A study was devised to investigate the role of physical fitness in moderating both cognitive work capacity and fatigue onset under sustained combat operations. Sixteen male ROTC cadets were followed through a two-and-a-half-day Pre Ranger Evaluation exercise. Prior to the actual start of the exercise the cadets' overall level of physical fitness was assessed by using five fitness indices (Harvard Step Test, chinups, pushups, situps, and two-mile run). Cognitive performance and subjective measures of fatigue state were assessed at regular intervals before, during, and one day after the exercise. The results suggest that fitness may attenuate decrements in cognitive work capacity for certain tasks requiring prolonged mental effort, particularly as the cumulative effects of sleep loss and other stressors begin to mount. Similarly, the results of this study suggest that as overall stress levels increase, fitness may have a beneficial effect in moderating fatigue rate. Fitness did not significantly enhance the recovery process with respect to cognitive work capacity, and actually appeared to hinder recovery from fatigue. GRA

N86-18983# Dunlap and Associates, Inc., Norwalk, Conn.
SYSTEM DEVELOPMENT AND EVALUATION TECHNOLOGY: STATE OF THE ART OF MANNED SYSTEM MEASUREMENT Final Report, 1980 - 1982
J. M. EDWARDS, R. F. BLOOM, and P. A. BRAININ Feb. 1985 85 p
(Contract MDA903-80-C-0345; DA PROJ. 2Q2-63743-A-794)
(AD-A160418; REPT-293-8; ARI-RN-85-20) Avail: NTIS HC A05/MF A01 CSCL 05H

This report is an up-to-date assessment of the state of the art of manned system measurement. The assessment is based in part on the material presented in the Task 3a report-Review of Manned System Measurement Literature. This report employs a topic outline compatible with the overall measurement model being developed under the present contract. The model is sufficiently representative and comprehensive so that all significant comments and authors have a place in its structure. One of the important uses of this report is the identification of current measurement capabilities and limitations, so that requirements and priorities for the improvement of system-oriented measurement can be delineated. In this review, it became apparent, for example, that measurement models need to be further developed, supported with appropriate human performance data, refined through more consistent and comprehensive applications, and validated by independent corroborations of some kind. Futhermore, the general sense of impracticality, and the need for simplifying assumptions in some cases, strongly suggests a requirement for improving the efficiency of measurement models by reducing the magnitude of effort required in their application. It is envisioned that much time, effort, and money can be saved, irrelevant measurements can be avoided, meaningfulness and utility can be enhanced, and additional applications of the models can be found if several key improvements are made. GRA

N86-18984# Naval Submarine Medical Research Lab., Groton, Conn.
MULTIMODAL VERSUS UNIMODAL INFORMATION PROCESSING OF WORDS Interim Report
L. J. LEWANDOWSKI, S. HURSH, and D. A. KOBUS 29 Jul. 1985 14 p
(AD-A160517; NSMRL-1056) Avail: NTIS HC A02/MF A01
CSCL 17A

Sonarmen are constantly confronted with information presented simultaneously through different sensory modalities. Verbal information is one type of input to which they are exposed. Little is known regarding the effect of undirected attention when verbal information is presented simultaneously to the auditory and visual modality. The question of interest is how to unimodal and multimodal presentation conditions differentially affect performance? The superiority of any particular modality depends upon the task requirements, response demands and the complexity of the stimuli. Multimodal stimulation facilities the RT of the slower unimodal presentation while providing little if any facilitates to the faster unimodal approach. Sonarmen are exposed to various types of information. Reports of this study and previous studies have shown that the results are task dependent. Therefore, it is important to determine how different types of stimuli interact with modes of presentation and affect sonar performance. GRA

N86-18985# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.
BEYOND ASSOCIATIONS: STRATEGIC COMPONENTS IN MEMORY RETRIEVAL Technical Report, Jun. 1983 - Jul. 1985
L. M. REDER 3 Oct. 1985 44 p
(Contract N00014-84-K-0063; NSF BNS-03711; RR0-4206)
(AD-A160783; TR-85-3-ONR) Avail: NTIS HC A03/MF A01
CSCL 05J

There are two dominant approaches to understanding human memory, one in the tradition of Ebbinghaus, the other in the tradition of Bartlett. The former approach views learning as the formation of associations, while in the latter views memory as the process of reconstruction of fragments based on prior knowledge. These positions are often considered antithetical: Ebbinghaus was concerned with laws of memory and tried to control for prior knowledge; Bartlett was concerned with how our world knowledge interacts with learning and memory. This paper argues that one can collect data that supports either position because people can adopt one of several memory strategies. Data are reviewed that ilustrate that the same knowledge structure can produce dramatically different results, depending on the strategies that operate on that structure. Author (GRA)

N86-18986# Tennessee Univ., Knoxville. Dept. of Psychology.
PLAUSIBILITY FUNCTIONS OF IOWA VOCABULARY TEST ITEMS ESTIMATED BY THE SIMPLE SUM PROCEDURE OF THE CONDITIONAL P.D.F. APPROACH
F. SAMEJIMA Dec. 1984 198 p
(Contract N00014-81-C-0569)
(AD-A160850; RR-84-1-ONR) Avail: NTIS HC A09/MF A01
CSCL 05J

Simple Sum Procedure of the Conditional P.D.F. Approach was applied for estimating the plausibility functions of the distractors of the Iowa Vocabulary Test items. In so doing, the normal ogive model was adopted for the correct answers of those items, and

those items were used as the substitute for the old test. The group of subjects consists of 2,364 students who took the Level 11 tests in 1971 through 1977. The results indicate the existence of informative distractors for certain test items. The model validation study accompanied to it indicates that for most items the normal ogive model is suitable. GRA

N86-18987# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

AN INVESTIGATION INTO EFFECTS OF ENVIRONMENTAL CHANGES ON LOCUS OF CONTROL M.S. Thesis

S. A. ANSWAY Sep. 1985 66 p

(AD-A160861; AFIT/GLM/LSB/85S-2) Avail: NTIS HC A04/MF A01 CSCL 05J

Past research suggest that relationships exist between Type A personality, stress, and coronary heart disease. This thesis determined that Type A individuals are inclined to experience more stress than Type B individuals in similar situations. A relationship was found between Type A behavior and internal locus of control indicating that individuals with internal locus of control are more likely to be Type A personalities than type B personalities. Relationships were also found among Type A behavior, internal locus of control, and assertiveness indicating that Type A individuals are more assertive than Type B individuals. Family inventory was inversely related to locus of control inferring that internal locus of control individuals are more satisfied with their personal relationships than are external locus of control individuals. Because family inventory was also inversely related to stress, when stress is present in one area of an internal locus of control individuals's life, the individual looks to other areas of his life for satisfaction. No relationship was found between stress and assertiveness indicating that assertive individuals deal more effectively with stressful situations. This investigation also determined that as the environment changes to a more structured rigid environment, the individual shifts from an internal to an external locus of control. These determinations were based on statistical analysis using Pearson Correlations, Paired t-Tests, and Regression Analysis.

Author (GRA)

N86-19896# Naval Aerospace Medical Research Lab., Pensacola, Fla.

SIMPLE AND CHOICE REACTION TIME IN A SECONDARY TASK UNDER VARIED STIMULUS MODALITY PROBABILITIES Interim Report

D. K. MCBRIDE, L. S. GOODMAN, and J. M. OWENS Feb. 1985 12 p

(AD-A159698; NAMRL-1313) Avail: NTIS HC A02/MF A01 CSCL 05J

Most investigations of attention and attention allocation have been limited to assessments of attention shifting among stimuli simultaneously presented within a single sensory modality. The construct of attention, however, is generally conceptualized as the process which determines the selection of sensory information from all potential sources, among all potential modalities. Although limited in relevance to more real-world, high demand task situations, many of the findings and interpretations from single modality attention studies provide an important theoretical basis for performance assessment in complex task environments requiring multimodal processing. The objective of the present research was to directly assess attention allocation in tasks requiring both visual and auditory information processing. In the present study, modality uncertainty was reduced by experimentally manipulating the probability of stimulus occurrence within a given modality. Furthermore, responding in the present experiment required choice as well as simple reaction, and the responses were made jointly with the continuous execution of a three-axis, compensatory tracking task. As expected, simple and choice reaction times to auditory signals were faster than were those to visual signals.

GRA

N86-19897# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

EVALUATION OF A MULTI-METHOD GROUP TREATMENT APPROACH FOR THE MANAGEMENT OF STRESS Ph.D. Thesis

S. H. TALLANT 1985 322 p

(AD-A160813; AFIT/CI/NR-85-118D) Avail: NTIS HC A14/MF A01 CSCL 05J

The treatment effectiveness of a stress management package is evaluated. The role of social support as a significant external factor in reducing stress symptomatology is then discussed. It is hypothesized that subjects receiving treatment would obtain significantly greater decreases in stress than subjects in a waiting list condition. Also, it is hypothesized that wait-list subjects with high levels of social support would obtain significant greater decreases in stress than wait-list subjects with low levels of social support. A matched-pair randomized block design is used. Thirty-two subjects are rank ordered on a measure of social support, matched according to level of social support, and randomized into either treatment or wait-list condition. The statistical and clinical results demonstrate the contribution of the stress management package in reducing stress when compared to no treatment intervention. GRA

N86-19898# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

AN INVESTIGATION INTO PEER AND SUPERVISOR DIFFERENCES IN THE OBSERVATION OF PERFORMANCE-RELATED BEHAVIORS M.S. Thesis

M. W. DALEY Dec. 1985 46 p

(AD-A160819; AFIT/CI/NR-85-132T) Avail: NTIS HC A03/MF A01 CSCL 05I

Differences between peer and supervisors with respect to the observation of performance-related behaviors using the Instanteneous Report of Judgments (IRJ) technique are examined. Undergraduate students and graduate teaching assistants served as peer and supervisor subjects respectively. All subjects viewed a videotape of an undergraduate giving a major classroom oral presentation. It was hypothesized that peer and supervisor subjects would differentially observe imbedded incidents due to their different role relationships to the presenter. The results indicate partial support for the hypothesis, with supervisor subjects observing significantly more critical incidents. An alternative interpretation for the results, that of rater expertise, is forwarded and discussed. Directions for future research in the area of cognitive processes and performance appraisal are discussed. GRA

N86-19899# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

THE CLINICAL PREDICTION OF DANGEROUSNESS Ph.D. Thesis

E. R. WILLIAMS May 1985 119 p

(AD-A160820; AFIT/CI/NR-85-133D) Avail: NTIS HC A06/MF A01 CSCL 05J

The failure to accurately predict violent potential in psychiatric patients is currently an area of popular and professional interest. Virtually all studies have shown psychological testing to be a poor predictor of violence. The present investigation utilized typed vignettes which described a brief, fictionalized interview as an analog to an actual contact with a patient. A recent history of violence (an actuarial factor), support by a caring person (an environmental factor), and psychological testing information were systematically manipulated among the vignettes. Vignettes were mailed to psychiatrists in California who are asked to rate dangerousness and to decide if emergency hospitalization was required for the fictionalized patient. Each psychiatrist received one of 16 possible vignettes. Statistical analyses were utilized to determine how the three manipulated variables actually influenced professional decision making, and these results were compared with what factors the psychiatrists said influenced them. Psychological testing exerts a powerful but unwarranted, and possible unconscious, influence on the judgmental process.

GRA

N86-19900# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MESOLIMBIC AND NIGROSTRIATAL DOPAMINERGIC SYSTEMS: BEHAVIORAL NEUROPHARMACOLOGY Ph.D. Thesis
S. L. HARTGRAVES Aug. 1985 150 p
(AD-A160821; AFIT/CI/NR-85-134D) Avail: NTIS HC A07/MF A01 CSCL 06O

Drug-induced behaviors associated with the nucleus acumbens and striatum are examined. The use of 6-Hydroxydopamine to anatomically enhance a behavior emanating from one of the above structures (by allowing doses of drugs low enough to prevent major behavioral competition from the other) was only partially successful. Thus, locomotor hyperactivity and circling were enhanced by 6-OHDA-induced lesions of the nucleus accumbens and the medial forebrain bundle, respectively. Bilateral lesions of the striatum did not result in simple enhancement of stereotypic behavior, but instead caused a unique, self-directed behavior termed stereotypic grooming. Competition between the nucleus accumbens and the striatum for behavioral expression was evident in most of these studies. GRA

N86-19901# Chicago Univ., Ill. Center for Decision Research.
A MODEL OF THE CONJUNCTION FALLACY
H. J. EINHORN Jun. 1985 26 p
(Contract N00014-84-C-0018)
(AD-A160876; TR-15) Avail: NTIS HC A03/MF A01 CSCL 05J

Tversky & Kahneman show that both sophisticated and naive people, in many different substantive problems, often judge the conjunction of events to be larger than one of its components (hereafter called a single violation). Furthermore, for some problems, people judge the conjunction as larger than both of its components (a double violation). The purpose of this document is to propose a quantitative model of how people judge the probability of conjunctive events. The advantage of the model is that it makes specific predictions as to when conjunction fallacies of different types will or will not occur. Moreover, the model is naturally extended to deal with conjunctive explanations for events. The conjunction fallacy occurs when the judged probability of a conjunctive event is larger than the probability of one (or more) of its constituents. A model of this phenomenon is proposed in which the judged conjunctive probability is a weighted geometric average of the component probabilities, where the weights reflect the representativeness of the components. The model generalizes to the case where the events involve a casual or correlational link, and, to the use of conjunctive explanations of an event. In all three situations, the model specifies the conditions under which different degrees of the fallacy will or will not occur. GRA

N86-19902# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
ON THE ANALYSIS AND DESIGN OF HUMAN INFORMATION PROCESSING ORGANIZATIONS
K. L. BOETTCHER and R. R. TENNEY Oct. 1985 6 p
(Contract N00014-77-C-0532; N00014-84-K-0519)
(AD-A161015; AD-F620003; LIDS-P-1503) Avail: NTIS HC A02/MF A01 CSCL 05J

The design of human organizations where members perform routine tasks under the pressure of time is considered. A three-phase approach is outlined. In the first phase, normative decision rules that specify ideal human behavior are obtained. In the second phase, implementations of these decision rules are devised, and descriptions of actual human behavior and workload are developed. Finally a third phase integrates design elements by placing parameters of the implementations for best organization performance, subject to individual member workload limitations. To illustrate the approach, a specific design problem is considered. Author (GRA)

N86-19903# Essex Corp., Orlando, Fla.
AN ANALYSIS OF VISUAL TASKS IN HELICOPTER SHIPBOARD LANDING Final Technical Report, Sep. 1981 - Apr. 1985
K. S. BERBAUM and R. S. KENNEDY 1 Nov. 1985 62 p
(Contract N61339-81-C-0105)
(AD-A161101; EOTR-85-7) Avail: NTIS HC A04/MF A01 CSCL 05H

The purpose of this research effort was to identify visual research issues concerning helicopter landings, particularly the hover phase, for future study in the Visual Technology Research Simulator (VTRS) program. Identification of salient visual issues is a step toward surfacing equipment features that can be modified and studied. As we discussed the task with pilots, reviewed NATOPS manuals, and simulations witnessed, it became apparent that the visual task may differ depending upon whether: experienced or inexperienced pilots are flying; a simulator or an aircraft is flown; the environment is day or night; the pilot sought to acquire or maintain a skill level. As a way of limiting this broad project, it was elected to review intensively a scenario involving a highly experienced operator flying dusk/night approaches in a simulator. The Naval aviator selected was prompted by another aviator more familiar with the objective who dictated verbal protocols of his visual and control activities during several landings. These protocols were sorted into 10 phases in order to correspond to increasing distances in the landing task and the visual information processing within each stage was described. Therefore, the stages are delimited in terms of range or altitude from the ship. We believe the most useful outcome of this analysis will be a list of visual cue augmentations that may be implemented and studied over the various stages of landing. GRA

N86-19904# Brown Univ., Providence, R. I. Center for Neural Science.
LOCAL AND GLOBAL FACTORS IN LEARNING
L. N. COOPER 6 Nov. 1985 42 p
(AD-A161128; TR-28) Avail: NTIS HC A03/MF A01 CSCL 05J

Recent progress in the interaction of theoretical ideas and experimental results that relate to learning and memory is discussed. Consideration is given, in particular, to the effects of the neurotransmitters GABA, Norepinephrine and Acetylcholine on the development of circuitry in visual cortex. That most intriguing aspect of human memory is that: its persistence in spite of continual loss of individual neurons over the lifetime of the individual has led many workers to the concept of distributed memory. For a distributed memory (more like a hologram than a photograph) possesses in a very natural way the property of relative invulnerability to the loss of storage units. Individual memory sites hold superimposed information concerning many events. We can make complex decisions in small parts of a second. This suggests very strongly that there is much parallel processing in the brain - an idea that is almost obvious on inspection of component such as the retina. It is now commonly thought that the synaptic junction may be a means to store information (memory, for example) as well as to transmit it from neuron to neuron. GRA

N86-19905# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
THE INFLUENCE OF QUALITY CIRCLES ON ATTITUDINAL OUTCOMES AMONG CIVIL ENGINEERING PERSONNEL M.S. Thesis
A. E. THAL, JR. Sep. 1985 29 p
(AD-A161152; AFIT/GEM/LSB/85S-21) Avail: NTIS HC A03/MF A01 CSCL 13B

This thesis investigated the influence of QCs on various satisfaction levels among Air Force civil engineering personnel with the objective being to determine whether a relationship exists between QC membership and an employee's level of satisfaction/morale. Surveys were mailed to a sample of QC members and nonmembers working in civil engineering squadrons at five different bases. Statistical analysis consisted of reliability estimation, Pearson correlation, and Student's t-tests. The results of this research indicated that there were significant differences between QC members and nonmembers on two variables:

self-ratings of both job performance and job effort. In fact, it appeared that QC members scored lower, but not significantly lower, on many of the variables. The many weaknesses inherent in this study suggest that these results are tentative, at best. Four tenable explanations for the results are given. If QCs are to be increasingly used by the government, further research into the outcomes of the QC process are warranted. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

A86-23424
DUTY-CYCLE ANALYSIS OF A HUMAN-CONTROLLED MANIPULATOR
R. S. STOUGHTON (Tennessee, University, Knoxville) and H. L. MARTIN (Oak Ridge National Laboratory, TN) Journal of Robotic Systems (ISSN 0741-2223), vol. 2, Winter 1985, p. 473-499. refs
(Contract DE-AC05-84OR-21400)

The duty cycles of a human-controlled servomanipulator system have been experimentally measured revealing how humans use manipulators to perform tasks. The use of the kinematic ranges, in both joint and Cartesian space is valuable to engineers in the kinematic design of servomanipulators. The working volume of human manipulation presented here is also of interest to designers of prosthetic systems. These results illuminate the relative merits of various system drive configurations. A graphical representation of mechanical power usage, which displays the total operation time as a function of torque and velocity, is presented for each manipulator joint. These data are compared with data representing idealized joint performance resulting in design criteria for quantitative improvements in joint torque and velocity capacities. A generalized method for applying this representation to any robotic system is discussed. Author

A86-23505* Technology, Inc., San Antonio, Tex.
MINIMUM PRESSURE FOR A ZERO-PREBREATHE PRESSURE SUIT
R. W. KRUTZ, JR. (Technology, Inc., San Antonio, TX), G. A. DIXON (USAF, School of Aerospace Medicine, Brooks AFB, TX), and W. T. HARVEY (Lockheed Missiles and Space Co. Inc., Sunnyvale, CA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 5 p. refs
(Contract NASA ORDER T-82170)
(SAE PAPER 851315)

There are two current approaches to reducing the risk of decompression sickness during repeated extravehicular activity (EVA) without prebreathing 100 percent oxygen. One approach suggests the use of different pressures in the transfer vehicle, the station, and the suit. The other would use advanced pressure-suit technology to build a suit that will make different pressures unnecessary provided the bends-free suit pressure is reasonable and can be readily determined. Research at the USAF School of Aerospace Medicine since November 1982 has been directed at determining this suit pressure using human subjects at simulated altitudes of 16,500 to 10,000 feet (7.8 to 10 psia). An earlier report of this ongoing research showed that bends is not totally eliminated at 7.8 psia. The present study is a continuation of this effort to define a 'bends-free' suit pressure with the initial results suggesting that this pressure begins at around 9.5 psia (from a 14.7 psia station). Author

A86-23521
THE ROLES OF ASTRONAUTS AND MACHINES FOR FUTURE SPACE OPERATIONS
R. H. SCHAEFER, R. E. OLSEN, and F. J. ABELES (Grumman Aerospace Corp., Bethpage, NY) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 13 p.
(SAE PAPER 851332)

A comparative assessment is made of remote operation space environment systems and human EVAs, with a view to future space missions, both individually and in combination. The tasks in question encompass servicing and construction operations on manned space station and unmanned platforms. Laboratory tests and simulations of representative remote system and EVA task performance are discussed and recommendations for additional development activities are presented. O.C.

A86-23522
EVOLUTION OF THE SHUTTLE EXTRAVEHICULAR MOBILITY UNIT'S LIFE SUPPORT SYSTEM
F. H. GREENWOOD and R. J. BALINSKAS (United Technologies Corp., Hamilton Standard Div., Windsor Locus, CT) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 11 p.
(SAE PAPER 85-1333)

The philosophy, design, and operation of the Shuttle Extravehicular Mobility Unit (EMU) Block I and Block II are discussed, stressing details of the life support system (LSS). Besides the need to meet performance requirements in environmental extremes, the major design considerations of the LSS were size and weight restrictions, and maintainability. The liquid cooling and ventilation garment (LCVG) contains tubes of cooling water and has ventilation ducting to return O2, CO2, and humidity to the LSS for purification, cooling, and recirculation. The primary life support subsystem (PLSS) mounted on the back of the hard upper torso (HUT) of the space suit assembly (SSA) includes the primary oxygen bottles, three storage tanks of water for heat rejection, the fan/separator/pump assembly, the heat rejection sublimator, the contaminant control cartridge, and a caution and warning system computer to monitor the LSS. A display and control module gives the computer readout and has manual control of the LCVG water temperature. Innovations in the Block II design resulted in reduced maintenance and a fourteen-fold increase in the mean time between failures. Detailed schematics are included. R.R.

A86-23523* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
YOUR SPACE SUIT AND YOU - SIGNIFICANCE OF MANLOADING IN PRESSURE SUIT DESIGN
M. ROUEN (NASA, Johnson Space Center, Houston, TX) and R. GRAY (ILC Industries, Inc., ILC Dover Div., Frederica, DE) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 15 p. refs
(SAE PAPER 851334)

Data collection on man-induced loads borne by space suits is discussed, with emphasis on the glove area. The distinction between the 'potential' maximum manload (measured according to the 95 percentile male outside the suit), and the actual manload experienced by the suit or 'limit manload', is stressed. Limit manload data for the glove were collected using a glove with finger and metacarpal joints and a hard shell to support strain gages. Potential manload data are theorized to exceed the limit manload (as corroborated by entire suit limit load data presented for the Apollo and Shuttle suits) because of load sharing within the fabric configuration, test inputs being at values other than 95 percentile values, and the restraint line acting like a spring and preventing the load from being induced. This, however, is not borne out by the glove test data, illustrating the difficulty of measuring the man/machine interface. Design load is determined by adding he pressure load and the limit load after compensations have been

made for load splitting. Finally, a method for better testing, used in the design of an improved mobility glove for the Space Shuttle program, is presented. R.R.

A86-23524
ENHANCEMENT OF SPACE SUIT GLOVE PERFORMANCE
H. C. WRIGHT, III (ILC Industries, Inc., ILC Dover Div., Frederica, DE) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 18 p.
(SAE PAPER 851335)

Space suit glove design from the Apollo program to the present day is detailed. The low operating pressure of the Apollo and Shuttle suits makes possible the fabrication of gloves from 'softgoods' (fabrics and dipped urethanes). Both systems have identical joint motions, accommodated for in the digits by softgoods material, and in the wrist by supporting hardware with the aid of bearings mounted in a disconnect coupling. The Apollo glove consisted of a custom-molded integral bladder/restraint forming the pressure retaining and loadbearing element, a Neoplrene/Latex sheath adding protection of the other elements, and an outer Thermal Garment (TMG) for thermal and abrasion/puncture protection. Different material, a separate removable bladder, pleats on the backs of TMG digits, and less abrasion and thermal protection in the Shuttle Baseline Glove resulted in better structural integrity and ease of production without compromising mobility. In the Shuttle Modified glove from 1985 on, a new bladder material eliminated its predecessor's problem of hydrolysis; increased pleating contributed to a 30 percent reduction in digit joint torque; and digit adjustment capability reduced the numer of projected custom gloves due to poor size fitting. Future developments will focus on mobility and the needs of the Space Station program. Glove schematics are included. R.R.

A86-23526
STATIC FEED WATER ELECTROLYSIS SYSTEM FOR SPACE STATION O2 AND H2 GENERATION
J. T. LARKINS and A. J. KOVACH (Life Systems, Inc., Cleveland, OH) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 14 p. refs
(SAE PAPER 851339)

The development of a three-person O2 generation system based upon the static feed water electrolysis (SFWE) concept is analyzed. A 30-cell electrolysis module, which is capable of producing 2.50 kg/day of O2 for metabolic use, 1.18 kg/day for CO2 removal, and 0.24 kg/day to compensate for overboard leakage, is designed. The electrochemical reaction which occurs in the water electrolysis cell, and the operation of the cell are examined. The three additional components of the oxygen generation system, the coolant control assembly, the three-fluids pressure controller, and the fluid control assembly, are described. The endurance testing of the components of the SFWE system is studied. The SFWE cell size optimization based on calculating total equivalent weight in terms power penalty is investigated. A SFWE system design for the Space Station is proposed. I.F.

A86-23527* Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
DEVELOPMENT STATUS OF REGENERABLE SOLID AMINE CO2 CONTROL SYSTEMS
A. K. COLLING, JR., T. A. NALETTE (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT), R. J. CUSICK (NASA, Johnson Space Center, Houston, TX), and R. P. REYSA (Boeing Aerospace Co., Seattle, WA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 10 p. refs
(Contract NAS9-13624; NAS9-16978)
(SAE PAPER 85-1340)

The development history of solid amine/water desorbed (SAWD) CO2 control systems is reviewed. The design of the preprototype SAWD I CO2 system on the basis of a three-man metabolic load at the 3.8 mm Hg ambient CO2 level, and the functions of the CO2 removal, CO2 storage/delivery, controller, and life test laboratory support packages are described. The development of a full-scale multiple canister SAWD II preprototype system, which is capable of conducting the CO2 removal/concentration function in a closed-loop atmosphere revitalization system during zero-gravity operation, is examined. The operation of the SAWD II system, including the absorption and desorption cycles, is analyzed. A reduction in the thermal mass of the canister and the system's energy transfer technique result in efficient energy use. The polyether foam, nylon felt, nickel foam, spring retained, and metal bellows bed tests performed to determine the design of the zero-gravity canister are studied; metal bellows are selected for the canister's configuration. I.F.

A86-23528* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ELECTROCHEMICAL CO2 CONCENTRATION FOR THE SPACE STATION PROGRAM
N. LANCE (NASA, Johnson Space Center, Houston, TX), M. SCHWARTZ (NASA, Ames Research Center, Moffett Field, CA), and R. B. BOYDA AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 10 p. refs
(SAE PAPER 851341)

Under the sponsorship of NASA, Electrochemical Carbon Dioxide (CO2) Concentration EDC technology has been developed that removes CO2 continuously or cyclically from low CO2 partial pressure (400 Pa) atmospheres with the performance and operating characteristics required for Space Station applications. The most recent advancement of this technology is the development of an advanced preprototype subsystem, the CS-3A, to remove the metabolic CO2 produced by three persons from the projected Space Station atmosphere. This paper provides an overview of EDC technology, shows how it is ideally suited for Space Station application, and presents technology enhancements that will be demonstrated by the CS-3A subsystem development program. Author

A86-23529* Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
INITIAL DEVELOPMENT AND PERFORMANCE EVALUATION OF A PROCESS FOR FORMATION OF DENSE CARBON BY PYROLYSIS OF METHANE
G. P. NOYES (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) and R. J. CUSICK (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 9 p. refs
(SAE PAPER 851342)

The three steps in pyrolytic carbon formation are: (1) gaseous hydrocarbon polymerization and aromatic formation; (2) gas-phase condensation and surface adsorption/impingement of polyaromatic hydrocarbon; and (3) final dehydration to carbon. The structure of the carbon in the various stages of formation is examined. The apparatuses and experimental procedures for the pyrolysis of methane in a 60 cm long quartz reactor tube at temperatures ranging from 1400-1600 K are described. The percentage of carbon converted and its density are calculated and tabularly presented. The results reveal that dense carbon formation is maximized and soot eliminated by this procedure. It is observed that conversion efficiency depends on the composition of the inlet gas and conversion increases with increasing temperature. Based on the experimental data a three-man carbon reactor subsystem (CRS) is developed; the functions of the Sabatier Methanation Reactor, two carbon formation reactors and fluid handling components of the CRS are analyzed. The CRS forms 16 kg of carbon at a rate of 0.8 kg/day for 20 days in a two percent volume density quartz wool packing at temperature of 1500-1600 K. I.F.

A86-23530
COMPARISON OF CO2 REDUCTION PROCESS - BOSCH AND SABATIER
L. SPINA and M. C. LEE (Life Systems, Inc., Cleveland, OH) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 12 p. refs
(SAE PAPER 851343)

An essential technology for making long-term, manned space missions a reality is related to regenerative life support processes for the revitalization of the spacecraft atmosphere. A major step in such processes is concerned with the reduction of metabolically produced CO2 for subsequent recovery of oxygen. The Bosch and Sabatier processes represent two leading candidates for CO2 reduction. Both processes are being investigated by NASA with respect to their applicability to the Space Station ECLSS (Environmental Control/Life Support Systems) requirements. In the Bosch process CO2 reacts catalytically with H2 to produce water and solid carbon, while the Sabatier process involves the catalytic reaction of CO2 and H2 to produce water and methane. The Bosch CO2 reduction subsystem is discussed along with the Sabatier CO2 reduction subsystem. G.R.

A86-23531
MEMBRANE-BASED WATER- AND ENERGY-RECOVERY SYSTEMS FOR THE MANNED SPACE STATION
R. RAY (Bend Research, Inc., OR) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 16 p. refs
(SAE PAPER 851345)

This paper describes four membrane-based subsystems to use in the waste-water treatment system of the manned space station being planned by NASA. These membrane-based subsystems involve the recycle of the various wastewater streams and result in increased energy efficiency. Furthermore, in these four subsystems, the membrane acts as a barrier between the wastewater source and the wastewater treatment and consumption systems, thus increasing the reliability of these systems. Finally, the membranes are highly impermeable to the contaminants in the wastewaters and thus help to reduce the load on such expendables as post-treatment adsorption beds. Author

A86-23532* Life Systems, Inc., Cleveland, Ohio.
PHASE CHANGE WATER PROCESSING FOR SPACE STATION
E. M. ZDANKIEWICZ (Life Systems, Inc., Cleveland, OH) and D. F. PRICE (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 12 p.
(SAE PAPER 851346)

The use of a vapor compression distillation subsystem (VCDS) for water recovery on the Space Station is analyzed. The self-contained automated system can process waste water at a rate of 32.6 kg/day and requires only 115 W of electric power. The improvements in the mechanical components of VCDS are studied. The operation of VCDS in the normal mode is examined. The VCDS preprototype is evaluated based on water quality, water production rate, and specific energy. The relation between water production rate and fluids pump speed is investigated; it is concluded that a variable speed fluids pump will optimize water production. Components development and testing currently being conducted are described. The properties and operation of the proposed phase change water processing system for the Space Station, based on vapor compression distillation, are examined. I.F.

A86-23533* Astro Resources International Corp., League City, Tex.
WATER QUALITY MONITOR FOR RECOVERED SPACECRAFT WATER
E. M. EJZAK (Astro Resources International Corp., League City, TX) and D. F. PRICE (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 6 p.
(Contract NAS9-16846)
(SAE PAPER 85-1347)

A total organic carbon (TOC) analysis system based on ultraviolet absorption is described. The equation for measuring the intensity of the absorbed radiation of the organic substances, which is based on the Lambert-Beer law, is given; the intensity of the absorption is proportional to the concentration of the solution. The operation of the UV-Absorption analyzer, which utilizes a split beam, two wvaelength method, is studied. The influences of the cell path length and specific compounds in the solution flowing through the cell on absorbances is discussed. The performance and response of the analyzer is evaluated; good correlation is observed between the absorption value and TOC. The advantage of the UV-Absorption as compared with the UV-Oxidation are examined. I.F.

A86-23534
THERMOELECTRIC INTEGRATION MEMBRANE EVAPORATION SUBSYSTEM WATER RECOVERY - TECHNOLOGY UPDATE
G. F. DEHNER (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) and R. P. REYSA (Boeing Aerospace Co., Seattle, WA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 8 p. refs
(SAE PAPER 851348)

A three-person preprototype Thermoelectric Integrated Membrane Evaporation Subsystem (TIMES I) has undergone additional wastewater processing testing in order to evaluate a redesigned evaporator assembly. The new evaporator design incorporates a number of concepts that have been selected for use in the next generation advanced preprototype subsystem design. A discussion of the operating performance of the TIMES I preprototype with the new evaporator installed is presented in this paper, as well as a more detailed description of the design changes currently being implemented in the improved water recovery subsystem (TIMES II). Special attention is given in this discussion to the improved maintenance aspects of the advanced preprototype evaporator/condenser assembly. In addition, specific advanced preprototype design information is provided in order to illustrate the end product of previous design studies. Author

A86-23535* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION NITROGEN SUPPLY SYSTEM BASED ON STORED CHEMICALS
F. T. POWELL (NASA, Ames Research Center, Cleveland, OH) and M. SCHWARTZ AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 11 p. refs
(SAE PAPER 851349)

The Space Station atmosphere is to have an 'earth-like' composition, and nitrogen is to be routinely supplied to replace losses. The required nitrogen is to be provided by an innovative method, involving a catalytic dissociation of liquid N2H4 and separation of the product nitrogen and hydrogen mixture. The considered technique of nitrogen storage and resupply has several advantages in comparison to methods using either cryogenic liquid or high pressure nitrogen. One advantage is related to savings with respect to launch weight, while a second advantage is provided by the obtained hydrogen which is available for other uses within the Space Station. G.R.

A86-23555* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WET OXIDATION OF A SPACECRAFT MODEL WASTE
C. C. JOHNSON and T. WYDEVEN (NASA, Ames Research Center, Moffett Field, CA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 14 p. refs
(SAE PAPER 851372)

Wet oxidation was used to oxidize a spacecraft model waste under different oxidation conditions. The variables studied were pressure, temperature, duration of oxidation, and the use of one homogeneous and three heterogeneous catalysts. Emphasis is placed on the final oxidation state of carbon and nitrogen since these are the two major components of the spacecraft model waste and two important plant nutrients. Author

A86-23557* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PERFORMANCE AND ENDURANCE TESTING OF A PROTOTYPE CARBON DIOXIDE AND HUMIDITY CONTROL SYSTEM FOR SPACE SHUTTLE EXTENDED MISSION CAPABILITY
C. H. LIN and R. J. CUSICK (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 10 p. refs
(SAE PAPER 851374)

An advanced flight prototype regenerable CO2 and humidity control system was delivered to NASA-JSC in February 1980. It is pointed out that this system offers substantial weight savings compared with the Shuttle Orbiter expendable lithium hydroxide CO2 removal system for extended duration missions. The present paper provides a brief description of the 4- to 10-man regenerable CO2 and humidity control system. The potential advantages which can be realized for an extended duration Shuttle mission are considered along with the results of extensive testing conducted at JSC. The performance evaluation and endurance tests show that the system is capable of long-term operation (up to 60 days) without maintenance. G.R.

A86-23558* Life Systems, Inc., Cleveland, Ohio.
SPACE STATION ENVIRONMENTAL CONTROL/LIFE SUPPORT SYSTEM ENGINEERING
C. W. MILLER and D. B. HEPPNER (Life Systems, Inc., Cleveland, OH) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 13 p. Research supported by Life Systems, Inc. and NASA. refs
(SAE PAPER 851375)

The present paper is concerned with a systems engineering study which has provided an understanding of the overall Space Station ECLSS (Environmental Control and Life Support System). ECLSS/functional partitioning is considered along with function criticality, technology alternatives, a technology description, single thread systems, Space Station architectures, ECLSS distribution, mechanical schematics per space station, and Space Station ECLSS characteristics. Attention is given to trade studies and system synergism. The Space Station functional description had been defined by NASA. The ECLSS will utilize technologies which embody regenerative concepts to minimize the use of expendables. G.R.

A86-23559* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS TECHNOLOGY OPTIONS FOR SPACE STATION APPLICATION
J. B. HALL, JR., M. J. FEREBEE, JR. (NASA, Langley Research Center, Hampton, VA), and K. H. SAGE (Kentron International, Inc., Hampton, VA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 19 p. refs
(SAE PAPER 851376)

Continuous assessments regarding the suitability of candidate technologies for manned Space Stations will be needed over the next several years to obtain a basis for recommending the optimum system for an Initial Operating Capability (IOC) Space Station which is to be launched in the early 1990's. This paper has the objective to present analysis programs, the candidate recommendations, and the recommended approach for integration these candidates into the NASA Space Station reference configuration. Attention is given to ECLSS (Environmental Control and Life Support System) technology assessment program, an analysis approach for candidate technology recommendations, mission model variables, a candidate integration program, metabolic oxygen recovery, urine/flush water and all waste water recovery, wash water and condensate water recovery, and an integration analysis. G.R.

A86-23560* Hamilton Standard, Windsor Locks, Conn.
UTILITY OF AN EMULATION AND SIMULATION COMPUTER MODEL FOR AIR REVITALIZATION SYSTEM HARDWARE DESIGN, DEVELOPMENT, AND TEST
J. L. YANOSY (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) and L. F. ROWELL (NASA, Langley Research Center, Hampton, VA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 13 p. refs
(SAE PAPER 851377)

Efforts to make increasingly use of suitable computer programs in the design of hardware have the potential to reduce expenditures. In this context, NASA has evaluated the benefits provided by software tools through an application to the Environmental Control and Life Support (ECLS) system. The present paper is concerned with the benefits obtained by an employment of simulation tools in the case of the Air Revitalization System (ARS) of a Space Station life support system. Attention is given to the ARS functions and components, a computer program overview, a SAND (solid amine water desorbed) bed model description, a model validation, and details regarding the simulation benefits. G.R.

A86-23567* Massachusetts Inst. of Tech., Cambridge.
POTENTIAL FOR UTILIZATION OF ALGAL BIOMASS FOR COMPONENTS OF THE DIET IN CELSS
A. R. KAMAREI, Z. NAKHOST, and M. KAREL (MIT, Cambridge, MA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 12 p. NASA-supported research. refs
(SAE PAPER 851388)

Techniques which eliminate or reduce the undesirable cell components of algae and enhance the potential nutritional and organoleptic acceptability of algae products are studied. The cell walls, nucleic acids, and pigments and lipids of the green algae Scenedesmus obiliquus need to be removed. The procedures for determining the composition of proteins, pigments and lipids, and moisture and ash are described. Chemical, enzymatic, and physical methods of removing the cell wall to make the algae digestable are analyzed; a homogenization technique is utilized. The problems encountered if algae nucleic acids are ingested directly are discussed; the reduction of DNA and RNA by applying extracellular DNase and RNase to the nucleic acids is examined. The color and flavor of the algae are enhanced with the extraction of pigments and lipids from the algae protein concentration. I.F.

A86-23569
BLSS, A EUROPEAN APPROACH TO CELSS
A. I. SKOOG (Dornier System GmbH, Friedrichshafen, West Germany) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 13 p.
(SAE PAPER 851391)

The development of a biological life support system (BLSS) for space is examined. The proposed design for the BLSS is a closed loop system which supplies O2, food, and water, and maintains a balanced, stable spacecraft ecology. The terrestrial and space experiments, which focus on cultivating plants that will provide the crew with an adequate food supply, designing and testing of a terrestrial reference system, microgravity and cosmic radiation effects, and the use of PAR-radiation and high energy particle radiation protection, are studied. The functions of the Solar Plant Power Facility are investigated. The closed loop ecological life support system (ELSS) created by the ELSS technology study is analyzed. I.F.

A86-23570
CELSS EXPERIMENT MODEL AND DESIGN CONCEPT OF GAS RECYCLE SYSTEM
K. NITTA, M. OGUCHI (National Aerospace Laboratory, Tokyo, Japan), and S. KANDA (Kawasaki Heavy Industries, Ltd., Submarine Designing Dept., Kobe, Japan) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 14 p. refs
(SAE PAPER 851393)

In order to prolong the duration of manned missions around the earth and to expand the human existing region from earth to other planets such as a Lunar Base or a manned Mars flight mission, the CELSS becomes an essential factor of the future technology to be developed through utilization of the Space Station. The preliminary system engineering and integration efforts regarding CELSS have been carried out by the Japanese CELSS concept study group for clarifying the feasibility of hardware development for Space Station Experiments and for getting the time phased mission sets after Fy 1992. The results of these studies are briefly summarized, and the design and utilization methods of a gas recycle system for CELSS experiments are discussed. Author

A86-23571
UTILIZATION OF MEMBRANES FOR H2O RECYCLE SYSTEM
H. OHYA (Yokohama National University, Japan) and M. OGUCHI (National Aerospace Laboratory, Chofu, Japan) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 9 p.
(SAE PAPER 851394)

Conceptual studies of closed ecological life support systems (CELSS) carried out at NAL in Japan for a water recycle system using membranes are reviewed. The system will treat water from shower room, urine, impure condensation from gas recycle system, etc. The H2O recycle system is composed of prefilter, ultrafiltration membrane, reverse osmosis membrane, and distillator. Some results are shown for a bullet train of toilet-flushing water recycle equipment with an ultrafiltration membrane module. The constant value of the permeation rate with a 4.7 sq m of module is about 70 l/h after 500 h of operation. Thermovaporization with porous polytetrafluorocarbon membrane is also proposed to replace the distillator. Author

A86-23575
WET-OXIDATION WASTE MANAGEMENT SYSTEM FOR CELSS
Y. TAKAHASHI (Niigata University, Japan) and H. OHYA (Yokohama National University, Japan) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 10 p.
(SAE PAPER 851398)

A wet oxidation system which is to treat organic wastes and redistribute inorganic compounds and elements is examined. The effect of temperature and reaction time on the solubility of carbon, nitrogen, and phosphorus in the oxidized water is investigated. The application of noble gas catalysts to the carbon and nitrogen reactions, and the need to develop catalysts which will complete oxidation and nitrification are analyzed. The behavior of metals in wet oxidation is studied. I.F.

A86-23701
HUMAN FACTORS SOCIETY, ANNUAL MEETING, 28TH, SAN ANTONIO, TX, OCTOBER 22-26, 1984, PROCEEDINGS. VOLUMES 1 & 2
E. A. ALLUISI, ED. (USAF, Human Resources Laboratory, Brooks AFB, TX), M. J. ALLUISI, ED., and S. DE GROOT, ED. Santa Monica, CA, Human Factors Society, 1984. Vol. 1, 566 p.; vol. 2, 505 p. For individual items see A86-23702 to A86-23750.

Developments regarding methods and techniques are considered along with human factors in falls of the elderly, prototyping and design of computer systems, consumer product design, human factors in system safety and robotics, visual performance and display design, mental models, the selection and evaluation of computer systems, programs and techniques in human factors education, industrial ergonomics, and industrial safety. Topics related to human factors and nuclear power are discussed, taking into account a systems approach to improved operations, a maintenance personnel performance simulation model, and nuclear power plant control room operators' performance research. Attention is also given to visual display design, computer displays, new alternatives in managing human factors and human resources functions, army aviation selection and training, visual detection and tracking, applications of fuzzy sets and systems methodologies in human factors, human factors and automation technology, computer based training, and human factors in computerized I/O communications products. G.R.

A86-23702
THE EFFECT OF ASYMMETRIC TRANSFER ON DUAL-TASK ASSESSMENT OF VOICE TECHNOLOGY
D. L. DAMOS and E. A. LYALL (Arizona State University, Tempe) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 21-25.
(Contract N00014-82-C-0179)

This experiment examines the effect of asymmetric transfer on multiple-task performance in a voice technology study. Male subjects performed a mental arithmetic and a visual memory task alone and together. Stimuli for the mental arithmetic task were presented either visually or auditorily; responses were made either vocally or manually. Stimuli for the visual memory task were always presented visually; responses were always made manually. Preliminary analyses revealed a number of statistically significant effects favoring auditory input and speech response. However, these analyses also revealed asymmetric transfer between response conditions. When the data affected by the asymmetric transfer were eliminated from subsequent analyses, no significant advantages for speech over manual response were found. The significance of these results for voice technology studies is discussed. Author

A86-23703
AN EMPIRICAL DEMONSTRATION OF MULTIPLE RESOURCES
W. L. DERRICK and T. M. MCCLOY (U.S. Air Force Academy, Colorado Springs, CO) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 26-30. USAF-supported research.

Results obtained by Gopher et al. (1982) suggest that evidence for multiple processing resources can be demonstrated only if both task difficulty and task priorities are manipulated in dual task studies. The present paper reports an experiment which was to replicate the study conductd by Gopher et al. Ten right-handed male subjects participated in the experiment. The subjects performed a dual-axis compensatory tracking task of first order

dynamics using a joystick with their right hand. A noise generator randomly perturbed the signal to be tracked. The results obtained in the experiment essentially replicate the findings reported by Gopher et al. Inspection of the Performance Operating Characteristics (POC) functions from both studies, however, suggests that more than two resources are involved. G.R.

A86-23704
A TECHNOLOGY FORECASTING AND ASSESSMENT METHOD FOR EVALUATING SYSTEM UTILITY AND OPERATOR WORKLOAD
R. G. EGGLESTON and P. V. KULWICKI (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 31-35.

In the context of system design, technology assessment often proceeds in a bottom-up fashion, beginning with an evaluation of individual candidate system technologies. Issues of technology integration and human factors considerations are not addressed until later in system development. This paper proposes the use of a top-down approach to technology assessment. The top-down approach has the advantage of evaluating technologies along dimensions of system utility, as well as technical performance, and treating human factors early in conceptual design. A technology forecasting and assessment methodology is described wherein technologies can be evaluated quantitatively in terms of technical performance, system utility, and operator workload. Author

A86-23707
A COMPUTER-BASED SYSTEM FOR WORKSTATION DESIGN AND ANALYSIS
L. C. BUTTERBAUGH and J. K. MCBRIDE (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 63-66. refs

The design of aircraft crew stations, powerplant control room consoles, and other man-machine systems is a complex task which includes also the consideration of a number of human factors issues. As traditional design approaches require much time and considerable expenditures of manpower, the employment of computer-based methods has been considered to achieve a more efficient and effective crew station design process. Thus, numerous compter aided design and evaluation techniques (CADETs) have been developed which can be used for the design and the evaluation of man-machine systems from a human factors standpoint. In an effort to upgrade the tools and methods available to the designers and human factors engineers of the Crew Systems Development Branch of the U.S. Air Force, the relative merits of a wide variety of CADETs were discussed at a workshop. The present paper is concerned with these discussions and the resulting conclusions. G.R.

A86-23711
EYE-CONTROLLED SWITCHING FOR CREW STATION DESIGN
G. L. CALHOUN, K. R. BOFF (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), and C. J. ARBAK (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 258-262. refs
(Contract F33615-82-C-0511)

Integration of eye and head position monitoring devices may enable practical control of systems using the operator's eye line-of-sight (LOS) under conditions of free head and eye movement. This paper describes the components of an eye-control system developed to examine the use of eye LOS as an alternate control interface for crew station design. The implications of the performance of this system to the implementation of eye-controlled switching are discussed. Author

A86-23712
THE EFFECTS OF REDUNDANCY, TARGET DENSITY AND PRACTICE ON A COMPLEX VISUAL SEARCH TASK
M. J. PATTERSON, W. J. ENGELMAN, L. J. NAJJAR, and G. M. CORSO (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 299-302. refs

In connection with increased prevalence of visual display units, the search and acquisition of information in various visual displays has become increasingly important. Often color is combined with another dimension to produce a redundant code which may improve performance above that obtained in the case of the single original dimension. There is, however, conflicting evidence on the efficacy of the use of a redundant code in a visual search task. The present paper is concerned with an experiment which was designed to investigate redundant coding in an ATC simulation. The primary objective of this study was to increase the transmission of the displayed information. The study involved the examination of redundant code (color with alphanumerics) versus an achromatic, uni-dimensional code in a visual search task. It is concluded that the inclusion of color will not necessarily improve performance within visual tasks of this type. G.R.

A86-23713
COLOR CODING OF SYNTHETIC APERTURE RADAR IMAGERY
F. WARD, D. WILSON (Wright State University, Dayton, OH), D. WALLQUIST, and G. KUPERMAN (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 303-307. refs

The purpose of the study was to investigate four types of coding strategies using the same Synthetic Aperture Radar (SAR) imagery. Unclassified SAR imagery were digitized to include scenes from urban areas, seaports, oil refineries, industrial sites, an airfield, and power transmission lines. Two color and two black and white (BW) coding schemes were applied to the imagery. Five experienced radar interpreters were briefed and viewed 35 mm slides of the imagery. They judged image usefulness by reference to an interpretability scale. Analysis of the ratings showed that the BW codes received significantly higher interpretability ratings than the color codes. Author

A86-23723
COGNITIVE ATTRIBUTES TO GUIDE DISPLAY DESIGN IN AUTOMATED COMMAND-AND-CONTROL SYSTEMS
E. D. MURPHY (Computer Sciences Corp., Silver Spring, MD) and C. M. MITCHELL (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 418-422. refs

The capacity of the short-term and working memory is examined. The need for display designs which activate the appropriate schema and initiate effective cognitive processing is discussed. The relationship between cognitive attributes, such as hierarchical organization of knowledge, failure-driven memory, multilevel processing, and strategic problem solving and display designs is analyzed. The effect of automation on these attributes is studied. I.F.

A86-23724
COCKPIT AUTOMATION TECHNOLOGY
A. J. ARETZ (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 487-491.

This paper presents a prototype methodology conceived by the United States Air Force to establish a baseline approach in the development of a new human factors crew station design methodology for emerging weapon systems. The goal of the project is to develop a structured human factors design methodology that

can be used by designers to assess emerging technologies and relate them to system requirements and human performance characteristics so that the features of the resulting designs satisfy specific operational mission objectives. Author

A86-23734
MESSAGE-BASED SCREEN INTERFACES - THE EFFECTS OF PRESENTATION RATES AND TASK COMPLEXITY ON OPERATOR PERFORMANCE
R. HALSTEAD-NUSSLOCH and R. E. GRANDA (IBM Corp., Human Factors Development Dept., Poughkeepsie, NY) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 740-744.

The present experiments investigated the effects of varying message-presentation rate and task complexity on human performance. Variables examined in the experiments included message rate, message presentation format, probability of a target message, and number of response alternatives for target messages. Response accuracy was used as a measure of operator performance. Significant main effects were obtained on all independent variables, except format of message flow. Increasing the message rate, target probability, and number of target categories resulted in poorer accuracy. In general, decreases in accuracy were accentuated when two or more of the manipulated factors were increased. This negative synergism must be taken into account in designing a user-system interface for control systems based on textual-message communications. Author

A86-23735
RESEARCH ISSUES IN TELEOPERATOR SYSTEMS
R. L. PEPPER and J. D. HIGHTOWER (U.S. Naval Ocean Systems Center, Kailua, HI) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 803-807. refs

Existing teleoperators have been very useful in providing support to the offshore oil industry and the salvage community. However, there is a fundamental limitation. These teleoperators are designed to perform only a very restricted range of specific tasks, and unanticipated events can occur which severely tax these specialized teleoperators' capabilities and render them ineffective. It is, therefore, felt that anthropomorphically-designed teleoperators offer the best means of transmitting man's remarkably adaptive problem solving and manipulative skills into the oceans' depths. Several approaches toward the goal of a mature teleoperator technology are identified. Attention is given to teleoperator viewing systems, the possible advantages of using motion parallax cues as an aid to depth perception, and efforts toward the creation of a general model of anthropomorphic teleoperator performance. G.R.

A86-23736* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HUMAN OPERATOR CONTROL OF A BILATERAL TELEOPERATOR IN PART-SIMULATION OF ZERO GRAVITY
K. CORKER (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) and J. REGER (California State University, Northridge) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 810-814. NASA-supported research. refs

Remote manipulators (teleoperators) are defined as mechanical devices which extend human manipulative ability to operational environments which are either hostile to or remote from the human operator. Teleoperation involves the explicit and active inclusion of the human operator (HO) in the system control loop. An investigation of human/teleoperator control interactions in the orbital operational environment has been conducted, taking into account the employment of a model describing human neuromotor control as a linear damped harmonic oscillator. The application of this model for the specification of the end point position in teleoperator control is explored, and two experiments are conducted. The results indicate the potential utility of relatively simple models of neuromotor control processes in investigating the interaction of the human operator and controller in teleoperation. G.R.

A86-23737
A DIGITAL IMAGE PROCESSING FACILITY FOR HUMAN FACTORS RESEARCH
G. G. KUPERMAN, D. L. WALLQUIST (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), and L. KATZ (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 815-819. refs

In human factors research, it is often necessary to obtain highly controlled, visual stimulus materials for use in the operator performance studies. In this context, it has been found that digital image processing system capabilities provide the human factor practitioner with powerful techniques for application against a wide range of problems. The Visual Image Processing, Enhancement, and Reconstruction (VIPER) facility was, therefore, established to identify, develop, and apply digital image processing techniques against a variety of Air Force research objectives. The present paper provides an overview of digital image processing, and a description of the VIPER facility. Attention is also given to current and planned examples involving the application of digital image processing to human factors engineering problems. G.R.

A86-23738
CONCEPT FLYING - A METHOD FOR DERIVING UNIQUE SYSTEM REQUIREMENTS
J. C. SIMONS and S. B. HOTTMAN (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 825-828. refs

Simons (1974) discussed an approach to achieving concept breakthroughs by inserting intuitive researchers in loosely structured, scaled-down situations. The approach involves the observation of the pilot when he is interacting in a loosely constrained operational environment. The considered approach, called 'concept flying', represents a technique for the development of new systems designs. Today the main shortfall of concept flying techniques is that they are seldom used. The present paper provides successful concept-flight programs, and new proposals for using concept flying in a study of concepts which are beyond the capabilities of current aircraft. G.R.

A86-23742* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION CREW SAFETY - HUMAN FACTORS MODEL
M. M. COHEN and M. K. JUNGE (NASA, Ames Research Center, Moffett Field, CA) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 908-912. Previously announced in STAR as N85-29540.

A model of the various human factors issues and interactions that might affect crew safety is developed. The first step addressed systematically the central question: How is this Space Station different from all other spacecraft? A wide range of possible issue was identified and researched. Five major topics of human factors issues that interacted with crew safety resulted: Protocols, Critical Habitability, Work Related Issues, Crew Incapacitation and Personal Choice. Second, an interaction model was developed that would show some degree of cause and effect between objective environmental or operational conditions and the creation of potential safety hazards. The intermediary steps between these two extremes of causality were the effects on human performance and the results of degraded performance. The model contains three milestones: stressor, human performance (degraded) and safety hazard threshold. Between these milestones are two countermeasure intervention points. The first opportunity for intervention is the countermeasure against stress. If this countermeasure fails, performance degrades. The second

opportunity for intervention is the countermeasure against error. If this second countermeasure fails, the threshold of a potential safety hazard may be crossed. R.J.F.

A86-23744
THE USE OF ACCIDENT STATISTICS TO INFLUENCE SIMULATOR DESIGN
R. P. BATEMAN and S. B. HOTTMAN (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 917-920. refs

The causes of aircraft accidents during low level operations may be categorized into five areas. These are vision, attention, knowledge, judgment, and discipline. The thesis presented in this paper is that for simulators to be effective in reducing the aircraft accident rate, they must provide training in at least one (and preferably all) of these areas. This training must include experience in preventing the occurrence of hazardous conditions, in recognizing the hazardous conditions as they develop, and in taking the appropriate corrective action to prevent an accident. For the student, all of this requires appropriate inputs, realistic scenarios, opportunity for errors, and immediate feedback on the consequences of those errors. For the instructor, there is a need to provide information on the causes of errors. Author

A86-23746
THE EFFECT OF INTERVENING TASK PERFORMANCE ON SUBJECTIVE WORKLOAD RATINGS
F. T. EGGEMEIER (Wright State University; Systems Research Laboratories, Inc., Dayton, OH), B. E. MELVILLE (Wright State University, Dayton, OH), and M. S. CRABTREE (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 954-958. refs

Thirty subjects performed a short-term memory task and used the Subjective Workload Assessment Technique (SWAT) to provide workload ratings under one of five conditions. Ratings were provided either immediately following task performance, after a delay period during which no additional tasks were performed, or after a delay period during which an additional set of memory tasks at one of three levels or difficulty was performed. Neither the delay interval nor the requirement to perform a set of intervening tasks significantly affected mean SWAT ratings relative to the immediate rating control condition. Patterns in the data suggested that performance of a set of difficult intervening tasks had the greatest tendency to affect memory task ratings, and indicate that the potential influence of intervening task performance should not be completely discounted in workload rating scale applications. Author

A86-23747
THE USE OF REFLECTIVE SWAT FOR WORKLOAD ASSESSMENT
C. J. ARBAK, R. L. SHEW, and J. C. SIMONS (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 959-962. refs
(Contract F33615-82-C-0511)

Reid et al. (1981) have proposed the Subjective Workload Assessment Technique (SWAT) as a generally applicable measure of operator workload. The SWAT technique applies the mathematics of conjoint measurement to assign a single measure of workload based on task ratings in three categories, including time, effort, and stress. It is pointed out that SWAT has typically been used to assess workload at a particular point in an ongoing or just completed task. In the present paper, the term immediate or in-flight SWAT is employed in connection with such an application. In many cases, however, it would be useful to be able to evalate workload through the operator's reflections on mission performance rather than through an immediate rating of workload. Advantages of such a 'reflective SWAT' are related to the possibility of an estimate of workload which reflects a more general set of conditions. In this paper, two examples of the use of reflective SWAT in combination with an interview are discussed. G.R.

A86-23748
DEVELOPMENT OF AN AUTOMATED ANTHROPOMETRIC DATA MEASUREMENT SYSTEM (AADMS)
W. F. MORONEY, R. E. HUGHES (U.S. Navy, Naval Air Test Center, Patuxent River, MD), and R. J. SPICUZZA (Systems Research Laboratories, Inc., Patuxent River, MD) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 1003-1005.

Due to the limited space available in modern cockpits and crewstations, certain critical anthropometric features of an aviator must be measured properly. Unreasonable and erroneous anthropometric values are sometimes recorded because of measuring and operator errors. The purpose of the Automated Anthropometric Data Measurement System (AADMS - pronounced ADMAS) is to reliably and accurately measure anthropometric features in a timely and efficient manner and to eliminate the source of many of these errors. AADMS utilizes a microcomputer interfaced to a variety of position sensors and transducers to gather and internally verify data on 11 anthropometric parameters. Author

A86-24121
PHYSIOLOGICAL INSIGHTS GAINED THROUGH ZERO-G MEDICAL RESEARCH
S. ZEIDLER Commercial Space (ISSN 8756-4831), vol. 1, Fall 1985, p. 58, 60.

The advantages medical experiments and manufacturing processes provide to the study of human physiology are investigated. The applications of electrokinetic separation in space to the isolation and examination of cell subgroups and the space electrophoresis for purification of hormones, enzymes, and proteins are discussed. The manipulation of fibrillogenensis of collagen for use as a replacement tissue or in surface tension casting is being studied. Pharmaceutical participation in space research includes the production and analysis of organic crystals which provide information on the molecular structure that is utilized in drug design and protein engineering. Electrophoresis experiments which are being conducted in space are examined. A study to evaluate if purification techniques for human growth hormones are more effective in space is described. I.F.

A86-25199#
SODIUM AND POTASSIUM RECYCLE IN CLOSED ECOSYSTEM-SPACE AGRICULTURE
M. YAMASHITA, H. OHYA, K. NITTA, and M. YATAZAWA Japan Society for Aeronautical and Space Sciences, Journal (ISSN 0021-4663), vol. 33, no. 376, 1985, p. 288-296. In Japanese, with abstract in English. refs

Sodium and potassium separation is studied for a closed ecological life support system (CELSS) and space agriculture program. The purpose of the system is to recycle minerals between man and higher plants in a closed system. For physiological reasons, man requires a greater amount of sodium than that contained in plants. For regenerative production of foods by the use of higher plants, it is necessary to remove excess sodium from human wastes. Several kinds of physicochemical and biological methods are discussed to examine their feasibility in this application. Author

A86-25229#
ON THE PILOT'S BEHAVIOR OF DETECTING A SYSTEM PARAMETER CHANGE
N. MORIZUMI and H. KIMURA Japan Society for Aeronautical and Space Sciences, Journal (ISSN 0021-4663), vol. 33, no. 380, 1985, p. 532-539. In Japanese, with abstract in English. refs

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

A86-25651
NOISE LEVELS IN COCKPITS OF AIRCRAFT DURING NORMAL CRUISE AND CONSIDERATIONS OF AUDITORY RISK
D. C. GASAWAY (Cabot Corp., E-A-R Div., Indianapolis, IN) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 103-112. refs

Noise data, including A-levels and C-minus-A values, are summarized for exposures associated with normal cruise flight in 13 groups of 593 aircraft; means and standard deviations are reported; degrees of auditory risk using OSHA-1983 criterion are presented; and at-the-ear protected and unprotected exposures are revealed. Mean A-levels were 95.0 for 528 fixed-wing; 100.9 for 65 rotary-wing; and 95.7 for all 593 aircraft. Of 13 subgroups, the lowest mean A-level (85.5) was exhibited in the cockpits of tail-mounted turbojet/fan-powered aircraft, and the highest (105.0) was found in both reciprocating and turbine-powered twin-rotor helicopters. All means A-levels exceeded the OSHA damage-risk criterion for 8 h/d exposures. At-the-ear exposures while wearing hearing protection are presented. Results clearly illustrate the potential for auditory damage of unprotected aircrews. Hearing protection must be considered to effectively control routinely encountered exposures. The material and illustrations resulting from this study will help health and safety monitors during indoctrination and counseling of aircrews concerning the need to protect their hearing against noise exposures during normal and routine flight operations. Author

A86-25652
EFFECT OF SEAT CUSHIONS OF HUMAN RESPONE TO +GZ IMPACT
B. F. HEARON and J. W. BRINKLEY (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 113-121. refs
(Contract F33615-83-C-0500)

Several ejection seat cushions are evaluated based on human response to vertical impact acceleration. The cushions consist of: (1) one layer of 5.1 cm thick low-density conventional polyurethane foam and a second layer of 1.3 cm thick high-density plastic foam (F-111 cushion); (2) a layer of 1 cm thick sheet foam polyethylene, 1.3 cm Temper foam, and 0.6 cm thick space fabric (ACES II cushions); and (3) 5.1 cm thick rate-dependent slow-recovery polyurethane foam. Vertical impact tests were performed on 25 subjects of 26.1 + or - 3.4 years, weighing 79.1 + or - 9.0 kg, and 178 + or - 7.1 cm tall; the test conditions and equipment are described. The carriage acceleration and velocity, seat loads, and head and chest acceleration are measured and compared. The data reveal that the F-111 and ACES II cushions have higher seat loads and head and chest accelerations than the rate-dependent polyurethane foam cushions; it is concluded that the rate-dependent cushions provided greater impact protection than current operational cushions. I.F.

A86-25657
EFFECT OF WEARING CHEMICAL PROTECTIVE CLOTHING IN THE HEAT ON SIGNAL DETECTION OVER THE VISUAL FIELD
J. L. KOBRICK and L. A. SLEEPER (U.S. Army, Army Research Institute of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 144-148. refs

Sensitivity for detecting visual signals distributed at various locations throughout the visual field was studied in 16 male subjects who were all exposed to two degrees of ambient heat (91 F/61 percent RH; 55 F/35 percent RH) while wearing the Army chemical protective clothing system; also to 70 F/35 percent RH while wearing Army battle-dress uniform (fatigues). Response time for signal detection increased systematically and significantly with peripheralization of stimulus locations. It was most impaired in the superior and inferior visual field areas and least affected along the horizontal axis area. The data support previous results obtained using this task. Both the Military Oriented Protective Posture (MOPP) and the heat + MOPP exposure conditions produced highly significant systematic increases in response time to all signals; the worst performance occurred under the heat + MOPP combination. Implications for visual performance while wearing chemical protective gear are discussed. Author

A86-26001
AEROSPACE BEHAVIORAL ENGINEERING TECHNOLOGY CONFERENCE, 3RD, LONG BEACH, CA, OCTOBER 15-18, 1984, PROCEEDINGS
Conference sponsored by SAE. Warrendale, PA, Society of Automotive Engineers, Inc., 1984, 322 p. For individual items see A86-26002 to A86-26033.
(SAE P-151)

The topics addressed include the use of flight deck technology to complement the flight crew's role in automation; pilot-machine cooperation in presence of mission uncertainty in connection with military cockpit design; current and advanced displays; pilot workload and performance; and civil aviation human performance issues. Additional subjects include the Air Force test pilot's perspective of the man/machine interface; man/machine interface research and development needs for civil aviation; fitness for duty; safety assurance in the air carrier operating environment; advanced technology for rotorcraft; and a case for realistic training in abnormal and emergency situations. In addition, papers are presented on questions of flight deck automation decisions, effect of vibration on the readability of color CRT displays, the training and certification of the general aviation pilot, and effects of digital altimetry on pilot workload. I.S.

A86-26002
FLIGHT DECK AUTOMATION DECISIONS
E. F. WEENER (Boeing Commercial Airplane Co., Seattle, WA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 3-8. refs
(SAE PAPER 841471)

Effective man-machine interface design for an airplane flight deck depends strongly on providing apppropriate levels of control capability for use by the flight crew. The range of control options available to the airplane system designer extends from manual through partially automatic to full automatic. Selection of appropriate types and levels of automation for each new airplane is a complex task. It involves understanding the capabilities and limitations of the human operator, airplane operational and functional considerations, as well as concerns for cost and available technology. Recent airplanes have demonstrated the practicality of providing different levels of automation which can be applied by the flight crew under different circumstances. This trend expands the options available to the flight crew in coping with the changing operational environment. It also allows the flight crew to participate directly in the choice of when and how to apply automation. This paper describes the various automation factors which are considered in the process of developing a design. Author

A86-26003
FLIGHT DECK DESIGN METHODOLOGY USING COMPUTERIZED ANTHROPOMETRIC MODELS
G. STONE and H. MCCAULEY (Douglas Aircraft Co., Long Beach, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 9-16. refs
(SAE PAPER 841472)

A new 'inside out' flight deck design methodology has been developed, in which the flight crew member is the logical starting point. Several computer models that simulate varying pilot sizes, proportions, reach, and vision capabilities are created and utilized to generate the required 'envelopes' of vision, reach, and motion for the entire range of the pilot population. These envelopes are then employed to define the internal geometric relationships of the flight deck and its components. The methodology is described, including discussions of the aspects of defining the user population, generation of crew sample, creating a three-dimensional operator model, determining functional envelopes, and component integration. Design diagrams are included. I.S.

A86-26004
AI APPLICATIONS TO MILITARY PILOT DECISION AIDING - A PERSPECTIVE ON TRANSITION
W. G. JAMES (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 19-24.
(SAE PAPER 841533)

The process of transition of the Pilot Decision Aiding AI technology to operational application is discussed in the framework of various R&D programs. The experience of implementing the 'intent-driven' cockpit technology in a Coast Guard helicopter and in simulation and flight test programs is described. A priority list of the subsystems and activities sufficiently mature for early automation and decision aiding is given, and the three consecutive steps to be taken for the transition ('Imitate', 'Embellish', and 'Fully Exploit') are explained. The importance of an airborne development program that precedes the flight evaluation program is emphasized. I.S.

A86-26005
AUTOMATION IN THE COCKPIT - WHO'S IN CHARGE?
R. W. MOSS, J. M. REISING, and N. R. HUDSON (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 25-29. refs
(SAE PAPER 841534)

This paper discusses levels of automation and decision making and arrives at an overall design philosophy for allocating tasks to the pilot and the computer. In order to produce a levels of automation matrix three categories of pilot-computer interface (pilot only, blended, and computer only) and three types of goals, (mission, functional and task), are identified. These two dimensions are then used to create a matrix which can be employed as a means of comparing automated systems. The options that the matrix produces are discussed and examples given. The overall design philosophy is to have the mission goals accomplished in a blended manner with both the pilot and computer contributing. Lower level goals are handled exclusively by the computer. The reasoning for this philosophy is to allow the pilot to operate in a rule-based environment so that he can optimally cope with the greatly increased amounts of information he will face in future missions. Author

A86-26009
EFFECT OF VIBRATION ON THE READABILITY OF COLOR CRT DISPLAYS
L. IVEY (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 53-59. refs
(SAE PAPER 841466)

The readability of symbols on a color CRT display in a vibrational environment equivalent to low-level flights was rated by eight aircraft personnel subjects undergoing tests in a Sixmode motion simulator. The differences in the values of the chrominance and luminance between static and vibrational conditions were determined. In addition, the impact of wearing protective PLZT goggles was evaluated. The comfortable viewing zone for the normal (non-PLZT) case was between 2.5 and 6.5 Hz, whereas the zone with PLZT was between 3 and 6.5 Hz. The colors and symbol changes caused by the applied vibration were acceptable, indicating the stability of the Sperry CRT shadow mask. The legibility data indicate that in a vibration environment, a minimum symbol size of greater than 0.12 in. is necessary. The digital update rate change should be between 3 and 5 Hz for the most comfortable viewing and the least errors. I.S.

A86-26016
A REVIEW OF PILOT WORKLOAD MEASUREMENT TECHNIQUES USED ON THE A-10 SINGLE SEAT NIGHT ATTACK TEST PROGRAM
C. D. CRITES (USAF, Human Factors Branch, Edwards AFB, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 107-112.
(SAE PAPER 841492)

A three-phase flight test program to evaluate the A-10 Single Seat Night Attack (SSNA) aircraft was conducted at the Air Force Flight Test Center (AFFTC), Edwards AFB, CA. An important objective of the SSNA testing was to assess, and where possible, measure pilot workload. The techniques utilized during the test program to quantify workload were: an objective measurement of task performance, control activity, and physiological status data, and the Subjective Workload Assessment Technique (SWAT). The use of objective techniques represented the first application in a flight test environment and an initial attempt to validate their use as work-load metrics. Both objective and subjective methods were of significant value, but both techniques had limitations and shortfalls. Lessons learned affecting the application of the techniques to on-going and future flight test programs are described. Author

A86-26018
ADVANCED FIGHTER TECHNOLOGY INTEGRATION (AFTI) F-16 - THE PILOT INTERFACE
D. R. MCMONAGLE (USAF, Flight Test Center, Edwards AFB, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 121-125.
(SAE PAPER 841633)

The aspects of the pilot-vehicle interphase in the two first phases of the Advanced Fighter Technology Integration (AFTI)/F-16 Program, which was designed to develop and demonstrate technologies and alternatives for future fighter aircraft design, are discussed. The results of the first AFTI phase, the Digital Flight Control System, indicated the need for multiple flight control mode capability in future multirole fighter aircraft. The second phase of the Program, the Automated Maneuvering Attack System, which began in July 1984, involves the development and evaluation of improved sensors, integrated fire and flight control for automated maneuvering weapon delivery, and enhancements in pilot-vehicle interface. I.S.

A86-26022
WINGING IT IN THE 1980'S - WHY GUIDELINES ARE NEEDED FOR COCKPIT AUTOMATION
M. R. HOAGLAND (Air Line Pilots Association, International, Washington, DC) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 155-162. refs
(SAE PAPER 841634)

There have been many reasons for the introduction of automation into the cockpit of the modern airliner. In some cases the forces driving technology have caused the design of automated systems which compromise the ability of the pilot to fulfill his responsibilities for the safety of the airplane under his command. This paper examines how these forces can lead to unnecessary cockpit automation, and discusses what must be done to avoid the introduction of automated systems which have the effect of removing the human operator from the information and control processes. Author

A86-26023
SITUATION VERSUS COMMAND
J. G. OLIVER (Air Line Pilots Association, International, Washington, DC) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 163-165.
(SAE PAPER 841638)

Two types of flight information are provided to pilots, situational and command. Situation information tells the pilot the state of the aircraft and its flight path while command information tells the pilot what to do and is not related to any given situation. This paper discusses why it is extremely important for the pilot to be provided with appropriate and adequate situation information in all aircraft but especially in modern highly-automated aircraft. Author

A86-26028
U.S. ARMY HELICOPTER VOICE TECHNOLOGY APPLICATIONS
F. J. MALKIN (U.S. Army, Human Engineering Laboratory, Aberdeen Proving Ground, MD) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 207-211. refs
(SAE PAPER 841609)

Voice technology provides a potential for alleviating the extremely high visual and manual workload of Army helicopter pilots. Before voice technology can be successfully employed in the cockpit, there are many human factors issues that must be resolved. This paper describes the approach used to identify potential applications of voice technology in an Army helicopter and the emulation of a voice interactive Doppler navigation set. Author

A86-26030* Psycho-Linguistic Research Associates, Menlo Park, Calif.
COMPARISON OF VOICE TYPES FOR HELICOPTER VOICE WARNING SYSTEMS
C. A. SIMPSON, K. MARCHIONDA-FROST, and T. NAVARRO (Psycho-Linguistic Research Associates, Menlo Park, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 217-224. Army-supported research. refs
(Contract NAS2-11341)
(SAE PAPER 841611)

Three related studies were conducted to compare different types of human voice warnings. In the first study, a comparison of three LPC-encoded voices, human female, human male, and phoneme-synthesized, by the criteria of pilot flight task performance showed no differences due to the voice type. In the second study, pilots' preferences were investigated, by comparing preference for direct synthesized speech to the LPC-encoded human female speech and to LPC-encoded synthesized speech. Most pilots were found to prefer direct synthesized speech over both LPC-encoded human female speech and the LPC-encoded synthesized speech. In the third study, phonetically balanced (PB) words heard in simulated helicopter noise were used to compare the intelligibility of direct synthesized and LPC-encoded phoneme-synthesized speech types. PB word intelligibility was found to be better for direct synthesized speech than for the LPC-encodes synthesized speech. I.S.

A86-26031
ADVANCED TECHNOLOGY - NEW FIXES OR NEW PROBLEMS?
C. A. SIMPSON (Psycho-Linguistic Research Associates, Menlo Park, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 225-236. refs

The principles of application of voice technology to cockpit control and display systems, the advantages of its use and the pitfalls of its misuse or overuse are discussed. The omnidirectionality and the sequential nature of speech imply the general requirements of short sentences, the minimal number of multiple messages, and avoidance of concurrent messages in the use of voice for both display and command purposes. To be of an advantage to the pilot, the use of voice displays must be limited to time-critical flight information, and the use of voice control must be limited to time-critical operations, both at the time when the pilot is visually or manually occupied to the extent that the voice display/command will reduce his workload. Especially important will be an integrated design of all voice controls and displays in order to avoid overloading the pilot with multiple messages and required control inputs, in a transmission mode that is essentially a single-channel system. I.S.

N86-18988 Department of the Navy, Washington, D. C.
SERVO OPERATED ANTI-G SUIT PRESSURIZATION SYSTEM Patent
R. J. CROSBIE and P. R. EDWARDS, inventors (to Navy) 13 Aug. 1985 7 p Supersedes AD-D011468
(AD-D011932; US-PATENT-4,534,338;
US-PATENT-APPL-SN-613497; US-PATENT-CLASS-128-1)
Avail: US Patent and Trademark Office CSCL 06Q

A servo operated system for controlling pressurization of an aircraft pilot's anti-G suit during high energy maneuvers has a servo operated control valve and a feedback loop controller for minimizing pressure lag in the suit. The controller has dual modes of operation: one for normal flight conditions and one for combat flight conditions. The normal flight mode provides nominal G-protection while the combat mode provides faster response by prepressurizing the anti-G suit to a base level and lowering the G-force threshold. While in the combat mode, the crewman may select an adjustment pulsating signal to be superimposed on the prepressurization level to obtain additional comfort. Alternatively, he may select a superimposed pulsating signal which is synchronized with his own heartbeat to reinforce the pumping action of the heart. GRA

N86-18989# Naval Coastal Systems Center, Panama City, Fla.
DESIGN GUIDELINES FOR CARBON DIOXIDE SCRUBBERS, REVISION A
M. L. NUCKOLS, A. PURER, and G. A. DEASON Jul. 1985 77 p
(AD-A160181; NCSC-TECH-MAN-4110-1-83-REV-A) Avail: NTIS HC A05/MF A01 CSCL 06K

Design data and guidelines are presented to help predict the performance of axial flow carbon dioxide canister designs using alkali metal hydroxide absorbers. The design data are derived from a large series of laboratory tests conducted at the Naval Coastal Systems Center to isolate the effects of environmental and goemetric parameters on canister absorption efficiency. Sample canister designs are considered to demonstrate the use

of the derived data to predict effective canister life and pressure drop levels. Alternative techniques for the sorption of carbon dioxide are also reviewed. GRA

N86-18990*# California Univ., San Diego. Space Inst.
INDEPENDENT STUDY OF AUTOMATION AND ROBOTICS FOR THE NATIONAL SPACE PROGRAM BY THE AUTOMATION AND ROBOTICS PANEL
25 Feb. 1985 138 p
(Contract NAGW-629)
(NASA-CR-176523; NAS 1.26:176523; DE85-902185; CSI-85-01)
Avail: NTIS HC A07/MF A01 CSCL 05H

Methods are suggested for promoting continual growth in space station automation and robotics. Initial operation capability (IOC) space station design criteria are emphasized that will allow for ever-increasing levels of automation. The required technology advancement in robotics are described. The need is explained for improved human-machine interfaces, manipulators and sensors, and their combination with Earth developed robot technology into hybrid systems. The needed research base in computer science, artificial intelligence, and applied mathematics is discussed. Effects on private and Government Sectors are explained. It is shown that the Station will provide broader opportunities in time, space and society. Organizational recommendations are given for meeting Congressional goals for space station automation and robotics. DOE

N86-19906*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS: CELSS 1985 WORKSHOP
R. D. MACELROY, ed., N. V. MARTELLO, ed., and D. T. SMERNOFF, ed. Jan. 1986 624 p refs Workshop held at Moffett Field, Calif., 16-19 Jul. 1985
(NASA-TM-88215; A-86132; NAS 1.15:88215) Avail: NTIS HC A99/MF A01 CSCL 06K

Various topics related to closed ecological systems are discussed. Space habitats, vegetative growth, photosynthesis, recycling, culture techniques, waste utilization bioreactors and controlled atmospheres on space stations are among the topics covered.

N86-19907*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Sciences.
POTENTIAL FOR UTILIZATION OF ALGAL BIOMASS FOR COMPONENTS OF THE DIET IN CELSS
A. R. KAMAREI, Z. NAKHOST, and M. KAREL *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 13-22 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell Density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances is potential nutritional and organoleptic acceptability as a diet component in controlled Ecological Life Support System. Author

N86-19908*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
BLSS, A EUROPEAN APPROACH TO CELSS
A. I. SKOOG *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 23-33 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Several studies have revealed the benefits of a biological life support system (BLSS) in space stations. Problem areas requiring experimental and analytical investigations necessary for the development of BLSS have been identified. The nature of these problems allows for the classification into near-term (prepilot) and long-term (pilot) studies, and into terrestrial and space research programmes. The knowledge of planned European and U.S. space experiments allows for a coordination with existing Spacelab and Shuttle programmes to avoid duplication of research efforts. The Japanese also plan biological experiments on Spacelab in 1988. Coordinating efforts should provide answers to certain BLSS relevant questions. Major areas which need immediate attention are: micorgravity effects; cosmic radiation effects; use of PAR-radiation and high energy particle radiation protection; and monitoring and control (including sensor technology). R.J.F.

N86-19909*# National Aerospace Lab., Tokyo (Japan).
CELSS EXPERIMENT MODEL AND DESIGN CONCEPT OF GAS RECYCLE SYSTEM
K. NITTA, M. OGUCHI, and S. KANDA (Kawasaki Heavy Industries Ltd., Kobe, Japan) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 35-46 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

In order to prolong the duration of manned missions around the Earth and to expand the human existing region from the Earth to other planets such as a Lunar Base or a manned Mars flight mission, the controlled ecological life support system (CELSS) becomes an essential factor of the future technology to be developed through utilization of space station. The preliminary system engineering and integration efforts regarding CELSS have been carried out by the Japanese CELSS concept study group for clarifying the feasibility of hardware development for Space station experiments and for getting the time phased mission sets after FY 1992. The results of these studies are briefly summarized and the design and utilization methods of a Gas Recycle System for CELSS experiments are discussed. Author

N86-19910*# Yokohama National Univ. (Japan). Dept. of Chemical Engineering.
UTILIZATION OF MEMBRANES FOR H2O RECYCLE SYSTEM
H. OHYA and M. OGUCHI (National Aerospace Lab., Tokyo, Japan) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 47-53 Jan. 1986
Avail: NTIS HC A99/MF A01 CSCL 06K

Conceptual studies of closed ecological life support systems (CELSS) carried out at NAL in Japan for a water recycle system using membranes are reviewed. The system will treat water from shower room, urine, impure condensation from gas recycle system, and so on. The H2O recycle system is composed of prefilter, ultrafiltration membrane, reverse osmosis membrane, and distillator. Some results are shown for a bullet train of toilet-flushing water recycle equipment with an ultraviltration membrane module. The constant value of the permeation rate with a 4.7 square meters of module is about 70 1/h after 500th of operation. Thermovaporization with porous polytetrafluorocarbon membrane is also proposed to replce the distillator. Author

N86-19911*# Commissariat a l'Energie Atomique, Cadarache (France). Service de Radioagronomie.
THE C23A SYSTEM, AN EXMAPLE OF QUANTITATIVE CONTROL OF PLANT GROWTH ASSOCIATED WITH A DATA BASE
M. ANDRE, A. DAGUENET, D. MASSIMINO, and A. GERBAUD *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 55-64 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The architecture of the C23A (Chambers de Culture Automatique en Atmosphere Artificielles) system for the controlled study of plant physiology is described. A modular plant growth chambers and associated instruments (I.R. CO2 analyser, Mass spectrometer and Chemical analyser); network of frontal processors controlling this apparatus; a central computer for the periodic control and the multiplex work of processors; and a network of terminal computers able to ask the data base for data processing and modeling are discussed. Examples of present results are given. A growth curve analysis study of CO2 and O2 gas exchanges of shoots and roots, and daily evolution of algal photosynthesis and of the pools of dissolved CO2 in sea water are discussed. R.J.F.

N86-19912*# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany). Raumfahrttechnik G.m.b.H.
DESCRIPTION OF CONCEPT AND FIRST FEASIBILITY TEST RESULTS OF A LIFE SUPPORT SUBSYSTEM OF THE BOTANY FACILITY BASED ON WATER RECLAMATION
H. R. LOESER *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 65-76 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The Botany Facility allows the growth of higher plants and fungi over a period of 6 months maximum. It is a payload planned for the second flight of the Eureca platform around 1990. Major tasks of the Life Support Subsystem (LSS) of the Botany Facility include the control of the pressure and composition of the atmosphere within the plant/fungi growth chambers, control of the temperature and humidity of the air and the regulation of the soil water content within specified limits. Previous studies have shown that various LSS concepts are feasible ranging from heavy, simple and cheap to light, complex and expensive solutions. A summary of those concepts is given. A new approach to accomplish control of the temperature and humidity of the air within the growth chambers based on water reclamation is discussed. This reclamation is achieved by condensation with a heat pump and capillary transport of the condensate back into the soil of the individual growth chamber. Some analytical estimates are given in order to obtain guidelines for circulation flow rates and to determine the specific power consumption. R.J.F.

N86-19914*# North Carolina State Univ., Raleigh. Dept. of Soil Science.
SIMULATION MODEL FOR PLANT GROWTH IN CONTROLLED ENVIRONMENT SYSTEMS
C. D. RAPER, JR. and M. WANN *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 85-101 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The role of the mathematical model is to relate the individual processes to environmental conditions and the behavior of the whole plant. Using the controlled-environment facilities of the phytotron at North Carolina State University for experimentation at the whole-plant level and methods for handling complex models, researchers developed a plant growth model to describe the relationships between hierarchial levels of the crop production system. The fundamental processes that are considered are: (1) interception of photosynthetically active radiation by leaves, (2) absorption of photosynthetically active radiation, (3) photosynthetic transformation of absorbed radiation into chemical energy of carbon bonding in solube carbohydrates in the leaves, (4) translocation between carbohydrate pools in leaves, stems, and roots, (5) flow of energy from carbohydrate pools for respiration, (6) flow from carbohydrate pools for growth, and (7) aging of tissues. These processes are described at the level of organ structure and of elementary function processes. The driving variables of incident photosynthetically active radiation and ambient temperature as inputs pertain to characterization at the whole-plant level. The output of the model is accumulated dry matter partitioned among leaves, stems, and roots; thus, the elementary processes clearly operate under the constraints of the plant structure which is itself the output of the model. R.J.F.

N86-19915*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLAN FOR CELSS TEST BED PROJECT
W. M. KNOTT *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 109-118 Jan. 1986
Avail: NTIS HC A99/MF A01 CSCL 06K

The Closed Ecological Life Support Systems (CELSS) testbed project will achieve two major goals: It will develop the knowledge and technology needed to build and test biological or combined biological physiochemical regenerative life support systems. It will fabricate, test, and operate ground based facilities to accomplish proof-of-concent testing and evaluation leading to flight experimentation. The project will combine basic research and applied research/engineering to achieve a phased, integrated development of hardware, systems, and techniques for food and oxygen production, food processing, and waste processing in closed systems. The project will design, fabricate, and operate within three years a botanical production system scaled to a sufficient size to verify oxygen and nutrient load production (carbohydrates, fats, proteins) at a useable level. It will develop within five years a waste management system compatible with the botanical production system and a food processing system that converts available biomass into edible products. It will design, construct, and operate within ten years a ground based candidate CELSS that includes man as an active participant in the system. It will design a flight CELSS module within twelve years and construct and conduct initial flight tests within fifteen years. R.J.F.

N86-19916*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANT GROWTH CHAMBER M DESIGN
R. P. PRINCE and W. M. KNOTT *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 119-128 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Crop production is just one of the many processes involved in establishing long term survival of man in space. The benefits of integrating higher plants into the overall plan was recognized early by NASA through the Closed Ecological Life Support System (CELSS) program. The first step is to design, construct, and operate a sealed (gas, liquid, and solid) plant growth chamber. A 3.6 m diameter by 6.7 m high closed cylinder (previously used as a hypobaric vessel during the Mercury program) is being modified for this purpose. The chamber is mounted on legs with the central axis vertical. Entrance to the chamber is through an airlock. This chamber will be devoted entirely to higher plant experimentation. Any waste treatment, food processing or product storage studies will be carried on outside of this chamber. Its primary purpose is to provide input and output data on solids, liquids, and gases for single crop species and multiple species production using different nutrient delivery systems. R.J.F.

N86-19917*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
OPERATIONAL DEVELOPMENT OF SMALL PLANT GROWTH SYSTEMS
H. W. SCHELD (PhytoResource Research, Inc., College Station, Tex.), J. W. MAGNUSON (PhytoResource Research, Inc., College Station, Tex.), and R. L. SAUER *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 129-150 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The results of a study undertaken on the first phase of an empricial effort in the development of small plant growth chambers for production of salad type vegetables on space shuttle or space station are discussed. The overall effort is visualized as providing the underpinning of practical experience in handling of plant systems in space which will provide major support for future efforts in planning, design, and construction of plant-based (phytomechanical) systems for support of human habitation in space. The assumptions underlying the effort hold that large scale phytomechanical habitability support systems for future space stations must evolve from the simple to the complex. The highly complex final systems will be developed from the accumulated experience and data gathered from repetitive tests and trials of fragments or subsystems of the whole in an operational mode. These developing system components will, meanwhile, serve a useful operational function in providing psychological support and diversion for the crews. R.J.F.

N86-19918*# New Hampshire Univ., Durham. Complex Systems Research Center.
ELECTROCHEMICAL CONTROL OF PH IN A HYDROPONIC NUTRIENT SOLUTION
S. H. SCHWARTZKOPF *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 151-158 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The electrochemical pH control system described was found to provide a feasible alternative method of controlling nutrient solution pH for CELSS applications. The plants grown in nutrient solution in which the pH was controlled electrochemically showed no adverse effects. Further research into the design of a larger capacity electrode bridge for better control is indicated by the results of this experiment, and is currently under way. Author

N86-19919*# Battelle Columbus Labs., Ohio.
AN ENGINEERING ANALYSIS OF A CLOSED CYCLE PLANT GROWTH MODULE
G. H. STICKFORD, JR., F. E. JAKOB, and D. K. LANDSTROM *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 159-181 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The SOLGEM model is a numerical engineering model which solves the flow and energy balance equations for the air flowing through a growing environment, assuming quasi-steady state conditions within the system. SOLGEM provides a dynamic simulation of the controlled environment system in that the temperature and flow conditions of the growing environment are estimated on an hourly basis in response to the weather data and the plant growth parameters. The flow energy balance considers the incident solar flux; incoming air temperature, humidity, and flow rate; heat exchange with the roof and floor; and heat and moisture exchange with the plants. A plant transpiration subroutine was developed based plant growth research facility, intended for the study of bioregenerative life support theories. The results of a performance analysis of the plant growth module are given. The estimated energy requirements of the module components and the total energy are given. R.J.F.

N86-19920*# National Aerospace Lab., Tokyo (Japan).
GAS AND WATER RECYCLING SYSTEM FOR IOC VIVARIUM EXPERIMENTS
K. NITTA and K. OTSUBO *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 185-200 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Water and gas recycling units designed as one of the common experiment support system for the life science experiment facilities used in the Japanese Experiment Module are discussed. These units will save transportation and operation costs for the life science experiments in the space station. These units are also designed to have interfaces so simple that the connection to another life science experiment facilities such as the Research Animal Holding Facility developed by the Rockheed Missiles and Space Company can be easily done with small modification. R.J.F.

N86-19921*# National Aerospace Lab., Tokyo (Japan).
WATER RECYCLING SYSTEM USING THERMOPERVAPORATION METHOD
K. NITTA, A. ASHIDA (Hitachi Ltd., Tokyo, Japan), K. MITANI (Hitachi Ltd., Tokyo, Japan), K. EBARA (Hitachi Ltd., Tokyo, Japan), and A. YAMADA *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 201-225 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

A water recycling system concept for the crew of the space station is presented. A thermopervaporation method is a new key technology used for the distillation process, utilizing a hydrophobic membrane. An experimental study of thermopervaporation revealed that the permeation depends on the gap between the membrane and the cooling surface in the condensation room: the steam diffusion occurs with gaps less than 5 mm while natural convection becomes dominant with gaps more than 5 mm. A brief discussion of the system operation is also described. Author

N86-19922*# MODEC, Cambridge, Mass.
SUPERCRITICAL WASTE OXIDATION OF AQUEOUS WASTES
M. MODELL *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 227-251 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 07B

For aqueous wastes containing 1 to 20 wt% organics, supercritical water oxidation is less costly than controlled incineration or activated carbon treatment and far more efficient than wet oxidation. Above the critical temperature (374 C) and pressure (218 atm) of water, organic materials and gases are completely miscible with water. In supercritical water oxidation, organics, air and water are brought together in a mixture at 250 atm and temperatures above 400 C. Organic oxidation is initiated spontaneously at these conditions. The heat of combustion is released within the fluid and results in a rise in temperature 600 to 650 C. Under these conditions, organics are destroyed rapidly with efficiencies in excess of 99.999%. Heteroatoms are oxidized to acids, which can be precipitated out as salts by adding a base to the feed. Examples are given for process configurations to treat aqueous wastes with 10 and 2 wt% organics. Author

N86-19923*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRBORNE TRACE CONTAMINANTS OF POSSIBLE INTEREST IN CELSS
J. S. GARAVELLI *In its* Controlled Ecological Life Support Systems p 253-262 Jan. 1986
Avail: NTIS HC A99/MF A01 CSCL 06K

One design goal of Closed Ecological Life Support Systems (CELSS) for long duration space missions is to maintain an atmosphere which is healthy for all the desirable biological species and not deleterious to any of the mechanical components in that atmosphere. CELESS design must take into account the interactions of at least six major components; (1) humans and animals, (2) higher plants, (3) microalgae, (4) bacteria and fungi, (5) the waste processing system, and (6) other mechanical systems. Each of these major components can be both a source and a target of airborne trace contaminants in a CELSS. A range of possible airborne trace contaminants is discussed within a chemical classification scheme. These contaminants are analyzed with respect to their probable sources among the six major components and their potential effects on those components. Data on airborne chemical contaminants detected in shuttle missions is presented along with this analysis. The observed concentrations of several classes of compounds, including hydrocarbons, halocarbons, halosilanes, amines and nitrogen oxides, are considered with respect to the problems which they present to CELSS. Author

N86-19924*# New Hampshire Univ., Durham. Complex Systems Research Center.
OBSERVATIONS ON GAS EXCHANGE AND ELEMENT RECYCLE WITHIN A GAS-CLOSED ALGAL-MOUSE SYSTEM
D. T. SMERNOFF, R. A. WHARTON, JR., and M. M. AVERNER *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 263-280 Jan. 1986
Avail: NTIS HC A99/MF A01 CSCL 06K

Life support systems based on bioregeneration rely on the control and manipulation of organisms. Algae are potentially useful for a variety of Closed Ecological Life Support System (CELSS) functions including the revitalization of atmospheres, production of food and for nitrogen fixation. The results of experiments conducted with a gas-closed algal-mouse system designed to investigate gas exchange phenomena under varying algal environmental conditions, and the ability of algae to utilize oxidized mouse solid waste are reported. Inherent instabilities exist between the uptake and release of carbon dioxide (CO2) and oxygen (O2) by the mouse and algae in a gas-closed system. Variations in light intensity and cell density alter the photosynthetic rate of the algae and enable short-term steady-state concentrations of atmospheric CO2 and O2. Different nitrogen sources (urea and

nitrate) result in different algal assimilatory quotients (AQ). Combinations of photosynthetic rate and AQ ratio manipulations were examined for their potential in stabilizing atmospheric gas concentrations in the gas-closed algal-mouse system. R.J.F.

N86-19925*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CELSS SCIENCE NEEDS
J. D. RUMMEL *In its* Controlled Ecological Life Support Systems p 281-284 Jan. 1986
Avail: NTIS HC A99/MF A01 CSCL 06K

Questions and areas of study that need to be persued in order to develope a Controlled Ecological Life Support System are posed. Research topics needing attention are grouped under various leadings: ecology, genetics, plant pathology, cybernetics, chemistry, computer science, fluid dynamics, optics, and solid-state physics. R.J.F.

N86-19926*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DESIGN CONCEPTS FOR BIOREACTORS IN SPACE
P. K. SESHAN, G. R. PETERSON, B. BEARD (Washington Univ., St. Louis, Mo.), and E. H. DUNLOP (Washington Univ., St. Louis, Mo.) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 287-313 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Microbial food sources are becoming viable and more efficient alternatives to conventional food sources especially in the context of Closed Ecological Life Support Systems (CELSS) in space habitats. Since bioreactor designs for terrestrial operation will not readily apply to conditions of microgravity, there is an urgent need to learn about the differences. These differences cannot be easily estimated due to the complex nature of the mass transport and mixing mechanisms in fermenters. Therefore, a systematic and expeditious experimental program must be undertaken to obtain the engineering data necessary to lay down the foundations of designing bioreactors for microgravity. Two bioreactor design concepts presented represent two dissimilar approaches to grappling with the absence of gravity in space habitats and deserve to be tested for adoption as important components of the life support function aboard spacecrafts, space stations and other extra-terrestrial habitats. R.J.F.

N86-19927*# Martin Marietta Corp., Baltimore, Md.
AN ANALYSIS OF THE PRODUCTIVITY OF A CELSS CONTINUOUS ALGAL CULTURE SYSTEM
R. RADMER, P. BEHRENS, E. FERNANDEZ, and K. ARNETT *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 315-328 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

One of the most attractive aspects of using algal cultures as plant components for a Closed Ecological Life Support Systems (CELSS) is the efficiency with which they can be grown. Although algae are not necessarily intrinsically more efficient than higher plants, the ease which they can be handled and manipulated (more like chemical reagents than plants), and the culturing techniques available, result in much higher growth rates than are usually attainable with higher plants. Furthermore, preliminary experiments have demonstrated that algal growth and physiology is not detectable altered in a microgravity environment, (1) whereas the response of higher plants to zero gravity is unknown. In order to rationally design and operate culture systems, it is necessary to understand how the macroparameters of a culture system, e.g., productivity, are related to the physiological aspects of the algal culture. A first principles analysis of culture system is discussed, and a mathematical model that describes the relationship of culture productivity to the cell concentration of light-limited culture is derived. The predicted productivity vs cell concentration curve agrees well with the experimental data obtained to test this model, indicating that this model permits an accurate prediction of culture productivity given the growth parameters of the system. R.J.F.

N86-19928*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DEVELOPMENT OF AN UNCONVENTIONAL FOOD REGENERATION PROCESS: QUANTIFYING THE NUTRITIONAL COMPONENTS OF A MODEL METHYLOTROPHIC YEAST
G. R. PETERSEN and B. O. STOKES (Biomass International, Ogden, Utah) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 329-338 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

A hybrid chemical/biological approach to unconventional food regeneration is discussed. Carbon dioxide and water, the major wastes of human metabolism would be converted to methanol by one of several physiochemical processes available (thermal, photocatalytic, etc.). Methanol is then used to supply carbon and energy for the culture of microorganisms which in turn produce biological useful basic food stuffs for human nutrition. Our work has focused on increasing the carbohydrate levels of a candidate methylotrophic yeast to more nearly coincide with human nutritional requirements. Yeasts were chosen due to their high carbohydrate levels compared to bacteria and their present familiarity in the human diet. The initial candidate yeast studied was a thermotolerant strain of Hansenula polymor pha, DL-1. The quantitative results that permit an evaluation of the overall efficiency in hybrid chemical/biological food production schemes are discussed. A preliminary evaluation of the overall efficiency of such schemes is also discussed. R.J.G.

N86-19929*# California Univ., Berkeley. Lawrence Berkeley Lab. Membrane Bioenergetics Group.
APPLICATION OF PHOTOSYNTHETIC N2-FIXING CYANOBACTERIA TO THE CELSS PROGRAM
L. PACKER, I. FRY, and S. BELKIN *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 339-352 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Commercially available air lift fermentors were used to simultaneously monitor biomass production, N2-fixation, photosynthesis, respiration, and sensitivity to oxidative damage during growth under various nutritional and light regimes, to establish a data base for the integration of these organisms into a Closed Ecological Life Support System (CELSS) program. Certain cyanobacterial species have the unique ability to reduce atmospheric N2 to organic nitrogen. These organisms combine the ease of cultivation characteristics of prokaryotes with the fully developed photosynthetic apparatus of higher plants. This, along with their ability to adapt to changes in their environment by modulation of certain biochemical pathways, make them attractive candidates for incorporation into the CELSS program. R.J.F.

N86-19930*# Cornell Univ., Ithaca, N.Y. School of Chemical Engineering.
CARBON DIOXIDE EVOLUTION RATE AS A METHOD TO MONITOR AND CONTROL AN AEROBIC BIOLOGICAL WASTE TREATMENT SYSTEM
S. S. LEE and M. L. SHULER *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 354-391 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

An experimental system was developed to study the microbial growth kinetic of an undefined mixed culture in an erobic biological waste treatment process. The experimental results were used to develop a mathematical model that can predict the performance of a bioreactor. The bioreactor will be used to regeneratively treat waste material which is expected to be generated during a long term manned space mission. Since the presence of insoluble particles in the chemically undefined complex media made estimating biomass very difficult in the real system, a clean system was devised to study the microbial growth from the soluble substrate. R.J.F.

N86-19931*# Commissariat a l'Energie Atomique, Cadarache (France). Service de Radioagronomie.
CAN PLANTS GROW IN QUASI-VACUUM?
M. ANDRE and C. RICHAUD *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 395-404 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

It was found that the growth of plants is possible under absolute pressure 14 times lower than the atmospheric pressure. In first approximation, plants ignore the absence of nitrogen and only react to the partial pressure of O2. Hence the growth of plantlets was delayed under low pressures of O2 in both cases with and without nitrogen. The CO2 availability being limited by the carbon content of the seed, the final results after 20 days were very similar. R.J.F.

N86-19932*# Commissariat a l'Energie Atomique, Cadarache (France). Service de Radioagronomie.
WHEAT RESPONSE TO CO2 ENRICHMENT: CO2 EXCHANGES TRANSPIRATION AND MINERAL UPTAKES
M. ANDRE, H. DUCLOUX, and C. RICHAUD *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 405-428 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

When simulating canopies planted in varied densities, researchers were able to demonstrate that increase of dry matter production by enhancing CO2 quickly becomes independant of increase of leaf area, especially above leaf area index of 2; dry matter gain results mainly from photosynthesis stimulation per unit of surface (primary CO2 effect). When crop density is low (the plants remaining alone a longer time), the effects of increasing leaf surface (tillering, leaf elongation here, branching for other plants etc.) was noticeable and dry matter simulation factor reached 1.65. This area effect decreased when canopy was closed in, as the effect of different surfaces no longer worked. The stimulation of photosynthesis reached to the primary CO2 effect. The accumulation in dry matter which was fast during that phase made the original weight advantage more and more neglectible. Comparison with short term measurements showed that first order long term effect of CO2 in wheat is predictible with short term experiment, from the effect of CO2 on photosynthesis measured on reference sample. R.J.F.

N86-19933*# California Univ., Davis. Plant Growth Lab.
EFFECTS OF NO3(-) AND NH4(+) AND UREA ON EACH OTHER'S UPTAKE AND INCORPORATION
R. C. HUFFAKER and M. R. WARD *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 429-445 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The purpose was to determine the optimal use by wheat plants of the N sources expected from processing biological waste products, NO3(-),NO2(-)NH4(+), and urea. The approach was to determine the uptake and metabolic products of each N source (from single and multiple component solutions), inhibitory effects of each, feedback inhibition, and overall in vivo regulation of the rates of assimilation of each by wheat plants. Previously, researchers determined the interactions of NO3(-),NO2(-),NH4(+) on each other's uptake and incorporation. The assimilation and some of its effects on NO3(-) and NH4(+) assimilation which have been completed to data are discussed. R.J.F.

N86-19934*# Utah State Univ., Logan. Plant Science Dept.
STUDIES ON MAXIMUM YIELD OF WHEAT FOR THE CONTROLLED ENVIRONMENTS OF SPACE
B. G. BUGBEE and F. B. SALISBURY *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 447-485 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The economic feasibility of using food-producing crop plants in a closed ecological Life-Support System (CELSS) will ultimately depend on the energy and area (or volume) required to provide the nutritional requirements for each person. Energy and area requirements are, to some extent, inversely related; that is, an increased energy input results in a decreased area requirement and vice versa. A major goal of the research effort was to determine the controlled-environment good-production efficiency of wheat per unit area, per unit time, and per unit energy input. R.J.F.

N86-19935*# Wisconsin Univ., Madison. Dept. of Horticulture.
UTILIZATION OF POTATOES IN CELSS: PRODUCTIVITY AND GROWING SYSTEMS
T. W. TIBBITTS *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 487-498 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The potato plant (solanum tuberosum L.) is one of the basic food crops that should be studied for use in NASA's closed Ecological Life Support System (CELSS). It offers high yields per unit area and time, with most of this production in the form of highly digestible carbohydrate. Potatoes, like wheat and rice, are particularly useful in human diets because of their nutritional versatility and ease of processing and preparation. The growth of the potato was studied and it was found to be a useful species for life support systems. R.J.F.

N86-19936*# Purdue Univ., West Lafayette, Ind. Dept. of Horticulture.
OPTIMIZATION OF CONTROLLED ENVIRONMENTS FOR HYDROPONIC PRODUCTION OF LEAF LETTUCE FOR HUMAN LIFE SUPPORT IN CELSS
C. A. MITCHELL, S. L. KNIGHT, and T. L. FORD *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 499-521 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

A research project in the food production group of the Closed Ecological Life Support System (CELSS) program sought to define optimum conditions for photosynthetic productivity of a higher plant food crop. The effects of radiation and various atmospheric compositions were studied. R.J.F.

N86-19937*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CLOSED CULTURE PLANT STUDIES: IMPLICATIONS FOR CELSS
T. HOSHIZAKI *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 523-540 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Arabidopsis plants were grown in closed cultures similar to those used in space experiments. A shift in metabolism from photosynthesis to respiration is indicated by the accumulation of CO2 in the culture atmosphere. Reproductive growth is suppressed. Plant growth and development is apparently related to the atmospheric volume available to each plant. The implications of these findings to closed ecological systems are given: (1) there is a need for an open culture having ample gas exchange, (2) CO2 levels must be maintained within prescribed limits, (3) the minimum atmospheric volume required for each plant is dependent on the precision of the gas monitors and of the subsystems used to maintain appropriate levels of various atmospheric components, and (4) volatiles such as ethylene and terpenes emanating from plants be monitored and reduced to benign concentrations. R.J.F.

N86-19938*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A METHOD FOR SCREENING OF PLANT SPECIES FOR SPACE USE
J. D. GOESCHL (Phytokinetics, Inc., College Station, Tex.), R. L. SAUER, and H. W. SCHELD (PhytoResource Research, Inc., College Station, Tex.) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 541-554 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

A cost-effective methodology which monitors numerous dynamic aspects of carbon assimilation and allocation kinetics in live, intact plants is discussed. Analogous methods can apply to nitrogen

uptake and allocation. This methodology capitalizes on the special properties of the short-lived, positron-gamma emitting isotope C-11 especially when applied as CO2-11 in a special extended square wave (ESW) pattern. The 20.4 minute half-life allows for repeated or continuous experiments on the same plant over periods of minutes, hours, days, or weeks. The steady-state isotope equilibrium approached during the ESW experiments, and the parameters which can be analyzed by this technique are also direct results of that short half-life. Additionally, the paired .511 MeV gamma rays penetrate any amount of tissue and their 180 deg opposite orientation provides good collimation and allows coincidence counting which nearly eliminates background. R.J.F.

N86-19939*# Wisconsin Univ., Madison. Dept. of Horticulture.
POTATO LEAF EXPLANTS AS A SPACEFLIGHT PLANT TEST SYSTEM
R. M. WHEELER *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 555-564 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The use of explant tissues or organs may circumvent limitations facing whole-plant experimentation during spaceflight. In the case of potato, a crop currently being studied for application to bioregenerative life support systems, excised leaves and their subtended axillary buds can be used to test a variety of stem growth and development phases ranging from tubers through stolons (horizontal stems) to upright leafy shoots. The leaves can be fit well into small-volume test packages and sustained under relatively low irradiance levels using light-weight growing media. Tubers formed on potato leaf cuttings can yield up from 0.5 to 1.0 g fresh mass 10 days after excision and up to 2.0 g or more, 14 days from excision. Author

N86-19940*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECT OF ULTRADIAN AND ORBITAL CYCLES ON PLANT GROWTH
W. BERRY (California Univ., Los Angeles), T. HOSHIZAKI, and A. ULRICH (California Univ., Berkeley) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 565-575 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

In a series of experiments using sugar beets, researchers investigated the effects of varying cycles lengths on growth (0.37 hr to 48 hr). Each cycle was equally divided into a light and dark period so that each treatment regardless of cycle length received the same amount of light over the 17 weeks of the experiment. Two growth parameters were used to evaluate the effects of cycle length, total fresh weight and sucrose content of the storage root. Both parameters showed very similar responses in that under long cycles (12 hr or greater) growth was normal, whereas plants growing under shorter cycle periods were progressively inhibited. Minimum growth occurred at a cycle period of 0.75 hr. The yield at the 0.75 hr cycle, where was at a minimum, for total fresh weight was only 51 percent compared to the 24 hr cycle. The yield of sucrose was even more reduced at 41 percent of the 24 hr cycle. R.J.F.

N86-19941*# North Carolina State Univ., Raleigh. Dept. of Soil Science.
NITROGEN UPTAKE AND UTILIZATION BY INTACT PLANTS
C. D. RAPER, JR. and L. C. TOLLEY-HENRY *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 577-594 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The results of experiments support the proposed conceptual model that relates nitrogen uptake activity by plants as a balanced interdependence between the carbon-supplying function of the shoot and the nitrogen-supplying function of the roots. The data are being used to modify a dynamic simulation of plant growth, which presently describes carbon flows through the plant, to describe nitrogen uptake and assimilation within the plant system. Although several models have been proposed to predict nitrogen uptake and partitioning, they emphasize root characteristics affecting nutrient uptake and relay on empirical methods to describe the relationship between nitrogen and carbon flows within the plant. Researchers, on the other hand, propose to continue to attempt a mechanistic solution in which the effects of environment on nitrogen (as well as carbon) assimilation are incorporated through their direct effects on photosynthesis, respiration, and aging processes. R.J.F.

N86-19942*# North Dakota State Univ., Fargo. Dept. of Plant Pathology.
THE ROLE OF PLANT DISEASE IN THE DEVELOPMENT OF CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS
B. NELSON *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 595-610 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Plant diseases could be important factors affecting growth of higher plants in Closed Ecological Life Support Systems (CELSS). Disease control, therefore, will be needed to maintain healthy plants. The most important controls should be aimed at preventing the introduction, reproduction and spread of pathogens and preventing plant infection. An integrared ease control program will maximize that approach. In the design and operation of CELSS, plant disease should be considered an important aspect of plant growth. The effects of plant diseases are reviewed and several disease control measures are discussed. R.J.F.

N86-19943*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DEVELOPMENT OF SPACE TECHNOLOGY FOR ECOLOGICAL HABITATS
N. V. MARTELLO *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 613-625 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The development of closed ecological systems for space stations is discussed. Growth chambers, control systems, microgravity, ecosystem stability, lighting equipment, and waste processing systems are among the topics discussed. R.J.F.

N86-19944# Navy Clothing and Textile Research Facility, Natick, Mass.
REFURBISHING SPRAY ON ALUMINUM ENAMEL ON PROXIMITY CLOTHING Final Technical Report, Oct. 1982 - Sep. 1983
H. WINER, J. WALKER, P. CAMPBELL, and J. CALFEE Jul. 1985 25 p
(Contract MIPR-N-82-29; DA PROJ. 250-5)
(AD-A159707; AFESC/ESL-TR-84-17) Avail: NTIS HC A02/MF A01 CSCL 06Q

The Navy Clothing and Textile Research Facility studied the effectiveness of refurbishing the aluminum coating on worn aluminized proximity firefighters' clothing. It was thought that, if a spray-on aluminum enamel could restore the surface aluminum coating to an acceptable level of infrared radiant heat reflectance, then the clothing could be worn for an extended period of time, reducing replacement costs. Vacuum-deposited aluminum fabric specimens were cut from worn firefighters' clothing and tested for their thermal transmission at three levels of heat flux. Before heat-testing, each specimen was identified as to its percentage of infrared reflectance at 1100 nanometers and, subjectively, by visually observing the worn aluminized surface. This report describes the laboratory investigation of two spray-on aluminum enamel coatings over worn aluminized fabric to obtain data that would allow a judgment as to their effectiveness, as well as the effectiveness of all spray-on aluminum enamel, to extend the use-life of proximity firefighters' clothing. GRA

N86-19945# Army Aeromedical Research Lab., Fort Rucker, Ala.
DYNAMICS OF HEAD PROTECTION (IMPACT PROTECTIVE COMPARISON OF THE SPH-4 FLIGHT HELMET TO A COMMERCIAL MOTORCYCLE HELMET)
R. F. ROLSTEN and J. L. HALEY, JR. Jul. 1985 37 p
(AD-A161164; USAARL-85-5) Avail: NTIS HC A03/MF A01
CSCL 06Q

The impact protection provided by a commercial motorcycle helmet is evaluated in this report. The motorcycle helmet utilizes an expanded plastic foam liner of 12 mm thickness, which is less than that used in most motorcycle helmets made in this country today. The thickness of the foam is identical to that used in the US Army Aviator's standard Sound Protective Helmet No. 4 (SPH-4). The impact protection provided by the commercial helmet is compared to the protection provided by the SPH-4 aviator helmet. GRA

N86-19946# Army Aeromedical Research Lab., Fort Rucker, Ala.
HELICOPTER-REFERENCED SINGLE CONTROL, CENTER-POSITION FORCE EXERTION CAPABILITIES OF MALES AND FEMALES Final Report
A. W. SCHOPPER and G. R. MASTROIANNI Aug. 1985 60 p
(Contract DA PROJ. 3E1-62777-A-879)
(AD-A161234; USAARL-85-4) Avail: NTIS HC A04/MF A01
CSCL 06P

In response to the need for reevaluation of anthropometric criteria contained in the US Army medical standards for flying duty, an assessment was made of helicopter-control-referenced force exertion capabilities of a sample of Army males and females. Males (N=74) ranged from 159 cm through 196 cm in stature; females (N=66) ranged from 152 cm through 183 cm. The force-exertion data were compared to values cited in MIL-H-8501A as upper force limits for the design of helicopter controls. The focuses of the analyses were upon the force exertion capabilities of individuals 167 cm and below in stature since, by virtue of their relatively small size, they represent the portion of the population which are most apt to evidence inabilities to exert forces which equal or exceed control force design limits. The comparison revealed that, overall, the presently existing limits (published in 1961) for other-than-the normal operational flight envelope exceeded the force exertion capabilities of 10% of the 39 small males evaluated and 27% of the 56 females evaluated. Most failures to achieve existing or proposed control force design limits occurred because of inabilities to attain criterion-level exertion data from the small individuals of this study, various combinations of specific control force design limits were evaluated to develop estimations of overall set-wise failure rates likely to be encountered during possible future strength testing/screening. GRA

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-25774
SIGNS OF LIFE
G. CAIRNS-SMITH (Glasgow, University, Scotland) New Scientist (ISSN 0028-6664), vol. 109, Jan. 2, 1986, p. 34-36.

The question of how to recognize signs of life by analysis of molecules or structures detected in remote parts of the Universe, is discussed. It is believed that to be a life indicator, a set of molecules or objects must not only belong to a certain broad class, such as amino acids or sand particles, but also possess a set of common but complex and unique structures, not readily explicable in terms of normal physical and chemical processes. The principle of these criteria is illustrated by examples of theme molecules, in which the C, H, O, N, and Fe atoms have their unique places in the molecule, and seashells, in which the 'uniqueness' is obvious because of their uncommon but repeating forms. Both are found in multitudes and thus can be recognized as parts of reproducing entities, and both possess qualities of complexity and uniqueness, suggesting that there is or was a selective advantage for a particular structure. I.S.

A86-26198
ISOLEUCINE STEREOISOMERS ON THE EARTH
J. L. BADA, M. ZHAO (California, University, La Jolla), S. STEINBERG, and E. RUTH (California, University, Los Angeles) Nature (ISSN 0028-0836), vol. 319, Jan. 23, 1986, p. 314-316. Research supported by the Petroleum Research Fund. refs
(Contract DE-AT03-76EV-70134)

To assess whether the amino acids D-isoleucine and L-allo-isoleucine could be produced on earth by beta-epimerization of L-isoleucine (L-Ile) and D-allo-isoleucine (D-alle), the beta-epimerization rate was measured at 250 C in aqueous solution, and the isoleucine stereoisometric composition was determined in fossil mollusks of various geological ages. The aqueous solution measurements suggest that the ratio of the alpha and beta-epimerization rates of isoleucine is 1000-10,000 in the neutral pH region at 250 C. If this ratio is applicable to geochemical systems, then the isoleucine beta-epimerization rate should have a half-life of about 100 million to 100 billion yr on the earth's surface. This implies that little if any beta-epimerization of L-Ile and D-alle would occur even over the entire age of the earth. An apparently enhanced rate of isoleucine beta-epimerization is found in carbonate fossils; several factors which may produce this enhancement are suggested. C.D.

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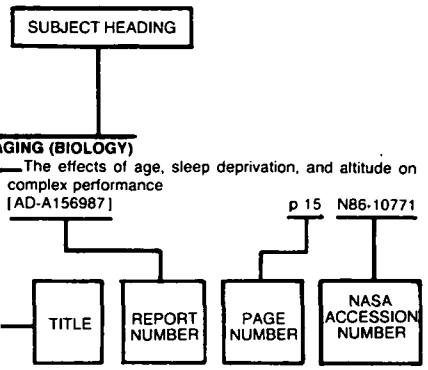

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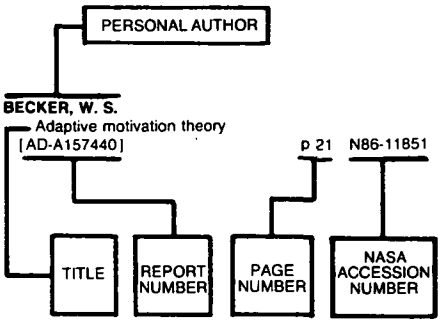

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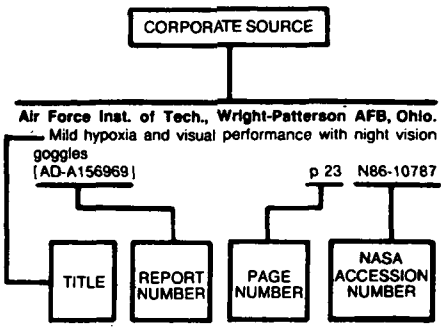

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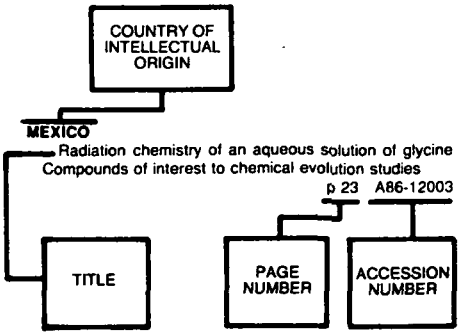

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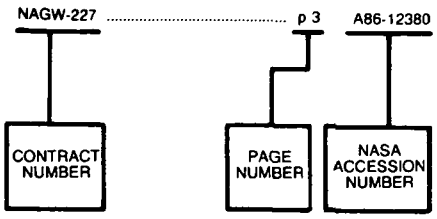

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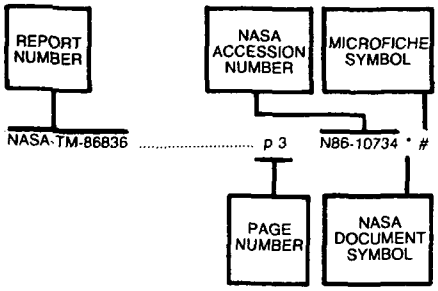

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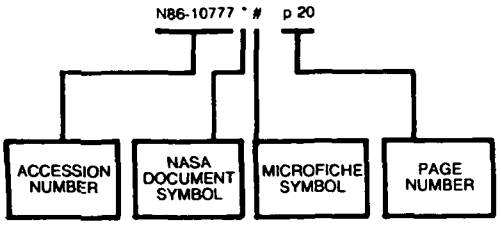

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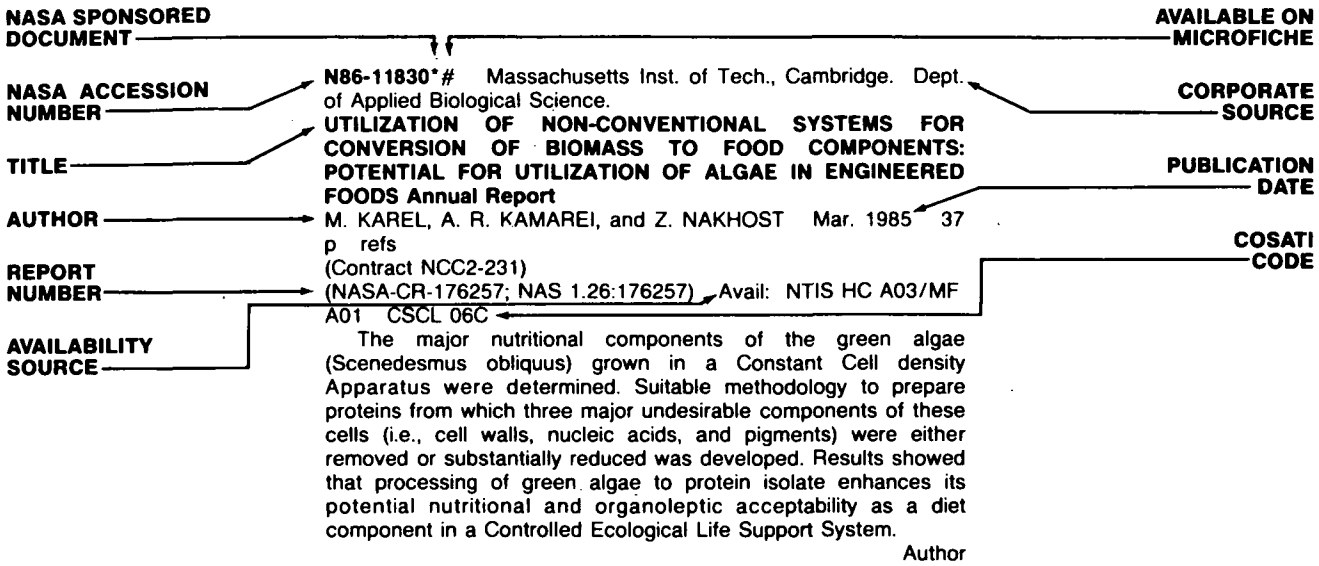

N86-11830*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Science.

UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report

M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs

(Contract NCC2-231)

(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C

The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.

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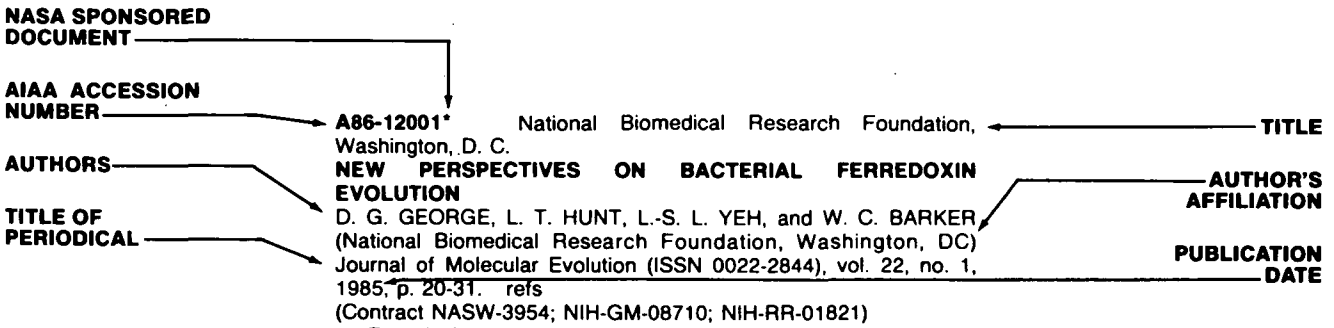

A86-12001* National Biomedical Research Foundation, Washington, D. C.

NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION

D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER (National Biomedical Research Foundation, Washington, DC)

Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 20-31. refs

(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)

Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.

G.R.

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