



Aerospace Medicine  
and Biology  
A Continuing  
Bibliography  
with Indexes

NASA SP-7011(308)  
March 1988

(NASA-SP-7011(308)) AEROSPACE MEDICINE AND  
BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH  
INDEXES (SUPPLEMENT 308) (NASA) 65 p

N88-18183

CSC 06E

Unclass

00/52 0126006

**Aerospace Medicine & Biology  
space Medicine & Biology Aero  
e Medicine & Biology Aerospace  
dicine & Biology Aerospace M  
ne & Biology Aerospace Medic  
Biology Aerospace Medicine &  
gy Aerospace Medicine & Biolo  
erospace Medicine & Biology  
pace Medicine & Biology Aeros  
Medicine & Biology Aerospace  
cine & Biology Aerospace Mec  
& Biology Aerospace Medicine**

# **AEROSPACE MEDICINE AND BIOLOGY**

**A CONTINUING BIBLIOGRAPHY  
WITH INDEXES**

**(Supplement 308)**

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in February 1988 in

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



Scientific and Technical Information Division 1988  
National Aeronautics and Space Administration  
Washington, DC

This document is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, price code A04.

# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 175 reports, articles and other documents announced during February 1988 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.

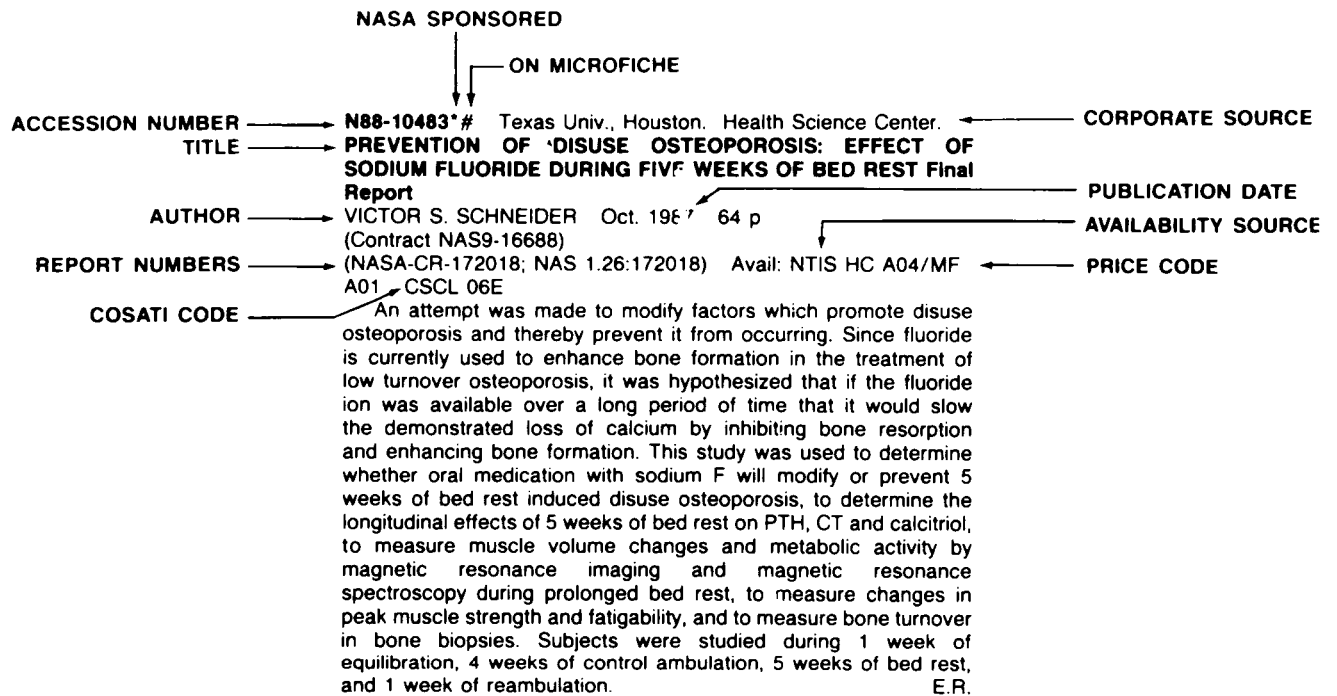
An annual index will be prepared at the end of the calendar year covering all documents listed in the 1988 Supplements.

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

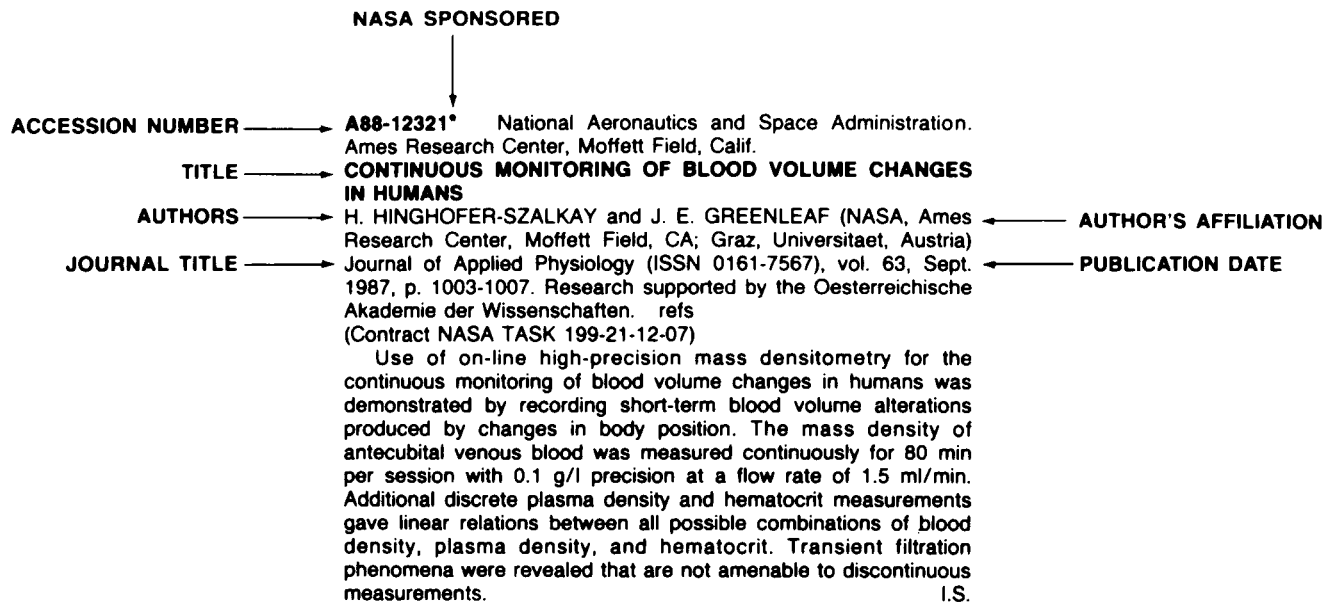
# TABLE OF CONTENTS

	<b>Page</b>
<b>Category 51 Life Sciences (General)</b>	<b>35</b>
<b>Category 52 Aerospace Medicine</b> Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.	<b>40</b>
<b>Category 53 Behavioral Sciences</b> Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.	<b>47</b>
<b>Category 54 Man/System Technology and Life Support</b> Includes human engineering; biotechnology; and space suits and protective clothing.	<b>49</b>
<b>Category 55 Space Biology</b> Includes exobiology; planetary biology; and extraterrestrial life.	<b>55</b>
<b>Subject Index .....</b>	<b>A-1</b>
<b>Personal Author Index .....</b>	<b>B-1</b>
<b>Corporate Source Index .....</b>	<b>C-1</b>
<b>Foreign Technology Index .....</b>	<b>D-1</b>
<b>Contract Number Index .....</b>	<b>E-1</b>
<b>Report Number Index .....</b>	<b>F-1</b>
<b>Accession Number Index .....</b>	<b>G-1</b>

## TYPICAL REPORT CITATION AND ABSTRACT



## TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



# AEROSPACE MEDICINE AND BIOLOGY

*A Continuing Bibliography (Suppl. 308)*

MARCH 1988

51

## LIFE SCIENCES (GENERAL)

**A88-13695**

### **ULTRAMICROFORMS OF BACTERIA IN SOIL AND OCEAN [UL'TRAMIKROFORMY BAKTERII V POCHVE I MORE]**

I. E. MISHUSTINA and T. V. KALIUZHNAIA (AN SSSR, Institut Mikrobiologii, Moscow, USSR) *Akademiia Nauk SSSR, Izvestiia, Seria Biologicheskaiia* (ISSN 0002-3329), Sept.-Oct. 1987, p. 686-700. In Russian. refs

The significance of the presence in high numbers of the ultraforms of soil- and sea-inhabiting bacteria is discussed along with the structures of the natural populations of ultramicrobacteria and their relationships with higher plants and animals. Methods used for isolating ultramicrobacteria and for studying their viability and metabolism are described. Attention is given to the various species of soil microbacteria, including the smallest forms of *Azotobacter* and *Rhizobium* genera, and to the ultramicroforms found in sea water and in sediments. The data collected suggest that the appearance of such microorganisms is connected with an unfavorable environment. The organisms can be formed as a result of mini-cell formation, multiple cleavage of the mother cell, or L-transformation. Their ecological role is interpreted in terms of adaptation to unfavorable conditions. I.S.

**A88-13697**

### **INVESTIGATION OF THE ABILITY OF PARA-AMINOBENZOIC ACID TO RESTORE THE ACTIVITY OF ALKALINE RIBONUCLEASE [ISSLEDOVANIE SPOSOBNOSTI PARA-AMINOBENZOINOI KISLOTY VOSSTANAVLIVAT' AKTIVNOST' SHCHELOCHNOI RIBONUKLEAZY]**

N. A. KOZHEVNIKOVA and I. A. RAPOPORT (AN SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR) *Akademiia Nauk SSSR, Izvestiia, Seria Biologicheskaiia* (ISSN 0002-3329), Sept.-Oct. 1987, p. 787-791. In Russian. refs

The paper studies the potential of para-aminobenzoic acid (PABA) for restoring the activity of alkaline RNase after its partial inactivation by heat, X-rays, or UV light. The activating effect of PABA was found to depend on its concentration and on the deactivating agent dose. Joint incubation with PABA protected the enzyme during 2-min-long incubation at 100 C or 5-day-long incubation at 60 C. It is suggested that PABA stabilizes the RNase by interacting with the active form of the enzyme. I.S.

**A88-13698**

### **CHARACTERISTICS OF HYPOTHALAMIC SELF-STIMULATION RELATED TO THE INTENSITY OF THE STIMULATING CURRENT [OSOBENOSTI GIPOTALAMICHESKOI SAMOSTIMULIATSII U KROLIKOV V ZAVISIMOSTI OT SILY RAZDRAZHAUSHCHEGO TOKA]**

A. IU. SLEDKOV and G. V. TROSHIKHIN (AN SSSR, Institut Fiziologii, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 73, Aug. 1987, p. 1047-1051. In Russian. refs

The intensity of stimulating current delivered to hypothalamus was correlated with the features of hypothalamic self-stimulation

in rabbits fitted with unipolar electrodes implanted into lateral region of the hypothalamus. The extent of the hypothalamic self-stimulation reaction was measured by a specific motor reaction that was expressed in rabbits by frequent pressing on a pedal installed into the cage wall. Three different pattern types were found in different rabbits for the current-intensity/pedal compression-rate correlation. I.S.

**A88-13699**

### **HOMOSYNAPTIC DEPRESSION AS A MODEL OF THE HABITUATION PHENOMENON [GOMOSINAPTICHESKAIA DEPRESSIIA - MODEL' FENOMENA PRIVYKANIIA]**

IU. P. PUSHKAREV and V. D. AVELEV (AN SSSR, Institut Fiziologii, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 73, Aug. 1987, p. 1064-1070. In Russian. refs

The mechanisms of homosynaptic depression of rhythmic discharges in the cerebrospinal monosynaptic arc were investigated in cats subjected to tracheotomy, isolation of a number of individual hind-limb nerves, laminectomy, and the excision of ventral and dorsal roots of the lumbar segments VI and VII and the sacral segment I. Intracellular motor neuron postsynaptic potentials and action potentials of these segments were diverted under anesthesia and artificial respiration. A high functional stability of the spinal cord motor neurons was demonstrated under conditions of long-term orthodromic and antidromic stimulation of afferent neurons. It was shown that the depression of reflex discharges observed was related to a drop in the probability of the transmitter release from the primary afferents' terminals. The analysis of the signs of the habituation phenomenon reveals their similarity to the phenomenon of the homosynaptic depression. I.S.

**A88-14422#**

### **THE METAPHYSICAL PRESUPPOSITIONS OF THE 'ANTHROPIC PRINCIPLE'**

JEAN SCHNEIDER (Meudon, Observatoire, France) IN: Origin and early history of the universe; Proceedings of the Twenty-sixth Liege International Astrophysical Colloquium, Liege, Belgium, July 1-4, 1986. Cointe-Ougree, Belgium, Universite de Liege, 1987, p. 445-451.

The 'anthropic principle' states that the discussion of the values of fundamental constants is possible only if these values allow for the development of biological molecules in the expanding universe required to develop intelligence. This statement rests on the implicit, and naive, hypothesis that 'knowledge' is a natural consequence of neuronal activity which is a prerequisite for its existence. This hypothesis constitutes a highly metaphysical prejudice. It will be discussed (and criticized) in the light of transcendental schematism (Kant) and transcendental semiotics (Appel).  
Author

A88-14548

**FEMTOSECOND LASER-TISSUE INTERACTIONS - RETINAL INJURY STUDIES**

REGINALD BIRNGRUBER (Augenlinik, Munich, Federal Republic of Germany), CARMEN A. PULIAFITO, A. GAWANDE (Massachusetts Eye and Ear Infirmary; Harvard University, Boston), WEI-ZHU LIN, ROBERT W. SCHOENLEIN (MIT, Cambridge, MA) et al. IEEE Journal of Quantum Electronics (ISSN 0018-9197), vol. QE-23, Oct. 1987, p. 1836-1844. refs  
(Contract NIH-1-R01-GM-35459-02; N0014-86-K-0117)

The first study of laser-tissue interaction in the femtosecond time regime is reported. Retinal damage thresholds and mechanisms produced by exposure to high-intensity femtosecond laser pulses were investigated in chinchilla grey rabbits. Exposures were performed using single laser pulses of 80 fs duration at 625 nm. ED(50) injury thresholds of 0.75 and 4.5 micro-J were measured using fluorescein angiographic and ophthalmoscopic visibility criteria evaluating 204 laser exposures. Ultrastructural studies including light and electron microscopy were performed on selected lesions. Results suggest that the primary energy deposition in the retina occurs in melanin. However, in contrast to laser injuries produced by longer pulses, exposures of more than 100 x threshold in the 50-100 micro-J range did not produce significantly more severe lesions or hemorrhage. This suggests the presence of a nonlinear damage limiting mechanics in tissue exposed to femtosecond laser pulses. Author

A88-14767

**ANALYSIS OF THE SYNERGISTIC EFFECT OF HEAT AND RADIATION ON BACTERIOPHAGE T4 AND THE SPORES OF BACILLUS SUBTILIS [ANALIZ EFFEKTA SINERGIZMA PRI TERMORADIATIONOM VOZDEISTVII NA BAKTERIOFAG T4 I SPORY BACILLUS SUBTILIS]**

V. P. KOMAROV and V. G. PETIN (AMN SSSR, Nauchno-Issledovatel'skii Institut Meditsinskoi Radiologii, Obninsk, USSR) Radiobiologiya (ISSN 0033-8192), vol. 27, July-Aug. 1987, p. 449-454. In Russian. refs

Using inactivation data on the bacteriophage T4 and the spores of B. subtilis subjected to the combined action of heat and ionizing radiation, a semiempirical model was developed describing the combined effect of hyperthermia and ionizing radiation in terms of lethal damage as a function of temperature, radiation dose, and the dosage rate. The model makes it possible to optimize the ratio of both factors for most effective sterilization. Thus, the model can predict the optimal radiation dose necessary to maximally inactivate a cell at a given temperature, and the optimal sterilizing temperature at a fixed radiation dose. Experimental inactivation data agreed well with theoretically predicted figures. I.S.

A88-14768

**ANALYSIS OF THE LIFE SHORTENING EFFECT OF CHRONIC EXTERNAL GAMMA-IRRADIATION - THE STRUCTURE OF THE MORTALITY RATE [ANALIZ SOKRASHCHENIIA PRODOLZHITEL'NOSTI ZHIZNI V EKSPERIMENTE S KHRONICHESKIM VNESHNIM GAMMA-OBLUCHENIEM - STRUKTURA SMERTNOSTI]**

P. V. GOLOSHCHAPOV, V. P. BOITSOVA, and M. I. VOROB'EVA (Institut Biofiziki, Moscow, USSR) Radiobiologiya (ISSN 0033-8192), vol. 27, July-Aug. 1987, p. 497-501. In Russian. refs

The effect of chronic whole-body irradiation by gamma-rays on the mortality of rats was investigated, using nine groups of rats irradiated for up to 1100 days, with radiation doses ranging from 0.19 to 13.6 cGy. Mortality rate data were analyzed statistically. The results revealed the life-shortening effect of chronic irradiation even at the lowest radiation doses. However, except in rats irradiated by 13.5 and 3.5 cGy doses, no specific pathological effects (such as radiation sickness or the excessive appearance of tumors) were found in radiation-exposed rats. I.S.

A88-14769

**INVESTIGATION OF THE LIFE-SHORTENING EFFECT IN AN EXPERIMENT WITH CHRONIC EXTERNAL GAMMA-IRRADIATION - IN SUPPORT OF THE AGING HYPOTHESIS [ANALIZ SOKRASHCHENIIA PRODOLZHITEL'NOSTI ZHIZNI V EKSPERIMENTE S KHRONICHESKIM VNESHNIM GAMMA-OBLUCHENIEM V ZASHCHITU GIPOTEZY STARENIIA]**

P. V. GOLOSHCHAPOV and M. I. VOROB'EVA (Institut Biofiziki, Moscow, USSR) Radiobiologiya (ISSN 0033-8192), vol. 27, July-Aug. 1987, p. 501-504. In Russian. refs

A88-14770

**CORRELATION BETWEEN CHANGES IN RADIOSENSITIVITY AND THE ACTIVITY OF BLOOD LYMPHOCYTE SUCCINATE DEHYDROGENASE EFFECTED BY EXOGENIC HYPOXIA [SOPOSTAVLENIE IZMENENIIA AKTIVNOSTI SUKTSINAT-DEGIDROGENAZY V LIMFOTSITAKH KROVI I MODIFITSIRUEMOI RADIOCHUVSTVITEL'NOSTI POD VLIANIEM EKZOGENNOI GIPOKSII]**

A. N. GAIDAMAKIN and M. M. ABRAMOV Radiobiologiya (ISSN 0033-8192), vol. 27, July-Aug. 1987, p. 524-528. In Russian. refs

The radioprotective efficiency of experimental hypoxia, expressed as a dose-modifying factor (DMF), was correlated with the reaction rate of blood-lymphocyte succinate dehydrogenase, V(SDH), determined as a measure of lymphocyte oxygen content. Following whole-body irradiation by Co-60, dogs and rats were exposed to oxygen/nitrogen atmospheres containing from 5 to 12 percent O<sub>2</sub>, and the values of V(SDH) were correlated with the O<sub>2</sub> content in the gas mixture and with the LD(50/30) of the animal. The empirical formulas for the relationships between the V(SDH) and the O<sub>2</sub>-content and between the DMF and the V(SDH) are presented. I.S.

A88-14771

**RADIOPROTECTIVE ACTIVITY OF AMINOARYLTHIAZOLES AND SOME MECHANISMS OF THEIR ACTION [RADIOZASHCHITNAIA AKTIVNOST' AMINOARILTHIAZOLOV I NEKOTORYE MEKHANIZMY IKH DEISTVIA]**

V. G. VLADIMIROV, O. N. CHUPAKHIN, A. P. NOVIKOVA, L. G. EGOROVA, N. I. LIBIKOVA (Voenno-Meditsinskaiia Akademiia, Leningrad; Ural'skii Politekhnikeskii Institut, Sverdlovsk, USSR) et al. Radiobiologiya (ISSN 0033-8192), vol. 27, July-Aug. 1987, p. 528-532. In Russian. refs

The radioprotective efficiencies of 17 derivatives of 2-amino-4-phenylthiazole were compared using mice irradiated with gamma-rays (7.3 cGy/min) and treated with the compound one hour before irradiation; survival rates were determined on the 30th day after irradiation. It is shown that the reaction center primarily responsible for the radioprotective effect of the aminoarylthiazoles is the amino group of the compounds. Phenyl residue also contributes. The 2-amino-4-phenylthiazole itself is the most efficient radioprotector and has relatively low toxicity. I.S.

A88-14772

**COMBINED EFFECTS OF IONIZING RADIATION AND PHYSICAL EXERCISE ON SOME INDICES OF NONSPECIFIC BIOPROTECTION AND IMMUNITY [SOCHETANNOE DEISTVIE IONIZIRUIUSHCHIKH IZLUCHENII I FIZICHESKIKH NAGRZOK NA NEKOTORYE POKAZATELI NESPETSIFICHESKOI ZASHCHITY I IMMUNITETA]**

V. M. SHUBIK, M. IA. LEVIN, N. I. MASHNEVA, and V. N. PUL'KOV (Leningradskii Nauchno-Issledovatel'skii Institut Radiatsionnoi Gigieny, Leningrad, USSR) Radiobiologiya (ISSN 0033-8192), vol. 27, July-Aug. 1987, p. 548-550. In Russian.

The combined effects of ionizing radiation and physical loads of various type and intensity on some indices of nonspecific bioprotection (such as lysozyme activity and leucocyte migration in agarose) and immunity (such as bactericidal activity, lysozyme activity, and complement concentration) were determined in rats and mice. Rats were either forced to swim several times a week for various periods of time or were subjected to static loads



(suspension) 3 months before a single X-ray exposure. Mice were also subjected to physical loads of varying intensity, after which they were irradiated internally, by being fed Sr-90 (1.11 x 10 to the 6th Bq/kg) for 30 days. It was found that moderate physical exercise preceding irradiation diminishes radiation-caused injury, while intensive physical stress aggravates the damages. I.S.

A88-14773

**EFFECT OF MICROWAVE RADIATION ON THE DOPAMINE-DEPENDENT BEHAVIOR OF RABBITS [VLIANIE ELEKTROMAGNITNYKH IZLUCHENII SVCH-DIAPAZONA NA DOFAMINZAVISIMOE Povedenie KROLIKOV]**

L. A. ANDREEVA, V. F. KONOVALOV, and I. IA. PODOL'SKII (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Radiobiologiya (ISSN 0033-8192), vol. 27, July-Aug. 1987, p. 567-569. In Russian. refs

The effect of caudal-area irradiation by microwaves on the stereotyped dopamine-induced behavior of rabbits was studied in animals injected with a dopamine receptor stimulator, apomorphine, and then exposed to microwaves (of 880 MHz frequency delivered to the caudal area) for 30 min in the following regimes: uniform exposure; exposure with 2-ms impulse modulation at 16 Hz; and exposure with 30-Hz modulation. The specific dopamine-stimulated behavior of rabbits (i.e., strong synergic blows with hind limbs, alternating with intensive licking and gnawing of the cage walls) observed in irradiated and control rabbits was recorded for one hour post-apomorphine, as a number of hind-limb blows every 3 min. Exposure to microwaves did not influence the stereotyped behavior of rabbits. However, 10 percent of animals exhibited a marked decrease in the test-response after irradiation with 16-Hz impulse. It is suggested that this reaction reflected an elevated individual sensitivity of some animals to microwaves. I.S.

A88-15341

**OTOLITH-ORGAN MECHANICS - LUMPED PARAMETER MODEL AND DYNAMIC RESPONSE**

WALLACE GRANT and WILLIAM BEST (Virginia Polytechnic Institute and State University, Blacksburg) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Oct. 1987, p. 970-976. refs

The otolith organs comprise a second-order system whose response is overdamped and whose dynamics can be expressed by two time constants. The long time constant has been experimentally measured at 10 s. The short time constant is approximately 0.0002 s using a maximum mechanical displacement criterion for the otoconial layer. With these two values determined, the system dynamic response indicates that, between the two system corner frequencies, the peripheral sensory cells (primary Type II cells) report skull velocity information to the central nervous system, and striolar cells (primary Type I cells) report skull acceleration information to the central nervous system. Below the lower corner frequency, peripheral sensory cells report skull acceleration information to the central nervous system, and striolar sensory cells report rate of change of acceleration information to the central nervous system. Author

A88-15342\* Iowa Univ., Iowa City.

**FEMUR-BENDING PROPERTIES AS INFLUENCED BY GRAVITY. V - STRENGTH VS. CALCIUM AND GRAVITY IN RATS EXPOSED FOR 2 WEEKS**

CHARLES C. WUNDER, KENNETH M. COOK, STANLEY R. WATKINS, and WILLIAM J. MORESSI (Iowa, University, Iowa City; Coe College, Cedar Rapids, IA; Winthrop College, Rock Hills, SC) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Oct. 1987, p. 977-982. refs  
(Contract NIH-GM-10093; NGR-16-001-031)

The dependence of gravitationally related changes in femur bone strength on the comparable changes in calcium content was investigated in rats exposed to chronic simulations of altered gravity from the 28th to 42nd day of age. Zero G was simulated by harness suspension and 3 G by centrifugation. Bone strength (S) was determined by bending (using modified quasi-static cantilever bending methods and equipment described by Wunder et al., 1977

and 1979) and Ca content (C, by mass pct) determined by atomic absorption spectrometry; results were compared with data obtained on both normal and harnessed control animals at 1 G. Multiple regression showed significant dependence of S upon earth's gravity, independent from C, for which there was no significant coefficient of partial regression. It is suggested that the lack of S/C correlation might have been due to the fact that considerable fraction of the calcium in these young, developing bones has not yet crystallized into the hydroxyapatite which provides strength. I.S.

A88-15343\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**INHIBITED INTERFERON-GAMMA BUT NORMAL INTERLEUKIN-3 PRODUCTION FROM RATS FLOWN ON THE SPACE SHUTTLE**

CHERYL L. GOULD, MARK LYTE, JOANN WILLIAMS, ADRIAN D. MANDEL, and GERALD SONNENFELD (NASA, Ames Research Center, Moffett Field, CA; Louisville, University, KY; Pittsburgh, University, PA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Oct. 1987, p. 983-986. refs  
(Contract NCC2-213)

Rats were flown on Space Shuttle SL-3 for one week. When spleen cells were removed from these rats and challenged with concanavalin-A, interferon-gamma production was severely inhibited, while interleukin-3 production was unaffected compared to ground-based control rats. These data indicate that there is a defect in interferon-gamma production in rats that have been exposed to spaceflight. This defect could contribute to, and be one reason for, immunosuppression observed after spaceflight. Author

A88-15344\* Wright State Univ., Dayton, Ohio.

**BUSPIRONE BLOCKS MOTION SICKNESS AND XYLAZINE-INDUCED EMESIS IN THE CAT**

JAMES B. LUCOT and GEORGE H. CRAMPTON (Wright State University, Dayton, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Oct. 1987, p. 989-991. refs  
(Contract NCC2-220)

The ability of buspirone to prevent motion sickness and the mechanism of the buspirone action were tested in cats pretreated (s.c. injection) by buspirone 30 min before being subjected to motion stimulus (in a device described by Crampton and Lucot, 1985) or to an injection of an emetic drug xylazine (using only cats susceptible to motion sickness or to xylazine, respectively). Buspirone treatment was found to block motion sickness with an effective dose-50 of 0.46 mg/kg. Buspirone pretreatment (with 4.0 mg/kg) has also significantly blocked vomiting in cats later injected with 0.66 mg/kg xylazine. The results indicate that buspirone is acting at the vomiting center, the point of convergence for the separate mechanisms subserving chemically-induced emesis and motion sickness. I.S.

A88-15345

**DECOMPRESSION AND OCCURRENCE OF CATARACT IN ENUCLEATED EYES OF EXPERIMENTAL ANIMALS**

H. S. FANG and H. M. CHEN (National Taiwan University, Taipei, Republic of China) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Oct. 1987, p. 992-995. Sponsorship: National Science Council of the Republic of China. refs  
(Contract NSC-73-0412-B0002-10)

Chamber flight at a simulated altitude of 58,000 ft (17,680 m) or more caused marked lens opacities in enucleated eyes of the experimental animals. After descent to ground level, the opacity could subsequently be regressed despite complete deprivation of blood supply to the eye. The present finding suggests that decompression might play an important role in inducing such a cataract. Author

**A88-15346\*** Louisville Univ., Ky.  
**DISUSE ATROPHY, PLASMA CORTICOSTERONE, AND MUSCLE GLUCOCORTICOID RECEPTOR LEVELS**

J. M. STEFFEN and X. J. MUSACCHIA (Louisville, University, KY) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Oct. 1987, p. 996-1000. refs  
(Contract NSG-2325; NAGW-70)

The effect of whole-body suspension on the time course and the extent of plasma corticosterone changes and the tissue sensitivity to glucocorticoids were investigated in rats subjected to seven days of whole-body suspension. Plasma corticosterone increased significantly on the first and the third days of suspension, but returned to control levels by day seven. Muscle glucocorticoid receptors exhibited a characteristic hormonal specificity (evaluated in competitive-displacement experiments). In controls, receptor site concentration in the slow-twitch soleus was comparable to that in the fast-twitch gastrocnemius and plantaris, but was significantly less than in the extensor; seven days of suspension resulted in significant differential effects on muscle receptor levels. The largest increase in receptor concentration was observed in the soleus in which it remained elevated after the receptor levels in other muscles returned to normal. I.S.

**A88-15696****TRIPHENYLDIOXANE - A NEW POWERFUL INDUCER OF CYTOCHROME P-450 [TRIFENILDIOKSAN - NOVYI MOSHCHNYI INDUKTOR TSITOKHROMA P-450]**

V. V. CHISTIYAKOV and L. N. POSPELOVA (AN SSSR, Institut Prikladnoi Molekuliarnoi Biologii, Moscow, USSR) Akademii Nauk SSSR, Doklady (ISSN 0002-3264), vol. 296, no. 2, 1987, p. 496-499. In Russian. refs

The following compounds were tested for their ability to induce the synthesis of cytochrome-450 in liver microsomes of the rat: trans-stilbene oxide; 1,2-naphthylloxirane; 2,6-diphenylpyridine, 2,5-diphenyltetrahydrofuran; 2,6-diphenylpiperidine; 2,4,5,6-tetraphenyldioxane-1,3; 2,4-diphenyldioxane-1,3; and 2,4,6-triphenyldioxane-1,3. The contents of the cytochrome-450 were determined 3 days after injection. Among the tested compounds, only 2,4,6-triphenyldioxane-1,3 (TPD) displayed significant induction activity. An injection of 10 mg/kg of cis-TPD increased cytochrome-P-450 concentration in rat liver by 90 percent; neither diphenyl nor tetraphenyl derivatives had a significant effect, and the trans-TPD was much less active. The TPD was only active in rats (Wistar and Fisher lines), but not in mice of DBA/2 and C57BL lines, indicating that TPD has a structural similarity with the receptor regulating the synthesis of cytochrome P-450 in rats, but not in mice. I.S.

**A88-16153#****INSULIN RECEPTORS AND ENZYME ACTIVITIES IN LIVER OF RATS AFTER SPACE FLIGHT ON BIOSATELLITE COSMOS 1667**

L. MACHO, S. NEMETH, E. SVABOVA, M. FICKOVA, S. ZORAD (Slovenska Akademia Vied, Ustav Experimentalnej Endokrinologie, Bratislava, Czechoslovakia) et al. IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 5 p. refs (IAF PAPER 87-530)

An investigation of insulin plasma levels, insulin binding to receptors, and enzyme activity of liver aminoacid metabolism in rats exposed to space flight for seven days aboard COSMOS 1667 is presented. Significant increases in the activity of tyrosine aminotransferase, tryptophan pyrrolase, alanine aminotransferase, and aspartate aminotransferase were noted following space flight. The present results show that increase of insulin plasma levels during flight was not followed by a decrease of insulin binding to receptors in the liver, and that the activity of enzymes involved in liver aminoacid metabolism increases due to short term space flight. R.R.

**A88-16162#****SUPPORT OF LIFE SCIENCE RESEARCH IN SPACE BY THE DFVLR MICROGRAVITY USER SUPPORT CENTER (MUSC)**

D. PADEKEN, M. SCHUBER, C. LINDBERG, G. REITZ, H. BUECKER (DFVLR, Institut fuer Flugmedizin, Cologne, Federal Republic of Germany) et al. IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 4 p. (IAF PAPER 87-544)

The activities being undertaken by DFVLR-MUSC to facilitate the planning and execution of space biomedical research are reviewed and illustrated with diagrams, drawings, and tables. Consideration is given to the experiments planned for the Exobiology and Radiation Assembly of Eureka-1; ground simulation of Anthracker physiology experiments for the second FRG Spacelab mission (D-2); and the Ariadne information system for the acquisition, processing, and dissemination of experimental data. T.K.

**A88-16173#****ULTRASTRUCTURE OF PEA MERISTEM AND ROOT CAP CELLS UNDER SPACE FLIGHT CONDITIONS**

K. M. SYTNIK, E. L. KORDIUM, N. A. BELIAVSKAIA, and A. G. PODLUTSKII (AN USSR, Institut Botaniki, Kiev, Ukrainian SSR) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 6 p. refs (IAF PAPER 87-558)

The effect of space flight conditions on the ultrastructure of pea meristem and root-cap cells was investigated using 7-day pea seedlings grown aboard the Salyut-6 station within the Oasis system. Electron microscopic observations detected essential changes in the plastid apparatus, mitochondria, and Golgi apparatus of root meristem and statenchyma cells; in these structures, the thickening and fusion of membranes were observed together with many electron-dense globules associated with membranes. The results of the treatment of ultrathin seedling sections with EDTA and EGTA and with proteolytic and phospholytic enzymes indicated that the electron-dense globules were binding sites, containing proteins, phospholipids, and Ca(2+) ions. The observed superlocalization of bound calcium suggests an increase of Ca concentration in these structures. The possible resources of this Ca are discussed. I.S.

**A88-16174#****PHYSICO-CHEMICAL AND BIOLOGICAL ASPECTS OF WEAK MAGNETIC FIELD EFFECTS ON PLANTS**

R. D. GOVORUN, V. I. DANILOV, and V. M. FOMICHEVA (Ob'edinnyi Institut Iadernykh Issledovaniy, Dubna, USSR; AN USSR, Institut Botaniki, Kiev, Ukrainian SSR) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 5 p. refs (IAF PAPER 87-560)

The effect of the weakening of the geomagnetic field on the growth and reproduction of plant cells was studied in root-meristem cells of the pea, flax, and lentil grown for 60-72 h under conditions of hypomagnetic field (produced by the use of magnetic screening devices). Geomagnetic screening was found to inhibit growth of all cells. Growth-cycle data, obtained on root cells exposed to tritiated thymidine, showed that the lengths of the presynthetic stage (G-1) of the meristem cells (but not of the mitotic, synthetic, and postsynthetic stages) increased significantly, with the result of a significant increase in the cell life-cycle length. The screening of the geomagnetic field also resulted in a considerable decrease in the numbers of proliferating (i.e., tritium-labeled) cells. The physical factors determining the interaction of magnetic field with biological structures are discussed. I.S.

A88-16175#

**GRAVITY EFFECTS ON MEMBRANE EQUILIBRIA**

A. SCHATZ, A. LINKE-HOMMES, and A. ZELLER (DFVLR, Institut fuer Flugmedizin, Cologne, Federal Republic of Germany) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 5 p. refs  
(IAF PAPER 87-561)

The paper considers the effect of gravity on the transport properties of membranous systems, applying the theory of concentration and potential variations at interfaces to the membrane-solution interface. Published results of model calculations for surface potentials were used to evaluate densities at the interfacial layer between the membrane and two electrolyte solutions, KCl and CaCl<sub>2</sub>. The results indicate that the fluid layer covering the membrane surface has higher density than the bulk fluid. Density differences of up to 0.04 g/cu cm for KCl and up to 0.1 g/cu cm for CaCl<sub>2</sub> solutions in a layer of about 1 nm thickness were found. It is suggested that the presence of density variations at the membrane-solution interface should be considered in the interpretation of the results from space-relevant experiments.

I.S.

A88-16178#

**EXPERIMENT ON STS 51-C - EFFECT OF WEIGHTLESSNESS ON THE MORPHOLOGY OF AGGREGATION OF HUMAN RED CELLS IN DISEASE**

L. DINTENFASS (Sydney, University; Rachel Forster Hospital, Redfern, Australia) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 9 p. Research supported by the Bushel Trust, CSIRO, Department of Science and Technology, et al. refs  
(IAF PAPER 87-563)

A space-rated automatic Slit-capillary Photo-Viscometer was placed on the middeck of Discovery STS 51-C, to study the effect of near zero g on the kinetics and morphology of aggregation of red cells obtained from patients with ischaemic heart disease, hyperlipidaemia, diabetes, cancer, etc. Aggregation was followed for 6 min during stasis by macro and microphotography, at a temperature of 25 C. Results show that aggregates are smaller under zero g than at 1 g; that morphology is drastically altered, and that aggregates formed at zero g show normal rouleaux formation although at 1 g the same samples show formation of compact clumps (sludges). Thus, it appears that zero g affects cell-cell interaction and probably the microstructure of the cell membrane. Author

A88-16179#

**BIOLOGY AND MICROGRAVITY**

DICK A. M. MESLAND (ESA, European Space Research and Technology Centre, Noordwijk, Netherlands) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 7 p. refs  
(IAF PAPER 87-564)

Results of the first flight of the ESA Biorack facility on the German Spacelab mission D1 in 1985 have revealed pronounced effects of microgravity on a cellular level. Here, an attempt is made to provide a framework for the interaction between gravity and biological organisms. A very generalized picture of an arbitrary biological organism is drawn, and three levels at which gravity could act on it (via genes, sensors, and directly) are examined. Experiments that could test some of the presumptions are suggested. V.L.

A88-16803

**FAUNAL COMPOSITION AND ORGANIC SURFACE ENCRUSTATIONS AT HYDROTHERMAL VENTS ON THE SOUTHERN JUAN DE FUCA RIDGE**

VERENA TUNNICLIFFE and A. R. FONTAINE (Victoria, University, Canada) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, Oct. 10, 1987, p. 11303-11314. Research supported by NSERC and Victoria University. refs

Examination of a small collection of macroinvertebrates from three vents of the southern Juan de Fuca vent field reveals

differences between the vents with respect to species composition, species habits, and microbial and metallic deposits on their surfaces. Two apparently new vestimentiferan species were found, and for the first time the Juan de Fuca palm worm was observed to dwell on smokers. High acidity values recorded in this system may interfere with the process of shell calcification in an archaeogastropod snail. The surfaces of vestimentiferan tubes at two vents are heavily encrusted with microbial and metallic accumulations. SEM, TEM and energy dispersive X-ray microanalysis observations show that iron-based crusts on orange tubes are built from accumulations of an Fe-rich particle of distinctive size and shape. Morphological evidence is presented for the microbial origin of Fe-rich particles. Zn-rich particles found on black tubes are not of microbial origin. Author

N88-12915# Joint Publications Research Service, Arlington, Va. JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES

5 Aug. 1987 103 p Transl. into ENGLISH from various Russian articles

(JPRS-ULS-87-009) Avail: NTIS HC A06/MF A01

Articles from the open literature are presented or summarized on the following topics: aerospace medicine, agricultural science, biochemistry, biotechnology, epidemiology, genetics, immunology, industrial medicine, laser bioeffects, medicine, microbiology, military medicine, nonionizing radiation effects, pharmacology and toxicology, physiology, public health, radiation biology, and virology. Recent research in the U.S.S.R. is the focus.

N88-12916# Joint Publications Research Service, Arlington, Va. CHANGE IN FUNCTIONAL ACTIVITY OF CORTICAL BRAIN STRUCTURES AND THEIR BLOOD SUPPLY IN ALERT RABBITS IN RESPONSE TO ROCKING

V. F. MAKSIMUK and N. A. SKOROMNYI In its JPRS Report: Science and Technology. USSR: Life Sciences p 1 5 Aug. 1987 Transl. into ENGLISH from Fiziologicheskii Zhurnal SSSR imeni I. M. Sechenova (Leningrad, USSR), v. 72, no. 7, Jul. 1986 p 881-887 Original language document was announced in IAA as A87-25198

Avail: NTIS HC A06/MF A01

Chronic experiments on alert rabbits studied the dynamics of changes in EEG, EMG, pulse rate, blood pressure, general and local circulation of the brain during rocking and its aftereffect to determine the peculiarities of individual reactions of the animals. Experiments were performed on 18 rabbits of both sexes with implanted platinum electrodes to record local blood flow by the hydrogen clearance method in several segments of the cerebral hemispheres. Steel subcutaneous electrodes in the cervical and subscapular areas were used to record EMG and EKG. The dynamics of changes in bioelectric activity of the various segments of the cerebral hemispheres, pulse rate, blood pressure, local and total brain blood flow and muscular tonus had features in common plus some specific features. One hour of rocking resulted in persistent changes in the status of all parameters studied, particularly the frequency components of the EEG. Local and total brain blood flow increased. EKG changes, bradycardia and hypotension were observed. Changes were greater in winter than in summer, indicating significant reserve capacity of the regulatory centers of the brain in summer. Author

**N88-12917#** Joint Publications Research Service, Arlington, Va.  
**STUDY OF CERTAIN BIOLOGICAL CHARACTERISTICS OF BACTERIA DURING THE FRENCH-SOVIET CYTOS-2 SPACE EXPERIMENT**

S. N. ZALOGUYEV, A. F. MOROZ, N. G. ANTSIFEROVA, L. I. GLATMAN, V. L. POPOV, V. K. ILYIN, F. M. KIRILLOVA, L. N. KATS. M. P. BRAGINA, and V. M. SHILOV *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 2 5 Aug. 1987 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i immunobiologii (Moscow, USSR), no. 8, Aug. 1985 p 3-7  
 Avail: NTIS HC A06/MF A01

The major purpose of the studies reported in this article was to determine the antibiotic sensitivity of opportunistic microorganisms among the autoflora of astronauts by in vitro cultivation in orbital flight. Experiments were performed on the Salyut-7 spacecraft during a visit by a French astronaut utilizing *S. aureus* and *E. coli* isolated from the astronaut before the flight. Antibiotic sensitivity of the microorganisms was determined by double serial dilution. *S. aureus* were tested with oxacillin, chloramphenicol and erythromycin, *E. coli* with kanamycin and colistin. The toxicity, immunogenicity and serotype membership of three strains of *Pseudomonas aeruginosa* were also determined. The antibiotic sensitivity of the microorganisms was found to be slightly higher under orbital conditions. Ultrastructural studies performed after the flight showed no significant morphologic changes in the *E. coli*, but some thickening of the cell walls, particularly in *S. aureus*. Characteristics of the *P. aeruginosa* were found to be stable and unaltered by space flight. Author

## 52

## AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

**A88-13162**

**MEDICAL ASPECTS OF ORBITAL SPACEFLIGHT AND THEIR IMPLICATIONS FOR MANUFACTURING IN SPACE**

GEORGE T. DELLI-SANTI (Zimmer, Inc., Warsaw, IN) IN: Advanced materials technology '87; Proceedings of the Thirty-second International SAMPE Symposium and Exhibition, Anaheim, CA, Apr. 6-9, 1987. Covina, CA, Society for the Advancement of Material and Process Engineering, 1987, p. 484-496. refs

A general review of the biomedical consequences of prolonged orbital spaceflight is presented. Data from Apollo, Skylab and Soviet space programs is used to describe a number of the physiologic changes associated with adaptation to a microgravity environment. The author concludes by speculating on how these medical aspects may influence the design and development of orbital manufacturing facilities. Author

**A88-13377**

**LIMB FLAIL INJURIES IN USAF EJECTIONS - 1979-1985**

RUDOLPH C. DELGADO (USAF, Inspection and Safety Center, Norton AFB, CA) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 1-3.

USAF ejection experience from January, 1978 through December, 1985 was analyzed for evidence of limb flail trauma caused by windblast during ejection. An effort was made to use the same criteria as Belk (1978). This analysis yielded 15 cases of significant limb-flail trauma. These cases are presented by aircraft type, seat type, airspeed, and probability of occurrence. Author

**A88-13379**

**SIMULATION OF A HIGHLY DYNAMIC G-TIME PROFILE - A PREDICTIVE ALGORITHM FOR CREW CUMBER ACCELERATION TOLERANCE**

MARK I. DARRAH and EDWARD A. KLEIN (McDonnell Douglas Corp., Saint Louis, MO) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 15-20.

An empirical model has been developed to predict air crew tolerance to dynamic G-time exposure. The resultant algorithm accurately predicts the onset of visual symptoms and loss of consciousness (LOC) based on human centrifuge data published in the literature. The model has been incorporated into the simulator to control cockpit and dome lights and provide positive feedback to simulator pilots on their G-endurance. The model provides a necessary link for the crew incapacitation decision algorithm for an aircraft G-LOC autorecovery system. C.D.

**A88-13387**

**DYNAMIC RESPONSE OF THE HUMAN HEAD TO +G(X) IMPACT**

MARK D. SALERNO, JAMES W. BRINKLEY, and MARY ANN ORZECH (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 74-79. refs

A test program to measure the dynamic response of the head during whole-body impact exposures in volunteer subjects is reported. A vertical impact tower was used to produce half-sine waveforms, +G(x) acceleration-time profiles with amplitudes up to 45 G, velocity changes up to 15.5 ft/sec, and rise times from 1 to 23 msec for 79 experimental-level tests performed under nine different impact conditions. The results support, at a greater than 95 percent confidence level, rejection of the null hypothesis that there is no difference in the dynamic response of the head as the acceleration rise time decreases. The results are in close agreement with the Maximum Strain Criterion Model. Data analysis of the dynamic response of the head demonstrated a natural frequency of 50 Hz. C.D.

**A88-13401\*** School of Aerospace Medicine, Brooks AFB, Tex.  
**DECOMPRESSION SICKNESS AND VENOUS GAS EMBOLI AT 8.3 PSIA**

KENNETH W. SMEAD, GENE A. DIXON, JAMES T. WEBB (USAF, School of Aerospace Medicine, Brooks AFB, TX), and ROBERT W. KRUTZ, JR. (Technology, Inc., Life Sciences Div., San Antonio, TX) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 196-199. refs  
 (Contract NASA ORDER T-82071)

This study sought to determine the bends risk on decompression from sea level to 8.3 psia. On the basis of several prior studies by NASA and the Air Force, this differential was expected to result in a minimal (about 5 percent) incidence of mild decompression sickness, and may be the pressure of choice for the next-generation NASA extravehicular activity (EVA) pressure suit. Thirty-one volunteer subjects, performing light work characteristic of EVA, were exposed to 8.3 psia pressure altitude for six hours. Limb bends incidence was 3.2 percent, and 25.8 percent of the subjects demonstrated significant intravascular bubbling. Those who bubbled were significantly older than the bubble-free group, but differed in no other aspect. An 8.3 psia advanced pressure suit design was considered insufficient to totally preclude the risk of decompression sickness. Author

A88-13411

**MENTAL AND PHYSICAL PERFORMANCE AT CORE TEMPERATURES AS LOW AS 31.2 C**

G. G. GIESBRECHT and G. K. BRISTOW (Manitoba, University, Winnipeg, Canada) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 270-275. refs

It has been stated that voluntary muscular activity is lost at 34.4 C core temperature (Tc). Mental and physical tests were performed by six fit healthy subjects cooled in stirred water (8 C) to Tc as low as 32.0 C. Grip strength, speed of movement and manual movement (dexterity) indicated physical ability while reaction time indicated mental performance. Subjects also endeavored to exercise on a treadmill (above 1.0 km/hr) upon removal from the cold insult. Physical performance deteriorated upon initial cold exposure prior to fall in Tc. A subsequent rapid decrease in performance occurred as Tc fell to 35 C. A further but slower decrease in performance continued to occur to Tc as low as 32.5 C. Reaction time performance did not decrease until Tc dropped below 34 C. All could walk on a treadmill with lowest Tc ranging from 31.2 C to 33 C (after-drop inclusive). Results show that physical abilities decrease at a much faster rate than mental ability with falling Tc. Voluntary muscular activity was possible at Tc lower than 34.4 C. Author

A88-13696

**THE SIGNIFICANCE OF THE PHASE MISMATCH OF SENSORY SIGNALS IN MECHANISMS OF MOTION-SICKNESS DEVELOPMENT [ZNACHENIE FAZOVOGO RASSOGLASOVANIYA SENSORNYKH SIGNALOV V MEKHAZIMAKH RAZVITIYA UKACHIVANIYA]**

O. A. VOROB'EV Akademiya Nauk SSSR, Izvestiya, Seriya Biologicheskaya (ISSN 0002-3329), Sept.-Oct. 1987, p. 753-761. In Russian. refs

Using previously obtained data, the features of the coordinated stimulation of the vestibular and the extralabyrinth systems which induce the development of motion sickness are analyzed. A hypothesis according to which human motion-sickness is mostly determined by the level of phase mismatch of signals from various sensory analyzers is substantiated. Accordingly, the motion sickness is believed to arise as a result of the appearance of 'spatial' excitation in the central nervous system, involving higher vegetative centers. I.S.

A88-14726

**FLUCTUATION LIMITS OF THE ACID-BASE STATUS AND OF THE GAS CONTENT OF BLOOD IN HEALTHY UNTRAINED MEN PERFORMING STANDARD PHYSICAL EXERCISE [GRANITSY KOLEBANIY KISLOTNO-OSNOVNOGO SOSTOYANIYA I GAZOVOGO SOSTAVA KROVI PRI STANDARTNYKH FIZICHESKIKH NAGRUZKAKH U ZDOROVYKH NETRENIROVANNYKH MUZHCHIN]**

T. A. KHANLAROVA and R. S. VINITSKAIA (Nauchno-Issledovatel'skii Institut Grazhdanskoi Aviatsii, Moscow, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 13, July-Aug. 1987, p. 611-615. In Russian. refs

A88-14727

**THE DYNAMICS OF THE LIPID METABOLISM AND HORMONAL BACKGROUND DURING ADAPTATION TO LONG-TERM PSYCHOEMOTIONAL AND PHYSICAL LOADS [DINAMIKA LIPIDNOGO OBMENA I GORMONAL'NYI FON V PROTSESSE ADAPTATSII K DLITEL'NYM PSIKHOEMOTSIONAL'NYM I FIZICHESKIM NAGRUZKAM]**

S. D. POLOZHENTSEV, D. A. RUDNEV, and A. V. KUVSHINNIKOV (Voenno-Meditsinskaya Akademiya, Leningrad, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 13, July-Aug. 1987, p. 616-620. In Russian. refs

The effects of psychoemotional stress (such as separation from the family, changes in the daily routine, and/or changes in the occupational environment) and physical load (such as physical work or intensive physical training) on the changes in lipid metabolism and in hormonal status were investigated in healthy

men living under otherwise identical circumstances. The concentrations of adrenaline and noradrenaline in urine, and the indices of lipid metabolism (total cholesterol, triglycerides, lipid hydroperoxides, and the cholesterol contents of low- and high-density lipoproteins) were measured in stressed and control subjects during two periods: the initial 20 days after the start of stress and the period between the 35th and 50th day. A long-lasting hormonal disbalance was recorded in subjects under psychoemotional stress, causing distortions of lipid metabolism. Such abnormalities can potentially cause the thinning of arterial walls and the formation of lipoprotein deposits in the arterial walls. I.S.

A88-14728

**REGULATION OF THE HEMODYNAMICS DURING THE SIMULATION OF WEIGHTLESSNESS (MATHEMATICAL MODELING) [REGULIATSIIA GEMODINAMIKI PRI IMITATSII PEREKHODA K NEVESOMOSTI /MATEMATICHESKOE MODELIROVANIIE/]**

B. L. PALETS, A. A. POPOV, M. A. TIKHONOV, and V. S. PANCHENKO (AN USSR, Institut Kibernetiki, Kiev, Ukrainian SSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 13, July-Aug. 1987, p. 627-632. In Russian. refs

A mathematical model of human circulation dynamics, based on the model of Palets et al. (1985), was used to study rapid responses of the cardiovascular system to the onset of weightlessness. The model was also used to study the effects on circulation of some weightlessness-counteracting methods, such as hypovolemia, lower-body negative pressure (LBNP), and hip cuffs. The analytical results show that upon the onset of weightlessness the right heart ventricle, due to the blood-volume overload, starts to function in a 'plateau' range of the accretion function. Hypovolemia, LBNP, and occlusion cuffs all function to decrease the volume load of the right ventricle. Among the counter-weightlessness methods, the LBNP is the most effective. I.S.

A88-14729

**ACCLIMATIZED DEFICIT OF IRON [AKKLIMATIZATSIONNYI DEFITSIT ZHELEZA]**

A. G. MARACHEV and A. A. ZHAVORONKOV (AMN SSSR, Institut Morfologii Cheloveka, Moscow, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 13, July-Aug. 1987, p. 640-646. In Russian. refs

The effect of geographical conditions on the effect of the iron deficit (FeD) was studied in male subjects residing in different geographical regions. The indices of erythropoiesis, Fe metabolism, and bioenergetics, as well as the morphological and functional characteristics of erythrocytes, were determined in residents of Moscow, Archangelsk, and several cities in northern Asia. The results indicated that the dynamic equilibrium of hemoglobin and erythrocyte numbers is maintained by the equilibrium between erythropoiesis and erythrocyte breakdown. Chronic exposure to cold leads to shifts in the Fe/transferrin/erythron equilibrium, causing FeD. The acclimatization to FeD state leads to an insufficiency of essential microelements which in turn can cause breakdown of erythropoietic processes, the onset of FeD-anemia, and the lowering of immunity. I.S.

A88-14730

**PHYSIOLOGICAL MECHANISMS OF THERMOREGULATION IN HUMANS DURING ADAPTATION TO COLD [O FIZIOLOGICHESKIKH MEKHAZIMAKH TERMOREGULIATSII CHELOVEKA PRI ADAPTATSII K KHOLODU]**

V. I. SOBOLEV and G. I. CHIRVA (Donetskii Gosudarstvennyi Universitet, Donetsk, Ukrainian SSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 13, July-Aug. 1987, p. 647-652. In Russian. refs

Male subjects were adapted to cold by being exposed (2 h daily for 24 days) to 14 C in a climatic chamber, and changes in their tympanic and skin temperatures and respiratory coefficient, as well as the values of the indices of muscle contractile activity and thermogenesis, were measured at different stages of

adaptation. The exposures to cold were found to initiate the development of physiological thermoregulatory processes characteristic of adaptation. Thus, the 'engagement' of processes responsible for thermogenesis was detected in the subjects much sooner at the end of 24 days than in the same subjects at the beginning of the experiment. In the cold-adapted subjects, cold-induced shivering became more effective than in the control state: heat production per one unit of muscle contraction increased by a factor of 5, and the energy expenditure of homiothermy fell by 70 percent. I.S.

**A88-14731**

**THE ROLE OF THE INDIVIDUAL CHARACTERISTICS OF VEGETATIVE REACTIONS DURING THE ACTION OF ADAPTOGENS ON PHYSICAL AND MENTAL WORK CAPACITY [ROL' INDIVIDUAL'NYKH OSOBENNSTEI VEGETATIVNYKH REAKTSII PRI DEISTVII ADAPTOGENOV NA FIZICHESKUIU I UMSTVENNIU RABOTOSPOSOBNOST']**

T. I. SHUSTOVA, F. V. OS'MININ, V. A. NIBUSH, A. F. ERSHOV, and A. P. PISANKO (Tomskii Gosudarstvennyi Universitet, Tomsk, USSR) *Fiziologiya Cheloveka* (ISSN 0131-1646), vol. 13, July-Aug. 1987, p. 696-698. In Russian.

The effect of an adaptogen (Eleuterococcus extract) on physical and mental work capacity was investigated in subjects with different types of vegetative reactions. Two-hundred healthy men were separated according to the reaction of pulse rate to various functional tests into three groups: sympatotonics, normotonics, and parasympatotonics. Results on changes in work capacity showed that the adaptogenic effect of the extract was enhanced by physical training. The effect of a given dose depended on the individual type of the subject. Subjects of the parasympatic type of reaction displayed the highest stimulating effect on the work capacity. I.S.

**A88-14744**

**PHYSIOLOGICAL CHARACTERISTICS OF ADAPTATION PROCESSES PRECEDING ACTIVITY CONDITIONS [FIZIOLOGICHESKIE ZAKONOMERNOSTI ADAPTATSIONNYKH PROTSESSOV, OPEREZHAIUSHCHIKH USLOVIA DEIATEL'NOSTI]**

A. M. URAZAEV, IU. A. KULAKOV, and M. A. MEDVEDEV (AN SSSR; Tomskii Gosudarstvennyi Meditsinskii Institut, Tomsk, USSR) *Akademiia Nauk SSSR, Doklady* (ISSN 0002-3264), vol. 295, no. 6, 1987, p. 1509-1512. In Russian. refs

Research was performed to investigate the adaptive-regulatory adjustments of human physiological functions preceding periodic intense muscular activity at low air temperatures and in the case of the desynchronization of the circadian rhythms of functionally conjugate systems. Data on 78 healthy industrial workers occupied with intense physical work in the open air were used in the study. It is shown that differences in the training of the muscular system which limit the work capacity of the subjects are the internal determinants of their functional states, preceding the combined action of different types of factors. B.J.

**A88-15338**

**RECURRENT +GZ-INDUCED LOSS OF CONSCIOUSNESS**

JAMES E. WHINNERY and DAVID R. JONES (USAF, School of Aerospace Medicine, Brooks AFB, TX) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 58, Oct. 1987, p. 943-947. refs

The psychological and emotional reactions to recurrent +Gz-induced loss of consciousness (LOC) episodes occurring over a period of about 15 min were analyzed in four individuals on the basis of detailed psychiatric interrogation. Major psychological reactions following G-induced LOC include confusion, anxiety, disorientation, suppression of G-LOC recognition, unreliability, altered judgment, embarrassment, dissociation, euphoria, fear, antagonism, and a 'give-up' attitude. The specific psychologic factors that characterize the different phases of recovery from G-LOC are discussed. I.S.

**A88-15339**

**COMPARATIVE ASSESSMENT OF VESTIBULAR, OPTOKINETIC, AND OPTOVESTIBULAR STIMULATION IN THE DEVELOPMENT OF EXPERIMENTAL MOTION SICKNESS**

EDUARD I. MATSNEV, MIKHAIL P. KUZ'MIN, and LIUDMILA N. ZAKHAROVA (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 58, Oct. 1987, p. 954-957. refs

The contribution of vestibular, optokinetic, and optovestibular stimulation to experimental motion sickness was evaluated in 29 volunteer subjects. Vestibular stimulation (Coriolis effect) was found to induce the most significant vestibular-autonomic disorders. Optokinetic stimulation (pseudo-Coriolis effect) and optovestibular stimulation could provoke such disorders only in susceptible subjects. In quantitative terms, optokinetic and optovestibular stimulation were less effective than vestibular Coriolis stress. Nystagmic reactions of susceptible subjects to the three types of stimulation differed significantly from those of tolerant subjects. This may be important from the theoretical point of view because susceptibility to motion sickness and responses to vestibular and optokinetic stimulation may be universal and associated with the general CNS mechanism, i.e., inhibition mechanism. The identified correlation between the duration of postoptokinetic illusion and motion sickness susceptibility may be used to differentiate susceptible and tolerant subjects. Author

**A88-15347**

**APICAL HYPERTROPHIC NONOBSTRUCTIVE CARDIOMYOPATHY IN A PILOT**

J. M. NEUTEL and D. P. MYBURGH (Institute for Aviation Medicine, Verwoerdburg, Republic of South Africa) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 58, Oct. 1987, p. 1005-1008. refs

Apical hypertrophic cardiomyopathy is a form of nonobstructive hypertrophic cardiomyopathy characterized by disproportionate hypertrophy of the left ventricular apical region; this condition is certain to be diagnosed amongst airmen. The question of flying status in these pilots may create a problem for the flight surgeon. This paper presents a pilot with clinical and morphological features typical of apical hypertrophic cardiomyopathy who has remained asymptomatic over a 15-year follow-up period. There appears to be a spectrum of severity in apical hypertrophic cardiomyopathy ranging from mild to severe. Those having the mild form of the disease may be considered for restricted licensing subject to having a normal exercise test and no significant arrhythmias on 24-h ambulatory electrocardiogram. If licensed, review by a cardiologist should be required every six months. Author

**A88-15349\*** National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

**CONSIDERATIONS IN PRESCRIBING PREFLIGHT AEROBIC EXERCISE FOR ASTRONAUTS**

MARY ANNE BASSETT FREY (NASA, Kennedy Space Center; Bionetics Corp., Cocoa Beach, FL) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 58, Oct. 1987, p. 1014-1023. refs

The physiological effects of prolonged exposure to weightlessness are discussed together with the effects of aerobic exercise on human characteristics affected by weightlessness. It is noted that, although early data on orthostatic intolerance after spaceflight led to a belief that a high level of aerobic fitness for astronauts was detrimental to orthostatic tolerance on return to earth, most of the data available today do not support this contention. Aerobic fitness was found to be beneficial to cardiovascular function and to mental performance; therefore, it may be important in performing extravehicular activities during flight. I.S.

A88-15350

**G-TOLERANCE STANDARDS FOR AIRCREW TRAINING AND SELECTION**

KENT K. GILLINGHAM (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Oct. 1987, p. 1024-1026. refs

Gravity tolerance ranges from +2.2 Gz to +7 Gz for unprotected young males and also varies within individuals from day to day. Inability to tolerate a 7-G 15-s rapid-onset G profile without totally losing peripheral vision or losing consciousness is the basis for internationally recognized (NATO, ASCC, and USAF) definitions of low G tolerance. The rationale for choosing this standard is discussed. Experience with the use of this standard, and the equivalent standard of 8 G for 15 s when the F-16-configured seat is used, reveals that fewer than 1 percent of actively flying aircrew are unable to meet the standard. Adaptation of a formal, more stringent, G tolerance standard (e.g., 10 G for 15 s, with anti-G suit and straining maneuver in an ATF-configured centrifuge seat) is urged for selecting and training aircrew for high-performance fighter aircraft. I.S.

A88-15650

**RESULTS OF MEDICAL INVESTIGATIONS CONDUCTED ABOARD THE 'SALYUT-6'-'SOYUZ' ORBITAL RESEARCH COMPLEX [REZUL'TATY MEDITSINSKIKH ISSLEDOVANIY VYPOLNENNYKH NA ORBITAL'NOM NAUCHNO-ISSLEDOVATEL'SKOM KOMPLEKSE 'SALIUT-6' - 'SOIUZ']**

N. N. GUROVSKII, ED. Moscow, Izdatel'stvo Nauka, 1986, 400 p. In Russian. No individual items are abstracted in this volume.

The results of medical tests investigating the health status of the Salyut-6-Soyuz spacecrew during the flight and after landing are presented. Consideration is given to changes found in various physiological systems, metabolic processes, sensor system functions, intestinal microflora, psychological status, and work capacity. The conditions of the space-station cabin, such as the atmosphere, microclimate, water supply, and chemical and microbial contamination, are discussed together with measures suggested to alleviate unfavorable effects of space flight and cosmic rays. Special attention is given to the Intercosmos program, developed to coordinate the space-flight-related experiments planned by the participating country members. The program's activities in the areas of radiation safety, the selection and training of cosmonauts, the development of the instruments for the evaluation of cosmonaut physiological and psychological reactions are discussed together with the results of these investigations during multinational flights. I.S.

A88-15655

**HUMAN ADAPTATION AND CONSTITUTION [ADAPTATSIYA I KONSTITUTSIYA CHELOVEKA]**

VLAIL' PETROVICH KAZNACHEEV and SERGEI VLAIL'EVICH KAZNACHEEV Novosibirsk, Izdatel'stvo Nauka, 1986, 120 p. In Russian. refs

This monograph discusses the division of human beings into one of the major body-constitution types, I and II, and the differences in physiological and metabolic reactions exhibited by the two constitutional types upon being subjected to physical loads, climatic extremes, and unfavorable living conditions. Special attention is given to the tests to be used for classifying the two constitutional types on the basis of the subjects' reactions to experimental loads: the respiration rate changes, hand strength, the ergographically measured work capacity, and the maximal oxygen consumption during work. It is also shown that groups I and II exhibit significant differences with respect to adaptability to unfavorable conditions of work and/or living and with respect to susceptibility to several diseases, such as peptic ulcer and bronchial pneumonia, as well as to the course of these ailments. I.S.

A88-16150#

**MAN IN SPACE FLIGHT**

O. G. GAZENKO, E. B. SHUL'ZHENKO, A. I. GRIGOR'EV, and A. D. EGOROV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. refs (IAF PAPER 87-527)

Physiological changes that occur in man during spaceflight are examined. The mechanisms which cause these main physiological changes, such as a change in the afferent load, the elimination of hydrostatic pressure, and the lack of weight load on the musculoskeletal system, are discussed, and methods for countering these mechanisms are described. Changes in man's vestibular functions, motor system, fluid-electrolyte metabolism, cardiovascular system, calcium metabolism, circulatory system, and immunology system during spaceflight are considered. I.F.

A88-16152#

**A NEUROPHARMACOLOGICAL APPROACH TO SPACE MOTION SICKNESS**

ANTONIO GUELL (CNES, Toulouse, France) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 6 p. refs (IAF PAPER 87-529)

Laboratory data from provocative tests employing a rotating chair were used to investigate the role of the dopaminergic system in the physiopathogenesis of space motion sickness (SMS). Administration of 100 mg of a benzamide derivative (O-methoxy-p-amino benzamide) was found to partly or wholly prevent any occurrence of the symptoms related to the sensory conflict produced by chair rotation, supporting the involvement of the dopaminergic system in the pathogenesis of SMS. The impact of the present data on three hypotheses concerning the mechanisms governing SMS (the neurosensory conflict hypothesis, the hemodynamic hypothesis, and the digestive hypothesis) is considered. R.R.

A88-16154\*# National Aeronautics and Space Administration, Washington, D.C.

**INFLIGHT COMBINED VERTICAL AND LATERAL SPACE VEHICULAR ACCELERATIONS - HUMAN TOLERANCES**

S. R. MOHLER, A. E. T. NICOGOSSIAN, P. D. MCCORMACK, and S. R. MOHLER, JR. (NASA, Washington, DC; Wright State University, Dayton, OH) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 17 p. refs (IAF PAPER 87-531)

Human tolerance studies related to inflight rolling (tumbling) accelerations are discussed, with emphasis on the need to provide data on combinations of Gy, as experienced during an anomalous roll aboard Gemini VIII during which upper body (-) Gz forces and lower body (+) Gz forces were experienced. The study also points to the need to provide data on tolerances to (+) or (-) Gy combined with (-) Gz, in addition to the lowered tolerances to Gy and Gz accelerations experienced by those adapted to microgravity. It is noted that such data can be used to establish limits on spacecraft acceleration maneuvering specifications. R.R.

A88-16155#

**HEAT DISSIPATION UNDER LOWER BODY NEGATIVE PRESSURE STRESS**

F. BAISCH and P. SMART (DFVLR, Institut fuer Flugmedizin, Cologne, Federal Republic of Germany) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 7 p. refs (IAF PAPER 87-532)

In the course of lower body negative pressure differential (LBNPD) development the question arose whether a temperature stimulus has an adverse effect on the test subject. This report summarizes the results of eight tests carried out with five different test subjects. The tests show that skin temperature in the areas inside the LBNPD varies only slightly with an increase in surrounding air temperature. The results also indicate that moderate values of airflow through the LBNPD perform the double task of noticeably



## 52 AEROSPACE MEDICINE

decreasing the box temperature while at the same time keeping relative humidity well within comfort condition levels. It may therefore be concluded that an additional temperature stimulus need not be considered. Author

**A88-16159#**

### **BIOMEDICAL PAYLOAD OF THE FRENCH-SOVIET LONG DURATION FLIGHT**

L. BRAAK, J. THOULOUSE, A. CHAPPE, D. VASSAUX (CNES, Toulouse, France), A. I. GRIGOR'EV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) et al. IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 4 p. (IAF PAPER 87-541)

The French-Soviet long-duration flight, planned for the second half of 1988, is expected to have a duration of 30 days. The mission payload will include the study of the cardiovascular system, the study of sensori-motor interactions, and radioprotection. Hemodynamic data will be collected using a new version of Echograph which makes it possible to obtain imagery of all organs and blood vessels accessible to clinical echography. The Physalie experiment will permit a better understanding of the effects of lack of gravity on the components of the central nervous system and their interaction both in the fast and longer term phases of adaptation. K.K.

**A88-16177\*#** Harvard Univ., Boston, Mass.

### **HUMAN BLOOD PLATELETS AT MICROGRAVITY**

D. MACN. SURGENOR, D. AUSPRUNK, D. BLEVINS, F. C. CHAO, W. CURBY (Harvard University; Lahey Clinic, Boston, MA; Massachusetts, University, Worcester) et al. IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 5 p. refs (Contract NAS9-17222) (IAF PAPER 87-562)

A set of freshly collected and separated human platelet suspensions were transported, in three types of plastic containers, on a 6 day, 2 hr mission of the orbiter Columbia to study the effect of prolonged exposure of human blood cells to microgravity. A controlled environment at a temperature of 22 + or - 1 deg with air flow was provided and another set of samples held on the ground acted as controls. Paired comparisons of platelets at ug versus controls at 1g revealed superior platelet survival at microgravity. When viewed in terms of plastic type, ug platelets in containers fabricated from PVC-TOTM displayed the best overall postflight viability. K.K.

**A88-16377**

### **WINGS AND SERPENTS**

HARRY HOPKINS Flight International (ISSN 0015-3710), vol. 132, Oct. 17, 1987, p. 34-36.

The activities of the RAF Institute of Aviation Medicine are surveyed. The history of the Institute is reviewed; the increased centrifuge-training requirements of advanced aircraft such as the Experimental Fighter Aircraft are discussed; and research on the effects of the cockpit temperature on crew performance, onboard oxygen systems, cockpit routines and workloads, sleep cycles, pilot clothing, and vibration problems is summarized. Extensive photographs are provided. T.K.

**A88-16750#**

### **RADIATION HAZARDS IN SPACE**

REIN SILBERBERG, CHEN H. TSAO, JAMES H. ADAMS, JR. (U.S. Navy, Naval Research Laboratory, Washington, DC), and JOHN R. LETAW (Severn Communications Corp., Severna Park, MD) Aerospace America (ISSN 0740-722X), vol. 25, Oct. 1987, p. 38-41.

Three basic types of radiation are of concern in manned space missions: galactic cosmic rays, solar flare particles, and trapped Van Allen radiation. Radiobiologists have observed that the same degree of biological damage can be inflicted at a lower dose by more highly ionizing types of radiation, such as cosmic rays, which are not only the most energetic but possess the highest fraction

of such highly ionizing heavy nuclei as carbon, oxygen, neon, and iron. The radiation dose rate on a manned Mars mission is comparable to that of Apollo astronauts during a moon mission. O.C.

### **N88-12238# Joint Publications Research Service, Arlington, Va. JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES**

25 Sep. 1987 84 p Transl. into ENGLISH from various Russian articles

(JPRS-ULS-87-012) Avail: NTIS HC A05/MF A01

Topics addressed include: medicine; biochemistry; biotechnology; epidemiology; genetics; microbiology; laser materials; radiation biology; physiology; and public health.

### **N88-12239# Joint Publications Research Service, Arlington, Va. EYESIGHT TRAINER FOR PILOTS**

YE. KUZNETSOV In its JPRS Report: Science and Technology. USSR: Life Sciences p 1-2 25 Sep. 1987 Transl. into ENGLISH from Izobretatel i Ratsionalizator (Moscow, USSR), no. 12, Dec. 1986 p 22

Avail: NTIS HC A05/MF A01

It was established that a pilot has his own optimum level of brightness at which his eyesight is keenest. Any decrease or increase from the optimum level leads to a decrease in visual acuity. Varying techniques were developed, including those requiring the use of special ophthalmological instruments. One of these methods is briefly examined. B.G.

**N88-12240#** Ryan Research International, Chico, Calif.

### **HEALTH HAZARDS OF VIDEO DISPLAY TERMINALS. A COMPREHENSIVE, ANNOTATED BIBLIOGRAPHY ON A CRITICAL ISSUE OF WORKPLACE HEALTH AND SAFETY WITH SOURCES FOR OBTAINING ITEMS AND LIST OF TERMINAL SUPPLIERS**

META NISSLEY, Comp. 1987 67 p

(RSI-IAS-4; LC-87-90423; ISBN-0-942158-04-0) Avail: NTIS HC A04/MF A01

A bibliography is presented on health hazards of video display terminals. The comprehensive and annotated bibliography is about critical issues of workplace health and safety. Increasing attention is paid to the overall workplace health and comfort of the steadily growing number of video terminal users, and ergonomics is now a central theme in industrial health and safety. Arrangement of items is by title. A name index is also provided for access by author or researcher. E.R.

**N88-12241#** Brookhaven National Lab., Upton, N. Y.

### **DNA DAMAGE AND REPAIR IN HUMAN SKIN IN SITU**

B. M. SUTHERLAND, R. W. GANGE (Harvard Medical School, Boston, Mass.), S. E. FREEMAN, and J. C. SUTHERLAND 1987 12 p Presented at the International Conference on DNA Damage and Repair, Rome, Italy, 12 Jul. 1987 Prepared in cooperation with Harvard Medical School, Boston, MA.

(Contract DE-AC02-76CH-00016)

(DE87-014288; BNL-40073; CONF-8707103-1) Avail: NTIS HC A02

Understanding the molecular and cellular origins of sunlight-induced skin cancers in man requires knowledge of the damages inflicted on human skin during sunlight exposure, as well as the ability of cells in skin to repair or circumvent such damage. Although repair has been studied extensively in prokaryotic and eucaryotic cells - including human cells in culture - there are important differences between repair by human skin cells in culture and human skin in situ: quantitative differences in rates of repair, as well as qualitative differences, including the presence or absence of repair mechanisms. Quantitation of DNA damage and repair in human skin required the development of new approaches for measuring damage at low levels in nanogram quantities of non-radioactive DNA. The method allows for analysis of multiple samples and the resulting data should be related to behavior of the DNA molecules by analytic expressions. Furthermore, it should be possible to assay a variety of lesions using the same



methodology. The development of new analysis methods, new technology, and new biochemical probes for the study of dna damage and repair are described. DOE

**N88-12242#** Naval Submarine Medical Research Lab., Groton, Conn.

**SUPEROXIDE DISMUTASE ASSAYS Interim Report**

HAROLD W. FISHER, A. A. MESSIER, E. HEYDER, and A. B. CALLAHAN 16 Jun. 1987 25 p  
(AD-A183972; NSMRL-M87-3) Avail: NTIS HC A03/MF A01 CSCL 06A

A number of studies support the idea that superoxide dismutase is one of the enzymes that modulates the threat of oxidative stress. This technical report presents detailed instructions for two methods presently being used at the Naval Submarine Medical Research Laboratory (NSMRL) to assay for superoxide dismutase. Both assays are of the indirect type consisting of two components: a superoxide generator and a superoxide detector. In the first method the generator produces the radical at a controlled rate, and in the absence of superoxide dismutase (SOD), the radical produced reacts with the detector. A unit of SOD then has been defined as that amount which will reduce the rate produced by the generator to 50% of its control value. The second method, which is about 100-fold more sensitive, takes advantage of the biphasic nature of the production of the radical and its dismutation both spontaneously and by SOD. By allowing the generator to react for a specific time period before addition of the detector, a burst of reduction is obtained followed by linear rate after the detector reaches a steady state. The height of this burst in the presence and absence of SOD thereby gives a sensitive assay for which the unit (50 percent of control burst) is in the picomolar range. These assays are useful in determining SOD in a variety of tissue types such as erythrocytes obtained from Navy divers or cell culture samples that have been exposed to oxidative stress. GRA

**N88-12243#** Naval Submarine Medical Research Lab., Groton, Conn.

**SCOTOPIC SENSITIVITY WITH 10 PERCENT OXYGEN Interim Report**

S. M. LURIA and DOUGLAS R. KNIGHT 9 Jul. 1987 17 p  
(AD-A183973; NSMRL-1097) Avail: NTIS HC A03/MF A01 CSCL 06E

The night vision (scotopic) sensitivity of 6 subjects was measured while they were breathing either air (21 percent oxygen, PO<sub>2</sub> 160 torr) or 10 percent oxygen, balance nitrogen (PO<sub>2</sub> 76 torr. Continuous monitoring showed that the mean oxygen content in the arterial blood (SaO<sub>2</sub>) dropped from 97 to 77 percent during the first seven minutes of breathing 10 percent oxygen, and there was a significant degradation of scotopic sensitivity. The reduced sensitivity was attributed solely to hypoxia with no contribution from hypocapnia. GRA

**N88-12244#** Washington Univ., St. Louis, Mo.

**STUDIES OF THE PROCESSING OF SINGLE WORDS USING POSITRON TOMOGRAPHIC MEASURES OF CEREBRAL BLOOD FLOW CHANGE**

STEVEN E. PETERSEN, PETER T. FOX, MICHAEL I. POSNER, and MARCUS RAICHLE 1987 53 p  
(Contract N00014-86-K-0289; RR0-4206)  
(AD-A184058; TR-87-7-ONR) Avail: NTIS HC A04/MF A01 CSCL 05H

Language is an essential characteristic of the human species, and as such has been a focal point for study in disciplines ranging from philosophy to neurology. Cognitive and neurological investigations of language often narrow the focus of study to the processing of individual words (lexical items). Lexical processing involves a network of several levels of internal coding that can be isolated by experiment. Examples of some of these separate codes include a visual image of the form of a spoken word (visual code), pronunciation of the word (phonological code) or the association of related words (semantic codes). Studies of the time course of activation of these internal codes of words and the roles they play in performance has been a central topic in the

cognitive psychology of reading and listening. Behavioral neurologists have been concerned as well with issues in lexical processing, but the focus has been in correlating the internal stages of processing with different brain regions. Recent advances in activation techniques and data analysis strategies using positron emission tomographic (PET) measurements of blood flow change have made it possible to address concerns relevant to both cognitive science and behavioral neurology. In this paper, we take advantage of these techniques to study words in normal subjects. GRA

**N88-12245#** Naval Postgraduate School, Monterey, Calif.

**ASSESSMENT OF FATIGUE IN AVIATION CREWS M.S. Thesis**

MARK L. HUTCHINS Jun. 1987 119 p  
(AD-A184129) Avail: NTIS HC A06/MF A01 CSCL 06J

This study investigated the relationship of Schonpflug's model of regulatory behavior and a questionnaire which was designed to assess behavioral change due to fatigue in aviation crew members. Data was gathered from three patrol aviation squadrons. Rotated factor analysis was used to determine designation of factors and their related questions. A paired sample t-test was utilized for the determination of change due to a one month period of flight operations. The two statistical tests were graphically combined and compared to Schonpflug's model of regulatory behavior. The psychological costs to benefits economics of Schonpflug's regulatory model were confirmed. Schonpflug's model was found to be an excellent evaluative tool when coupled with the questionnaire's statistical tests in determining non resolution of problems brought about by fatigue. GRA

**N88-12510#** Joint Publications Research Service, Arlington, Va.

**MOTION AND SPACE SICKNESS**

NAOKI ISU *In its* JPRS Report: Science and Technology. Japan p 28-30 24 Aug. 1987 Transl. into ENGLISH from Kogiken Nyusu (Tokyo, Japan), Nov. 1986 p 2-4  
Avail: NTIS HC A06/MF A01

An experiment was conducted using 65 cats under anesthesia. After insertion of electrodes, neurone activities were recorded from nuclei vestibulares. Four kinds of vestibular secondary neurones of the posterior semicircular duct system were found, serving in part to control the motor nerve of contralateral cervical muscles. The existence of these neurones is believed to have advantageous functions, coordinating movements of the eyeballs and the neck. J.P.B.

**N88-12525\*#** Naval Submarine Medical Research Lab., Groton, Conn.

**FIRE-RELATED MEDICAL SCIENCE**

DOUGLAS R. KNIGHT *In* NASA, Lewis Research Center, Spacecraft Fire Safety p 59-64 1987  
Avail: NTIS HC A07/MF A01 CSCL 22B

Spacecraft fire safety may be improved by the use of a fire-retardant atmosphere in occupied spaces. Low concentrations of oxygen can protect humans from fire damage by reducing the rate and spread of combustion, but care must be taken to avoid the hypoxic effects of oxygen-lean atmospheres. Crews can live and work in 11 percent oxygen if barometric pressure were adjusted to maintain the partial pressure of oxygen above 16 kPa. Eleven percent oxygen should prevent most types of fires, since 15 percent oxygen retards the combustion of paper and 13 percent oxygen extinguishes pentane flames. Test results indicate that seated humans can perform mental tasks in atmospheres containing 11.5 percent oxygen. Although this strategy of fire safety is under consideration for submarines, it could be adapted to spacecraft once operational procedures define a maximum hyperbaric pressure and fire research defines the effects of reduced oxygen concentrations on combustion in low gravity environments.

Author

## 52 AEROSPACE MEDICINE

**N88-12918#** Los Alamos National Lab., N. Mex.  
**LATENCY DIFFERENCES AND EFFECTS OF SELECTIVE ATTENTION TO GRATINGS IN THE CENTRAL AND RIGHT VISUAL FIELDS: 2**

C. J. AINE, J. S. GEORGE, and E. R. FLYNN 1987 5 p  
Presented at the 6th International Conference on Biomagnetism, Tokyo, Japan, 27 Aug. 1987  
(Contract W-7405-ENG-36)  
(DE87-014730; LA-UR-87-2683-2; CONF-8708121-1) Avail: NTIS HC A02/MF A01

The goals were to examine the temporal sequence in which visual information (such as visual field, spatial frequency) are processed and to determine whether different neural sources are activated when such features are attended versus not attended. These issues are basic to current models of visual selective attention. DOE

**N88-12919#** Los Alamos National Lab., N. Mex.  
**VISUAL EVOKED RESPONSES TO SINUSOIDAL GRATINGS PRESENTED IN CENTRAL AND RIGHT VISUAL FIELDS: 1**

J. S. GEORGE, C. J. AINE, and E. R. FLYNN 1987 5 p  
Presented at the 6th International Conference on Biomagnetism, Tokyo, Japan, 27 Aug. 1987  
(Contract W-7405-ENG-36)  
(DE87-014731; LA-UR-87-2682-1; CONF-8708121-2) Avail: NTIS HC A02/MF A01

The present study applies neuromagnetic measurement techniques to probe the neurophysiological processing of spatial frequency (SF) by normal human observers. By exploiting the temporal and spatial resolution of neuromagnetic measurements, we hope to discriminate and characterize underlying neural functions and explore their correlation with perceptual or behavioral performance measures. Spatial frequency analysis has proven a useful paradigm for the study of visual perception and has been applied in psychophysical studies as well as invasive anatomical and physiological studies of experimental animals. These approaches have produced evidence of specialized neural activity and network structure for the analysis of spatial frequency information. Because the encoding of spatial frequency is a function of neuronal receptive-field size and since receptive-field size varies as a function of retinal location, we have also examined effects of visual field on responses to stimuli of defined spatial frequency content. DOE

**N88-12920#** California Univ., Irvine. Center for the Neurobiology of Learning and Memory.

**LARGE-SCALE NEURONAL CIRCUITS FOR SELECTIVE STORAGE AND RECOGNITION OF COMPLEX STIMULI, A PILOT STUDY Final Report**

1 Jul. 1987 3 p  
(Contract N00014-85-K-0650)  
(AD-A184134) Avail: NTIS HC A02/MF A01 CSCL 06D

Studies are undertaken on the nature and behavior of neural circuits based on the known anatomical and physiological characteristics of cortical circuits in rat brain. They are focused on olfactory (piriform) cortex, for a number of reasons, including the fact that piriform cortex is phylogenetically old, and significantly simpler than neocortical areas, and that piriform receives its inputs monosynaptically from the olfactory bulb, which in turn receives inputs monosynaptically from the nasal epithelium, directly in response to chemical olfactory inputs. This offers an unusual opportunity to study cortical mechanisms operating on inputs that have only minimally been preprocessed, in contrast to the inputs to other cortical areas (even sensory cortical areas) that receive extensive preprocessing before reaching the cortex. GRA

**N88-12921#** Connecticut Univ., Farmington. School of Medicine.

**THE TOXICOLOGY AND METABOLISM OF NICKEL COMPOUNDS Final Technical Progress Report, 1 Dec. 1985 - 31 Aug. 1987**

F. W. SUNDERMAN, JR. 1 Sep. 1987 9 p  
(Contract DE-AC02-76EV-03140)  
(DE87-014801; DOE/EV-03140/10) Avail: NTIS HC A02/MF A01

The toxicology of nickel compounds was investigated in rats and the metabolism of nickel was studied in humans. Lipid peroxidation is one of the molecular mechanisms of acute toxicity of NiCl<sub>2</sub> in rats. The thymus is a target organ of acute nickel toxicity, as evidenced by the thymic involution that occurs within 24 hours after parenteral administration of NiCl<sub>2</sub> to rats. The lung is the primary target organ of subacute nickel toxicity in rats, as manifested by marked bronchoalveolar proliferation and degenerative changes in the pulmonary vascular endothelium of rats after 3 to 6 weeks of daily injections of NiCl<sub>2</sub>. Electrothermal atomic absorption spectrophotometry with Zeeman background correction provides an accurate, sensitive, and practical routine method for analysis of nickel concentrations in body fluids and tissues of human subjects to monitor environmental, occupational, or iatrogenic exposures to nickel compounds. DOE

**N88-12922\*** National Aeronautics and Space Administration, Washington, D.C.

**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES**

Dec. 1987 65 p  
(NASA-SP-7011(304); NAS 1.21:7011(304)) Avail: NTIS HC A04; NTIS standing order as PB86-912300, \$8.00 domestic, \$16.00 foreign CSCL 06E

This bibliography lists 161 reports, articles, and other documents introduced into the NASA scientific and technical information system in November, 1987. Author

**N88-12923#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.

**HUMAN RESPIRATORY RESPONSES DURING HIGH PERFORMANCE FLIGHT**

R. M. HARDING (Institute of Aviation Medicine, Farnborough, England) Nov. 1987 93 p  
(AGARD-AG-312; ISBN-92-835-1561-7) Avail: NTIS HC A05/MF A01

The respiratory responses of experienced pilots were studied during flight in a high performance jet aircraft. Over 38 hours of physiological monitoring was carried out involving over 47,000 breaths. The importance and relevance of information about these respiratory responses is reviewed, with particular emphasis on the difficulties of in-flight recording and the history of such experimentation in four specific areas of respiratory physiology: respiratory frequency and flow, added external resistance, hyperventilation, and the metabolic cost of flying. Author

## BEHAVIORAL SCIENCES

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

**A88-15348****SMALL GROUPS IN ORBIT - GROUP INTERACTION AND CREW PERFORMANCE ON SPACE STATION**

JOHN M. NICHOLAS (Loyola University, Chicago, IL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Oct. 1987, p. 1009-1013. Research supported by the James A. Kemper Foundation. refs

Orbiting space stations raise unprecedented demands on crew performance and group interaction. Previously, Antarctic studies revealed evidence of deterioration in social relationships and work effectiveness, particularly during the long winter; a decline was observed in compatibility, group pride, teamwork, and group efficiency, and groups with the greatest decline had the lowest morale and experienced most difficulty in keeping essential equipment operating. These findings are consistent with reports from Soviet Salyut missions. It is noted that, in spite of these reports, the interpersonal criterion is virtually ignored in the current Space Station planning. Directions for possible training and team development are suggested. I.S.

**A88-15680****AUTOMATED LEARNING SYSTEMS FOR THE OCCUPATIONAL TRAINING OF FLIGHT-VEHICLE OPERATORS [AVTOMATIZIROVANNYE OBUCHAIUSHCHIE SISTEMY PROFESSEIONAL'NOI PODGOTOVKI OPERATOROV LETATEL'NYKH APPARATOV]**

LEV STEPANOVICH DEMIN, IURII GRIGOR'EVICH ZHUKOVSKII, ALEKSEI PETROVICH SEMENIN, ALEKSANDR IAKOVLEVICH KRAMARENKO, IGOR' VLADIMIROVICH MILIUKOV et al. Moscow, Izdatel'stvo Mashinostroenie, 1986, 240 p. In Russian. refs

Aspects of the design and development of automated learning systems (ALSs) for the training of operators of manned spacecraft and aircraft are described. Consideration is given to methodological, engineering, software, language, informational, and experimental support for such systems. The training of cosmonauts and pilots is considered in a man-machine framework. ALS design principles are elaborated which provide for both theoretical training and the acquisition of occupational skills. B.J.

**A88-16151#****COSMONAUT BEHAVIOUR IN ORBITAL FLIGHT SITUATION - PRELIMINARY ETHOLOGICAL ANALYSIS**

C. TAFFORIN, B. THON, R. CAMPAN (Toulouse III, Universite, France), and A. GUELL (CNES, Groupe Biologique et Medical Spatial, Toulouse, France) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 10 p. refs (IAF PAPER 87-528)

A frame by frame analysis of current video-tape recordings reveals that the behavioral adaptation process of the cosmonaut to weightlessness is achieved via adaptation of the motor units patterns according to the movement direction, differential responses in the movement kinetics according to the attention level of the cosmonaut while performing the task, and to the needed accuracy. Results are presented pertaining to the cosmonaut's posture and body orientation. It is found that the cosmonaut systematically orientates according to visual references of his proximate spatial environment. K.K.

**A88-16171#****A ROLE FOR BIOBEHAVIORAL APPLICATIONS IN SUPPORT OF SPACEFLIGHT OPERATIONS PROGRAMS**

LEONARD GARDNER (Hernandez Engineering, Inc., Houston, TX) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 6 p. (IAF PAPER 87-555)

The psychosocial and biobehavioral aspects of long-duration manned spaceflights are discussed together with some of the adverse consequences of failing to adequately address this issue. The importance of incorporating biobehavioral expertise into the spaceflight operations programs is emphasized; it is suggested that experienced behavioral aerospace professionals should contribute to astronaut selection, training, and other relevant professional activities. In view of the advent of long-duration missions and multicultural/multinational crews, the need for international unity and uniformity regarding psychosocial factors is stressed. I.S.

**A88-16679\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**FLIGHT SIMULATOR REQUIREMENTS FOR AIRLINE TRANSPORT PILOT TRAINING - AN EVALUATION OF MOTION SYSTEM DESIGN ALTERNATIVES**

A. T. LEE (NASA, Ames Research Center, Moffett Field, CA) and S. R. BUSSOLARI (MIT, Cambridge, MA) IN: International Conference on Simulators, 2nd, Coventry, England, Sept. 7-11, 1986, Proceedings. London, Institution of Electrical Engineers, 1986, p. 20-25. refs

The effect of motion platform systems on pilot behavior is considered with emphasis placed on civil aviation applications. A dynamic model for human spatial orientation based on the physiological structure and function of the human vestibular system is presented. Motion platform alternatives were evaluated on the basis of the following motion platform conditions: motion with six degrees-of-freedom required for Phase II simulators and two limited motion conditions. Consideration was given to engine flameout, airwork, and approach and landing scenarios. K.K.

**A88-16741****PASSENGER BEHAVIOUR IN AIRCRAFT EMERGENCIES**

ROGER GREEN (RAF, Institute of Aviation Medicine, Farnborough, England) IN: Passenger cabin safety; Proceedings of the Symposium, London, England, Oct. 29, 1986. London, Royal Aeronautical Society, 1987, p. 52-58.

Although more passengers are likely to escape harm in such aircraft emergencies as cabin fires if evacuation is orderly, rather than disorderly, the factor of individual vs. group motivation has been found to create an important differentiation between real and demonstration evacuations due to the maximization of individual motivation in the former. It is accordingly recommended that the individual's perceived likelihood of escape be enhanced through the use of smoke hoods, which greatly increase feelings of security and thereby reduce disorderly attempts at self-preservation that jeopardize the entire evacuation operation. O.C.

**N88-12246\*#** Psycho-Linguistic Research Associates, Menlo Park, Calif.

**INTEGRATED VOICE AND VISUAL SYSTEMS RESEARCH TOPICS**

DOUGLAS H. WILLIAMS and CAROL A. SIMPSON Jun. 1986 6 p

(Contract NAS2-11341)

(NASA-CR-177417; NAS 1.26:177417) Avail: NTIS HC A02/MF A01 CSCL 17B

A series of studies was performed to investigate factors of helicopter speech and visual system design and measure the effects of these factors on human performance, both for pilots and non-pilots. The findings and conclusions of these studies were applied by the U.S. Army to the design of the Army's next generation threat warning system for helicopters and to the linguistic functional requirements for a joint Army/NASA

## 53 BEHAVIORAL SCIENCES

flightworthy, experimental speech generation and recognition system. Author

**N88-12247#** European Space Agency, Paris (France).  
**INVESTIGATION OF PILOT BEHAVIOR IN A TRAINING PROGRAM FOR ASSESSING HANDLING QUALITIES USING A GROUND SIMULATOR**

DIETRICH ALTENKIRCH Sep. 1987 40 p Transl. into ENGLISH of Untersuchung des Pilotenverhaltens im Rahmen eines Trainingsprogrammes im Bodensimulator zur Flugeigenschaftsbeurteilung (Brunswick, Federal Republic of Germany) Original language document was previously announced as N86-32975 (ESA-TT-999; DFVLR-MITT-86-01; ETN-87-91111) Avail: NTIS HC A03/MF A01; original German version available from DFVLR, Cologne, Federal Republic of Germany DM 15.50

A pilot training session for rating handling qualities of transport aircraft was conducted with four test pilots by using a moving cockpit ground simulator. Each pilot flew three tasks take-off/climb, cruise/landing, approach/touchdown. In addition to the basic version of the aircraft, the pilots rated the handling qualities of two configurations differing in dynamics and control modes. Cooper-Harper pilot ratings and special effort ratings, as well as statistical values computed from measured performance data of the pilot/aircraft system are presented as a function of the configuration and turbulence levels. ESA

**N88-12248\*#** California Univ., Irvine. Program in Social Ecology.

**HUMAN ADAPTATION TO ISOLATED AND CONFINED ENVIRONMENTS Final Report, Apr. 1985 - Jul. 1987**

GARY W. EVANS, DANIEL STOKOLS, and SYBIL CARRERE 10 Dec. 1987 141 p (Contract NAG2-387; NSF DPP-86-08969) (NASA-CR-181502; NAS 1.26:181502) Avail: NTIS HC A07/MF A01 CSCL 051

A study was conducted over seven months in a winter Antarctic isolated and confined environment (ICE). Physiological and psychological data was collected several times a week. Information was collected on a monthly basis on behavior and the use of physical facilities. Adaptation and information indicated that there was a significant decrease in epinephrine and norepinephrine during the middle trimester of the winter. No vital changes were found for blood pressure. Self reports of hostility and anxiety show a linear increase. There were no significant changes in depression during ICE. The physiological and psychological data do not move in a synchronous fashion over time. The data also suggest that both ambient qualities of an ICE and discrete social environmental events, such as the arrival of the summer crew, have an impact on the outcome measures used. It may be most appropriate to develop a model for ICE's that incorporates not only global chronic stressors common to all ICE's but also the role of discrete environmental effects which can minimize or enhance the influence of more chronic stressors. Behavioral adjustment information highlight the importance of developing schedules which balance work and recreational activities. Author

**N88-12249#** Washington Univ., Seattle. Dept. of Psychology.  
**COMPUTER-CONTROLLED TESTING OF VISUAL-SPATIAL ABILITY Final Report, Jan. 1985 - Jan. 1986**

EARL HUNT, JAMES W. PELLEGRINO, RONALD ABATE, DAVID L. ALDERTON, and SIMON A. FARR Aug. 1987 49 p Prepared in cooperation with California Univ., Santa Barbara (Contract N66001-85-C-0017; F63-521) (AD-A183971; REPT-91-6001-537; NPRDC-TR-87-31) Avail: NTIS HC A03/MF A01 CSCL 051

Identifying people who have high spatial-visual ability would facilitate the assignment of individuals to occupations where success depends on these skills. The major facilitation would be expected for jobs requiring machinery operations and/or the reading of analog displays and diagrams. Traditionally, spatial-visual ability is tested by asking people to reason about pictures presented in a conventional paper-and-pencil format. Computer-controlled

testing makes it possible to make much finer measures of how people reason about a visual scene, and to measure reasoning about absolute and relative motion. The purpose is to (1) develop tests of spatial-visual reasoning based on computer technology, (2) determine if these tests measure any dimensions of spatial-visual ability not measured by current tests, and (3) provide these new tests to the Navy for further investigation as personnel classification tools. Eleven computer-administered tasks requiring spatial-visual ability were developed. Six of these took advantage of the computer's ability to present moving objects. Five took advantage of the computer's ability to measure reaction time for individual problems. These tasks and eight conventional paper and pencil tests were given to 170 college students. Scores were correlated, and multivariate factor analyses were conducted. GRA

**N88-12250#** Washington Univ., St. Louis, Mo. Dept. of Neurology.

**EFFECTS OF DIVIDED ATTENTION ON IDENTITY AND SEMANTIC PRIMING**

JENNIFER SANDSON and MICHAEL I. POSNER 1987 41 p (Contract N00014-86-K-0289; DA PROJ. RRO-4206) (AD-A184289; TR-87-6-ONR) Avail: NTIS HC A03/MF A01 CSCL 05H

According to some models of lexical access visual information can directly activate semantic memory. Priming can be obtained from stimuli that are either physically identical or semantically related to the target. Studies show that identity priming is not reduced by performance of a simultaneous auditory shadowing task. The strength of identity priming does not vary between conditions in which the relatedness of the prime provides information about the correct response (lexical decision) and conditions in which it does not (semantic classification). On the other hand, semantic priming is reduced during shadowing with lexical decision and in semantic classification. These data suggest that identity primes operate upon a visual code of the input that is not influenced by simultaneous auditory processing while semantic priming involves a system to which both auditory and visual information have access. GRA

**N88-12924\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**RESEARCH PAPERS AND PUBLICATIONS (1981-1987): WORKLOAD RESEARCH PROGRAM**

SANDRA G. HART, comp. Aug. 1987 124 p (NASA-TM-100016; A-87196; NAS 1.15:100016) Avail: NTIS HC A06/MF A01 CSCL 051

An annotated bibliography of the research reports written by participants in NASA's Workload Research Program since 1981 is presented, representing the results of theoretical and applied research conducted at Ames Research Center and at universities and industrial laboratories funded by the program. The major program elements included: 1) developing an understanding of the workload concept; 2) providing valid, reliable, and practical measures of workload; and 3) creating a computer model to predict workload. The goal is to provide workload-related design principles, measures, guidelines, and computational models. The research results are transferred to user groups by establishing close ties with manufacturers, civil and military operators of aerospace systems, and regulatory agencies; publishing scientific articles; participating in and sponsoring workshops and symposia; providing information, guidelines, and computer models; and contributing to the formulation of standards. In addition, the methods and theories developed have been applied to specific operational and design problems at the request of a number of industry and government agencies. Author

## MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

### A88-13376

#### SAFE ASSOCIATION, ANNUAL SYMPOSIUM, 24TH, SAN ANTONIO, TX, DEC. 11-13, 1986, PROCEEDINGS

Newhall, CA, SAFE Association, 1987, 310 p. For individual items see A88-13377 to A88-13413.

Various papers on safety systems are presented. The topics addressed include: limb flail injuries in USAF ejections, decompression tests of personal flight equipment, simulation of a highly dynamic G-time profile, computer simulation of manikin head-neck system, CREST system design, CREST restraint system development program, CREST seat structure development, CREST windblast protection system design, development of the true human analog ADAM, Koch emergency egress lighting systems, Space Shuttle Orbiter ejection seat survey, Mk15 ejection seat, aircraft passenger protection from smoke and fire, CREST flight controller, and NACES program and seat. Also discussed are: RU-36/P HELO emergency egress device, H-46 helicopter emergency flotation system, ADAM data acquisition system, emergency command recognizer for voiced system control, decompression sickness and venous gas emboli, mechanical analog of the human dynamic spin/viscera, delayed ejection, biodynamics data bank, laser fiber optic initiation system, inductively coupled initiator, and mental and physical performance at low core temperatures. C.D.

### A88-13378

#### DECOMPRESSION TESTS OF THE FRENCH PERSONAL FLIGHT EQUIPMENT IN 439 - VHA 90

H. MAROTTE (Centre d'Essais en Vol, Bretigny-sur-Orge, France), G. GUTMAN (Intertechnique, S.A., Plaisir, France), and V. CROME (Litton Industries, Inc., Clifton Precision Instrument and Life Support Div., Davenport, IA) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 4-9.

The French flight crew ensemble series VHA 90, a so-called 'three-piece suit' protecting high-performance fighter pilots against various hazards encountered during missions, is discussed. The architecture of the system is described, and its basic design concepts are reviewed, including its ability to dilute oxygen at low altitudes, to protect against explosive decompression, and to preserve user mobility. The results of system performance in slow decompression and rapid decompression tests are discussed. C.D.

### A88-13380

#### A COMPUTER SIMULATION OF THE HYBRID II MANIKIN HEAD-NECK SYSTEM

BRIAN J. DOHERTY and JACQUELINE G. PAVER (Duke University, Durham, NC) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 21-26. refs (Contract F49620-85-C-0013)

A data set for the Hybrid II manikin head-neck system has been developed for the Head-Spine Model (HSM). The HSM is briefly described, as is the dummy specimen used in the study. The use of the Part 572 Head-Neck Pendulum Compliance Test to validate the data set is reviewed. An adequate fit was obtained. C.D.

### A88-13382

#### THE CREST RESTRAINT SYSTEM DEVELOPMENT PROGRAM

R. LLOYD FARRIS (Pacific Scientific Co., Kin-Tech Div., Anaheim, CA), ERNEST L. STECH (Frost Engineering Development Corp., Englewood, CA), and ROGER F. YURCZYK (Boeing Military Airplane Co., Seattle, WA) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 32-38.

This paper discusses the requirements and progress toward the development of the CREST (Crew Escape Technologies) crew member restraint subsystem. The development of the seat-mounted X-band harness and the pilot-worn X-band harness is described. The Haulback system, which provides maximum protection during in-flight maneuvers associated with sudden, high-acceleration motions of advanced fighter aircraft, is addressed, discussing the design challenges and performance expectations. Seat interface equipment and functions are described. C.D.

### A88-13386

#### ADAM - THE NEXT STEP IN DEVELOPMENT OF THE TRUE HUMAN ANALOG

RICHARD P. WHITE, JR. and AILEEN M. BARTOL (Systems Research Laboratories, Inc., Dayton, OH) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 67-73. refs

The basic goals of the ADAM (Advanced Dynamic Anthropomorphic Manikin) development program are summarized along with some of the basic features of the ADAM that distinguish it from previous manikins designed for ejection testing. The manikin anthropometry, flexible spine/viscera system, body articulation, and unique instrumentation system are examined. The program status regarding design, fabrication, and subsystem checkout testing is discussed. C.D.

### A88-13389

#### THE USAF ADVANCED DYNAMIC ANTHROPOMORPHIC MANIKIN - ADAM

ROY R. RASMUSSEN, JR. and INTS KALEPS (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 88-91.

The USAF is embarking on a new effort to design and develop an Advanced Dynamic Anthropomorphic Manikin (ADAM) with improved biofidelity and instrumentation over currently available escape system testing dummies. This effort will provide for the development of two prototype instrumented, anthropomorphic manikins for testing, evaluating, and qualifying high performance aircraft escape systems. Discussed are the design specifications for ADAM, including the required experimental verification to demonstrate that the manikins mimic specified human biomechanical responses and are adequate for ejection system testing. Author

### A88-13393

#### DEVELOPMENT OF THE TACTICAL AIRCREW EYE RESPIRATORY SYSTEMS

JOHN DAMRON (ILC Dover, Inc., Frederica, DE) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings. Newhall, CA, SAFE Association, 1987, p. 117-121.

This paper presents the background and development philosophy utilized in designing and fabricating protective mask systems for the USAF Aircrew Eye Respiratory Protection program. The interface criteria and design requirements for the various USAF aircraft and operational user constraints are reviewed, showing that a single mask cannot meet all the requirements. Three kinds of masks, all within the Tactical Aircrew Eye Respiratory System (TAERS), are described. Qualification tests that have been completed by the Air Force on the TAERS mask for the limited safe-to-fly certification are reviewed. C.D.

A88-13396

**THE SRU-36/P HELO EMERGENCY EGRESS DEVICE**

GEORGE GILLESPIE and STAN CARDWELL (U.S. Navy, Naval Air Development Center, Warminster, PA) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings . Newhall, CA, SAFE Association, 1987, p. 144-146.

The SRU-36/P Helo Emergency Egress Device (HEED) is a compact, lightweight breathing apparatus designed for use by helicopter crewmen during an emergency ditching at sea. The HEED provides emergency breathing air required to safely egress from a submerged aircraft with 2 to 4 min of emergency breathing time. This paper will elaborate on the operational and technical characteristics of the HEED system. Author

A88-13398

**THE ADAM DATA ACQUISITION SYSTEM**

JOSEPH F. KOWALSKI (Systems Research Laboratories, Inc., Dayton, OH) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings . Newhall, CA, SAFE Association, 1987, p. 163-167.

This paper presents the system level design of the ADAM instrumentation system by first presenting the design requirements and the major design challenges of the instrumentation. A discussion of the major elements of the instrumentation design is presented, including the analog signal conditioning, analog-to-digital conversion, onboard computer-generated telemetry, and computer systems, along with a discussion of their expected capabilities. Author

A88-13402

**THE DESIGN EVOLUTION OF THE MECHANICAL ANALOG OF THE HUMAN DYNAMIC SPINE/VISCERA**

RICHARD P. WHITE, JR. and BRIAN P. MURPHY (Systems Research Laboratories, Inc., Dayton, OH) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings . Newhall, CA, SAFE Association, 1987, p. 205-211.

As part of the Crew Escape Technologies Program, an advanced dynamic anthropometric manikin was developed to duplicate human fidelity to the greatest degree possible. The dynamic spine/viscera design that evolved in an attempt to simulate the dynamic characteristics of various body organs is described. Ways in which the final design might duplicate the desired response of the human body during dynamic loadings associated with ejection are discussed. K.K.

A88-13404

**CURRENT RESEARCH ON AN ARTIFICIAL INTELLIGENCE-BASED LOSS OF CONSCIOUSNESS MONITORING SYSTEM FOR ADVANCED FIGHTER AIRCRAFT**

R. E. VAN PATTEN (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings . Newhall, CA, SAFE Association, 1987, p. 217-221. refs

The evolution of the conceptual approach in the search for a reliable 'signature' of an incapacitated pilot is outlined. A list is given of candidate sensor technologies that could be applied in this system without any significant encumbrance of the pilot. Included are head status, hand/grip status, seizure activity, straining behavior, anti-G suit status, eye status/blink rates, superficial temporal artery pulse, and blood pressure modeling. It is noted that the use of an expert system is central to the Loss of Consciousness Monitoring System concept. K.K.

A88-13405

**UNITED STATES NAVY MOLECULAR SIEVE ON-BOARD OXYGEN GENERATION (OBOG) SYSTEM DEVELOPMENT EFFORTS - A HISTORY AND 1986 STATUS REPORT**

MATTHEW J. LAMB (U.S. Navy, Naval Air Development Center, Warminster, PA) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings . Newhall, CA, SAFE Association, 1987, p. 222-228.

A88-13412

**MASS PROPERTIES AND INERTIAL LOADING EFFECTS OF HEAD ENCUMBERING DEVICES**

JEFFREY J. SETTECERRI, JENNIFER MCKENZIE (Systems Research Laboratories, Inc., Dayton, OH), EBERHARDT PRIVITZER (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), and ROBERT M. BEECHER (Dayton, University, OH) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings . Newhall, CA, SAFE Association, 1987, p. 276-282. refs

(Contract F33615-85-C-0530)

The paper presents mass property measurements for various head encumbering devices (i.e. helmets, gas masks, and night vision goggles) which were obtained with the automated mass properties measurement system of the USAF Armstrong Aerospace Medical Research Laboratory. Head encumbering devices were mounted onto a Hybrid III manikin head-neck assembly to assess inertial loading effects. Of the two sets of fighter gear and chemical defense equipment tested, the HGU-55/P + MBU-12/P and HGU-55/P + AR-5 appear to be safer than the HGU-26/P + MBU-12/P and HGU-39/P + MBU-13/P, respectively. K.K.

A88-13413

**MOLECULAR SIEVES FOR ONBOARD STORAGE OF GASEOUS OXYGEN AND NITROGEN**

KENNETH G. IKELS and CHERIE J. NOLES (USAF, School of Aerospace Medicine, Brooks AFB, TX) IN: SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings . Newhall, CA, SAFE Association, 1987, p. 283-287.

Molecular sieve pressure swing adsorption has advanced considerably in the past decade such that molecular sieves are utilized in techniques other than oxygen or nitrogen separation. A rather unusual application for molecular sieves is the storage of oxygen produced by molecular sieve oxygen generating systems (MSOGS) or nitrogen produced by fuel tank inerting systems. Laboratory experiments with molecular sieves type 4A, 5A, and MG-3 have demonstrated that it is possible to store three times as much oxygen and four times as much nitrogen in a plenum filled with molecular sieve than in an empty plenum of the same size pressurized to the same pressure. Using this technology, a system could be readily designed to function either as a primary or secondary backup oxygen supply for an Onboard Oxygen Generating System. Author

A88-13538

**DELETHALIZED CYCLIC CONTROL STICK**

RICHARD E. ZIMMERMAN (Simula, Inc., Phoenix, AZ) and KENT F. SMITH (U.S. Army, Aviation Applied Technology Directorate, Fort Eustis, VA) SAFE Journal, vol. 17, Fall 1987, p. 7-13.

The design, development and testing of a de-lethalized cyclic control stick for the UH-60A Black Hawk is discussed. A low-friction joint was designed which satisfied both operational and crash requirements. Full-scale testing with an anthropomorphic dummy and an energy-absorbing UH-60A Black Hawk crewseat was conducted with both the de-lethalized and the existing sticks. While the design constraints appear to prevent the exclusion of all injury, the tests demonstrated that the de-lethalized stick should reduce both the frequency and severity of serious injury. Author

A88-13541

**THE PROSPECTS FOR HELICOPTER HELMET DESIGN TO MEET RAPIDLY EXPANDING REQUIREMENTS**

RICHARD J. LONG (Gentex Corp., Carbondale, PA) SAFE Journal, vol. 17, Fall 1987, p. 33-38.

The evolution of a new SPH helmet system that is created by the SPH helmet shell shape and a lightweight balanced array of integrated modular components is addressed. A thermal plastic liner (TPL), when used in conjunction with a '0.625' thick styrofoam liner, will increase impact protection by approximately 200 percent over that of the existing '0.500' styrofoam and web suspension combination. In addition to the increased protective properties of the retrofit TPL and styrofoam liner combination, it is possible to

use the helmet and liner as provided prior to custom fitting and to fit it with no special fixtures or hazardous chemicals. K.K.

**A88-13542**  
**PERFORMANCE STUDIES ON A MOLECULAR SIEVE OXYGEN CONCENTRATOR (MSOC) - COMPARISON OF MG3, 5AMG, AND 13X MOLECULAR SIEVES**

GEORGE W. MILLER and C. F. THEIS (USAF, School of Aerospace Medicine, Brooks AFB, TX) SAFE Journal, vol. 17, Fall 1987, p. 43-51. refs

A comparison is made between three molecular sieve adsorbents (MG3, 5AMG, and 13X) employed in molecular sieve oxygen concentrators to determine which is the most efficient at concentrating oxygen from air based on air consumption, oxygen purity, and oxygen recovery. Overall, the performance of MG3 and 13X molecular sieves was similar, and superior to 5AMG. The three-bed aircraft MSOC loaded with MG3 produced the highest oxygen concentrations over the product flow range. The two-bed aircraft MSOC gave the greatest oxygen recovery when loaded with MG3 or 13X molecular sieves. MG3 was found to be the optimum molecular sieve in terms of air consumption, oxygen purity, and oxygen recovery. K.K.

**A88-15283**  
**TECHNOLOGY ADVANCEMENTS TO IMPROVE CREW PRODUCTIVITY IN SPACE**

MELANIE M. MANKAMYER (McDonnell Douglas Astronautics Co., Huntington Beach, CA) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 7 p.

Advances in technologies that will improve crew productivity and comfort on the Space Station are reviewed. These technologies include the development of computer tools to optimize the crew work place in the Space Station (e.g., solid modeling and interior layout evaluation programs) as well as advances in Station equipment to minimize or eliminate tedious and/or time-intensive tasks. These latter advances include automated inventory management and equipment controls, galley oven, housekeeping and trash compactor technologies, and personal hygiene improvements in the waste management system and full body shower. A third area of advancement is the development of job aids and procedural improvements for the everyday operation and maintenance of Station equipment and experiments. These advances include EVA space suit and glove design and procedural aids such as an operations and maintenance information system. B.J.

**A88-15284**  
**DESIGN AND DEVELOPMENT OF A COMPUTER-ASSISTED GROUND CONTROL TECHNIQUE FOR SPACE STATION ROBOTICS**

CARL R. KONKEL and PHILLIP E. HARMON (Teledyne Brown Engineering, Huntsville, AL) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 17 p.

Recent design activities for the International Space Station have included studies of the operations and productivity of the U.S. Laboratory module. A major finding was that the most limited resource on the Station will be crew time. A ground-controlled robot has been proposed that will help alleviate these constraints and allow around-the-clock U.S. Laboratory operations. However, the ground control of a mechanism in earth orbit imposes command and feedback delays because of the distance and communications network involved. A unique predictive display for use by the ground operator in the presence of varying time delays has been developed and tested and has reduced the 'move-and-wait' task times normally associated with delayed feedback teleoperations, minimized operator training, and reduced downlink bandwidth required. Author

**A88-15340**  
**IMMERSION SUIT INSULATION - THE EFFECT OF DAMPENING ON SURVIVAL ESTIMATES**

I. M. LIGHT, A. AVERY, and A. M. GRIEVE (Robert Gordon's Institute of Technology; Shell U.K. Oil, Ltd., Aberdeen, Scotland) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Oct. 1987, p. 964-969. Research supported by Shell U.K. Oil, Ltd. refs

The possible effect of wetting the clothing worn underneath helicopter-passenger survival suits on estimated cold-water survival times was investigated using immersion suit leakage values from realistic testing of four different immersion suits. The realistic scenario of either a 2- or 4-h flight (with the undergarment becoming wet from sweating), coupled with a capsizing procedure and a subsequent 20-min swim representing vital survival actions, was evaluated to predict the cumulative loss of insulation and proportionate decrease in survival time. It was found that undergarment wetting from sweating contributes the smallest part to the potential reduction in survival time and that the watertight integrity of a suit is by far the most important criterion to be satisfied. The suit with the enhanced inner neck-seal fitted with a thin neoprene face-seal performed best. I.S.

**A88-15524#**  
**DYNAMIC ANALYSIS OF ROBOTIC MANIPULATORS FOR SPACECRAFT APPLICATIONS**

R. J. HOOKER and N. A. MORRIS (Queensland, University, Brisbane, Australia) IN: National Space Engineering Symposium, 2nd, Sydney, Australia, Mar. 25-27, 1986, Preprints. Volume 2. Barton, Australia/Brookfield, VT, Institution of Engineers, Australia/Brookfield Publishing Co., 1986, 11 p.

This paper deals with the dynamic analysis of multi-DOF three-dimensional manipulators. A general dynamic analysis procedure is developed (covering kinematic and kinetic aspects) and implemented for digital computation, and some verifying examples are presented. The program gives either (1) an instantaneous analysis of all forces and moments acting throughout the mechanism for specified link positions, velocities, and accelerations, or (2) the time-varying forces and moments for a time-specified workpath. The analysis can be applied to a zero-gravity situation or to a gravity or acceleration field of any magnitude and direction. Author

**A88-15816\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**NASA'S TELEROBOTICS R & D PROGRAM - STATUS AND FUTURE DIRECTIONS**

DONNA SHIRLEY PIVROTTO (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) and GIULIO VARSÌ (NASA, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. refs (Contract NAS7-918) (IAF PAPER 87-24)

NASA's telerobotics technology program is described as well as the process for the transfer of this technology to the Space Station, and some of the implications of the technology for station design and operations, including those for international cooperation. A diagram is presented of the NASREM control hierarchy with the Office of Aeronautics and Space Technology telerobot testbed architecture superimposed. In telerobotics, the following areas were identified as possible subjects for developing data to support international standards: (1) task boards, (2) system performance measures on task boards, (3) human performance measures on task boards with teleoperation, and (4) autonomous-telerobotic-teleoperated performance comparisons. K.K.



## 54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

**A88-15817\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.  
**THE FLIGHT TELEROBOTIC SERVICER (FTS) - A FOCUS FOR AUTOMATION AND ROBOTICS ON THE SPACE STATION**  
SANFORD W. HINKAL, JAMES F. ANDARY, JAMES G. WATZIN, and DAVID E. PROVOST (NASA, Goddard Space Flight Center, Greenbelt, MD) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 9 p. refs (IAF PAPER 87-25)

The concept, fundamental design principles, and capabilities of the FTS, a multipurpose telerobotic system for use on the Space Station and Space Shuttle, are discussed. The FTS is intended to assist the crew in the performance of extravehicular tasks; the telerobot will also be used on the Orbital Maneuvering Vehicle to service free-flyer spacecraft. The FTS will be capable of both teleoperation and autonomous operation; eventually it may also utilize ground control. By careful selection of the functional architecture and a modular approach to the hardware and software design, the FTS can accept developments in artificial intelligence and newer, more advanced sensors, such as machine vision and collision avoidance. V.L.

**A88-15819#**  
**TELEROBOTICS AND ORBITAL LABORATORIES - AN END-TO-END ANALYSIS AND DEMONSTRATION**

CARL R. KONKEL (Teledyne Brown Engineering, Huntsville, AL) and CRAIG F. MILLER (Intellex, Inc., Corvallis, OR) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 7 p. refs (IAF PAPER 87-27)

Concepts for a Laboratory Experiment Manipulator system consisting of an onboard mobile manipulator and a computer-assisted operator control station are discussed, with application to the International Space Station. A unique predictive display for data evaluation is considered as a solution to the problem of robot remote control in the presence of time delay. Correction factors for the calibration of the robot predictor model have been incorporated such as geometric distortion and spherical aberration caused by the video optics. The onboard manipulator concept has been demonstrated experimentally using an industrial robot, with operator joystick command capability and delayed video feedback included to simulate the Space Station Teleoperation system. R.R.

**A88-15830#**  
**EUROPEAN EVA REQUIREMENTS AND SPACE SUIT DESIGN**  
L. LEMAIGNEN, M. WEIBEL (Avions Marcel Dassault Breguet Aviation, Saint-Cloud, France), and J. HEYN (Dornier System GmbH, Friedrichshafen, Federal Republic of Germany) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 11 p. refs (IAF PAPER 87-41)

EVA activities associated with operations of the Columbus space station and the Hermes manned reusable spacecraft require space suits for ESA astronauts characterized by high mobility and dexterity, exceptional protection against radiation, thermal loads, and micrometeoroids, and good communications equipment. Such suits must also minimize donning/doffing time and prebreathing requirements. Attention is presently given to operational performance criteria that must be met by these suits in the course of EVA concerned with Orbit Replaceable Units on such ESA spacecraft as the enhanced Eureka platform, as well as to the anthropometric constraints of suit geometry. O.C.

**A88-15850#**  
**MAN TENDED FREE FLYER INTERIOR EQUIPMENT FOR MANNED AND AUTOMATED OPERATION**

H. SIEMANN (Dornier System GmbH, Friedrichshafen, Federal Republic of Germany), G. HIRZINGER (DFVLR, Cologne, Federal Republic of Germany), and E. SCHMIDT (MBB-ERNO Raumfahrttechnik GmbH, Bremen, Federal Republic of Germany) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 5 p. (IAF PAPER 87-75)

The man tended free flyer (MTFF), part of the European Space Station program Columbus, is an orbiting laboratory operated by AI systems and robots. The MTFF is visited semiannually by astronauts aboard Hermes. In effect, the MTFF interior equipment has to be accessible to both man and machine. Germany has undertaken a robotics technology experiment (Rotex) to be flown on the Spacelab D-2 mission to verify robot technology for MTFF. Rotex operation will begin with functional verification involving the calibration of sensors, plant parameter verification, and the measurement of static and dynamic performance. The handling of a biological experiment, assembly of a truss structure, and the capture of a free-flying object are among the handling tasks to be performed. K.K.

**A88-15854#**  
**SELECTED ADVANCED TECHNOLOGY STUDIES FOR THE U.S. SPACE STATION**

R. W. HAGER (Boeing Aerospace Co., Huntsville, AL) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 9 p. (IAF PAPER 87-79)

Results of three of the most significant studies completed as part of Work Package 1 of the U.S. Space Station are reported. In particular, water reclamation techniques have been developed using multifiltration methods and reverse osmosis with both longitudinal hollow fibers and spiral wound sheet structures. In the course of another study, methods of on-orbit pressurized module repair have been tested using the Neutral Buoyancy Test Facility at the Marshall Space Flight Center (MSFC). The discussion also covers the development and fabrication of a full scale flight weight, flight quality prototype pressurized module. V.L.

**A88-16067\*#** Massachusetts Inst. of Tech., Cambridge.  
**DESIGN OF A FORCE REFLECTING HAND CONTROLLER FOR SPACE TELEMANIPULATION STUDIES**

J. D. B. PAINES (MIT, Cambridge, MA) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 9 p. refs (Contract NAGW-21) (IAF PAPER 87-ST-01)

The potential importance of space telemanipulator systems is reviewed, along with past studies of master-slave manipulation using a generalized force reflecting master arm. Problems concerning their dynamic interaction with the human operator have been revealed in the use of these systems, with marked differences between 1-g and simulated weightless conditions. A study is outlined to investigate the optimization of the man machine dynamics of master-slave manipulation, and a set of specifications is determined for the apparatus necessary to perform this investigation. This apparatus is a one degree of freedom force reflecting hand controller with closed loop servo control which enables it to simulate arbitrary dynamic properties to high bandwidth. Design of the complete system and its performance is discussed. Finally, the experimental adjustment of the hand controller dynamics for smooth manual control performance with good operator force perception is described, resulting in low inertia, viscously damped hand controller dynamics. Author



**A88-16156\*#** National Aeronautics and Space Administration, Washington, D.C.

**ARTIFICIAL GRAVITY - A COUNTERMEASURE FOR ZERO GRAVITY**

A. E. NICOGLOSSIAN and P. D. MCCORMACK (NASA, Office of Space Science and Applications, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 10 p. refs  
(IAF PAPER 87-533)

Current knowledge on artificial gravity is presented with emphasis placed on the unique characteristics of such an environment and their effects on crew performance and vehicle habitability. A parametric optimization of the vehicle size and operation is performed. The following set of 'optimum' parameter values is obtained: a cost of 15.8 billion dollars, a radius of 80 feet, a rotation rate of 4.8 rpm, and a g-value of 0.62. Consideration is also given to the problems of adaptation, retention of adaptation, and simultaneous adaptation to both nonrotating and rotating environments. K.K.

**A88-16157#**

**THE SOLAR PLANT GROWTH FACILITY - AN APPROACH TOWARDS FUTURE BIOLOGICAL LIFE SUPPORT SYSTEMS**

G. TRAXLER (Oesterreichische Raumfahrt- und Systemtechnik GmbH, Vienna, Austria) and HEIDEMARIE HURTL (Wien, Universitaet, Vienna, Austria) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 6 p. refs  
(IAF PAPER 87-538)

The Solar Plant Growth Facility, conceptually designed as a reusable life science facility, supports investigations pertaining to future biological life support systems. A laboratory model offering the technical infrastructure for performing ground experiments in a closed system was used to verify the concept. Studies with various types of higher plants (lettuce, mung, and soy beans) were carried out to investigate the effects of particular illumination conditions (60 min day/35 min night cycle in LEO) on the biological specimen. Total biomass production showed a decrease of up to 50 percent for mung beans and about 25 percent for soy beans. K.K.

**A88-16158#**

**SPACE SUIT SYSTEMS - TECHNICAL AND PHYSIOLOGICAL CONSTRAINTS**

N. HERBER (Dornier System GmbH, Friedrichshafen, Federal Republic of Germany), J. WENZEL, and L. VOGT (DFVLR, Cologne, Federal Republic of Germany) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 7 p.  
(IAF PAPER 87-540)

The major issues relevant to the design of a space suit system are discussed with emphasis placed on technical and physiological constraints. It is noted that prebreathing, required to prevent decompression sickness, is strongly affected by the change in nitrogen partial pressure and atmospheric composition the astronaut experiences prior to EVA. Technical solutions are presented together with a graph of spacecraft cabin pressure versus suit enclosure pressure. K.K.

**A88-16160#**

**RADIATION PROBLEMS WITH THE SPACE STATION SCENARIO AND THE NECESSARY SURVEILLANCE FOR ASTRONAUTS**

J. U. SCHOTT and H. BUECKER (DFVLR, Institut fuer Flugmedizin, Cologne, Federal Republic of Germany) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. refs  
(IAF PAPER 87-542)

Radiation problems in the typical orbits of Space Shuttle flights are discussed as well as problems with radiation surveillance in space radiation fields. A graph is presented of the LET spectrum of the D-1 mission (altitude 324 km, inclination 57 deg) and related quality factors. It is believed that the maximum stay in Space Station orbits might be limited to 20-30 days. An independent group focusing on an on- and off-line radiation surveillance for

astronauts is expected to be established in the crew training center of the DFVLR. K.K.

**A88-16161#**

**'O<sub>2</sub>-MP' - A DEVICE FOR MEASURING THE PARTIAL PRESSURE OF OXYGEN IN CAPILLARY BLOOD UNDER SPACE FLIGHT CONDITIONS**

H. HAASE, B. JARSUMBECK, J. KOENIG, G. NACKE (Gesellschaft fuer Weltraumforschung und Raumfahrt der DDR, Berlin, German Democratic Republic), N. M. AZIAMOLOVA (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) et al. IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. refs  
(IAF PAPER 87-543)

A device allowing the pO<sub>2</sub> in liquid biological microsamples to be rapidly and simply determined under the conditions of weightlessness is proposed. The polarographic principle is used for pO<sub>2</sub> determination, and the heated measuring electrode has a time of operation of 15-20 sec. The present method requires a quantity of only 10-20 microliters of blood, and specimens go directly from the subject to the measuring chamber. The accuracy of the device is demonstrated by comparison of measurements with those obtained using stationary devices. R.R.

**A88-16163#**

**PROVIDING ARTIFICIAL GRAVITY - PHYSIOLOGIC LIMITATIONS TO ROTATING HABITATS**

PETER H. DIAMANDIS IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 19 p. refs  
(IAF PAPER 87-545)

The medical rationale for artificial gravity is examined and past investigations of optimal rotation velocity and habitat radius are reviewed. The artificial gravity sleeper, a proposed countermeasure for long duration space flight, is also discussed. The physiologic changes and potential concerns due to long duration habitation in zero gravity are discussed with emphasis placed on the renal/fluid shift, cardiovascular deconditioning, osteoporosis, immune system changes, and reproductive capability. K.K.

**A88-16164\*#** National Aeronautics and Space Administration, Washington, D.C.

**A SYSTEMS ENGINEERING VIEW OF THE HUMAN IN SPACE**

JOHN L. ANDERSON (NASA, Office of Aeronautics and Space Technology, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 7 p. refs  
(IAF PAPER 87-547)

A model of the human as an 'engineered' system provides a starting point for determining human requirements and performance on an equivalent basis with technological systems. The human as an engineered system with performance requirements is defined to consist of four subsystems: cognitive, psychological, biomechanical, and biomedical. It is suggested that the treatment of the psychological subsystem as one that modulates the efficiency and quality of human performance offers a particular approach for examining and characterizing psychological effects. K.K.

**A88-16165\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

**HUMAN FACTORS - MAN-MACHINE SYMBIOSIS IN SPACE**

JERI W. BROWN (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 10 p. refs  
(IAF PAPER 87-548)

The relation between man and machine in space is studied. Early spaceflight and the goal of establishing a permanent space presence are described. The need to consider the physiological, psychological, and social integration of humans for each space mission is examined. Human factors must also be considered in the design of spacecraft. The effective utilization of man and machine capabilities, and research in anthropometry and biomechanics aimed at determining the limitations of spacecrews are discussed. I.F.

**A88-16166\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**HUMAN FACTOR DESIGN OF HABITABLE SPACE FACILITIES**  
 YVONNE A. CLEARWATER (NASA, Ames Research Center, Moffett Field, CA) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 10 p. refs (IAF PAPER 87-549)

Current fundamental and applied habitability research conducted as part of the U.S. space program is reviewed with emphasis on methods, findings, and applications of the results to the planning and design of the International Space Station. The discussion covers the following six concurrent directions of habitability research: operational simulation, functional interior decor research, space crew privacy requirements, interior layout and configuration analysis, human spatial habitability model, and analogous environments research. V.L.

**A88-16167#**  
**NASA-STD-3000, MAN-SYSTEM INTEGRATION STANDARDS - THE NEW SPACE HUMAN ENGINEERING STANDARDS**

KEITH H. MILLER and CHARLES W. GEER (Boeing Aerospace Co., Seattle, WA) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. (IAF PAPER 87-550)

Various aspects of the process used to develop NASA-STD-3000, Man-System Integration Standards (MSIS) are reviewed, as are the documents, the database, and a videotape that are currently available from NASA. The MSIS provides the specific information needed to ensure proper integration of the man-system interface requirements with those of other aerospace disciplines. In addition to the requirements, the MSIS provides design considerations and examples which help the user understand the rationale behind the requirements. The implementation and maintenance of MSIS are also discussed. V.L.

**A88-16168#**  
**SPACEHAB MODULE DESIGN PROJECT UTILIZES ENGINEERING SERVICES FOR HUMAN FACTORS CONSIDERATION**

S. E. TICE (SimGraphics Engineering Corp., South Pasadena, CA) and TOM C. TAYLOR (SpaceHab, Inc., Seattle, WA) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 6 p. refs (IAF PAPER 87-551)

The use of state-of-the-art computer graphics simulation for the purpose of preliminary product, vehicle, and subsystem design and analysis is discussed with reference to the design of a pressurized Spacehab module which fits in the first quarter of the Space Shuttle payload bay. The use of flight simulator type real-time computer graphics is shown to provide a cost-effective and innovative way of designing vehicles, operations, and equipment by providing an environment for the consideration of human factors, mechanisms, and robotics design requirements. Details of the Spacehab module design are given. V.L.

**A88-16169#**  
**IMPORTANCE OF HUMAN FACTORS IN THE CONCEPTION OF HERMES SPACECRAFT**

R. MOLLARD (Paris V, Universite, France) and C. DARLES (CNES, Toulouse, France) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 5 p. refs (IAF PAPER 87-552)

The habitability of the Hermes spacecraft is evaluated using CAD evaluations (human body simulations) and neutral buoyancy experiments (two subjects suited with simulated EVA pressurized equipment in a water tank). Particular attention is given to the volume and arrangement for different airlocks and the cabin layout. The three airlock arrangements studied are: (1) a cylinder, (2) a cylinder modified by the adjunction of two vertical planes, and (3) a truncated half cylinder. The data reveal that the first airlock arrangement, a cylinder with a 1.6 m diameter, is most ergonomic.

New designs for the cockpit, locker, life volume, and airlock are proposed. I.F.

**A88-16170#**  
**LOW-COST PROTOTYPES FOR HUMAN FACTORS EVALUATION OF SPACE STATION CREW EQUIPMENT**

DAVID NIXON, CHRIS MILLER, JOE KENNEDY, BRAD SKEPNER (Space Projects Group, Santa Monica, CA), and TOM TAYLOR (Spacehab, Inc., Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 9 p. refs (IAF PAPER 87-553)

The development of inexpensive prototypes for human factor evaluation of Space Station crew equipment is demonstrated with several examples. These include testing of a multipurpose wardrobe table, intended for crew meetings, meals, and work applications; portable/wearable workstation, which will provide Space Station crew members with a compact, portable, and versatile facility with communications, data, and audio-visual management and interface capabilities; and passive leg restraint. Consideration is also given to the prototype fabrication/flight-test costs. I.S.

**A88-16172\*#** National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

**ACTIVATION OF A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM (CELSS) BREADBOARD FACILITY - WHEAT GROWTH STUDIES**

WILLIAM M. KNOTT (NASA, Kennedy Space Center, Cocoa Beach, FL) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 6 p. (IAF PAPER 87-557)

NASA's Controlled Ecological Life Support System (CELSS) will include subsystems for biomass production, food processing, and waste management in space. This paper discusses the CELSS Breadboard program, which is a research project for integration and evaluation of concepts and techniques of the CELSS facility, with special attention given to the Biomass Production Chamber (BPC). The design of the BPC and of its subsystems for nutrient delivery, atmospheric control, and computer control are discussed together with the subsystem control and monitoring parameter requirements. Results from preliminary wheat-growth tests in the BPC are included. I.S.

**A88-16176\*#** California Univ., Davis.  
**ARTIFICIAL GRAVITY - THE EVOLUTION OF VARIABLE GRAVITY RESEARCH**

CHARLES A. FULLER (California, University, Davis), FRANK M. SULZMAN, and J. RICHARD KEEFE (NASA, Div. of Life Sciences, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. refs (IAF PAPER 87-539)

The development of a space life science research program based on the use of rotational facilities is described. In-flight and ground centrifuges can be used as artificial gravity environments to study the following: nongravitational biological factors; the effects of 0, 1, and hyper G on man; counter measures for deconditioning astronauts in weightlessness; and the development of suitable artificial gravity for long-term residence in space. The use of inertial fields as a substitute for gravity, and the relations between the radius of the centrifuge and rotation rate and specimen height and rotation radius are examined. An example of a centrifuge study involving squirrel monkeys is presented. I.F.

**A88-16182#**  
**SPACE BIOLOGIST'S INFLIGHT SAFETY CONSIDERATIONS**

A. COGOLI (Zuerich, Eidgenoessische Technische Hochschule, Zurich, Switzerland) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 4 p. (IAF PAPER 87-570)

Safety constraints arising in the preparation of biological experiments for manned space laboratories are related to instrumentation, and to biological, chemical, and radioactive hazards. A more standardized application of safety rules by different

space centers is suggested as well as an improved understanding between investigators and safety engineers. In addition, The Space Station/Columbus Utilization Preparation Program encourages the use of off-the-shelf hardware on future Spacelab missions. K.K.

**A88-16187#****CREWMAN RESCUE EQUIPMENT IN MANNED SPACE MISSIONS - ASPECTS OF APPLICATION**

G. I. SEVERIN, I. P. ABRAMOV, and V. I. SVERTSHEK (AN SSSR, Sovet Interkosmos, Moscow, USSR) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 6 p. refs  
(IAF PAPER 87-576)

The application of survival suits to earth-to-orbit transport vehicles, permanently orbiting space stations, and interplanetary spacecraft is discussed. Crewman activities during various emergencies are described along with the role of the suit. The features of different types of survival suits are examined. C.D.

**A88-16309****MODELLING AND SIMULATION OF DISTRIBUTED FLEXIBILITY IN A SPACEBORNE MANIPULATOR**

J. P. CHRETIEN, M. DELPECH, and A. LOUHADI (Toulouse, Centre d'Etudes et de Recherches, France) IN: Automatic control in space 1985. Oxford and New York, Pergamon Press, 1986, p. 269-277. refs  
(Contract CNES-82/0766; CNES-83/721)

The modal impedance, assumed-mode, and fictitious joint-introduction approaches to the characterization of distributed flexibility are evaluated for the case of an in-plane, two-degrees-of-freedom manipulator. General, multipurpose software for the geometric, kinematic, and dynamic analysis of rigid multibody mechanical systems is used. The introduction of fictitious joints is used to solve problems associated with simulation, kinematic inversion, and closed-loop analysis. O.C.

**A88-16310****FEASIBILITY OF TIME DELAY COMPENSATION FOR A SPACE TELEOPERATION TASK**

M. DELPECH (Toulouse, Centre d'Etudes et de Recherches, France) and M. MAURETTE (CNES, Toulouse, France) IN: Automatic control in space 1985. Oxford and New York, Pergamon Press, 1986, p. 279-286. refs

In order to enhance the level of performance that is degraded when time delay is introduced by long communication links into a remote manipulator system (RMS), the time delay may be compensated for by presenting the operator with a predicted view of the system on a visual display. This method is presently applied to a satellite-grasping task involving the two control problems of instability within the control loop due to time delay, and time delay located on the reference input, which induces a tracking error. Digital simulations of the RMS in which an autopilot is substituted for the operator have demonstrated the method's efficiency. O.C.

**A88-16312****CONTROL OF IN-ORBIT SPACE MANIPULATION**

J. L. LACOMBE and TH. BLAIS (Matra, S.A., Velizy-Villacoublay, France) IN: Automatic control in space 1985. Oxford and New York, Pergamon Press, 1986, p. 295-302.

An account is given of the primary applications of robotics, telemanipulation, and servicing technologies, in the context of special space constraints and critical manipulator control problems. Attention is given to such aspects of control as electrical system architecture, proprioceptive and exteroceptive sensors, and man-machine task sharing. The progress made to date with terrestrial manipulator control systems is evaluated. The focus of these technology development efforts is the emerging set of robotics systems requirements associated with ESA's Hermes reusable manned orbiter. O.C.

**A88-16313****CONTROL ASPECTS OF A EUROPEAN SPACE MANIPULATOR SYSTEM**

W. VAN LEEUWEN (Fokker, Schiphol, Netherlands) IN: Automatic control in space 1985. Oxford and New York, Pergamon Press, 1986, p. 303-309.

The aim of this study was to review existing design techniques for robots on the matter of their applicability for the design and development of a space manipulator system. Attention is paid to the definition and the design approach of the overall control system. Special emphasis is given to the control elements dealing with task-definition, path construction, and on-board control. Also, a number of on-board implementation aspects are considered. Furthermore, a comparison is made with the Remote Manipulator Control, as used on the Space Shuttle. Author

**A88-16739****ASPECTS OF HEALTH AND SAFETY IN THE PASSENGER CABIN**

J. H. B. VANT (Air Transport Users Committee, London, England) IN: Passenger cabin safety; Proceedings of the Symposium, London, England, Oct. 29, 1986. London, Royal Aeronautical Society, 1987, p. 29-45. refs

Health and safety considerations for airliner cabin environments fall into the categories of (1) the effects of reduced ventilation, chemical and microbial contamination, and the presence of tobacco smoke and ozone; (2) reduced cabin pressure and ionizing radiation; and (3) emergency instructions to passengers, the control of fires, and the use of emergency breathing equipment. It is noted that smoke and toxic gases are the principal cause of death in survivable crashes, requiring that special attention be given to the effectiveness of smoke masks and hoods. The threat posed by terrorism is briefly considered. O.C.

**N88-11668#** Royal Netherlands Air Force, The Hague.

**DEVELOPMENT, TESTING AND EVALUATION OF A NIGHT VISION GOGGLE COMPATIBLE BO-105 FOR NIGHT LOW LEVEL OPERATION**

R. H. FRIEDERICY /n AGARD, Rotorcraft Design for Operations 8 p Jun. 1987

Avail: NTIS HC A14/MF A01

With the recommended equipment package, it was demonstrated that a BO-105 helicopter could be operated by experienced helicopter pilots at low level at night over fairly unfamiliar terrain under adverse weather conditions. The helmet mounted night vision goggles (NVG) gave a night low level capability. The third generation image intensifying tube (IIT) added an extra darkness and reduced visibility margin. The blue NVG cockpit lighting made easy monitoring of flight and engine performance instruments possible and allowed the use of navigation equipment. This greatly improved confidence and reduced workload. Author

**N88-12251\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: REGENERATIVE LIFE SUPPORT SYSTEMS IN SPACE**

ROBERT D. MACELROY and DAVID T. SMERNOFF (New Hampshire Univ., Durham.) Sep. 1987 153 p The 26th COSPAR Meeting held in Toulouse, France, Jul. 1986 (Contract NCC2-231)

(NASA-CP-2480; A-87256; NAS 1.55:2480) Avail: NTIS HC A08/MF A01 CSCL 06K

A wide range of topics related to the extended support of humans in space are covered. Overviews of research conducted in Japan, Europe, and the U.S. are presented. The methods and technologies required to recycle materials, especially respiratory gases, within a closed system are examined. Also presented are issues related to plant and algal productivity, efficiency, and processing methods. Computer simulation of closed systems, discussions of radiation effects on systems stability, and modeling of a computer bioregenerative system are also covered.

**N88-12252\*#** Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

**PROGRESS IN EUROPEAN CELSS ACTIVITIES**

A. I. SKOOG *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 1-4 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

The European Controlled Ecological Life Support System (CELSS) activities started in the late 1970's with system analysis and feasibility studies of Biological Life Support Systems (BLSS). The initiation for CELSS came from the industry side in Europe, but since then planning and hardware feasibility analyses have been initiated also from customer/agency side. Despite this, it is still too early to state that a CELSS program as a concerted effort has been agreed upon in Europe. However, the general CELSS objectives were accepted as planning and possible development goals for the European effort for manned space activities, and as experimental planning topics in the life sciences community for the next decades. It is expected that ecological life support systems can be tested and implemented on a space station towards the end of this century or early in the next. For the European activities a possible scenario can be projected based on ongoing life support system development activities and the present life sciences goals. Author

**N88-12253\*#** National Aerospace Lab., Tokyo (Japan). Space Technology Research Group.

**FOOD PRODUCTION AND GAS EXCHANGE SYSTEM USING BLUE-GREEN ALGA (SPIRULINA) FOR CELSS**

MITSUO OGUCHI, KOJI OTSUBO, KEIJI NITTA, and SHIGEKI HATAYAMA *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 5-8 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

In order to reduce the cultivation area required for the growth of higher plants in space adoption of algae, which have a higher photosynthetic ability, seems very suitable for obtaining oxygen and food as a useful source of high quality protein. The preliminary cultivation experiment for determining optimum cultivation conditions and for obtaining the critical design parameters of the cultivator itself was conducted. Spirulina was cultivated in the 6 liter medium containing a sodium hydrogen carbonate solution and a cultivation temperature controlled using a thermostat. Generated oxygen gas was separated using a polypropylene porous hollow fiber membrane module. Through this experiment, oxygen gas (at a concentration of more than 46 percent) at a rate of 100 to approx. 150 ml per minute could be obtained. Author

**N88-12254\*#** Martek Corp., Columbia, Md.  
**BIOMASS RECYCLE AS A MEANS TO IMPROVE THE ENERGY EFFICIENCY OF CELSS ALGAL CULTURE SYSTEMS**

R. RADMER, J. COX, D. LIEBERMAN, P. BEHRENS, and K. ARNETT *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 9-13 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

Algal cultures can be very rapid and efficient means to generate biomass and regenerate the atmosphere for closed environmental life support systems. However, as in the case of most higher plants, a significant fraction of the biomass produced by most algae cannot be directly converted to a useful food product by standard food technology procedures. This waste biomass will serve as an energy drain on the overall system unless it can be efficiently recycled without a significant loss of its energy content. Experiments are reported in which cultures of the alga *Scenedesmus obliquus* were grown in the light and at the expense of an added carbon source, which either replaced or supplemented the actinic light. As part of these experiments, hydrolyzed waste biomass from these same algae were tested to determine whether the algae themselves could be made part of the biological recycling process. Results indicate that hydrolyzed algal (and plant) biomass can serve as carbon and energy sources for the growth of these

algae, suggesting that the efficiency of the closed system could be significantly improved using this recycling process. Author

**N88-12255\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**OPERATION OF AN EXPERIMENTAL ALGAL GAS EXCHANGER FOR USE IN A CELSS**

DAVID T. SMERNOFF, ROBERT A. WHARTON, JR., and MAURICE M. AVERNER (National Aeronautics and Space Administration, Washington, D.C.) *In* its Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 15-25 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

Concepts of a Closed Ecological Life Support System (CELSS) anticipate the use of photosynthetic organisms (higher plants and algae) for air revitalization. The rates of production and uptake of carbon dioxide and oxygen between the crew and the photosynthetic organisms are mismatched. An algal system used for gas exchange only will have the difficulty of an accumulation or depletion of these gases beyond physiologically tolerable limits (in a closed system the mismatch between assimilatory quotient (AQ) and respiratory quotient (RQ) is balanced by the operation of the waste processor). The results are given of a study designed to test the feasibility of using environmental manipulations to maintain physiologically appropriate atmospheres for algae and mice in a gas closed system. Specifically, the atmosphere behavior of this system is considered with algae grown on nitrate or urea and at different light intensities and optical densities. Manipulation of both allow operation of the system in a gas stable manner. Operation of such a system in a CELSS may be useful for reduction of buffer sizes, as a backup system for higher plant air revitalization and to supply extra oxygen to the waste processor or during crew changes. Author

**N88-12256\*#** Massachusetts Inst. of Tech., Cambridge.  
**NON-CONVENTIONAL APPROACHES TO FOOD PROCESSING IN CELSS, 1. ALGAL PROTEINS: CHARACTERIZATION AND PROCESS OPTIMIZATION**

Z. NAKHOST, M. KAREL, and V. J. KRUKONIS (Phasex Corp., Lawrence, Mass.) *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 27-36 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

Protein isolate obtained from green algae cultivated under controlled conditions was characterized. Molecular weight determination of fractionated algal proteins using SDS-polyacrylamide gel electrophoresis revealed a wide spectrum of molecular weights ranging from 15,000 to 220,000. Isoelectric points of dissociated proteins were in the range of 3.95 to 6.20. Amino acid composition of protein isolate compared favorably with FAO standards. High content of essential amino acids leucine, valine, phenylalanine and lysine make algal protein isolate a high quality component of closed ecological life support system diets. To optimize the removal of algal lipids and pigments supercritical carbon dioxide extraction (with and without ethanol as a co-solvent) was used. Addition of ethanol to supercritical carbon dioxide resulted in more efficient removal of algal lipids and produced protein isolate with a good yield and protein recovery. The protein isolate extracted by the above mixture had an improved water solubility. Author

**N88-12257\*#** California Univ., Berkeley. Lawrence Berkeley Lab. Bioenergetics Group.

**APPLICATION OF PHOTOSYNTHETIC N(2)-FIXING CYANOBACTERIA TO THE CELSS PROGRAM**

IAN V. FRY, JANA HRABETA, JOE DSOUZA (Goa Univ., India), and LESTER PACKER *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 37-41 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

The feasibility of using photosynthetic microalgae (cyanobacteria) as a subsystem component for the closed ecological life support system program, with particular emphasis

on the manipulation of the biomass (protein/carbohydrate) was addressed. Using factors which retard growth rates, but not photosynthetic electron flux, the partitioning of photosynthetically derived reductant may be dictated towards CO<sub>2</sub> fixation (carbohydrate formation) and away from N<sub>2</sub> fixation (protein formation). Cold shock treatment of fairly dense cultures markedly increases the glycogen content from 1 to 35 percent (dry weight), and presents a useful technique to change the protein/carbohydrate ratio of these organisms to a more nutritionally acceptable form. Author

**N88-12258\*#** Keio Univ., Yokohama (Japan).  
**SUNLIGHT SUPPLY AND GAS EXCHANGE SYSTEMS IN MICROALGAL BIOREACTOR**

K. MORI, H. OHYA, K. MATSUMOTO, and H. FURUNE (La Foret Engineering and Information Service Co., Tokyo, Japan ) *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 45-50 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

The bioreactor with sunlight supply system and gas exchange systems presented has proved feasible in ground tests and shows much promise for space use as a closed ecological life support system device. The chief conclusions concerning the specification of total system needed for a life support system for a man in a space station are the following: (1) Sunlight supply system - compactness and low electrical consumption; (2) Bioreactor system - high density and growth rate of chlorella; and (3) Gas exchange system - enough for O<sub>2</sub> production and CO<sub>2</sub> assimilation. Author

**N88-12259\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.  
**A REVIEW OF RECENT ACTIVITIES IN THE NASA CELSS PROGRAM**

R. D. MACELROY, J. TREMOR, D. T. SMERNOFF, W. KNOTT, and R. P. PRINCE (National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.) *In its* Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 51-55 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

A CELSS (Controlled Ecological Life Support System) is a device that utilizes photosynthetic organisms and light energy to regenerate waste materials into oxygen and food for a crew in space. The results of studies with the CELSS program suggest that a bioregenerative life support system is a useful and effective method of regenerating consumable materials for crew sustenance. The data suggests that the operation of a CELSS in space is practical if plants can be made to behave predictably in the space environment. Much of the work centers on the biological components of the CELSS system. Ways of achieving high efficiency and long term stability of all components of the system are examined. Included are explorations of the conversion of nonedible cellulose to edible materials, nitrogen fixation by biological and chemical methods, and methods of waste processing. A description is provided of the extent to which a bioregenerative life support system can meet the constraints of the space environment, and the degree is assessed to which system efficiency and stability can be increased during the next decade. Author

**N88-12260\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.  
**A MODULAR BLSS SIMULATION MODEL**

JOHN D. RUMMEL and TYLER VOLK (New York Univ., New York.) *In its* Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 57-65 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

A bioregenerative life support system (BLSS) for extraterrestrial use will be faced with coordination problems more acute than those in any ecosystem found on Earth. A related problem in BLSS design is providing an interface between the various life

support processors, one that will allow for their coordination while still allowing for system expansion. A modular model is presented of a BLSS that interfaces system processors only with the material storage reservoirs, allowing those reservoirs to act as the principal buffers in the system and thus minimizing difficulties with processor coordination. The modular nature of the model allows independent development of the detailed submodels that exist within the model framework. Using this model, BLSS dynamics were investigated under normal conditions and under various failure modes. Partial and complete failures of various components, such as the waste processors or the plants themselves, drive transient responses in the model system, allowing the examination of the effectiveness of the system reservoirs as buffers. The results from simulations help to determine control strategies and BLSS design requirements. An evolved version could be used as an interactive control aid in a future BLSS. Author

**N88-12261\*#** Mitsubishi Heavy-Industries Ltd., Nagoya (Japan).  
**PRELIMINARY EXPERIMENTAL RESULTS OF GAS RECYCLING SUBSYSTEMS EXCEPT CARBON DIOXIDE CONCENTRATION**

K. OTSUJI, T. SAWADA, S. SATOH, S. KANDA, H. MATSUMURA, S. KONDO, and K. OTSUBO (National Aerospace Lab., Tokyo, Japan ) *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 67-70 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

Oxygen concentration and separation is an essential factor for air recycling in a controlled ecological life support system (CELSS). Furthermore, if the value of the plant assimilatory quotient is not coincident with that of the animal respiratory quotient, the recovery of oxygen from the concentrated CO<sub>2</sub> through chemical methods will become necessary to balance the gas contents in a CELSS. Therefore, oxygen concentration and separation equipment using Salcomine and O<sub>2</sub> recovery equipment, such as Sabatier and Bosch reactors, were experimentally developed and tested. Author

**N88-12262\*#** Hitachi Ltd., Tokyo (Japan). Space Systems Div.  
**VAPOR COMPRESSION DISTILLER AND MEMBRANE TECHNOLOGY FOR WATER REVITALIZATION**

A. ASHIDA, K. MITANI, K. EBARA, H. KUROKAWA, I. SAWADA, H. KASHIWAGI, T. TSUJI, S. HAYASHI, K. OTSUBO, and K. NITTA (National Aerospace Lab., Tokyo, Japan ) *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 71-74 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

Water revitalization for a space station can consist of membrane filtration processes and a distillation process. Water recycling equipment using membrane filtration processes was manufactured for ground testing. It was assembled using commercially available components. Two systems for the distillation are studied: one is absorption type thermopervaporation cell and the other is a vapor compression distiller. Absorption type thermopervaporation, able to easily produce condensed water under zero gravity, was investigated experimentally and through simulated calculation. The vapor compression distiller was studied experimentally and it offers significant energy savings for evaporation of water. Author

**N88-12263\*#** Science Univ. of Tokyo, Chiba (Japan).  
**FUNDAMENTAL STUDY ON GAS MONITORING IN CELSS**

I. NISHI, T. TATEISHI, G. TOMIZAWA, K. NITTA, and M. OGUCHI (National Aerospace Lab., Tokyo, Japan ) *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 75-78 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

A mass spectrometer and computer system was developed for conducting a fundamental study on gas monitoring in a Controlled Ecological Life Support System. Respiration and metabolism of the hamster and photosynthesis of the Spirulina were measured in a combination system consisting of a hamster chamber and a Spirulina cultivator. They are connected through a membrane gas exchanger. Some technical problems were

examined. In the mass spectrometric gas monitoring, a simultaneous multisample measurement was developed by employing a rotating exchange valve. Long term precise measurement was obtained by employing an automatic calibration system. The membrane gas sampling probe proved to be useful for long term measurement. The cultivation rate of the Spirulina was effectively changed by controlling CO<sub>2</sub> and light supply. The experimental results are helpful for improving the hamster-spirulina system. Author

**N88-12264\*#** Niigata Univ. (Japan). Dept. of Civil Engineering.  
**THE APPLICABILITY OF THE CATALYTIC WET-OXIDATION TO CELSS**

Y. TAKAHASHI, K. NITTA, H. OHYA, and M. OGUCHI (National Aerospace Lab., Tokyo, Japan) *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 79-82 Sep. 1987  
Avail: NTIS HC A08/MF A01 CSCL 06K

The wet oxidation catalysis of Au, Pd, Pt, Rh or Ru on a ceramic honeycomb carrier was traced in detail by 16 to 20 repetitive batch tests each. As a result, Pt or Pd on a honeycomb carrier was shown to catalyze complete nitrogen gasification as N<sub>2</sub>. Though the catalysts which realize both complete nitrogen gasification and complete oxidation could not be found, the Ru+Rh catalyst was found to be most promising. Ru honeycomb catalyzed both nitrification and nitrogen gasification. Author

**N88-12265\*#** Mitsubishi-Kasei Inst. of Life Sciences, Tokyo (Japan). Lab. of Biogeochemistry and Sociogeochemistry.

**A LARGE-SCALE PERSPECTIVE ON ECOSYSTEMS**  
HIROSHI MIZUTANI *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 83-86 Sep. 1987  
Avail: NTIS HC A08/MF A01 CSCL 06K

Interactions between ecological elements must be better understood in order to construct an ecological life support system in space. An index was devised to describe the complexity of material cyclings within a given ecosystem. It was then applied to the cyclings of bioelements in various systems of material cyclings including the whole Earth and national economies. The results show interesting characteristics of natural and man-made systems. Author

**N88-12266\*#** California Univ., Davis. Plant Growth Lab.  
**DESIGN OF AN ELEMENTAL ANALYSIS SYSTEM FOR CELSS RESEARCH**

STEVEN H. SCHWARTZKOPF *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 87-91 Sep. 1987  
Avail: NTIS HC A08/MF A01 CSCL 06K

The results of experiments conducted with higher plants in tightly sealed growth chambers provide definite evidence that the physical closure of a chamber has significant effects on many aspects of a plant's biology. One of these effects is seen in the change in rates of uptake, distribution, and re-release or nutrient elements by the plant (mass balance). Experimental data indicates that these rates are different from those recorded for plants grown in open field agriculture, or in open growth chambers. Since higher plants are a crucial component of a controlled ecological life support system (CELSS), it is important that the consequences of these rate differences be understood with regard to the growth and yield of the plants. A description of a system for elemental analysis which can be used to monitor the mass balance of nutrient elements in CELSS experiments is given. Additionally, data on the uptake of nutrient elements by higher plants grown in a growth chamber is presented. Author

**N88-12267\*#** National Aerospace Lab., Tokyo (Japan). Space Technology Research Group.

**AN OVERVIEW OF JAPANESE CELSS RESEARCH ACTIVITIES**

KEIJI NITTA *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 93-101 Sep. 1987  
Avail: NTIS HC A08/MF A01 CSCL 06K

Development of Controlled Ecological Life Support System (CELSS) technology is inevitable for future long duration stays of human beings in space, for lunar base construction and for manned Mars flight programs. CELSS functions can be divided into 2 categories, Environmental Control and Material Recycling. Temperature, humidity, total atmospheric pressure and partial pressure of oxygen and carbon dioxide, necessary for all living things, are to be controlled by the environment control function. This function can be performed by technologies already developed and used as the Environment Control Life Support System (ECLSS) of Space Shuttle and Space Station. As for material recycling, matured technologies have not yet been established for fully satisfying the specific metabolic requirements of each living thing including human beings. Therefore, research activities for establishing CELSS technology should be focused on material recycling technologies using biological systems such as plants and animals and physico-chemical systems, for example, a gas recycling system, a water purifying and recycling system and a waste management system. Japanese research activities were conducted and will be continued accordingly. Author

**N88-12268\*#** Commissariat a l'Energie Atomique, Cadarache (France). Service de Radioagronomie.

**STUDY OF THE RELATIONSHIP BETWEEN PHOTOSYNTHESIS, RESPIRATION, TRANSPIRATION, AND MINERAL NUTRITION IN WHEAT [ETUDE DES RELATIONS ENTRE PHOTOSYNTHESE RESPIRATION TRANSPIRATION ET NUTRITION MINERALE CHEZ LE BLE]**

M. ANDRE, H. DUCLOUX, C. RICHAUD, D. MASSIMINO, A. DAGUENET, J. MASSIMINO, and A. GERBAUD (Institut National de la Recherche Agronomique, Thiverval-Grignon, France) *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 103-112 Sep. 1987 *In* FRENCH  
Avail: NTIS HC A08/MF A01 CSCL 06K

The growth of wheat (*triticum aestivum*) was studied in an enclosed controlled environment for a period of 70 days. The exchange of gases (photosynthesis, respiration), water (transpiration) and the consumption of mineral elements (nitrogen, phosphorus, potassium) were continuously measured. The dynamical relations observed in the different physiological functions, under the influence of growth and in response to environment modifications are presented. The influence of carbon dioxide content during growth (normal or double percentage) was made clear. Author

**N88-12269\*#** Wisconsin Univ., Madison. Dept. of Horticulture.  
**UTILIZATION OF POTATOES IN BIOREGENERATIVE LIFE SUPPORT SYSTEMS**

T. W. TIBBITTS and R. M. WHEELER *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 113-120 Sep. 1987  
Avail: NTIS HC A08/MF A01 CSCL 06K

Data on the tuberization, harvest index, and morphology of 2 cvs of white potato (*Solanum tuberosum* L.) grown at 12, 16, 20, 24 and 28 C, 250, 400 and 550 micromol/s/m photosynthetic photon flux (PPF), 350, 1000 and 1600 microliter 1 sup -1 CO<sub>2</sub> is presented. A productivity of 21.9 g/m day sup -1 of edible tubers from a solid stand of potatoes grown for 15 weeks with continuous irradiation at 400 micromol/s/m, 16 C and 1000 microliter 1 sup -1 CO<sub>2</sub> was obtained. This equates to an area of 34.3 sq m being required to provide 2800 kcal of potatoes per day for a human diet. Separated plants receiving side lighting have produced 32.8 g/m day sup -1 which equates to an area of 23.6 sq m to provide 2800 kcal. Studies with side lighting indicate that



productivities in this range should be realized from potatoes. Glycoalkaloid levels in tubers of controlled environment grown plants are within the range of levels found in tubers of field grown plants. The use and limitation of recirculating solution cultures for potato growth is discussed. Author

**N88-12270\*#** Utah State Univ., Logan. Dept. of Plant Science.  
**WHEAT PRODUCTION IN CONTROLLED ENVIRONMENTS**

FRANK B. SALISBURY, BRUCE BUGBEE, and DAVID BUBENHEIM *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 121-130 Sep. 1987 Sponsored in part by Utah Agricultural Experiment Station, Logan

(Contract NCC2-139)

(UAES-PAPER-3324) Avail: NTIS HC A08/MF A01 CSCL 06K

Conditions are optimized for maximum yield and quality of wheat to be used in a controlled environment life support system (CELSS) in a Lunar or Martian base or a spacecraft. With yields of 23 to 57 g/sq m/d of edible biomass, a minimum size for a CELSS would be between 12 and 30 sq m per person, utilizing about 600 W/sq m of electrical energy for artificial light. Temperature, irradiance, photoperiod, carbon dioxide levels, humidity, and wind velocity are controlled in growth chambers. Nutrient solutions (adjusted for wheat) are supplied to the roots via a recirculating system that controls pH by adding HNO<sub>3</sub> and controlling the NO<sub>3</sub>/NH<sub>4</sub> ratio in solution. A rock-wool plant support allows direct seeding and densities up to 10,000 plants sq m. Densities up to 2000 plants/sq m appear to increase seed yield. Biomass production increases almost linearly with increasing irradiance from 400 to 1700 micromol/sq m/s of photosynthetic photon flux, but the efficiency of light utilization decreases over this range. Photoperiod and temperature both have a profound influence on floral initiation, spikelet formation, stem elongation, and fertilization. Author

**N88-12271\*#** Alberta Research Council, Edmonton (Canada). Dept. of Biotechnology.

**THE EFFECT OF RADIATION ON THE LONG TERM PRODUCTIVITY OF A PLANT BASED CELSS**

B. G. THOMPSON (New York Univ., New York.) and B. H. LAKE *In* NASA, Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support System in Space p 131-138 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

Mutations occur at a higher rate in space than under terrestrial conditions, primarily due to an increase in radiation levels. These mutations may effect the productivity of plants found in a controlled ecological life support system (CELSS). Computer simulations of plants with different ploidies, modes of reproduction, lethality thresholds, viability thresholds and susceptibilities to radiation induced mutations were performed under space normal and solar flare conditions. These simulations identified plant characteristics that would enable plants to retain high productivities over time in a CELSS. Author

**N88-12272\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**MASS BALANCES FOR A BIOLOGICAL LIFE SUPPORT SYSTEM SIMULATION MODEL**

TYLER VOLK (New York Univ., New York.) and JOHN D. RUMMEL *In its* Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 139-146 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

Design decisions to aid the development of future space based biological life support systems (BLSS) can be made with simulation models. The biochemistry stoichiometry was developed for: (1) protein, carbohydrate, fat, fiber, and lignin production in the edible and inedible parts of plants; (2) food consumption and production of organic solids in urine, feces, and wash water by the humans; and (3) operation of the waste processor. Flux values for all components are derived for a steady state system with wheat as the sole food source. The large scale dynamics of a materially

closed (BLSS) computer model is described in a companion paper. An extension of this methodology can explore multifeed systems and more complex biochemical dynamics while maintaining whole system closure as a focus. Author

**N88-12273\*#** Meijo Univ., Nagoya (Japan).

**TRICKLE WATER AND FEEDING SYSTEM IN PLANT CULTURE AND LIGHT-DARK CYCLE EFFECTS ON PLANT GROWTH**

T. TAKANO, K. INADA, and J. TAKANASHI (National Inst. of Agrobiological Resources, Ibaraki, Japan ) *In* NASA- Ames Research Center, Controlled Ecological Life Support System: Regenerative Life Support Systems in Space p 147-150 Sep. 1987

Avail: NTIS HC A08/MF A01 CSCL 06K

Rockwool, as an inert medium covered or bagged with polyethylene film, can be effectively used for plant culture in space stations. The most important machine is the pump adjusting the dripping rate in the feeding system. Hydro-aeroponics may be adaptable to a space laboratory. The shortening of the light-dark cycles inhibits plant growth and induces an abnormal morphogenesis. A photoperiod of 12 hr dark may be needed for plant growth. Author

**N88-12274** Civil Aviation Authority, London (England).

**REPORT OF THE HELICOPTER HUMAN FACTORS WORKING GROUP**

1987 29 p

(CAA-PAPER-87007; ISBN-0-86039-312-7; ETN-87-90962) Avail: Issuing Activity

The extent to which incidents and accidents to helicopters were due wholly or in part to human factor causes was evaluated. Steps to be taken, within the limits of current technology, to minimize or eliminate these causes are suggested. ESA

**N88-12275#** State Univ. of New York at Buffalo, Amherst. Dept. of Industrial Engineering.

**HUMAN MOTOR REACTIONS TO DANGEROUS MOTIONS IN ROBOT OPERATIONS**

M. G. HELANDER and M. H. KARWAN Mar. 1987 48 p Sponsored by National Inst. for Occupational Safety and Health, Morgantown, W. Va.

(PB87-222196) Avail: NTIS HC A03/MF A01 CSCL 05H

In order to increase the safety factor for human workers who must work in conjunction with robots, a study was performed to analyze a robotic operation at a factory and use this analysis to propose a model containing factors which contribute to potential safety problems, such as being struck by a robot element or tooling or being caught in a pinch point. The study was also designed to develop a mathematical model relating robot speed and human reaction time to risk of injury by the robot. The site of the visit was a manufacturing company using an arc welding robot. Later two additional robots were added to the work force. Two were hydraulic and one an electromechanical version of the other two. The robots were to perform arc welding of steel frames for cabinets for computers. There were about 30 welds per frame. The productivity rate using these robots increased three to four times compared to manual welding. In the robot workplace there were three different types of jobs: the robot operator, the millwright, and the electrician. Factors which influenced the robotic safety included speed of robot arm movement, design of the teach pendant, and movement pattern of the robot. The current workplace lacked safety devices such as safety gates, floor mats, or lockout procedures. GRA

**N88-12276#** California Univ., San Diego. Dept. of Applied Mechanics and Engineering Sciences.  
**OPERATOR MULTIPLE-TASKING STUDY FOR REMOTELY OPERATED PLATFORMS Final Report, Oct. 1985 - Aug. 1986**  
 K. S. HAALAND and D. D. SWORDER Apr. 1987 100 p  
 (Contract N66001-85-D-0203; C12-134)  
 (AD-A184487; NOSC-TD-1084) Avail: NTIS HC A05/MF A01  
 CSCL 05H

This report provides the equations of evolution of an encounter involving a teleoperated vehicle. The global model contains interconnected submodels describing the conventional external primitives of the encounter (base states), suddenly occurring events (feature states), and a dynamic description of the remote operator (the generalized operator model). This model is phrased as a set of stochastic differential equations that can accommodate both linear and nonlinear effects. The final section of the report places these results within the context of the multitask problem, and indicates the direction of future research which will yield a quantitative description of vehicle performance in a rapidly changing environment. GRA

**N88-12277#** Oak Ridge National Lab., Tenn.  
**ARCHITECTURE FOR DYNAMIC TASK ALLOCATION IN A MAN-ROBOT SYMBIOTIC SYSTEM**  
 L. E. PARKER and F. G. PIN 1987 14 p Presented at the SPIE Cambridge Symposium on Intelligent Robots and Computer Vision, Cambridge, Mass., 1 Nov. 1987  
 (Contract DE-AC05-84OR-21400)  
 (DE87-013872; CONF-871163-2) Avail: NTIS HC A02

Presented is a methodological approach to the dynamic allocation of tasks in a man-machine symbiotic system in the context of dexterous manipulation and teleoperation. This paper addresses a symbiosis containing two partners working toward controlling a single manipulator arm for the execution of a series of sequential manipulation subtasks. The proposed automated task allocator uses knowledge about the allocation policies of the problem, the available resources, and the tasks to be performed to dynamically allocate tasks to the man and the machine. DOE

**N88-12278#** California Univ., Berkeley. Lawrence Berkeley Lab.  
**A SCIENTIFIC WORKSTATION OPERATOR-INTERFACE FOR ACCELERATOR CONTROL**  
 V. PAXSON, V. JACOBSON, E. THEIL, M. LEE, and S. CLEARWATER 23 Apr. 1987 14 p Presented at the Particle Accelerator Conference, Washington, D.C., 16 Mar. 1987  
 (Contract DE-AC03-76SF-00098)  
 (DE87-014689; LBL-23206; CONF-870302-249) Avail: NTIS HC A03/MF A01

Research in human factors has demonstrated that people use computers more efficiently and effectively if they have a highly visual interface to the machine. Today's scientific workstations provide sufficient power to implement such interfaces. By using these workstations, an operator interface for an accelerator control system can be built which is powerful, flexible, and easy to learn. We discuss such a system currently being developed on a Sun-3 workstation. The system is designed as a set of building blocks (e.g., Working Diagram, Twiss Plot, Beamline, Orbit Correction) which can be run independently or linked together. This toolbox approach gives the operator the ability to execute precisely those programs needed for the task at hand. Each program runs in a separate window and communicates with other running programs via a common data base. When the operator makes a change in one window, the effects are then shown in the other windows. For example, to change the tune of the machine while monitoring beam scraping, the operator activates the Working Diagram and Beam Position tools. The operator points to the new tune on the working diagram window and sees the effects it would have on the beam profile in the other window. DOE

**N88-12279#** Naval Postgraduate School, Monterey, Calif.  
**A SIMULATION STUDY OF A SPEED CONTROL SYSTEM FOR AUTONOMOUS ON-ROAD OPERATION OF AUTOMOTIVE VEHICLES M.S. Thesis**  
 MICHAEL J. DOLEZAL Jun. 1987 270 p  
 (Contract MIPR-ATEC-88-86)  
 (AD-A184030; NPS52-87-020) Avail: NTIS HC A12/MF A01  
 CSCL 17G

The study of human driving of automotive vehicles is an important aid to the development of viable autonomous vehicle navigation and control techniques. Observation of human behavior during driving suggests that this activity involved two distinct levels, the conscious and the unconscious. The behavior of a driver while stopping his vehicle at a stop sign can be conscious or unconscious, depending on the driver's skill level and the driving conditions. The driver's behavior involves a difficult process of estimating the distance to the stop sign and the velocity of the vehicle. Using these estimates, the driver then takes the necessary control actions to stop the vehicle. This research attempts to mimic the driver's conscious and unconscious behavior through mathematical modeling and computer simulation. GRA

**N88-12925#** Naval Submarine Medical Research Lab., Groton, Conn.  
**PERFORMANCE AND PREFERENCE WITH VARIOUS VDT (VIDEO DISPLAY TERMINAL) PHOSPHORS Interim Report**  
 S. M. LURIA, DAVID F. NERI, and CHRISTINE SCHLICHTING 24 Apr. 1987 20 p  
 (AD-A184085; NSMRL-1093) Avail: NTIS HC A02/MF A01  
 CSCL 07E

Subjects searched for target letters and symbols in VDT displays produced with phosphors of different colors: green, amber, yellow, red, blue, and white. There were no significant differences in search time, but there were significant differences in the number of errors made with different phosphors. Yellow produced the fewest errors and white the most. Speed and accuracy did not correlate with the preference ratings for the various phosphors. GRA

**N88-12926\*#** Presearch, Inc., Houston, Tex.  
**AN ASSESSMENT OF CLINICAL CHEMICAL SENSING TECHNOLOGY FOR POTENTIAL USE IN SPACE STATION HEALTH MAINTENANCE FACILITY**  
 31 Aug. 1987 308 p  
 (Contract NAS9-17594)  
 (NASA-CR-172013; NAS 1.26:172013) Avail: NTIS HC A14/MF A01 CSCL 06K

A Health Maintenance Facility is currently under development for space station application which will provide capabilities equivalent to those found on Earth. This final report addresses the study of alternate means of diagnosis and evaluation of impaired tissue perfusion in a microgravity environment. Chemical data variables related to the dysfunction and the sensors required to measure these variables are reviewed. A technology survey outlines the ability of existing systems to meet these requirements. How the candidate sensing system was subjected to rigorous testing is explored to determine its suitability. Recommendations for follow-on activities are included that would make the commercial system more appropriate for space station applications. Author

**N88-12927\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.  
**SPACE SUIT EXTRAVEHICULAR HAZARDS PROTECTION DEVELOPMENT**  
 JOSEPH J. KOSMO Aug. 1987 29 p  
 (NASA-TM-100458; S-565; NAS 1.15:100458) Avail: NTIS HC A03/MF A01 CSCL 06K

Presented is an overview of the development of the integral thermal/micrometeoroid garment (ITMG) used for protection of a space-suited crewmember from hazards of various extravehicular environments. These hazard conditions can range from thermal extremes, meteoroid and debris particles, and radiation conditions in near-earth orbits and free space to sand and dust environments encountered on lunar and planetary surfaces. Representative ITMG



materials cross-section layups are identified and described for various space suit configurations ranging from the Gemini program to planned protective requirements and considerations for anticipated Space Station EV operations. Author

is reported for the Comet Wilson. This comet appears to be making its first visit to the solar neighborhood; thus, the observed emission should come from grains which are the most pristine yet encountered. The differences in emission from the grains on Halley and Wilson may then reflect either local conditions in their respective birthplaces and/or their diverse histories. C.D.

## 55

## SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

**A88-14294\*** Hawaii Univ., Honolulu.

**ORGANIC MATTER ON ASTEROID 130 ELEKTRA**

D. P. CRUIKSHANK (Hawaii, University, Honolulu) and R. H. BROWN (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) Science (ISSN 0036-8075), vol. 238, Oct. 9, 1987, p. 183, 184. refs  
(Contract NGL-12-001-057)

Infrared absorption spectra of a low-albedo water-rich asteroid appear to show a weak 3.4-micrometer carbon-hydrogen stretching mode band, which suggests the presence of hydrocarbons on asteroid 130 Elektra. The organic extract from the primitive carbonaceous chondritic Murchison meteorite shows similar spectral bands. Author

**A88-15438\*** California Univ., Los Angeles.

**ISOTOPIC CHARACTERISATION OF KEROGEN-LIKE MATERIAL IN THE MURCHISON CARBONACEOUS CHONDRITE**

JOHN F. KERRIDGE (California, University, Los Angeles), SHERWOOD CHANG, and RUTH SHIPP (NASA, Ames Research Center, Moffett Field, CA) Geochimica et Cosmochimica Acta (ISSN 0016-7037), vol. 51, Sept. 1987, p. 2527-2540. refs  
(Contract NGR-05-007-289; NAG9-27; NAGW-347)

Data on isotopic composition of C, H, and N in insoluble organic fraction from the Murchison CM chondrite were used to discriminate between different theories for the origin of prebiotic organic material in the early solar system. Considerable isotopic variability was found among the samples and attributed to kerogen-like organic fraction. Three to four different isotopic components, two of them of polycyclic aromatic nature, were tentatively identified. Aliphatic moieties in the kerogen-like material, most of the polycyclic aromatic network, and extractable amino acids were found to carry a highly D-enriched component believed to have originated in an interstellar molecular cloud. A least part of the polycyclic aromatic fraction may also represent interstellar material. I.S.

**A88-16199#**

**DETECTION OF LIFE IN OTHER PLANETARY SYSTEMS**

BERNARD F. BURKE (MIT, Cambridge, MA) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 5 p. refs  
(IAF PAPER 87-597)

The general requirements that an aperture-synthesis interferometer would have in order to be able to detect planetary systems of nearby stars are examined in a quantitative way. The aperture interferometry technique is reviewed, and the use of it to solve the central problem of suppressing the diffracted and scattered light from a star in order to detect a nearby planet is examined. Some practical considerations involved in the realization of such an interferometer are addressed. C.D.

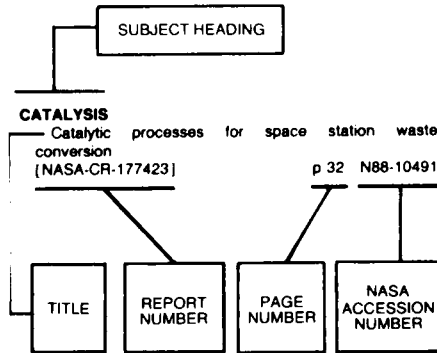
**A88-16324**

**DISCOVERY OF ORGANIC GRAINS IN COMET WILSON**

D. A. ALLEN (Anglo-Australian Observatory, Epping, Australia) and D. T. WICKRAMASINGHE (Australian National University, Canberra) Nature (ISSN 0028-0836), vol. 329, Oct. 15, 1987, p. 615, 616. refs

The detection of a spectral emission feature similar to, but distinct from, the features from organic grains seen in Comet Halley

## Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of document content, the title extension is added, separated from the title by three hyphens. The (NASA or AIAA) accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

## A

### ACCELERATION STRESSES (PHYSIOLOGY)

- Dynamic response of the human head to +G(x) impact p 40 A88-13387
- Comparative assessment of vestibular, optokinetic, and optovestibular stimulation in the development of experimental motion sickness p 42 A88-15339

### ACCELERATION TOLERANCE

- Simulation of a highly dynamic G-time profile - A predictive algorithm for crewmember acceleration tolerance p 40 A88-13379
- G-tolerance standards for aircrew training and selection p 43 A88-15350
- Inflight combined vertical and lateral space vehicular accelerations - Human tolerances [IAF PAPER 87-531] p 43 A88-16154

### ACCIDENT PREVENTION

- Report of the helicopter human factors working group -- accident prevention [CAA-PAPER-87007] p 59 N88-12274

### ACID BASE EQUILIBRIUM

- Fluctuation limits of the acid-base status and of the gas content of blood in healthy untrained men performing standard physical exercise p 41 A88-14726

### ACTIVITY (BIOLOGY)

- Investigation of the ability of para-aminobenzoic acid to restore the activity of alkaline ribonuclease p 35 A88-13697
- A role for biobehavioral applications in support of spaceflight operations programs [IAF PAPER 87-555] p 47 A88-16171

### ADAPTATION

- The dynamics of the lipid metabolism and hormonal background during adaptation to long-term psychoemotional and physical loads p 41 A88-14727
- Physiological characteristics of adaptation processes preceding activity conditions p 42 A88-14744
- Human adaptation and constitution -- Russian book p 43 A88-15655

### AEROEMBOLISM

- Decompression sickness and venous gas emboli at 8.3 psia p 40 A88-13401

### AEROSPACE ENGINEERING

- A systems engineering view of the human in space [IAF PAPER 87-547] p 53 A88-16164

### AEROSPACE MEDICINE

- The significance of the phase mismatch of sensory signals in mechanisms of motion-sickness development p 41 A88-13696
- Recurrent +Gz-induced loss of consciousness p 42 A88-15338
- Comparative assessment of vestibular, optokinetic, and optovestibular stimulation in the development of experimental motion sickness p 42 A88-15339
- Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle p 37 A88-15343
- Buspirone blocks motion sickness and xylazine-induced emesis in the cat p 37 A88-15344
- Apical hypertrophic nonobstructive cardiomyopathy in a pilot p 42 A88-15347

- Considerations in prescribing preflight aerobic exercise for astronauts p 42 A88-15349
- Results of medical investigations conducted aboard the 'Salyut-6'-'Soyuz' orbital research complex -- Russian book p 43 A88-15650
- A neuropharmacological approach to space motion sickness [IAF PAPER 87-529] p 43 A88-16152
- Biomedical payload of the French-Soviet long duration flight [IAF PAPER 87-541] p 44 A88-16159
- Wings and serpents -- centrifuge-training requirements of advanced aircraft p 44 A88-16377
- Motion and space sickness p 45 N88-12510
- JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915
- Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917

- Aerospace medicine and biology: A continuing bibliography with indexes [NASA-SP-7011(304)] p 46 N88-12922
- Human respiratory responses during high performance flight [AGARD-AG-312] p 46 N88-12923

### AEROSPACE SAFETY

- SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings p 49 A88-13376
- Decompression tests of the French personal flight equipment in 439 - VHA 90 p 49 A88-13378
- Report of the helicopter human factors working group -- accident prevention [CAA-PAPER-87007] p 59 N88-12274

### AGING (BIOLOGY)

- Investigation of the life-shortening effect in an experiment with chronic external gamma-irradiation - In support of the aging hypothesis p 36 A88-14769

### AGRICULTURE

- JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915

### AIR PURIFICATION

- Operation of an experimental algal gas exchanger for use in a CELSS p 56 N88-12255
- Non-conventional approaches to food processing in CELSS, 1. Algal proteins: Characterization and process optimization p 56 N88-12256
- Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261

### AIRCRAFT ACCIDENT INVESTIGATION

- Delethalized cyclic control stick p 50 A88-13538

### AIRCRAFT ACCIDENTS

- Passenger behaviour in aircraft emergencies p 47 A88-16741

### AIRCRAFT EQUIPMENT

- Current research on an artificial intelligence-based Loss of Consciousness Monitoring System for advanced fighter aircraft p 50 A88-13404
- Performance studies on a molecular sieve oxygen concentrator (MSOC) - Comparison of MG3, SAMG, and 13X molecular sieves p 51 A88-13542

### AIRCRAFT PILOTS

- Human respiratory responses during high performance flight [AGARD-AG-312] p 46 N88-12923

### AIRCRAFT SAFETY

- Current research on an artificial intelligence-based Loss of Consciousness Monitoring System for advanced fighter aircraft p 50 A88-13404
- The prospects for helicopter helmet design to meet rapidly expanding requirements p 50 A88-13541
- Aspects of health and safety in the passenger cabin p 55 A88-16739
- Passenger behaviour in aircraft emergencies p 47 A88-16741

### ALERTNESS

- Mental and physical performance at core temperatures as low as 31.2 C p 41 A88-13411

### ALGAE

- Controlled Ecological Life Support System: Regenerative Life Support Systems in Space [NASA-CP-2480] p 55 N88-12251
- Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems p 56 N88-12254
- Operation of an experimental algal gas exchanger for use in a CELSS p 56 N88-12255
- Non-conventional approaches to food processing in CELSS, 1. Algal proteins: Characterization and process optimization p 56 N88-12256
- Sunlight supply and gas exchange systems in microalgal bioreactor p 57 N88-12258

### ALGORITHMS

- Simulation of a highly dynamic G-time profile - A predictive algorithm for crewmember acceleration tolerance p 40 A88-13379

### ALKALINITY

- Investigation of the ability of para-aminobenzoic acid to restore the activity of alkaline ribonuclease p 35 A88-13697

### ALLOCATIONS

- Architecture for dynamic task allocation in a man-robot symbiotic system [DEB7-013872] p 60 N88-12277

### ALTITUDE SIMULATION

- Decompression and occurrence of cataract in enucleated eyes of experimental animals p 37 A88-15345

### AMINO ACIDS

- Investigation of the ability of para-aminobenzoic acid to restore the activity of alkaline ribonuclease p 35 A88-13697

### ANEMIAS

- Acclimatized deficit of iron p 41 A88-14729

### ANGULAR ACCELERATION

- Artificial gravity - A countermeasure for zero gravity [IAF PAPER 87-533] p 53 A88-16156

### ANTARCTIC REGIONS

- Human adaptation to isolated and confined environments [NASA-CR-181502] p 48 N88-12248

### ANTIBIOTICS

- Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917

### ANTIRADIATION DRUGS

- Radioprotective activity of aminoarythiazoles and some mechanisms of their action p 36 A88-14771

### ARTIFICIAL GRAVITY

- Artificial gravity - A countermeasure for zero gravity [IAF PAPER 87-533] p 53 A88-16156
- Providing artificial gravity - Physiologic limitations to rotating habitats [IAF PAPER 87-545] p 53 A88-16163

- Artificial gravity - The evolution of variable gravity research  
[IAF PAPER 87-539] p 54 A88-16176
- ARTIFICIAL INTELLIGENCE**  
Current research on an artificial intelligence-based Loss of Consciousness Monitoring System for advanced fighter aircraft p 50 A88-13404
- ASTEROIDS**  
Organic matter on asteroid 130 Elektra p 61 A88-14294
- ASTRONAUT PERFORMANCE**  
Small groups in orbit - Group interaction and crew performance on Space Station p 47 A88-15348  
Considerations in prescribing preflight aerobic exercise for astronauts p 42 A88-15349
- ASTRONAUT TRAINING**  
Automated learning systems for the occupational training of flight-vehicle operators --- Russian book p 47 A88-15680
- ASTRONAUTS**  
A neuropharmacological approach to space motion sickness  
[IAF PAPER 87-529] p 43 A88-16152  
Radiation problems with the Space Station scenario and the necessary surveillance for astronauts  
[IAF PAPER 87-542] p 53 A88-16160
- ATMOSPHERIC COMPOSITION**  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261  
Fire-related medical science p 45 N88-12525
- ATROPHY**  
Disuse atrophy, plasma corticosterone, and muscle glucocorticoid receptor levels p 38 A88-15346
- ATTENTION**  
Effects of divided attention on identity and semantic priming  
[AD-A184289] p 48 N88-12250  
Latency differences and effects of selective attention to gratings in the central and right visual fields: 2  
[DE87-014730] p 46 N88-12918
- AUTOMATIC CONTROL**  
Automated learning systems for the occupational training of flight-vehicle operators --- Russian book p 47 A88-15680
- AUTOMOBILES**  
A simulation study of a speed control system for autonomous on-road operation of automotive vehicles [AD-A184030] p 60 N88-12279
- AUTONOMIC NERVOUS SYSTEM**  
The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731  
Motion and space sickness p 45 N88-12510
- AUTONOMOUS NAVIGATION**  
A simulation study of a speed control system for autonomous on-road operation of automotive vehicles [AD-A184030] p 60 N88-12279
- AVIATION PSYCHOLOGY**  
Passenger behaviour in aircraft emergencies p 47 A88-16741

## B

- BACILLUS**  
Analysis of the synergistic effect of heat and radiation on bacteriophage T4 and the spores of *Bacillus subtilis* p 36 A88-14767
- BACTERIA**  
Ultramicroforms of bacteria in soil and ocean p 35 A88-13695  
Application of photosynthetic N(2)-fixing cyanobacteria to the CELSS program p 56 N88-12257  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917
- BACTERIOLOGY**  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917
- BACTERIOPHAGES**  
Analysis of the synergistic effect of heat and radiation on bacteriophage T4 and the spores of *Bacillus subtilis* p 36 A88-14767
- BEHAVIOR**  
Effect of microwave radiation on the dopamine-dependent behavior of rabbits p 37 A88-14773  
Assessment of fatigue in aviation crews [AD-A184129] p 45 N88-12245
- BENDING**  
Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342

## BIBLIOGRAPHIES

- Health hazards of video display terminals. A comprehensive, annotated bibliography on a critical issue of workplace health and safety with sources for obtaining items and list of terminal suppliers  
[RSI-IAS-4] p 44 N88-12240
- Aerospace medicine and biology: A continuing bibliography with indexes  
[NASA-SP-7011(304)] p 46 N88-12922
- Research papers and publications (1981-1987): Workload research program  
[NASA-TM-100016] p 48 N88-12924
- BIOASSAY**  
DNA damage and repair in human skin in situ  
[DE87-014288] p 44 N88-12241  
Superoxide dismutase assays  
[AD-A183972] p 45 N88-12242
- BIOASTRONAUTICS**  
Medical aspects of orbital spaceflight and their implications for manufacturing in space p 40 A88-13162  
Results of medical investigations conducted aboard the 'Salyut-6'-'Soyuz' orbital research complex --- Russian book p 43 A88-15650  
Man in space flight  
[IAF PAPER 87-527] p 43 A88-16150  
Insulin receptors and enzyme activities in liver of rats after space flight on biosatellite COSMOS 1667  
[IAF PAPER 87-530] p 38 A88-16153  
Biomedical payload of the French-Soviet long duration flight  
[IAF PAPER 87-541] p 44 A88-16159  
Support of life science research in space by the DFLVR Microgravity User Support Center (MUSC)  
[IAF PAPER 87-544] p 38 A88-16162  
Human factors - Man-machine symbiosis in space  
[IAF PAPER 87-548] p 53 A88-16165  
A role for biobehavioral applications in support of spaceflight operations programs p 47 A88-16171  
Human blood platelets at microgravity  
[IAF PAPER 87-562] p 44 A88-16177
- BIOCHEMISTRY**  
Triphenyldioxane - A new powerful inducer of cytochrome P-450 p 38 A88-15696  
JPRS report: Science and technology. USSR: Life sciences [JPRS-UJS-87-009] p 39 N88-12915
- BIODYNAMICS**  
A computer simulation of the Hybrid II manikin head-neck system p 49 A88-13380  
Dynamic response of the human head to +G(x) impact p 40 A88-13387  
The design evolution of the mechanical analog of the human dynamic spine/viscera p 50 A88-13402
- BIOELECTRICITY**  
Homosynaptic depression as a model of the habituation phenomenon p 35 A88-13699
- BIOLOGICAL EFFECTS**  
Analysis of the synergistic effect of heat and radiation on bacteriophage T4 and the spores of *Bacillus subtilis* p 36 A88-14767  
Effect of microwave radiation on the dopamine-dependent behavior of rabbits p 37 A88-14773  
Physico-chemical and biological aspects of weak magnetic field effects on plants  
[IAF PAPER 87-560] p 38 A88-16174  
Experiment on STS 51-C - Effect of weightlessness on the morphology of aggregation of human red cells in disease  
[IAF PAPER 87-563] p 39 A88-16178  
Aerospace medicine and biology: A continuing bibliography with indexes  
[NASA-SP-7011(304)] p 46 N88-12922
- BIOLOGICAL MODELS (MATHEMATICS)**  
Regulation of the hemodynamics during the simulation of weightlessness (Mathematical modeling) p 41 A88-14728  
Analysis of the synergistic effect of heat and radiation on bacteriophage T4 and the spores of *Bacillus subtilis* p 36 A88-14767  
Otolith-organ mechanics - Lumped parameter model and dynamic response p 37 A88-15341  
A systems engineering view of the human in space  
[IAF PAPER 87-547] p 53 A88-16164
- BIOMAGNETISM**  
Physico-chemical and biological aspects of weak magnetic field effects on plants  
[IAF PAPER 87-560] p 38 A88-16174
- BIOMASS**  
Wheat production in controlled environments  
[UAES-PAPER-3324] p 59 N88-12270

## BIOMASS ENERGY PRODUCTION

- Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems p 56 N88-12254
- BIOMEDICAL DATA**  
Gravity effects on membrane equilibria  
[IAF PAPER 87-561] p 39 A88-16175  
Human respiratory responses during high performance flight  
[AGARD-AG-312] p 46 N88-12923
- BIOREACTORS**  
Sunlight supply and gas exchange systems in microalgal bioreactor p 57 N88-12258
- BIOSYNTHESIS**  
Radioprotective activity of aminoarylthiazoles and some mechanisms of their action p 36 A88-14771
- BIOTECHNOLOGY**  
JPRS report: Science and technology. USSR: Life sciences [JPRS-UJS-87-012] p 44 N88-12238
- BLACKOUT (PHYSIOLOGY)**  
Simulation of a highly dynamic G-time profile - A predictive algorithm for crewmember acceleration tolerance p 40 A88-13379  
Current research on an artificial intelligence-based Loss of Consciousness Monitoring System for advanced fighter aircraft p 50 A88-13404
- BLOOD**  
Scotopic sensitivity with 10 percent oxygen  
[AD-A183973] p 45 N88-12243  
An assessment of clinical chemical sensing technology for potential use in space station health maintenance facility  
[NASA-CR-172013] p 60 N88-12926
- BLOOD CIRCULATION**  
'O2-MP' - A device for measuring the partial pressure of oxygen in capillary blood under space flight conditions  
[IAF PAPER 87-543] p 53 A88-16161
- BLOOD FLOW**  
Studies of the processing of single words using positron tomographic measures of cerebral blood flow change  
[AD-A184058] p 45 N88-12244
- BLOOD PLASMA**  
Fluctuation limits of the acid-base status and of the gas content of blood in healthy untrained men performing standard physical exercise p 41 A88-14726  
Disuse atrophy, plasma corticosterone, and muscle glucocorticoid receptor levels p 38 A88-15346
- BLUE GREEN ALGAE**  
Food production and gas exchange system using blue-green alga (spirulina) for CELSS p 56 N88-12253
- BODY KINEMATICS**  
A computer simulation of the Hybrid II manikin head-neck system p 49 A88-13380  
Comparative assessment of vestibular, optokinetic, and optovestibular stimulation in the development of experimental motion sickness p 42 A88-15339
- BODY TEMPERATURE**  
Mental and physical performance at core temperatures as low as 31.2 C p 41 A88-13411  
Physiological mechanisms of thermoregulation in humans during adaptation to cold p 41 A88-14730  
Heat dissipation under lower body negative pressure stress  
[IAF PAPER 87-532] p 43 A88-16155
- BONE MINERAL CONTENT**  
Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342
- BRAIN**  
Latency differences and effects of selective attention to gratings in the central and right visual fields: 2  
[DE87-014730] p 46 N88-12918
- BRAIN CIRCULATION**  
Studies of the processing of single words using positron tomographic measures of cerebral blood flow change  
[AD-A184058] p 45 N88-12244  
Change in functional activity of cortical brain structures and their blood supply in alert rabbits in response to rocking p 39 N88-12916
- BREATHING APPARATUS**  
The SRU-36/P Halo emergency egress device p 50 A88-13396
- BRIGHTNESS**  
Eysight trainer for pilots p 44 N88-12239
- BUFFETING**  
A modular BLSS simulation model p 57 N88-12260

## C

## CALCIUM METABOLISM

- Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342

- CANCER**  
DNA damage and repair in human skin in situ [DE87-014288] p 44 N88-12241
- CAPILLARIES (ANATOMY)**  
'O<sub>2</sub>-MP' - A device for measuring the partial pressure of oxygen in capillary blood under space flight conditions [IAF PAPER 87-543] p 53 A88-16161
- CARBONACEOUS CHONDRITES**  
Isotopic characterisation of kerogen-like material in the Murchison carbonaceous chondrite p 61 A88-15438
- CARDIOLOGY**  
Fluctuation limits of the acid-base status and of the gas content of blood in healthy untrained men performing standard physical exercise p 41 A88-14726
- CATALYSIS**  
The applicability of the catalytic wet-oxidation to CELSS p 58 N88-12264
- CATARACTS**  
Decompression and occurrence of cataract in enucleated eyes of experimental animals p 37 A88-15345
- CELLS (BIOLOGY)**  
Ultrastructure of pea meristem and root cap cells under space flight conditions [IAF PAPER 87-558] p 38 A88-16173  
Superoxide dismutase assays [AD-A183972] p 45 N88-12242
- CEREBRAL CORTEX**  
Change in functional activity of cortical brain structures and their blood supply in alert rabbits in response to rocking p 39 N88-12916  
Large-scale neuronal circuits for selective storage and recognition of complex stimuli, a pilot study [AD-A184134] p 46 N88-12920
- CEREBRUM**  
Studies of the processing of single words using positron tomographic measures of cerebral blood flow change [AD-A184058] p 45 N88-12244
- CHEMICAL ANALYSIS**  
An assessment of clinical chemical sensing technology for potential use in space station health maintenance facility [NASA-CR-172013] p 60 N88-12926
- CHEMICAL COMPOSITION**  
Discovery of organic grains in Comet Wilson p 61 A88-16324
- CHEMICAL WARFARE**  
Development of the tactical aircrew eye respiratory systems p 49 A88-13393
- CHRONIC CONDITIONS**  
Analysis of the life shortening effect of chronic external gamma-irradiation - The structure of the mortality rate p 36 A88-14768  
Investigation of the life-shortening effect in an experiment with chronic external gamma-irradiation - In support of the aging hypothesis p 36 A88-14769
- CLASSIFICATIONS**  
Computer-controlled testing of visual-spatial ability [AD-A183971] p 48 N88-12249
- CLINICAL MEDICINE**  
JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-012] p 44 N88-12238  
JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915  
An assessment of clinical chemical sensing technology for potential use in space station health maintenance facility [NASA-CR-172013] p 60 N88-12926
- CLOSED ECOLOGICAL SYSTEMS**  
Activation of a controlled ecological life support system (CELSS) breadboard facility - Wheat growth studies [IAF PAPER 87-557] p 54 A88-16172  
Controlled Ecological Life Support System: Regenerative Life Support Systems in Space [NASA-CP-2480] p 55 N88-12251  
Progress in European CELSS activities p 56 N88-12252  
Food production and gas exchange system using blue-green alga (spirulina) for CELSS p 56 N88-12253  
Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems p 56 N88-12254  
Operation of an experimental algal gas exchanger for use in a CELSS p 56 N88-12255  
Non-conventional approaches to food processing in CELSS, 1. Algal proteins: Characterization and process optimization p 56 N88-12256  
Application of photosynthetic N(2)-fixing cyanobacteria to the CELSS program p 56 N88-12257  
Sunlight supply and gas exchange systems in microalgal bioreactor p 57 N88-12258  
A review of recent activities in the NASA CELSS program p 57 N88-12259
- A modular BLSS simulation model p 57 N88-12260  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261  
Fundamental study on gas monitoring in CELSS p 57 N88-12263  
The applicability of the catalytic wet-oxidation to CELSS p 58 N88-12264  
A large-scale perspective on ecosystems p 58 N88-12265  
Design of an elemental analysis system for CELSS research p 58 N88-12266  
An overview of Japanese CELSS research activities p 58 N88-12267  
Utilization of potatoes in bioregenerative life support systems p 58 N88-12269  
Wheat production in controlled environments [UAES-PAPER-3324] p 59 N88-12270  
The effect of radiation on the long term productivity of a plant based CELSS p 59 N88-12271  
Mass balances for a biological life support system simulation model p 59 N88-12272
- COCKPIT SIMULATORS**  
Investigation of pilot behavior in a training program for assessing handling qualities using a ground simulator [ESA-TT-999] p 48 N88-12247
- CODING**  
Studies of the processing of single words using positron tomographic measures of cerebral blood flow change [AD-A184058] p 45 N88-12244
- COGNITION**  
Studies of the processing of single words using positron tomographic measures of cerebral blood flow change [AD-A184058] p 45 N88-12244  
Effects of divided attention on identity and semantic priming [AD-A184289] p 48 N88-12250
- COLD ACCLIMATIZATION**  
Acclimatized deficit of iron p 41 A88-14729  
Physiological mechanisms of thermoregulation in humans during adaptation to cold p 41 A88-14730
- COLOR**  
Performance and preference with various VDT (Video Display Terminal) phosphors [AD-A184085] p 60 N88-12925
- COLUMBUS SPACE STATION**  
Man tended free flyer interior equipment for manned and automated operation [IAF PAPER 87-75] p 52 A88-15850
- COMBUSTION**  
Fire-related medical science p 45 N88-12525
- COMET NUCLEI**  
Discovery of organic grains in Comet Wilson p 61 A88-16324
- COMMAND AND CONTROL**  
Telerobotics and orbital laboratories - An end-to-end analysis and demonstration [IAF PAPER 87-27] p 52 A88-15819
- COMMERCIAL AIRCRAFT**  
Aspects of health and safety in the passenger cabin p 55 A88-16739
- COMPUTER AIDED DESIGN**  
Design and development of a computer-assisted ground control technique for Space Station robotics p 51 A88-15284
- COMPUTER GRAPHICS**  
A scientific workstation operator-interface for accelerator control [DE87-014689] p 60 N88-12278  
A simulation study of a speed control system for autonomous on-road operation of automotive vehicles [AD-A184030] p 60 N88-12279
- COMPUTER TECHNIQUES**  
Computer-controlled testing of visual-spatial ability [AD-A183971] p 48 N88-12249
- COMPUTERIZED SIMULATION**  
Mass balances for a biological life support system simulation model p 59 N88-12272  
A simulation study of a speed control system for autonomous on-road operation of automotive vehicles [AD-A184030] p 60 N88-12279
- CONFERENCES**  
SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings p 49 A88-13376  
Research papers and publications (1981-1987): Workload research program [NASA-TM-100016] p 48 N88-12924
- CONFINEMENT**  
Human adaptation to isolated and confined environments [NASA-CR-181502] p 48 N88-12248
- CONSTRAINTS**  
Space suit systems - Technical and physiological constraints [IAF PAPER 87-540] p 53 A88-16158
- CONTROL SIMULATION**  
A simulation study of a speed control system for autonomous on-road operation of automotive vehicles [AD-A184030] p 60 N88-12279
- CONTROL STICKS**  
Delethalized cyclic control stick p 50 A88-13538
- CONTROL SYSTEMS DESIGN**  
Design and development of a computer-assisted ground control technique for Space Station robotics p 51 A88-15284  
Control aspects of a European space manipulator system p 55 A88-16313  
A scientific workstation operator-interface for accelerator control [DE87-014689] p 60 N88-12278
- CONTROLLABILITY**  
Investigation of pilot behavior in a training program for assessing handling qualities using a ground simulator [ESA-TT-999] p 48 N88-12247
- CONTROLLED ATMOSPHERES**  
Fire-related medical science p 45 N88-12525
- CONTROLLERS**  
Design of a force reflecting hand controller for space telemanipulation studies [IAF PAPER 87-ST-01] p 52 A88-16067
- CORIOLIS EFFECT**  
Artificial gravity - A countermeasure for zero gravity [IAF PAPER 87-533] p 53 A88-16156
- CORTICOSTEROIDS**  
Disuse atrophy, plasma corticosterone, and muscle glucocorticoid receptor levels p 38 A88-15346
- COSMOCHEMISTRY**  
Organic matter on asteroid 130 Elektra p 61 A88-14294
- COSMOLOGY**  
The metaphysical presuppositions of the 'anthropic principle' p 35 A88-14422
- COSMONAUTS**  
Cosmonaut behaviour in orbital flight situation - Preliminary ethological analysis [IAF PAPER 87-528] p 47 A88-16151
- COSMOS SATELLITES**  
Insulin receptors and enzyme activities in liver of rats after space flight on biosatellite COSMOS 1667 [IAF PAPER 87-530] p 38 A88-16153
- COUNTERMEASURES**  
Artificial gravity - A countermeasure for zero gravity [IAF PAPER 87-533] p 53 A88-16156
- CRASH INJURIES**  
Delethalized cyclic control stick p 50 A88-13538
- CRASH LANDING**  
A computer simulation of the Hybrid II manikin head-neck system p 49 A88-13380
- CREW WORKSTATIONS**  
Low-cost prototypes for human factors evaluation of Space Station crew equipment [IAF PAPER 87-553] p 54 A88-16170
- CROP GROWTH**  
Wheat production in controlled environments [UAES-PAPER-3324] p 59 N88-12270
- CULTIVATION**  
Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems p 56 N88-12254  
Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth p 59 N88-12273
- CULTURE TECHNIQUES**  
Superoxide dismutase assays [AD-A183972] p 45 N88-12242
- CYANO COMPOUNDS**  
Application of photosynthetic N(2)-fixing cyanobacteria to the CELSS program p 56 N88-12257
- CYTOCHROMES**  
Triphenyldioxane - A new powerful inducer of cytochrome P-450 p 38 A88-15696

D

- DARKNESS**  
Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth p 59 N88-12273
- DATA ACQUISITION**  
The ADAM data acquisition system --- Advanced Dynamic Anthropomorphic Manikin for ejection seat tests p 50 A88-13398
- DATA BASES**  
NASA-STD-3000, Man-System Integration Standards - The new space human engineering standards [IAF PAPER 87-550] p 54 A88-16167

## DATA PROCESSING TERMINALS

Health hazards of video display terminals. A comprehensive, annotated bibliography on a critical issue of workplace health and safety with sources for obtaining items and list of terminal suppliers  
[RSI-IAS-4] p 44 N88-12240

Performance and preference with various VDT (Video Display Terminal) phosphors  
[AD-A184085] p 60 N88-12925

## DECOMPRESSION SICKNESS

Decompression tests of the French personal flight equipment in 439 - VHA 90 p 49 A88-13378  
Decompression sickness and venous gas emboli at 8.3 psia p 40 A88-13401

## DEOXYRIBONUCLEIC ACID

DNA damage and repair in human skin in situ  
[DE87-014288] p 44 N88-12241

## DESIGN ANALYSIS

ADAM - The next step in development of the true human analog p 49 A88-13386  
Flight simulator requirements for airline transport pilot training - An evaluation of motion system design alternatives p 47 A88-16679

## DIAGNOSIS

Computer-controlled testing of visual-spatial ability  
[AD-A183971] p 48 N88-12249

## DIFFERENTIAL EQUATIONS

Operator multiple-tasking study for remotely operated platforms  
[AD-A184487] p 60 N88-12276

## DISPLAY DEVICES

Integrated voice and visual systems research topics  
[NASA-CR-177417] p 47 N88-12246  
Computer-controlled testing of visual-spatial ability  
[AD-A183971] p 48 N88-12249  
A scientific workstation operator-interface for accelerator control  
[DE87-014689] p 60 N88-12278

## DISTILLATION EQUIPMENT

Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262

## DITCHING (LANDING)

The SRU-36/P Helo emergency egress device  
p 50 A88-13396

## DOPA

Effect of microwave radiation on the dopamine-dependent behavior of rabbits  
p 37 A88-14773

## DUMMIES

A computer simulation of the Hybrid II manikin head-neck system p 49 A88-13380  
ADAM - The next step in development of the true human analog p 49 A88-13386  
The USAF Advanced Dynamic Anthropomorphic Manikin - ADAM p 49 A88-13389  
The ADAM data acquisition system --- Advanced Dynamic Anthropomorphic Manikin for ejection seat tests p 50 A88-13398

## DYNAMIC LOADS

The design evolution of the mechanical analog of the human dynamic spine/viscera p 50 A88-13402

## DYNAMIC MODELS

Dynamic analysis of robotic manipulators for spacecraft applications p 51 A88-15524  
Modelling and simulation of distributed flexibility in a spaceborne manipulator p 55 A88-16309

## DYNAMIC RESPONSE

Dynamic response of the human head to +G(x) impact p 40 A88-13387  
Otolith-organ mechanics - Lumped parameter model and dynamic response p 37 A88-15341

## DYNAMIC TESTS

Mass properties and inertial loading effects of head encumbering devices p 50 A88-13412  
Computer-controlled testing of visual-spatial ability  
[AD-A183971] p 48 N88-12249

## E

## EARTH ORBITAL ENVIRONMENTS

Radiation hazards in space p 44 A88-16750

## ECOLOGY

Activation of a controlled ecological life support system (CELS) breadboard facility - Wheat growth studies  
[IAF PAPER 87-557] p 54 A88-16172

## ECONOMIC ANALYSIS

A large-scale perspective on ecosystems  
p 58 N88-12265

## ECOSYSTEMS

Faunal composition and organic surface encrustations at hydrothermal vents on the southern Juan de Fuca Ridge p 39 A88-16803  
A modular BLSS simulation model p 57 N88-12260  
A large-scale perspective on ecosystems  
p 58 N88-12265

## EJECTION INJURIES

Limb flail injuries in USAF ejections - 1979-1985  
p 40 A88-13377

The design evolution of the mechanical analog of the human dynamic spine/viscera p 50 A88-13402

## EJECTION SEATS

The CREST restraint system development program  
p 49 A88-13382

ADAM - The next step in development of the true human analog p 49 A88-13386

The USAF Advanced Dynamic Anthropomorphic Manikin - ADAM p 49 A88-13389

The ADAM data acquisition system --- Advanced Dynamic Anthropomorphic Manikin for ejection seat tests p 50 A88-13398

Wings and serpents --- centrifuge-training requirements of advanced aircraft p 44 A88-16377

## ELECTRIC STIMULI

Characteristics of hypothalamic self-stimulation related to the intensity of the stimulating current  
p 35 A88-13698

Homosynaptic depression as a model of the habituation phenomenon p 35 A88-13699

## ELECTROENCEPHALOGRAPHY

Change in functional activity of cortical brain structures and their blood supply in alert rabbits in response to rocking p 39 N88-12916

## ELECTROMAGNETIC RADIATION

Effect of microwave radiation on the dopamine-dependent behavior of rabbits  
p 37 A88-14773

Gravity effects on membrane equilibria  
[IAF PAPER 87-561] p 39 A88-16175

## ELECTROMECHANICAL DEVICES

Operator multiple-tasking study for remotely operated platforms  
[AD-A184487] p 60 N88-12276

## EMERGENCIES

Passenger behaviour in aircraft emergencies  
p 47 A88-16741

## EMISSION

Studies of the processing of single words using positron tomographic measures of cerebral blood flow change  
[AD-A184058] p 45 N88-12244

## EMISSION SPECTRA

Discovery of organic grains in Comet Wilson  
p 61 A88-16324

## END-TO-END DATA SYSTEMS

Telerobotics and orbital laboratories - An end-to-end analysis and demonstration  
[IAF PAPER 87-27] p 52 A88-15819

## ENVIRONMENTAL ENGINEERING

The Solar Plant Growth Facility - An approach towards future biological life support systems  
[IAF PAPER 87-538] p 53 A88-16157

## ENZYME ACTIVITY

Investigation of the ability of para-aminobenzoic acid to restore the activity of alkaline ribonuclease  
p 35 A88-13697

Correlation between changes in radiosensitivity and the activity of blood lymphocyte succinate dehydrogenase effected by exogenic hypoxia p 36 A88-14770

Insulin receptors and enzyme activities in liver of rats after space flight on biosatellite COSMOS 1667  
[IAF PAPER 87-530] p 38 A88-16153

## ENZYMOLGY

Superoxide dismutase assays  
[AD-A183972] p 45 N88-12242

## EPIDEMIOLGY

JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-87-012] p 44 N88-12238

JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-87-009] p 39 N88-12915

## ERYTHROCYTES

Experiment on STS 51-C - Effect of weightlessness on the morphology of aggregation of human red cells in disease  
[IAF PAPER 87-563] p 39 A88-16178

## ESA SPACECRAFT

Man tended free flyer interior equipment for manned and automated operation  
[IAF PAPER 87-75] p 52 A88-15850

## ESCAPE SYSTEMS

The USAF Advanced Dynamic Anthropomorphic Manikin - ADAM p 49 A88-13389

The SRU-36/P Helo emergency egress device  
p 50 A88-13396

## ESCHERICHIA

Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment  
p 40 N88-12917

## EUROPEAN SPACE PROGRAMS

European EVA requirements and space suit design  
[IAF PAPER 87-41] p 52 A88-15830

Control aspects of a European space manipulator system p 55 A88-16313

## EVOKED RESPONSE (PSYCHOPHYSIOLOGY)

Visual evoked responses to sinusoidal gratings presented in central and right visual fields: 1  
[DE87-014731] p 46 N88-12919

## EXERCISE PHYSIOLOGY

Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity p 36 A88-14772

## EXOBIOLGY

Biology and microgravity  
[IAF PAPER 87-564] p 39 A88-16179

Space biologist's inflight safety considerations  
[IAF PAPER 87-570] p 54 A88-16182

Aerospace medicine and biology: A continuing bibliography with indexes  
[NASA-SP-7011(304)] p 46 N88-12922

## EXPERIMENT DESIGN

Support of life science research in space by the DFVLR Microgravity User Support Center (MUSC)  
[IAF PAPER 87-544] p 38 A88-16162

## EXTRASOLAR PLANETS

Detection of life in other planetary systems  
[IAF PAPER 87-597] p 61 A88-16199

## EXTRATERRESTRIAL LIFE

Detection of life in other planetary systems  
[IAF PAPER 87-597] p 61 A88-16199

## EXTRAVEHICULAR ACTIVITY

European EVA requirements and space suit design  
[IAF PAPER 87-41] p 52 A88-15830

Design of a force reflecting hand controller for space telemanipulation studies  
[IAF PAPER 87-ST-01] p 52 A88-16067

Space suit extravehicular hazards protection development  
[NASA-TM-100458] p 60 N88-12927

## EYE (ANATOMY)

Motion and space sickness p 45 N88-12510

## EYE PROTECTION

Development of the tactical aircrew eye respiratory systems p 49 A88-13393

## F

## FACTOR ANALYSIS

Assessment of fatigue in aviation crews  
[AD-A184129] p 45 N88-12245

## FATIGUE (BIOLOGY)

Assessment of fatigue in aviation crews  
[AD-A184129] p 45 N88-12245

## FEED SYSTEMS

Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth  
p 59 N88-12273

## FEMUR

Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks  
p 37 A88-15342

## FIGHTER AIRCRAFT

Decompression tests of the French personal flight equipment in 439 - VHA 90 p 49 A88-13378

Simulation of a highly dynamic G-time profile - A predictive algorithm for crewmember acceleration tolerance p 40 A88-13379

Current research on an artificial intelligence-based Loss of Consciousness Monitoring System for advanced fighter aircraft p 50 A88-13404

## FILTRATION

Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262

## FIRES

Fire-related medical science p 45 N88-12525

## FLEXIBLE SPACECRAFT

Modelling and simulation of distributed flexibility in a spaceborne manipulator p 55 A88-16309

## FLIGHT CONDITIONS

Ultrastructure of pea meristem and root cap cells under space flight conditions  
[IAF PAPER 87-558] p 38 A88-16173

## FLIGHT CREWS

Development of the tactical aircrew eye respiratory systems p 49 A88-13393

Wings and serpents --- centrifuge-training requirements of advanced aircraft p 44 A88-16377

Assessment of fatigue in aviation crews  
[AD-A184129] p 45 N88-12245

## FLIGHT SAFETY

SAFE Association, Annual Symposium, 24th, San Antonio, TX, Dec. 11-13, 1986, Proceedings  
p 49 A88-13376

Space biologist's inflight safety considerations  
[IAF PAPER 87-570] p 54 A88-16182

- Report of the helicopter human factors working group  
--- accident prevention  
[CAA-PAPER-87007] p 59 N88-12274
- FLIGHT SIMULATORS**  
Flight simulator requirements for airline transport pilot training - An evaluation of motion system design alternatives p 47 A88-16679
- FLIGHT TESTS**  
Human respiratory responses during high performance flight  
[AGARD-AG-312] p 46 N88-12923
- FLIGHT TRAINING**  
Automated learning systems for the occupational training of flight-vehicle operators --- Russian book  
p 47 A88-15680
- FOOD PRODUCTION (IN SPACE)**  
Food production and gas exchange system using blue-green alga (spirulina) for CELSS p 56 N88-12253  
Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems p 56 N88-12254  
Non-conventional approaches to food processing in CELSS, 1. Algal proteins: Characterization and process optimization p 56 N88-12256  
Sunlight supply and gas exchange systems in microalgal bioreactor p 57 N88-12258  
A review of recent activities in the NASA CELSS program p 57 N88-12259  
Mass balances for a biological life support system simulation model p 59 N88-12272
- G**
- GAMMA RAYS**  
Analysis of the life shortening effect of chronic external gamma-irradiation - The structure of the mortality rate p 36 A88-14768  
Investigation of the life-shortening effect in an experiment with chronic external gamma-irradiation - In support of the aging hypothesis p 36 A88-14769
- GAS COMPOSITION**  
Fluctuation limits of the acid-base status and of the gas content of blood in healthy untrained men performing standard physical exercise p 41 A88-14726
- GAS DETECTORS**  
Fundamental study on gas monitoring in CELSS p 57 N88-12263
- GAS EXCHANGE**  
Controlled Ecological Life Support System: Regenerative Life Support Systems in Space [NASA-CP-2480] p 55 N88-12251  
Food production and gas exchange system using blue-green alga (spirulina) for CELSS p 56 N88-12253  
Operation of an experimental algal gas exchanger for use in a CELSS p 56 N88-12255  
Sunlight supply and gas exchange systems in microalgal bioreactor p 57 N88-12258  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261  
Fundamental study on gas monitoring in CELSS p 57 N88-12263
- GAS MIXTURES**  
Correlation between changes in radiosensitivity and the activity of blood lymphocyte succinate dehydrogenase effected by exogenic hypoxia p 36 A88-14770
- GAS RECOVERY**  
Food production and gas exchange system using blue-green alga (spirulina) for CELSS p 56 N88-12253  
An overview of Japanese CELSS research activities p 58 N88-12267
- GASIFICATION**  
The applicability of the catalytic wet-oxidation to CELSS p 58 N88-12264
- GENETICS**  
JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915
- GEOMAGNETISM**  
Physico-chemical and biological aspects of weak magnetic field effects on plants [IAF PAPER 87-560] p 38 A88-16174
- GLUCOSE**  
Disuse atrophy, plasma corticosterone, and muscle glucocorticoid receptor levels p 38 A88-15346
- GOGGLES**  
Mass properties and inertial loading effects of head encumbering devices p 50 A88-13412  
Development, testing and evaluation of a night vision goggle compatible BO-105 for night low level operation p 55 N88-11668
- GRAIN SIZE**  
Discovery of organic grains in Comet Wilson p 61 A88-16324
- GRAVITATIONAL EFFECTS**  
Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342  
Gravity effects on membrane equilibria [IAF PAPER 87-561] p 39 A88-16175
- GRAVITATIONAL PHYSIOLOGY**  
The significance of the phase mismatch of sensory signals in mechanisms of motion-sickness development p 41 A88-13696  
Regulation of the hemodynamics during the simulation of weightlessness (Mathematical modeling) p 41 A88-14728  
Recurrent +Gz-induced loss of consciousness p 42 A88-15338  
Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342  
Considerations in prescribing preflight aerobic exercise for astronauts p 42 A88-15349  
Inflight combined vertical and lateral space vehicular accelerations - Human tolerances [IAF PAPER 87-531] p 43 A88-16154  
'O2-MP' - A device for measuring the partial pressure of oxygen in capillary blood under space flight conditions [IAF PAPER 87-543] p 53 A88-16161  
Support of life science research in space by the DFVLR Microgravity User Support Center (MUSC) [IAF PAPER 87-544] p 38 A88-16162  
Providing artificial gravity - Physiologic limitations to rotating habitats [IAF PAPER 87-545] p 53 A88-16163  
Artificial gravity - The evolution of variable gravity research [IAF PAPER 87-539] p 54 A88-16176  
Human blood platelets at microgravity [IAF PAPER 87-562] p 44 A88-16177  
Biology and microgravity [IAF PAPER 87-564] p 39 A88-16179
- GROUP DYNAMICS**  
Small groups in orbit - Group interaction and crew performance on Space Station p 47 A88-15348
- H**
- HABITUATION (LEARNING)**  
Homosynaptic depression as a model of the habituation phenomenon p 35 A88-13699
- HARNESSES**  
The CREST restraint system development program p 49 A88-13382
- HAZARDS**  
Human motor reactions to dangerous motions in robot operations [PB87-222196] p 59 N88-12275
- HEAD (ANATOMY)**  
A computer simulation of the Hybrid II manikin head-neck system p 49 A88-13380  
Dynamic response of the human head to +G(x) impact p 40 A88-13387
- HEALTH**  
An assessment of clinical chemical sensing technology for potential use in space station health maintenance facility [NASA-CR-172013] p 60 N88-12926
- HEALTH PHYSICS**  
Health hazards of video display terminals. A comprehensive, annotated bibliography on a critical issue of workplace health and safety with sources for obtaining items and list of terminal suppliers [RSI-IAS-4] p 44 N88-12240
- HEART DISEASES**  
Apical hypertrophic nonobstructive cardiomyopathy in a pilot p 42 A88-15347
- HELICOPTER CONTROL**  
Dealthalized cyclic control stick p 50 A88-13538
- HELICOPTERS**  
Integrated voice and visual systems research topics [NASA-CR-177417] p 47 N88-12246  
Report of the helicopter human factors working group --- accident prevention [CAA-PAPER-87007] p 59 N88-12274
- HELMETS**  
Mass properties and inertial loading effects of head encumbering devices p 50 A88-13412  
The prospects for helicopter helmet design to meet rapidly expanding requirements p 50 A88-13541
- HEMATOLOGY**  
Human blood platelets at microgravity [IAF PAPER 87-562] p 44 A88-16177
- Experiment on STS 51-C - Effect of weightlessness on the morphology of aggregation of human red cells in disease [IAF PAPER 87-563] p 39 A88-16178
- HEMODYNAMIC RESPONSES**  
Regulation of the hemodynamics during the simulation of weightlessness (Mathematical modeling) p 41 A88-14728
- HERMES MANNED SPACEPLANE**  
Importance of human factors in the conception of Hermes spacecraft [IAF PAPER 87-552] p 54 A88-16169
- HISTOLOGY**  
Radioprotective activity of aminoarylthiazoles and some mechanisms of their action p 36 A88-14771
- HORMONE METABOLISMS**  
The dynamics of the lipid metabolism and hormonal background during adaptation to long-term psychoemotional and physical loads p 41 A88-14727
- HUMAN BEHAVIOR**  
Cosmonaut behaviour in orbital flight situation - Preliminary ethological analysis [IAF PAPER 87-528] p 47 A88-16151  
Passenger behaviour in aircraft emergencies p 47 A88-16741  
Studies of the processing of single words using positron tomographic measures of cerebral blood flow change [AD-A184058] p 45 N88-12244  
Human adaptation to isolated and confined environments [NASA-CR-181502] p 48 N88-12248  
A simulation study of a speed control system for autonomous on-road operation of automotive vehicles [AD-A184030] p 60 N88-12279
- HUMAN BODY**  
Physiological characteristics of adaptation processes preceding activity conditions p 42 A88-14744
- HUMAN CENTRIFUGES**  
Wings and serpents --- centrifuge-training requirements of advanced aircraft p 44 A88-16377
- HUMAN FACTORS ENGINEERING**  
ADAM - The next step in development of the true human analog p 49 A88-13386  
Human factors - Man-machine symbiosis in space [IAF PAPER 87-548] p 53 A88-16165  
Human factor design of habitable space facilities [IAF PAPER 87-549] p 54 A88-16166  
Spacehab module design project utilizes engineering services for human factors consideration [IAF PAPER 87-551] p 54 A88-16168  
Importance of human factors in the conception of Hermes spacecraft [IAF PAPER 87-552] p 54 A88-16169  
Low-cost prototypes for human factors evaluation of Space Station crew equipment p 54 A88-16170  
Computer-controlled testing of visual-spatial ability [AD-A183971] p 48 N88-12249  
Report of the helicopter human factors working group --- accident prevention [CAA-PAPER-87007] p 59 N88-12274  
A scientific workstation operator-interface for accelerator control [DE87-014689] p 60 N88-12278  
Research papers and publications (1981-1987): Workload research program [NASA-TM-100016] p 48 N88-12924
- HUMAN PERFORMANCE**  
Mental and physical performance at core temperatures as low as 31.2 C p 41 A88-13411  
A systems engineering view of the human in space [IAF PAPER 87-547] p 53 A88-16164  
Integrated voice and visual systems research topics [NASA-CR-177417] p 47 N88-12246  
Research papers and publications (1981-1987): Workload research program [NASA-TM-100016] p 48 N88-12924
- HUMAN REACTIONS**  
Human adaptation and constitution --- Russian book p 43 A88-15655  
Human motor reactions to dangerous motions in robot operations [PB87-222196] p 59 N88-12275
- HUMAN TOLERANCES**  
Inflight combined vertical and lateral space vehicular accelerations - Human tolerances [IAF PAPER 87-531] p 43 A88-16154
- HYDROTHERMAL SYSTEMS**  
Faunal composition and organic surface encrustations at hydrothermal vents on the southern Juan de Fuca Ridge p 39 A88-16803
- HYPODYNAMIA**  
Disuse atrophy, plasma corticosterone, and muscle glucocorticoid receptor levels p 38 A88-15346

## HYPOTHALAMUS

Characteristics of hypothalamic self-stimulation related to the intensity of the stimulating current p 35 A88-13698

## HYPOTHERMIA

Mental and physical performance at core temperatures as low as 31.2 C p 41 A88-13411

## HYPOXIA

Correlation between changes in radiosensitivity and the activity of blood lymphocyte succinate dehydrogenase effected by exogenic hypoxia p 36 A88-14770  
Superoxide dismutase assays [AD-A183972] p 45 N88-12242  
Scotopic sensitivity with 10 percent oxygen [AD-A183973] p 45 N88-12243

## I

## IDENTITIES

Effects of divided attention on identity and semantic priming [AD-A184289] p 48 N88-12250

## IMAGE INTENSIFIERS

Development, testing and evaluation of a night vision goggle compatible BO-105 for night low level operation p 55 N88-11668

## IMMUNOLOGY

Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity p 36 A88-14772  
Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle p 37 A88-15343  
Triphenyldioxane - A new powerful inducer of cytochrome P-450 p 38 A88-15696  
JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915

## IMPACT TESTS

Dynamic response of the human head to +G(x) impact p 40 A88-13387

## INERTIA

Mass properties and inertial loading effects of head encumbering devices p 50 A88-13412

## INFRARED ASTRONOMY

Organic matter on asteroid 130 Elektra p 61 A88-14294

## INFRARED SPECTRA

Discovery of organic grains in Comet Wilson p 61 A88-16324

## INJURIES

Femtosecond laser-tissue interactions - Retinal injury studies p 36 A88-14548

## INPUT/OUTPUT ROUTINES

Integrated voice and visual systems research topics [NASA-CR-177417] p 47 N88-12246

## INSTRUMENT COMPENSATION

Feasibility of time delay compensation for a space teleoperation task p 55 A88-16310

## INSULATION

Immersion suit insulation - The effect of dampening on survival estimates p 51 A88-15340

## INSULIN

Insulin receptors and enzyme activities in liver of rats after space flight on biosatellite COSMOS 1667 [IAF PAPER 87-530] p 38 A88-16153

## INTERFACES

A scientific workstation operator-interface for accelerator control [DE87-014689] p 60 N88-12278

## INTERFEROMETRY

Detection of life in other planetary systems [IAF PAPER 87-597] p 61 A88-16199

## INTERFERON

Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle p 37 A88-15343

## INVERTEBRATES

Faunal composition and organic surface encrustations at hydrothermal vents on the southern Juan de Fuca Ridge p 39 A88-16803

## IONIZING RADIATION

Analysis of the synergistic effect of heat and radiation on bacteriophage T4 and the spores of *Bacillus subtilis* p 36 A88-14767  
Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity p 36 A88-14772

## IRON

Acclimatized deficit of iron p 41 A88-14729

## IRRADIATION

Utilization of potatoes in bioregenerative life support systems p 58 N88-12269

## ISOLATION

Human adaptation to isolated and confined environments [NASA-CR-181502] p 48 N88-12248

## ISOTOPIC ENRICHMENT

Isotopic characterisation of kerogen-like material in the Murchison carbonaceous chondrite p 61 A88-15438

## J

## JOINTS (JUNCTIONS)

Modelling and simulation of distributed flexibility in a spaceborne manipulator p 55 A88-16309

## K

## KEROGEN

Isotopic characterisation of kerogen-like material in the Murchison carbonaceous chondrite p 61 A88-15438

## L

## LASER APPLICATIONS

Femtosecond laser-tissue interactions - Retinal injury studies p 36 A88-14548  
JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915

## LASER MATERIALS

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-012] p 44 N88-12238

## LATERAL OSCILLATION

Inflight combined vertical and lateral space vehicular accelerations - Human tolerances [IAF PAPER 87-531] p 43 A88-16154

## LEAKAGE

Immersion suit insulation - The effect of dampening on survival estimates p 51 A88-15340

## LEARNING MACHINES

Automated learning systems for the occupational training of flight-vehicle operators - Russian book [DE87-014689] p 47 A88-15680

## LIFE SCIENCES

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915

## LIFE SPAN

Investigation of the life-shortening effect in an experiment with chronic external gamma-irradiation - In support of the aging hypothesis p 36 A88-14769

## LIFE SUPPORT SYSTEMS

The Solar Plant Growth Facility - An approach towards future biological life support systems [IAF PAPER 87-538] p 53 A88-16157  
Activation of a controlled ecological life support system (CELSS) breadboard facility - Wheat growth studies [IAF PAPER 87-557] p 54 A88-16172  
Crewman rescue equipment in manned space missions - Aspects of application [IAF PAPER 87-576] p 55 A88-16187

## LIPID METABOLISM

The dynamics of the lipid metabolism and hormonal background during adaptation to long-term psychoemotional and physical loads p 41 A88-14727

## LIVER

Insulin receptors and enzyme activities in liver of rats after space flight on biosatellite COSMOS 1667 [IAF PAPER 87-530] p 38 A88-16153

## LOAD TESTS

Mass properties and inertial loading effects of head encumbering devices p 50 A88-13412

## LONG DURATION SPACE FLIGHT

Medical aspects of orbital spaceflight and their implications for manufacturing in space p 40 A88-13162

Biomedical payload of the French-Soviet long duration flight [IAF PAPER 87-541] p 44 A88-16159

Providing artificial gravity - Physiologic limitations to rotating habitats [IAF PAPER 87-545] p 53 A88-16163

A role for biobehavioral applications in support of spaceflight operations programs [IAF PAPER 87-555] p 47 A88-16171

Activation of a controlled ecological life support system (CELSS) breadboard facility - Wheat growth studies [IAF PAPER 87-557] p 54 A88-16172

## LONG TERM EFFECTS

Medical aspects of orbital spaceflight and their implications for manufacturing in space p 40 A88-13162

The dynamics of the lipid metabolism and hormonal background during adaptation to long-term psychoemotional and physical loads p 41 A88-14727

## LOW ALTITUDE

Development, testing and evaluation of a night vision goggle compatible BO-105 for night low level operation p 55 N88-11668

## LOWER BODY NEGATIVE PRESSURE

Heat dissipation under lower body negative pressure stress [IAF PAPER 87-532] p 43 A88-16155

## LUMINOUS INTENSITY

Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth p 59 N88-12273

## LUMPED PARAMETER SYSTEMS

Otolith-organ mechanics - Lumped parameter model and dynamic response p 37 A88-15341

## LYMPHOCYTES

Correlation between changes in radiosensitivity and the activity of blood lymphocyte succinate dehydrogenase effected by exogenic hypoxia p 36 A88-14770

## M

## MAN MACHINE SYSTEMS

Design of a force reflecting hand controller for space telemanipulation studies [IAF PAPER 87-ST-01] p 52 A88-16067  
Space suit systems - Technical and physiological constraints [IAF PAPER 87-540] p 53 A88-16158  
Human factors - Man-machine symbiosis in space [IAF PAPER 87-548] p 53 A88-16165  
NASA-STD-3000, Man-System Integration Standards - The new space human engineering standards [IAF PAPER 87-550] p 54 A88-16167  
Spacehab module design project utilizes engineering services for human factors consideration [IAF PAPER 87-551] p 54 A88-16168  
Architecture for dynamic task allocation in a man-robot symbiotic system [DE87-013872] p 60 N88-12277  
A scientific workstation operator-interface for accelerator control [DE87-014689] p 60 N88-12278

## MANIPULATORS

Design of a force reflecting hand controller for space telemanipulation studies [IAF PAPER 87-ST-01] p 52 A88-16067  
Modelling and simulation of distributed flexibility in a spaceborne manipulator p 55 A88-16309  
Architecture for dynamic task allocation in a man-robot symbiotic system [DE87-013872] p 60 N88-12277

## MANNED ORBITAL RESEARCH LABORATORIES

Space biologist's inflight safety considerations [IAF PAPER 87-570] p 54 A88-16182

## MANNED SPACE FLIGHT

Medical aspects of orbital spaceflight and their implications for manufacturing in space p 40 A88-13162

Man in space flight [IAF PAPER 87-527] p 43 A88-16150

Cosmonaut behaviour in orbital flight situation - Preliminary ethological analysis [IAF PAPER 87-528] p 47 A88-16151

Biomedical payload of the French-Soviet long duration flight [IAF PAPER 87-541] p 44 A88-16159

Radiation problems with the Space Station scenario and the necessary surveillance for astronauts [IAF PAPER 87-542] p 53 A88-16160

NASA-STD-3000, Man-System Integration Standards - The new space human engineering standards [IAF PAPER 87-550] p 54 A88-16167

Radiation hazards in space [IAF PAPER 87-550] p 44 A88-16150

Progress in European CELSS activities p 56 N88-12252

## MANNED SPACECRAFT

Artificial gravity - A countermeasure for zero gravity [IAF PAPER 87-533] p 53 A88-16156

Crewman rescue equipment in manned space missions - Aspects of application [IAF PAPER 87-576] p 55 A88-16187

## MANUAL CONTROL

Design of a force reflecting hand controller for space telemanipulation studies [IAF PAPER 87-ST-01] p 52 A88-16067

## MARINE BIOLOGY

Ultramicroforms of bacteria in soil and ocean p 35 A88-13695

## MATERIAL BALANCE

Design of an elemental analysis system for CELSS research p 58 N88-12266



- Mass balances for a biological life support system simulation model p 59 N88-12272
- MATERIALS RECOVERY**  
A large-scale perspective on ecosystems p 58 N88-12265  
An overview of Japanese CELSS research activities p 58 N88-12267
- MATHEMATICAL MODELS**  
A simulation study of a speed control system for autonomous on-road operation of automotive vehicles [AD-A184030] p 60 N88-12279
- MECHANICAL DEVICES**  
The design evolution of the mechanical analog of the human dynamic spine/viscera p 50 A88-13402
- MECHANICAL PROPERTIES**  
Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342
- MEMBRANE STRUCTURES**  
Gravity effects on membrane equilibria [IAF PAPER 87-561] p 39 A88-16175
- MEMBRANES**  
Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262
- MENTAL PERFORMANCE**  
Mental and physical performance at core temperatures as low as 31.2 C p 41 A88-13411  
The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731  
Computer-controlled testing of visual-spatial ability [AD-A183971] p 48 N88-12249
- METABOLISM**  
Fundamental study on gas monitoring in CELSS p 57 N88-12263  
The toxicology and metabolism of nickel compounds [DE87-014801] p 46 N88-12921
- METEORIC COMPOSITION**  
Isotopic characterisation of kerogen-like material in the Murchison carbonaceous chondrite p 61 A88-15438
- METEOROID PROTECTION**  
Space suit extravehicular hazards protection development [NASA-TM-100458] p 60 N88-12927
- MICROBIOLOGY**  
Ultramicroforms of bacteria in soil and ocean p 35 A88-13695  
JPRS report: Science and technology. USSR: Life sciences [JPRES-ULS-87-009] p 39 N88-12915
- MICROGRAVITY APPLICATIONS**  
Biology and microgravity [IAF PAPER 87-564] p 39 A88-16179
- MILITARY AIRCRAFT**  
Limb flail injuries in USAF ejections - 1979-1985 p 40 A88-13377  
The CREST restraint system development program p 49 A88-13382  
The USAF Advanced Dynamic Anthropomorphic Manikin - ADAM p 49 A88-13389  
Development of the tactical aircrew eye respiratory systems p 49 A88-13393  
United States Navy molecular sieve on-board oxygen generation (OBOG) system development efforts - A history and 1986 status report p 50 A88-13405
- MILITARY HELICOPTERS**  
The SRU-36/P Helo emergency egress device p 50 A88-13396  
The prospects for helicopter helmet design to meet rapidly expanding requirements p 50 A88-13541  
Development, testing and evaluation of a night vision goggle compatible BO-105 for night low level operation p 55 N88-11668
- MINERAL METABOLISM**  
Acclimatized deficit of iron p 41 A88-14729
- MODULES**  
A modular BLSS simulation model p 57 N88-12260
- MORPHOLOGY**  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917
- MORTALITY**  
Analysis of the life shortening effect of chronic external gamma-irradiation - The structure of the mortality rate p 36 A88-14768  
Investigation of the life-shortening effect in an experiment with chronic external gamma-irradiation - In support of the aging hypothesis p 36 A88-14769
- MOTION SICKNESS**  
The significance of the phase mismatch of sensory signals in mechanisms of motion-sickness development p 41 A88-13696  
Comparative assessment of vestibular, optokinetic, and optovestibular stimulation in the development of experimental motion sickness p 42 A88-15339
- A neuropharmacological approach to space motion sickness [IAF PAPER 87-529] p 43 A88-16152  
Motion and space sickness p 45 N88-12510  
Change in functional activity of cortical brain structures and their blood supply in alert rabbits in response to rocking p 39 N88-12916
- MOTION SICKNESS DRUGS**  
Buspirone blocks motion sickness and xylazine-induced emesis in the cat p 37 A88-15344
- MOTION SIMULATORS**  
Flight simulator requirements for airline transport pilot training - An evaluation of motion system design alternatives p 47 A88-16679
- MURCHISON METEORITE**  
Organic matter on asteroid 130 Elektra p 61 A88-14294  
Isotopic characterisation of kerogen-like material in the Murchison carbonaceous chondrite p 61 A88-15438
- MUSCLES**  
Motion and space sickness p 45 N88-12510
- MUSCULAR FUNCTION**  
Physiological characteristics of adaptation processes preceding activity conditions p 42 A88-14744  
Disuse atrophy, plasma corticosterone, and muscle glucocorticoid receptor levels p 38 A88-15346  
Apical hypertrophic nonobstructive cardiomyopathy in a pilot p 42 A88-15347

## N

## NASA PROGRAMS

NASA's Telerobotics R & D Program - Status and future directions [IAF PAPER 87-24] p 51 A88-15816

## NASA SPACE PROGRAMS

Selected advanced technology studies for the U.S. Space Station -- waste water reclamation, module design and fabrication [IAF PAPER 87-79] p 52 A88-15854

## NAVY

United States Navy molecular sieve on-board oxygen generation (OBOG) system development efforts - A history and 1986 status report p 50 A88-13405

## NECK (ANATOMY)

A computer simulation of the Hybrid II manikin head-neck system p 49 A88-13380  
Motion and space sickness p 45 N88-12510

## NERVES

Motion and space sickness p 45 N88-12510

## NEURAL NETS

Large-scale neuronal circuits for selective storage and recognition of complex stimuli, a pilot study [AD-A184134] p 46 N88-12920

## NEUROMUSCULAR TRANSMISSION

Homosynaptic depression as a model of the habituation phenomenon p 35 A88-13699

## NEUROPHYSIOLOGY

Characteristics of hypothalamic self-stimulation related to the intensity of the stimulating current p 35 A88-13698

Effect of microwave radiation on the dopamine-dependent behavior of rabbits p 37 A88-14773

A neuropharmacological approach to space motion sickness [IAF PAPER 87-529] p 43 A88-16152

Visual evoked responses to sinusoidal gratings presented in central and right visual fields: 1 [DE87-014731] p 46 N88-12919

Large-scale neuronal circuits for selective storage and recognition of complex stimuli, a pilot study [AD-A184134] p 46 N88-12920

## NEUROTRANSMITTERS

Large-scale neuronal circuits for selective storage and recognition of complex stimuli, a pilot study [AD-A184134] p 46 N88-12920

## NICKEL COMPOUNDS

The toxicology and metabolism of nickel compounds [DE87-014801] p 46 N88-12921

## NIGHT VISION

Development, testing and evaluation of a night vision goggle compatible BO-105 for night low level operation p 55 N88-11668

Scotopic sensitivity with 10 percent oxygen [AD-A183973] p 45 N88-12243

## NITROGEN

Molecular sieves for onboard storage of gaseous oxygen and nitrogen p 50 A88-13413

## NITROGENATION

Application of photosynthetic N(2)-fixing cyanobacteria to the CELSS program p 56 N88-12257

## NUTRITION

Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat p 58 N88-12266

## NUTRITIONAL REQUIREMENTS

Design of an elemental analysis system for CELSS research p 58 N88-12266

## O

## OCEAN BOTTOM

Faunal composition and organic surface encrustations at hydrothermal vents on the southern Juan de Fuca Ridge p 39 A88-16803

## ONBOARD EQUIPMENT

United States Navy molecular sieve on-board oxygen generation (OBOG) system development efforts - A history and 1986 status report p 50 A88-13405

Molecular sieves for onboard storage of gaseous oxygen and nitrogen p 50 A88-13413

An assessment of clinical chemical sensing technology for potential use in space station health maintenance facility [NASA-CR-172013] p 60 N88-12926

## OPERATOR PERFORMANCE

Automated learning systems for the occupational training of flight-vehicle operators -- Russian book p 47 A88-15680

Assessment of fatigue in aviation crews [AD-A184129] p 45 N88-12245

## OPHTHALMOLOGY

Decompression and occurrence of cataract in enucleated eyes of experimental animals p 37 A88-15345

## OPTIMIZATION

Dynamic analysis of robotic manipulators for spacecraft applications p 51 A88-15524

## ORBITAL SERVICING

Control of in-orbit space manipulation p 55 A88-16312

Control aspects of a European space manipulator system p 55 A88-16313

## ORGANIC COMPOUNDS

Organic matter on asteroid 130 Elektra p 61 A88-14294

## ORGANIC MATERIALS

Discovery of organic grains in Comet Wilson p 61 A88-16324

## OTOLITH ORGANS

Otolith-organ mechanics - Lumped parameter model and dynamic response p 37 A88-15341

## OXIDATION

The applicability of the catalytic wet-oxidation to CELSS p 58 N88-12264

## OXIMETRY

'O2-MP' - A device for measuring the partial pressure of oxygen in capillary blood under space flight conditions [IAF PAPER 87-543] p 53 A88-16161

## OXYGEN

Scotopic sensitivity with 10 percent oxygen [AD-A183973] p 45 N88-12243

Fire-related medical science p 45 N88-12525

## OXYGEN BREATHING

Scotopic sensitivity with 10 percent oxygen [AD-A183973] p 45 N88-12243

## OXYGEN MASKS

Development of the tactical aircrew eye respiratory systems p 49 A88-13393

## OXYGEN PRODUCTION

A review of recent activities in the NASA CELSS program p 57 N88-12259

## OXYGEN SUPPLY EQUIPMENT

United States Navy molecular sieve on-board oxygen generation (OBOG) system development efforts - A history and 1986 status report p 50 A88-13405

Molecular sieves for onboard storage of gaseous oxygen and nitrogen p 50 A88-13413

Performance studies on a molecular sieve oxygen concentrator (MSOC) - Comparison of MG3, 5AMG, and 13X molecular sieves p 51 A88-13542

## P

## PARTICLE ACCELERATORS

A scientific workstation operator-interface for accelerator control [DE87-014689] p 60 N88-12278

## PASSENGER AIRCRAFT

Aspects of health and safety in the passenger cabin p 55 A88-16739

## PASSENGERS

Passenger behaviour in aircraft emergencies p 47 A88-16741



## PATHOGENESIS

The significance of the phase mismatch of sensory signals in mechanisms of motion-sickness development p 41 A88-13696

## PERCEPTION

Studies of the processing of single words using positron tomographic measures of cerebral blood flow change [AD-A184058] p 45 N88-12244

## PERIPHERAL CIRCULATION

Correlation between changes in radiosensitivity and the activity of blood lymphocyte succinate dehydrogenase effected by exogenic hypoxia p 36 A88-14770

## PHARMACOLOGY

The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731  
Triphenyldioxane - A new powerful inducer of cytochrome P-450 p 38 A88-15696

A neuropharmacological approach to space motion sickness

[IAF PAPER 87-529] p 43 A88-16152

JPRS report: Science and technology. USSR: Life sciences

[JPRS-ULS-87-012] p 44 N88-12238

JPRS report: Science and technology. USSR: Life sciences

[JPRS-ULS-87-009] p 39 N88-12915

## PHILOSOPHY

The metaphysical presuppositions of the 'anthropic principle' p 35 A88-14422

## PHOSPHORS

Performance and preference with various VDT (Video Display Terminal) phosphors [AD-A184085] p 60 N88-12925

## PHOTOSYNTHESIS

Operation of an experimental algal gas exchanger for use in a CELSS p 56 N88-12255

Application of photosynthetic N(2)-fixing cyanobacteria to the CELSS program p 56 N88-12257

A review of recent activities in the NASA CELSS program p 57 N88-12259

Fundamental study on gas monitoring in CELSS p 57 N88-12263

Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat p 58 N88-12268

Utilization of potatoes in bioregenerative life support systems p 58 N88-12269

Wheat production in controlled environments [UAES-PAPER-3324] p 59 N88-12270

## PHYSICAL CHEMISTRY

Physico-chemical and biological aspects of weak magnetic field effects on plants [IAF PAPER 87-560] p 38 A88-16174

## PHYSICAL EXERCISE

Fluctuation limits of the acid-base status and of the gas content of blood in healthy untrained men performing standard physical exercise p 41 A88-14726

The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731

Physiological characteristics of adaptation processes preceding activity conditions p 42 A88-14744

Considerations in prescribing preflight aerobic exercise for astronauts p 42 A88-15349

## PHYSICAL WORK

Mental and physical performance at core temperatures as low as 31.2 C p 41 A88-13411

The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731

## PHYSIOLOGICAL ACCELERATION

Recurrent +Gz-induced loss of consciousness p 42 A88-15338

## PHYSIOLOGICAL DEFENSES

Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity p 36 A88-14772

## PHYSIOLOGICAL EFFECTS

Mass properties and inertial loading effects of head encumbering devices p 50 A88-13412

Providing artificial gravity - Physiologic limitations to rotating habitats [IAF PAPER 87-545] p 53 A88-16163

Eyesight trainer for pilots p 44 N88-12239

Human adaptation to isolated and confined environments [NASA-CR-181502] p 48 N88-12248

Change in functional activity of cortical brain structures and their blood supply in alert rabbits in response to rocking p 39 N88-12916

Human respiratory responses during high performance flight [AGARD-AG-312] p 46 N88-12923

## PHYSIOLOGICAL FACTORS

Space suit systems - Technical and physiological constraints [IAF PAPER 87-540] p 53 A88-16158

## PHYSIOLOGICAL RESPONSES

The design evolution of the mechanical analog of the human dynamic spine/viscera p 50 A88-13402

Physiological mechanisms of thermoregulation in humans during adaptation to cold p 41 A88-14730

Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle p 37 A88-15343

Human adaptation and constitution --- Russian book p 43 A88-15655

## PHYSIOLOGICAL TESTS

Physiological characteristics of adaptation processes preceding activity conditions p 42 A88-14744

Decompression and occurrence of cataract in enucleated eyes of experimental animals p 37 A88-15345

## PHYSIOLOGY

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-012] p 44 N88-12238

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915

## PILOT PERFORMANCE

Apical hypertrophic nonobstructive cardiomyopathy in a pilot p 42 A88-15347

Eyesight trainer for pilots p 44 N88-12239

Investigation of pilot behavior in a training program for assessing handling qualities using a ground simulator [ESA-TT-999] p 48 N88-12247

## PILOT SELECTION

G-tolerance standards for aircrew training and selection p 43 A88-15350

## PILOT TRAINING

G-tolerance standards for aircrew training and selection p 43 A88-15350

Automated learning systems for the occupational training of flight-vehicle operators --- Russian book p 47 A88-15680

Flight simulator requirements for airline transport pilot training - An evaluation of motion system design alternatives p 47 A88-16679

## PILOTS

Decompression tests of the French personal flight equipment in 439 - VHA 90 p 49 A88-13378

## PLANETARY SYSTEMS

Detection of life in other planetary systems [IAF PAPER 87-597] p 61 A88-16199

## PLANT ROOTS

Ultrastructure of pea meristem and root cap cells under space flight conditions [IAF PAPER 87-558] p 38 A88-16173

Physico-chemical and biological aspects of weak magnetic field effects on plants [IAF PAPER 87-560] p 38 A88-16174

## PLATELETS

Human blood platelets at microgravity [IAF PAPER 87-562] p 44 A88-16177

## PORTABLE LIFE SUPPORT SYSTEMS

European EVA requirements and space suit design [IAF PAPER 87-41] p 52 A88-15830

## POSITRONS

Studies of the processing of single words using positron tomographic measures of cerebral blood flow change [AD-A184058] p 45 N88-12244

## POTATOES

Utilization of potatoes in bioregenerative life support systems p 58 N88-12269

## PREFLIGHT OPERATIONS

Considerations in prescribing preflight aerobic exercise for astronauts p 42 A88-15349

## PRESSURE REDUCTION

Decompression and occurrence of cataract in enucleated eyes of experimental animals p 37 A88-15345

## PRESSURE SUITS

Decompression sickness and venous gas emboli at 8.3 psia p 40 A88-13401

Immersion suit insulation - The effect of dampening on survival estimates p 51 A88-15340

## PRODUCTIVITY

Technology advancements to improve crew productivity in space p 51 A88-12823

The effect of radiation on the long term productivity of a plant based CELSS p 59 N88-12271

## PROTEINS

Non-conventional approaches to food processing in CELSS, 1. Algal proteins: Characterization and process optimization p 56 N88-12256

## PSEUDOMONAS

Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917

## PSYCHOLOGICAL EFFECTS

Human adaptation to isolated and confined environments [NASA-CR-181502] p 48 N88-12248

## PSYCHOLOGICAL FACTORS

Recurrent +Gz-induced loss of consciousness p 42 A88-15338

A role for biobehavioral applications in support of spaceflight operations programs [IAF PAPER 87-555] p 47 A88-16171

## PSYCHOLOGY

Assessment of fatigue in aviation crews [AD-A184129] p 45 N88-12245

## PUBLIC HEALTH

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-012] p 44 N88-12238

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915

## Q

## QUANTITATIVE ANALYSIS

Design of an elemental analysis system for CELSS research p 58 N88-12266

## QUANTUM MECHANICS

The metaphysical presuppositions of the 'anthropic principle' p 35 A88-14422

## R

## RADIATION DAMAGE

DNA damage and repair in human skin in situ [DE87-014288] p 44 N88-12241

## RADIATION DOSAGE

Radiation problems with the Space Station scenario and the necessary surveillance for astronauts [IAF PAPER 87-542] p 53 A88-16160

The effect of radiation on the long term productivity of a plant based CELSS p 59 N88-12271

## RADIATION EFFECTS

Investigation of the ability of para-aminobenzoic acid to restore the activity of alkaline ribonuclease p 35 A88-13697

Health hazards of video display terminals. A comprehensive, annotated bibliography on a critical issue of workplace health and safety with sources for obtaining items and list of terminal suppliers [RSI-IAS-4] p 44 N88-12240

The effect of radiation on the long term productivity of a plant based CELSS p 59 N88-12271

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915

## RADIATION HAZARDS

Radiation hazards in space p 44 A88-16750

## RADIATION PROTECTION

Correlation between changes in radiosensitivity and the activity of blood lymphocyte succinate dehydrogenase effected by exogenic hypoxia p 36 A88-14770

Radioprotective activity of aminoarylthiazoles and some mechanisms of their action p 36 A88-14771

## RADIATIVE HEAT TRANSFER

Heat dissipation under lower body negative pressure stress [IAF PAPER 87-532] p 43 A88-16155

## RADIOBIOLOGY

Investigation of the life-shortening effect in an experiment with chronic external gamma-irradiation - In support of the aging hypothesis p 36 A88-14769

Radioprotective activity of aminoarylthiazoles and some mechanisms of their action p 36 A88-14771

Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity p 36 A88-14772

Radiation problems with the Space Station scenario and the necessary surveillance for astronauts [IAF PAPER 87-542] p 53 A88-16160

## RATS

The toxicology and metabolism of nickel compounds [DE87-014801] p 46 N88-12921

## RECYCLING

Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems p 56 N88-12254

Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261

## S

- An overview of Japanese CELSS research activities  
p 58 N88-12267
- REDUCED GRAVITY**  
Artificial gravity - A countermeasure for zero gravity  
[IAF PAPER 87-533] p 53 A88-16156
- REFLEXES**  
Homosynaptic depression as a model of the habituation phenomenon p 35 A88-13699
- REINFORCEMENT (PSYCHOLOGY)**  
Characteristics of hypothalamic self-stimulation related to the intensity of the stimulating current p 35 A88-13698
- REMOTE MANIPULATOR SYSTEM**  
Dynamic analysis of robotic manipulators for spacecraft applications p 51 A88-15524  
Feasibility of time delay compensation for a space teleoperation task p 55 A88-16310  
Control of in-orbit space manipulation p 55 A88-16312  
Control aspects of a European space manipulator system p 55 A88-16313
- REMOTELY PILOTED VEHICLES**  
Operator multiple-tasking study for remotely operated platforms [AD-A184487] p 60 N88-12276
- RESCUE OPERATIONS**  
Crewman rescue equipment in manned space missions - Aspects of application [IAF PAPER 87-576] p 55 A88-16187
- RESEARCH AND DEVELOPMENT**  
ADAM - The next step in development of the true human analog p 49 A88-13386  
Development of the tactical aircrew eye respiratory systems p 49 A88-13393  
NASA's Telerobotics R & D Program - Status and future directions [IAF PAPER 87-24] p 51 A88-15816  
The Solar Plant Growth Facility - An approach towards future biological life support systems [IAF PAPER 87-538] p 53 A88-16157  
Human factor design of habitable space facilities [IAF PAPER 87-549] p 54 A88-16166  
Artificial gravity - The evolution of variable gravity research [IAF PAPER 87-539] p 54 A88-16176
- RESPIRATION**  
Fundamental study on gas monitoring in CELSS p 57 N88-12263  
Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat p 58 N88-12268  
Human respiratory responses during high performance flight [AGARD-AG-312] p 46 N88-12923
- RETINA**  
Femtosecond laser-tissue interactions - Retinal injury studies p 36 A88-14548
- ROBOTICS**  
Design and development of a computer-assisted ground control technique for Space Station robotics p 51 A88-15284  
NASA's Telerobotics R & D Program - Status and future directions [IAF PAPER 87-24] p 51 A88-15816  
The Flight Telerobotic Servicer (FTS) - A focus for automation and robotics on the Space Station [IAF PAPER 87-25] p 52 A88-15817  
Telerobotics and orbital laboratories - An end-to-end analysis and demonstration [IAF PAPER 87-27] p 52 A88-15819  
Man tended free flyer interior equipment for manned and automated operation [IAF PAPER 87-75] p 52 A88-15850  
Feasibility of time delay compensation for a space teleoperation task p 55 A88-16310  
Control of in-orbit space manipulation p 55 A88-16312  
Operator multiple-tasking study for remotely operated platforms [AD-A184487] p 60 N88-12276  
Architecture for dynamic task allocation in a man-robot symbiotic system [DE87-013872] p 60 N88-12277
- ROBOTS**  
Modelling and simulation of distributed flexibility in a spaceborne manipulator p 55 A88-16309  
Human motor reactions to dangerous motions in robot operations [PB87-222196] p 59 N88-12275
- SAFETY**  
Human motor reactions to dangerous motions in robot operations [PB87-222196] p 59 N88-12275
- SAFETY FACTORS**  
Crewman rescue equipment in manned space missions - Aspects of application [IAF PAPER 87-576] p 55 A88-16187
- SAMPLING**  
Superoxide dismutase assays [AD-A183972] p 45 N88-12242
- SATELLITE-BORNE INSTRUMENTS**  
Feasibility of time delay compensation for a space teleoperation task p 55 A88-16310
- SELF STIMULATION**  
Characteristics of hypothalamic self-stimulation related to the intensity of the stimulating current p 35 A88-13698
- SENSITIVITY**  
Scotopic sensitivity with 10 percent oxygen [AD-A183973] p 45 N88-12243
- SENSORIMOTOR PERFORMANCE**  
Characteristics of hypothalamic self-stimulation related to the intensity of the stimulating current p 35 A88-13698  
Recurrent +Gz-induced loss of consciousness p 42 A88-15338
- SENSORY STIMULATION**  
The significance of the phase mismatch of sensory signals in mechanisms of motion-sickness development p 41 A88-13696
- SERVOCONTROL**  
Design of a force reflecting hand controller for space telemanipulation studies [IAF PAPER 87-ST-01] p 52 A88-16067
- SIEVES**  
United States Navy molecular sieve on-board oxygen generation (OBOG) system development efforts - A history and 1986 status report p 50 A88-13405  
Molecular sieves for onboard storage of gaseous oxygen and nitrogen p 50 A88-13413  
Performance studies on a molecular sieve oxygen concentrator (MSOC) - Comparison of MG3, 5AMG, and 13X molecular sieves p 51 A88-13542
- SIGNAL ANALYSIS**  
The significance of the phase mismatch of sensory signals in mechanisms of motion-sickness development p 41 A88-13696
- SIGNS AND SYMPTOMS**  
Buspirone blocks motion sickness and xylazine-induced emesis in the cat p 37 A88-15344  
Apical hypertrophic nonobstructive cardiomyopathy in a pilot p 42 A88-15347
- SIMULATION**  
A modular BLSS simulation model p 57 N88-12260
- SKIN (ANATOMY)**  
DNA damage and repair in human skin in situ [DE87-014288] p 44 N88-12241
- SOCIAL FACTORS**  
Small groups in orbit - Group interaction and crew performance on Space Station p 47 A88-15348
- SOFTWARE TOOLS**  
A scientific workstation operator-interface for accelerator control [DE87-014689] p 60 N88-12278
- SOIL SCIENCE**  
Ultramicroforms of bacteria in soil and ocean p 35 A88-13695
- SOVIET SPACECRAFT**  
Results of medical investigations conducted aboard the 'Salyut-6'-'Soyuz' orbital research complex --- Russian book p 43 A88-15650
- SPACE FLIGHT FEEDING**  
Activation of a controlled ecological life support system (CELSS) breadboard facility - Wheat growth studies [IAF PAPER 87-557] p 54 A88-16172  
Ultrastructure of pea meristem and root cap cells under space flight conditions [IAF PAPER 87-558] p 38 A88-16173
- SPACE FLIGHT STRESS**  
Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle p 37 A88-15343  
Inflight combined vertical and lateral space vehicular accelerations - Human tolerances [IAF PAPER 87-531] p 43 A88-16154  
'O2-MP' - A device for measuring the partial pressure of oxygen in capillary blood under space flight conditions [IAF PAPER 87-543] p 53 A88-16161  
A role for biobehavioral applications in support of spaceflight operations programs [IAF PAPER 87-555] p 47 A88-16171
- SPACE FLIGHT TRAINING**  
Human factors - Man-machine symbiosis in space [IAF PAPER 87-548] p 53 A88-16165
- SPACE HABITATS**  
Providing artificial gravity - Physiologic limitations to rotating habitats [IAF PAPER 87-545] p 53 A88-16163  
Spacehab module design project utilizes engineering services for human factors consideration [IAF PAPER 87-551] p 54 A88-16168
- SPACE LABORATORIES**  
Telerobotics and orbital laboratories - An end-to-end analysis and demonstration [IAF PAPER 87-27] p 52 A88-15819
- SPACE MANUFACTURING**  
Medical aspects of orbital spaceflight and their implications for manufacturing in space p 40 A88-13162
- SPACE PERCEPTION**  
Computer-controlled testing of visual-spatial ability [AD-A183971] p 48 N88-12249  
Latency differences and effects of selective attention to gratings in the central and right visual fields: 2 [DE87-014730] p 46 N88-12918
- SPACE SHUTTLES**  
Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle p 37 A88-15343
- SPACE STATION PAYLOADS**  
Telerobotics and orbital laboratories - An end-to-end analysis and demonstration [IAF PAPER 87-27] p 52 A88-15819
- SPACE STATIONS**  
Technology advancements to improve crew productivity in space p 51 A88-15283  
Design and development of a computer-assisted ground control technique for Space Station robotics p 51 A88-15284  
Small groups in orbit - Group interaction and crew performance on Space Station p 47 A88-15348  
The Flight Telerobotic Servicer (FTS) - A focus for automation and robotics on the Space Station [IAF PAPER 87-25] p 52 A88-15817  
Selected advanced technology studies for the U.S. Space Station --- waste water reclamation, module design and fabrication [IAF PAPER 87-79] p 52 A88-15854  
Radiation problems with the Space Station scenario and the necessary surveillance for astronauts [IAF PAPER 87-542] p 53 A88-16160  
Human factor design of habitable space facilities [IAF PAPER 87-549] p 54 A88-16166  
Low-cost prototypes for human factors evaluation of Space Station crew equipment [IAF PAPER 87-553] p 54 A88-16170  
An assessment of clinical chemical sensing technology for potential use in space station health maintenance facility [NASA-CR-172013] p 60 N88-12926  
Space suit extravehicular hazards protection development [NASA-TM-100458] p 60 N88-12927
- SPACE SUITS**  
European EVA requirements and space suit design [IAF PAPER 87-41] p 52 A88-15830  
Space suit systems - Technical and physiological constraints [IAF PAPER 87-540] p 53 A88-16158  
Crewman rescue equipment in manned space missions - Aspects of application [IAF PAPER 87-576] p 55 A88-16187  
Space suit extravehicular hazards protection development [NASA-TM-100458] p 60 N88-12927
- SPACE TRANSPORTATION SYSTEM**  
Experiment on STS 51-C - Effect of weightlessness on the morphology of aggregation of human red cells in disease [IAF PAPER 87-563] p 39 A88-16178
- SPACE-TIME FUNCTIONS**  
The metaphysical presuppositions of the 'anthropic principle' p 35 A88-14422
- SPACEBORNE EXPERIMENTS**  
Results of medical investigations conducted aboard the 'Salyut-6'-'Soyuz' orbital research complex --- Russian book p 43 A88-15650  
Biomedical payload of the French-Soviet long duration flight [IAF PAPER 87-541] p 44 A88-16159  
Support of life science research in space by the DFVLR Microgravity User Support Center (MUSC) [IAF PAPER 87-544] p 38 A88-16162  
Human blood platelets at microgravity [IAF PAPER 87-562] p 44 A88-16177

- Experiment on STS 51-C - Effect of weightlessness on the morphology of aggregation of human red cells in disease  
[IAF PAPER 87-563] p 39 A88-16178
- Biology and microgravity  
[IAF PAPER 87-564] p 39 A88-16179
- Space biologist's inflight safety considerations  
[IAF PAPER 87-570] p 54 A88-16182
- Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth  
p 59 N88-12273
- Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment  
p 40 N88-12917

**SPACECRAFT CABIN ATMOSPHERES**

Progress in European CELSS activities

p 56 N88-12252

**SPACECRAFT CABINS**

Crewman rescue equipment in manned space missions - Aspects of application

[IAF PAPER 87-576] p 55 A88-16187

**SPACECRAFT COMMUNICATION**The Flight Telerobotic Servicer (FTS) - A focus for automation and robotics on the Space Station  
[IAF PAPER 87-25] p 52 A88-15817**SPACECRAFT CONTROL**

Design and development of a computer-assisted ground control technique for Space Station robotics

p 51 A88-15284

Modelling and simulation of distributed flexibility in a spaceborne manipulator  
p 55 A88-16309**SPACECRAFT DESIGN**

Low-cost prototypes for human factors evaluation of Space Station crew equipment

[IAF PAPER 87-553] p 54 A88-16170

**SPACECRAFT ENVIRONMENTS**

Radiation problems with the Space Station scenario and the necessary surveillance for astronauts

[IAF PAPER 87-542] p 53 A88-16160

Support of life science research in space by the DFVLR Microgravity User Support Center (MUSC)

[IAF PAPER 87-544] p 38 A88-16162

Radiation hazards in space  
p 44 A88-16750Fire-related medical science  
p 45 N88-12525**SPACECRAFT MODULES**

Man tended free flyer interior equipment for manned and automated operation

[IAF PAPER 87-75] p 52 A88-15850

**SPACECREWS**Technology advancements to improve crew productivity in space  
p 51 A88-15283Small groups in orbit - Group interaction and crew performance on Space Station  
p 47 A88-15348An assessment of clinical chemical sensing technology for potential use in space station health maintenance facility  
[NASA-CR-172013] p 60 N88-12926**SPATIAL RESOLUTION**

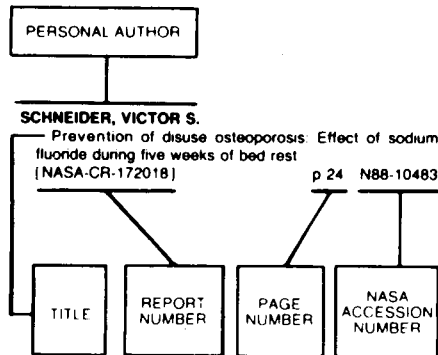
Visual evoked responses to sinusoidal gratings presented in central and right visual fields: 1

[DE87-014731] p 46 N88-12919

**SPEECH**Studies of the processing of single words using positron tomographic measures of cerebral blood flow change  
[AD-A184058] p 45 N88-12244**SPEECH RECOGNITION**Integrated voice and visual systems research topics  
[NASA-CR-177417] p 47 N88-12246**SPEED CONTROL**A simulation study of a speed control system for autonomous on-road operation of automotive vehicles  
[AD-A184030] p 60 N88-12279**STANDARDIZATION**NASA-STD-3000, Man-System Integration Standards - The new space human engineering standards  
[IAF PAPER 87-550] p 54 A88-16167**STANDARDS**G-tolerance standards for aircrew training and selection  
p 43 A88-15350**STAPHYLOCOCCUS**Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment  
p 40 N88-12917**STATISTICAL ANALYSIS**Analysis of the life shortening effect of chronic external gamma-irradiation - The structure of the mortality rate  
p 36 A88-14768**STOCHASTIC PROCESSES**Operator multiple-tasking study for remotely operated platforms  
[AD-A184487] p 60 N88-12276**STORAGE**Molecular sieves for onboard storage of gaseous oxygen and nitrogen  
p 50 A88-13413**STRESS (PHYSIOLOGY)**Fluctuation limits of the acid-base status and of the gas content of blood in healthy untrained men performing standard physical exercise  
p 41 A88-14726The dynamics of the lipid metabolism and hormonal background during adaptation to long-term psychoemotional and physical loads  
p 41 A88-14727Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity  
p 36 A88-14772Human adaptation and constitution --- Russian book  
p 43 A88-15655Heat dissipation under lower body negative pressure stress  
[IAF PAPER 87-532] p 43 A88-16155**STRESS (PSYCHOLOGY)**The dynamics of the lipid metabolism and hormonal background during adaptation to long-term psychoemotional and physical loads  
p 41 A88-14727**STRESSES**Superoxide dismutase assays  
[AD-A183972] p 45 N88-12242**SUNLIGHT**The Solar Plant Growth Facility - An approach towards future biological life support systems  
[IAF PAPER 87-538] p 53 A88-16157Sunlight supply and gas exchange systems in microalgal bioreactor  
p 57 N88-12258**SUPERHIGH FREQUENCIES**Effect of microwave radiation on the dopamine-dependent behavior of rabbits  
p 37 A88-14773**SURVIVAL**Immersion suit insulation - The effect of dampening on survival estimates  
p 51 A88-15340**SYNAPSES**Large-scale neuronal circuits for selective storage and recognition of complex stimuli, a pilot study  
[AD-A184134] p 46 N88-12920**SYSTEMS ANALYSIS**The ADAM data acquisition system --- Advanced Dynamic Anthropomorphic Manikin for ejection seat tests  
p 50 A88-13398**SYSTEMS ENGINEERING**The design evolution of the mechanical analog of the human dynamic spine/viscera  
p 50 A88-13402Space suit systems - Technical and physiological constraints  
[IAF PAPER 87-540] p 53 A88-16158A systems engineering view of the human in space  
[IAF PAPER 87-547] p 53 A88-16164**SYSTEMS INTEGRATION**Human factors - Man-machine symbiosis in space  
[IAF PAPER 87-548] p 53 A88-16165A modular BLSS simulation model  
p 57 N88-12260**T****TASKS**Architecture for dynamic task allocation in a man-robot symbiotic system  
[DE87-013872] p 60 N88-12277**TECHNOLOGY ASSESSMENT**Space suit systems - Technical and physiological constraints  
[IAF PAPER 87-540] p 53 A88-16158**TECHNOLOGY UTILIZATION**Technology advancements to improve crew productivity in space  
p 51 A88-15283**TELEOPERATORS**Dynamic analysis of robotic manipulators for spacecraft applications  
p 51 A88-15524Design of a force reflecting hand controller for space telemanipulation studies  
[IAF PAPER 87-ST-01] p 52 A88-16067Feasibility of time delay compensation for a space teleoperation task  
p 55 A88-16310Control of in-orbit space manipulation  
p 55 A88-16312Operator multiple-tasking study for remotely operated platforms  
[AD-A184487] p 60 N88-12276**TEMPERATURE EFFECTS**Investigation of the ability of para-aminobenzoic acid to restore the activity of alkaline ribonuclease  
p 35 A88-13697**TEMPORAL RESOLUTION**Visual evoked responses to sinusoidal gratings presented in central and right visual fields: 1  
[DE87-014731] p 46 N88-12919**TEST FACILITIES**The Solar Plant Growth Facility - An approach towards future biological life support systems  
[IAF PAPER 87-538] p 53 A88-16157**THERMAL PROTECTION**Space suit extravehicular hazards protection development  
[NASA-TM-100458] p 60 N88-12927**THERMAL RADIATION**Analysis of the synergistic effect of heat and radiation on bacteriophage T4 and the spores of *Bacillus subtilis*  
p 36 A88-14767**THERMOREGULATION**Physiological mechanisms of thermoregulation in humans during adaptation to cold  
p 41 A88-14730**TIME DEPENDENCE**Homosynaptic depression as a model of the habituation phenomenon  
p 35 A88-13699Analysis of the life shortening effect of chronic external gamma-irradiation - The structure of the mortality rate  
p 36 A88-14768**TIME LAG**Feasibility of time delay compensation for a space teleoperation task  
p 55 A88-16310**TOLERANCES (PHYSIOLOGY)**Superoxide dismutase assays  
[AD-A183972] p 45 N88-12242**TOXICITY**The toxicology and metabolism of nickel compounds [DE87-014801]  
p 46 N88-12921**TOXICOLOGY**JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-87-012] p 44 N88-12238**TRAINING EVALUATION**Investigation of pilot behavior in a training program for assessing handling qualities using a ground simulator  
[ESA-TT-999] p 48 N88-12247**TRAINING SIMULATORS**Flight simulator requirements for airline transport pilot training - An evaluation of motion system design alternatives  
p 47 A88-16679**TRANSPIRATION**Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat  
p 58 N88-12268**TRANSPORT AIRCRAFT**Investigation of pilot behavior in a training program for assessing handling qualities using a ground simulator  
[ESA-TT-999] p 48 N88-12247**TRIPHENYLS**Triphenyldioxane - A new powerful inducer of cytochrome P-450  
p 38 A88-15696**U****U.S.S.R. SPACE PROGRAM**Biomedical payload of the French-Soviet long duration flight  
[IAF PAPER 87-541] p 44 A88-16159JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-87-009] p 39 N88-12915**UH-60A HELICOPTER**Delithalized cyclic control stick  
p 50 A88-13538**ULTRASHORT PULSED LASERS**Femtosecond laser-tissue interactions - Retinal injury studies  
p 36 A88-14548**ULTRAVIOLET RADIATION**DNA damage and repair in human skin in situ  
[DE87-014288] p 44 N88-12241**UNCONSCIOUSNESS**Recurrent +Gz-induced loss of consciousness  
p 42 A88-15338**UNDERWATER TESTS**Immersion suit insulation - The effect of dampening on survival estimates  
p 51 A88-15340**V****VEGETATION GROWTH**The Solar Plant Growth Facility - An approach towards future biological life support systems  
[IAF PAPER 87-538] p 53 A88-16157Controlled Ecological Life Support System: Regenerative Life Support Systems in Space  
[NASA-CP-2480] p 55 N88-12251Progress in European CELSS activities  
p 56 N88-12252Design of an elemental analysis system for CELSS research  
p 58 N88-12266Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat  
p 58 N88-12268Utilization of potatoes in bioregenerative life support systems  
p 58 N88-12269The effect of radiation on the long term productivity of a plant based CELSS  
p 59 N88-12271

- Mass balances for a biological life support system simulation model p 59 N88-12272
- Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth p 59 N88-12273
- VERTICAL MOTION**  
Inflight combined vertical and lateral space vehicular accelerations - Human tolerances [IAF PAPER 87-531] p 43 A88-16154
- VESTIBULAR TESTS**  
Comparative assessment of vestibular, optokinetic, and optovestibular stimulation in the development of experimental motion sickness p 42 A88-15339
- VESTIBULES**  
Motion and space sickness p 45 N88-12510
- VIDEO EQUIPMENT**  
Health hazards of video display terminals. A comprehensive, annotated bibliography on a critical issue of workplace health and safety with sources for obtaining items and list of terminal suppliers [RSI-IAS-4] p 44 N88-12240
- VISUAL ACUITY**  
Eyesight trainer for pilots p 44 N88-12239
- VISUAL DISCRIMINATION**  
Latency differences and effects of selective attention to gratings in the central and right visual fields: 2 [DE87-014730] p 46 N88-12918  
Visual evoked responses to sinusoidal gratings presented in central and right visual fields: 1 [DE87-014731] p 46 N88-12919
- VISUAL FIELDS**  
Latency differences and effects of selective attention to gratings in the central and right visual fields: 2 [DE87-014730] p 46 N88-12918  
Visual evoked responses to sinusoidal gratings presented in central and right visual fields: 1 [DE87-014731] p 46 N88-12919
- VISUAL PERCEPTION**  
Computer-controlled testing of visual-spatial ability [AD-A183971] p 48 N88-12249  
Effects of divided attention on identity and semantic priming [AD-A184289] p 48 N88-12250
- VISUAL STIMULI**  
Comparative assessment of vestibular, optokinetic, and optovestibular stimulation in the development of experimental motion sickness p 42 A88-15339
- VOICE COMMUNICATION**  
Integrated voice and visual systems research topics [NASA-CR-177417] p 47 N88-12246
- VOICE CONTROL**  
Integrated voice and visual systems research topics [NASA-CR-177417] p 47 N88-12246
- W**
- WASTE UTILIZATION**  
Operation of an experimental algal gas exchanger for use in a CELSS p 56 N88-12255  
A review of recent activities in the NASA CELSS program p 57 N88-12259  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261  
Mass balances for a biological life support system simulation model p 59 N88-12272
- WATER**  
Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth p 59 N88-12273
- WATER IMMERSION**  
Immersion suit insulation - The effect of dampening on survival estimates p 51 A88-15340
- WATER LANDING**  
The SRU-36/P Helo emergency egress device p 50 A88-13396
- WATER RECLAMATION**  
Selected advanced technology studies for the U.S. Space Station --- waste water reclamation, module design and fabrication [IAF PAPER 87-79] p 52 A88-15854
- WATER TREATMENT**  
Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262  
An overview of Japanese CELSS research activities p 58 N88-12267
- WEIGHTLESSNESS**  
Cosmonaut behaviour in orbital flight situation - Preliminary ethological analysis [IAF PAPER 87-528] p 47 A88-16151  
Human blood platelets at microgravity [IAF PAPER 87-562] p 44 A88-16177
- Experiment on STS 51-C - Effect of weightlessness on the morphology of aggregation of human red cells in disease [IAF PAPER 87-563] p 39 A88-16176
- WEIGHTLESSNESS SIMULATION**  
Regulation of the hemodynamics during the simulation of weightlessness (Mathematical modeling) p 41 A88-14728  
Artificial gravity - The evolution of variable gravity research [IAF PAPER 87-539] p 54 A88-16176
- WHEAT**  
Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat p 58 N88-12268  
Wheat production in controlled environments [UAES-PAPER-3324] p 59 N88-12270
- WORDS (LANGUAGE)**  
Studies of the processing of single words using positron tomographic measures of cerebral blood flow change [AD-A184058] p 45 N88-12244
- WORK CAPACITY**  
The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731
- WORKLOADS (PSYCHOPHYSIOLOGY)**  
Research papers and publications (1981-1987): Workload research program [NASA-TM-100016] p 48 N88-12924
- WORKSTATIONS**  
A scientific workstation operator-interface for accelerator control [DE87-014689] p 60 N88-12278

## Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document listed (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title. Under any one author's name the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

### A

**ABATE, RONALD**  
Computer-controlled testing of visual-spatial ability  
[AD-A183971] p 48 N88-12249

**ABRAMOV, I. P.**  
Crewman rescue equipment in manned space missions  
- Aspects of application  
[IAF PAPER 87-576] p 55 A88-16187

**ABRAMOV, M. M.**  
Correlation between changes in radiosensitivity and the activity of blood lymphocyte succinate dehydrogenase effected by exogenic hypoxia p 36 A88-14770

**ADAMS, JAMES H., JR.**  
Radiation hazards in space p 44 A88-16750

**AINE, C. J.**  
Latency differences and effects of selective attention to gratings in the central and right visual fields: 2  
[DE87-014730] p 46 N88-12918  
Visual evoked responses to sinusoidal gratings presented in central and right visual fields: 1  
[DE87-014731] p 46 N88-12919

**ALDERTON, DAVID L.**  
Computer-controlled testing of visual-spatial ability  
[AD-A183971] p 48 N88-12249

**ALLEN, D. A.**  
Discovery of organic grains in Comet Wilson p 61 A88-16324

**ALTENKIRCH, DIETRICH**  
Investigation of pilot behavior in a training program for assessing handling qualities using a ground simulator  
[ESA-TT-999] p 48 N88-12247

**ANDARY, JAMES F.**  
The Flight Telerobotic Servicer (FTS) - A focus for automation and robotics on the Space Station  
[IAF PAPER 87-25] p 52 A88-15617

**ANDERSON, JOHN L.**  
A systems engineering view of the human in space  
[IAF PAPER 87-547] p 53 A88-16164

**ANDRE, M.**  
Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat p 58 N88-12268

### B

**ANDREEVA, L. A.**  
Effect of microwave radiation on the dopamine-dependent behavior of rabbits p 37 A88-14773

**ANTSIFEROVA, N. G.**  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917

**ARNETT, K.**  
Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems p 56 N88-12254

**ASHIDA, A.**  
Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262

**AUSPRUNK, D.**  
Human blood platelets at microgravity  
[IAF PAPER 87-562] p 44 A88-16177

**AVELEV, V. D.**  
Homosynaptic depression as a model of the habituation phenomenon p 35 A88-13699

**AVERNER, MAURICE M.**  
Operation of an experimental algal gas exchanger for use in a CELSS p 56 N88-12255

**AVERY, A.**  
Immersion suit insulation - The effect of dampening on survival estimates p 51 A88-15340

**AZIAMOLOVA, N. M.**  
'O<sub>2</sub>-MP' - A device for measuring the partial pressure of oxygen in capillary blood under space flight conditions  
[IAF PAPER 87-543] p 53 A88-16161

**BAISCH, F.**  
Heat dissipation under lower body negative pressure stress  
[IAF PAPER 87-532] p 43 A88-16155

**BARTOL, AILEEN M.**  
ADAM - The next step in development of the true human analog p 49 A88-13386

**BEECHER, ROBERT M.**  
Mass properties and inertial loading effects of head encumbering devices p 50 A88-13412

**BEHRENS, P.**  
Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems p 56 N88-12254

**BELIAVSKAIA, N. A.**  
Ultrastructure of pea meristem and root cap cells under space flight conditions  
[IAF PAPER 87-558] p 38 A88-16173

**BEST, WILLIAM**  
Otolith-organ mechanics - Lumped parameter model and dynamic response p 37 A88-15341

**BIRNGRUBER, REGINALD**  
Femtosecond laser-tissue interactions - Retinal injury studies p 36 A88-14548

**BLAIS, TH.**  
Control of in-orbit space manipulation p 55 A88-16312

**BLEVINS, D.**  
Human blood platelets at microgravity  
[IAF PAPER 87-562] p 44 A88-16177

**BOITSOVA, V. P.**  
Analysis of the life shortening effect of chronic external gamma-irradiation - The structure of the mortality rate p 36 A88-14768

**BRAAK, L.**  
Biomedical payload of the French-Soviet long duration flight  
[IAF PAPER 87-541] p 44 A88-16159

**BRAGINA, M. P.**  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917

**BRINKLEY, JAMES W.**  
Dynamic response of the human head to +G(x) impact p 40 A88-13387

**BRISTOW, G. K.**  
Mental and physical performance at core temperatures as low as 31.2 C p 41 A88-13411

**BROWN, JERI W.**  
Human factors - Man-machine symbiosis in space  
[IAF PAPER 87-548] p 53 A88-16165

**BROWN, R. H.**  
Organic matter on asteroid 130 Elektra p 61 A88-14294

**BUBENHEIM, DAVID**  
Wheat production in controlled environments  
[UAES-PAPER-3324] p 59 N88-12270

**BUECKER, H.**  
Radiation problems with the Space Station scenario and the necessary surveillance for astronauts  
[IAF PAPER 87-542] p 53 A88-16160  
Support of life science research in space by the DFVLR Microgravity User Support Center (MUSC)  
[IAF PAPER 87-544] p 38 A88-16162

**BUGBEE, BRUCE**  
Wheat production in controlled environments  
[UAES-PAPER-3324] p 59 N88-12270

**BURKE, BERNARD F.**  
Detection of life in other planetary systems  
[IAF PAPER 87-597] p 61 A88-16199

**BUSSOLARI, S. R.**  
Flight simulator requirements for airline transport pilot training - An evaluation of motion system design alternatives p 47 A88-16679

### C

**CALLAHAN, A. B.**  
Superoxide dismutase assays  
[AD-A183972] p 45 N88-12242

**CAMPAN, R.**  
Cosmonaut behaviour in orbital flight situation - Preliminary ethological analysis  
[IAF PAPER 87-528] p 47 A88-16151

**CARDWELL, STAN**  
The SRU-36/P Halo emergency egress device p 50 A88-13396

**CARRERE, SYBIL**  
Human adaptation to isolated and confined environments  
[NASA-CR-181502] p 48 N88-12248

**CHANG, SHERWOOD**  
Isotopic characterisation of kerogen-like material in the Murchison carbonaceous chondrite p 61 A88-15438

**CHAO, F. C.**  
Human blood platelets at microgravity  
[IAF PAPER 87-562] p 44 A88-16177

**CHAPPE, A.**  
Biomedical payload of the French-Soviet long duration flight  
[IAF PAPER 87-541] p 44 A88-16159

**CHEN, H. M.**  
Decompression and occurrence of cataract in enucleated eyes of experimental animals p 37 A88-15345

**CHIRVA, G. I.**  
Physiological mechanisms of thermoregulation in humans during adaptation to cold p 41 A88-14730

**CHISTIYAKOV, V. V.**  
Triphenyldioxane - A new powerful inducer of cytochrome P-450 p 38 A88-15696

**CHRETIEN, J. P.**  
Modelling and simulation of distributed flexibility in a spaceborne manipulator p 55 A88-16309

**CHUPAKHIN, O. N.**  
Radioprotective activity of aminoarythiazoles and some mechanisms of their action p 36 A88-14771

**CLEARWATER, S.**  
A scientific workstation operator-interface for accelerator control  
[DE87-014689] p 60 N88-12278

**CLEARWATER, YVONNE A.**  
Human factor design of habitable space facilities  
[IAF PAPER 87-549] p 54 A88-16166

## COGOLI, A.

## COGOLI, A.

Space biologist's inflight safety considerations  
[IAF PAPER 87-570] p 54 A88-16182

## COOK, KENNETH M.

Femur-bending properties as influenced by gravity. V -  
Strength vs. calcium and gravity in rats exposed for 2  
weeks p 37 A88-15342

## COX, J.

Biomass recycle as a means to improve the energy  
efficiency of CELSS algal culture systems p 56 N88-12254

## CRAMPTON, GEORGE H.

Buspirone blocks motion sickness and xylazine-induced  
emesis in the cat p 37 A88-15344

## CROME, V.

Decompression tests of the French personal flight  
equipment in 439 - VHA 90 p 49 A88-13378

## CRUIKSHANK, D. P.

Organic matter on asteroid 130 Elektra p 61 A88-14294

## CURBY, W.

Human blood platelets at microgravity  
[IAF PAPER 87-562] p 44 A88-16177

## D

## DAGUENET, A.

Study of the relationship between photosynthesis,  
respiration, transpiration, and mineral nutrition in wheat  
p 58 N88-12268

## DAMRON, JOHN

Development of the tactical aircrew eye respiratory  
systems p 49 A88-13393

## DANILOV, V. I.

Physico-chemical and biological aspects of weak  
magnetic field effects on plants p 38 A88-16174

## DARLES, C.

Importance of human factors in the conception of  
Hermes spacecraft [IAF PAPER 87-552] p 54 A88-16169

## DARRAH, MARK I.

Simulation of a highly dynamic G-time profile - A  
predictive algorithm for crewmember acceleration  
tolerance p 40 A88-13379

## DELGADO, RUDOLPH C.

Limb flail injuries in USAF ejections - 1979-1985  
p 40 A88-13377

## DELLI-SANTI, GEORGE T.

Medical aspects of orbital spaceflight and their  
implications for manufacturing in space p 40 A88-13162

## DELPECH, M.

Modelling and simulation of distributed flexibility in a  
spaceborne manipulator p 55 A88-16309  
Feasibility of time delay compensation for a space  
teleoperation task p 55 A88-16310

## DEMINS, LEV STEPANOVICH

Automated learning systems for the occupational  
training of flight-vehicle operators p 47 A88-15680

## DIAMANDIS, PETER H.

Providing artificial gravity - Physiologic limitations to  
rotating habitats [IAF PAPER 87-545] p 53 A88-16163

## DINTENFASS, L.

Experiment on STS 51-C - Effect of weightlessness on  
the morphology of aggregation of human red cells in  
disease [IAF PAPER 87-563] p 39 A88-16178

## DIXON, GENE A.

Decompression sickness and venous gas emboli at 8.3  
psia p 40 A88-13401

## DOHERTY, BRIAN J.

A computer simulation of the Hybrid II manikin head-neck  
system p 49 A88-13380

## DOLEZAL, MICHAEL J.

A simulation study of a speed control system for  
autonomous on-road operation of automotive vehicles  
[AD-A184030] p 60 N88-12279

## DSOUZA, JOE

Application of photosynthetic N(2)-fixing cyanobacteria  
to the CELSS program p 56 N88-12257

## DUCLOUX, H.

Study of the relationship between photosynthesis,  
respiration, transpiration, and mineral nutrition in wheat  
p 58 N88-12268

## E

## EBARA, K.

Vapor compression distiller and membrane technology  
for water revitalization p 57 N88-12262

## B-2

## EGOROV, A. D.

Man in space flight  
[IAF PAPER 87-527] p 43 A88-16150

## EGOROVA, L. G.

Radioprotective activity of aminoarythiazoles and some  
mechanisms of their action p 36 A88-14771

## ERSHOV, A. F.

The role of the individual characteristics of vegetative  
reactions during the action of adaptogens on physical and  
mental work capacity p 42 A88-14731

## EVANS, GARY W.

Human adaptation to isolated and confined  
environments [NASA-CR-181502] p 48 N88-12248

## F

## FANG, H. S.

Decompression and occurrence of cataract in  
enucleated eyes of experimental animals p 37 A88-15345

## FARR, SIMON A.

Computer-controlled testing of visual-spatial ability  
[AD-A183971] p 48 N88-12249

## FARRIS, R. LLOYD

The CREST restraint system development program  
p 49 A88-13382

## FICKOVA, M.

Insulin receptors and enzyme activities in liver of rats  
after space flight on biosatellite COSMOS 1667  
[IAF PAPER 87-530] p 38 A88-16153

## FISHER, HAROLD W.

Superoxide dismutase assays  
[AD-A183972] p 45 N88-12242

## FLYNN, E. R.

Latency differences and effects of selective attention  
to gratings in the central and right visual fields: 2  
[DE87-014730] p 46 N88-12918  
Visual evoked responses to sinusoidal gratings  
presented in central and right visual fields: 1  
[DE87-014731] p 46 N88-12919

## FOMICHEVA, V. M.

Physico-chemical and biological aspects of weak  
magnetic field effects on plants [IAF PAPER 87-560] p 38 A88-16174

## FONTAINE, A. R.

Faunal composition and organic surface encrustations  
at hydrothermal vents on the southern Juan de Fuca  
Ridge p 39 A88-16803

## FOX, PETER T.

Studies of the processing of single words using positron  
tomographic measures of cerebral blood flow change  
[AD-A184058] p 45 N88-12244

## FREEMAN, S. E.

DNA damage and repair in human skin in situ  
[DE87-014288] p 44 N88-12241

## FREY, MARY ANNE BASSETT

Considerations in prescribing preflight aerobic exercise  
for astronauts p 42 A88-15349

## FRIEDERICY, R. H.

Development, testing and evaluation of a night vision  
goggle compatible BO-105 for night low level operation  
p 55 N88-11668

## FRY, IAN V.

Application of photosynthetic N(2)-fixing cyanobacteria  
to the CELSS program p 56 N88-12257

## FULLER, CHARLES A.

Artificial gravity - The evolution of variable gravity  
research [IAF PAPER 87-539] p 54 A88-16176

## FURUNE, H.

Sunlight supply and gas exchange systems in microalgal  
bioreactor p 57 N88-12258

## G

## GAIDAMAKIN, A. N.

Correlation between changes in radiosensitivity and the  
activity of blood lymphocyte succinate dehydrogenase  
effected by exogenic hypoxia p 36 A88-14770

## GANGE, R. W.

DNA damage and repair in human skin in situ  
[DE87-014288] p 44 N88-12241

## GARDNER, LEONARD

A role for biobehavioral applications in support of  
spaceflight operations programs [IAF PAPER 87-555] p 47 A88-16171

## GAWANDE, A.

Femtosecond laser-tissue interactions - Retinal injury  
studies p 36 A88-14548

## GAZENKO, O. G.

Man in space flight  
[IAF PAPER 87-527] p 43 A88-16150

## GEER, CHARLES W.

NASA-STD-3000, Man-System Integration Standards -  
The new space human engineering standards  
[IAF PAPER 87-550] p 54 A88-16167

## GEORGE, J. S.

Latency differences and effects of selective attention  
to gratings in the central and right visual fields: 2  
[DE87-014730] p 46 N88-12918  
Visual evoked responses to sinusoidal gratings  
presented in central and right visual fields: 1  
[DE87-014731] p 46 N88-12919

## GERBAUD, A.

Study of the relationship between photosynthesis,  
respiration, transpiration, and mineral nutrition in wheat  
p 58 N88-12268

## GIESBRECHT, G. G.

Mental and physical performance at core temperatures  
as low as 31.2 C p 41 A88-13411

## GILLESPIE, GEORGE

The SRU-36/P Helo emergency egress device  
p 50 A88-13396

## GILLINGHAM, KENT K.

G-tolerance standards for aircrew training and  
selection p 43 A88-15350

## GLATMAN, L. I.

Study of certain biological characteristics of bacteria  
during the French-Soviet CYTOS-2 space experiment  
p 40 N88-12917

## GOLOSHCHAPOV, P. V.

Analysis of the life shortening effect of chronic external  
gamma-irradiation - The structure of the mortality rate  
p 36 A88-14768

Investigation of the life-shortening effect in an  
experiment with chronic external gamma-irradiation - In  
support of the aging hypothesis p 36 A88-14769

## GOULD, CHERYL L.

Inhibited interferon-gamma but normal interleukin-3  
production from rats flown on the Space Shuttle  
p 37 A88-15343

## GOVORUM, R. D.

Physico-chemical and biological aspects of weak  
magnetic field effects on plants [IAF PAPER 87-560] p 38 A88-16174

## GRANT, WALLACE

Otolith-organ mechanics - Lumped parameter model and  
dynamic response p 37 A88-15341

## GREEN, ROGER

Passenger behaviour in aircraft emergencies  
p 47 A88-16741

## GRIEVE, A. M.

Immersion suit insulation - The effect of dampening on  
survival estimates p 51 A88-15340

## GRIGOR'EV, A. I.

Man in space flight  
[IAF PAPER 87-527] p 43 A88-16150

Biomedical payload of the French-Soviet long duration  
flight [IAF PAPER 87-541] p 44 A88-16159

## GUELL, A.

Cosmonaut behaviour in orbital flight situation -  
Preliminary ethological analysis [IAF PAPER 87-528] p 47 A88-16151

## GUELL, ANTONIO

A neuropharmacological approach to space motion  
sickness [IAF PAPER 87-529] p 43 A88-16152

## GUROVSKII, N. N.

Results of medical investigations conducted aboard the  
'Salyut-6'-'Soyuz' orbital research complex  
p 43 A88-15650

## GUTMAN, G.

Decompression tests of the French personal flight  
equipment in 439 - VHA 90 p 49 A88-13378

## H

## HAALAND, K. S.

Operator multiple-tasking study for remotely operated  
platforms [AD-A184487] p 60 N88-12276

## HAASE, H.

'O2-MP' - A device for measuring the partial pressure  
of oxygen in capillary blood under space flight conditions  
[IAF PAPER 87-543] p 53 A88-16161

## HAGER, R. W.

Selected advanced technology studies for the U.S.  
Space Station [IAF PAPER 87-79] p 52 A88-15854

## HARDING, R. M.

Human respiratory responses during high performance  
flight [AGARD-AG-312] p 46 N88-12923

- HARMON, PHILLIP E.**  
Design and development of a computer-assisted ground control technique for Space Station robotics  
p 51 A88-15284
- HART, SANDRA G.**  
Research papers and publications (1981-1987): Workload research program [NASA-TM-100016]  
p 48 N88-12924
- HATAYAMA, SHIGEKI**  
Food production and gas exchange system using blue-green alga (spirulina) for CELSS  
p 56 N88-12253
- HAYASHI, S.**  
Vapor compression distiller and membrane technology for water revitalization  
p 57 N88-12262
- HELANDER, M. G.**  
Human motor reactions to dangerous motions in robot operations [PB87-222196]  
p 59 N88-12275
- HERBER, N.**  
Space suit systems - Technical and physiological constraints [IAF PAPER 87-540]  
p 53 A88-16158
- HEYDER, E.**  
Superoxide dismutase assays [AD-A183972]  
p 45 N88-12242
- HEYN, J.**  
European EVA requirements and space suit design [IAF PAPER 87-41]  
p 52 A88-15830
- HINKAL, SANFORD W.**  
The Flight Telerobotic Servicer (FTS) - A focus for automation and robotics on the Space Station [IAF PAPER 87-25]  
p 52 A88-15817
- HIRZINGER, G.**  
Man tended free flyer interior equipment for manned and automated operation [IAF PAPER 87-75]  
p 52 A88-15850
- HOOKER, R. J.**  
Dynamic analysis of robotic manipulators for spacecraft applications  
p 51 A88-15524
- HOPKINS, HARRY**  
Wings and serpents  
p 44 A88-16377
- HRABETA, JANA**  
Application of photosynthetic N(2)-fixing cyanobacteria to the CELSS program  
p 56 N88-12257
- HUNT, EARL**  
Computer-controlled testing of visual-spatial ability [AD-A183971]  
p 48 N88-12249
- HURTL, HEIDEMARIE**  
The Solar Plant Growth Facility - An approach towards future biological life support systems [IAF PAPER 87-538]  
p 53 A88-16157
- HUTCHINS, MARK L.**  
Assessment of fatigue in aviation crews [AD-A184129]  
p 45 N88-12245
- I**
- IKELS, KENNETH G.**  
Molecular sieves for onboard storage of gaseous oxygen and nitrogen  
p 50 A88-13413
- ILYIN, V. K.**  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment  
p 40 N88-12917
- INADA, K.**  
Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth  
p 59 N88-12273
- ISU, NAOKI**  
Motion and space sickness  
p 45 N88-12510
- J**
- JACOBSON, V.**  
A scientific workstation operator-interface for accelerator control [DE87-014689]  
p 60 N88-12278
- JARSUMBECK, B.**  
'O<sub>2</sub>-MP' - A device for measuring the partial pressure of oxygen in capillary blood under space flight conditions [IAF PAPER 87-543]  
p 53 A88-16161
- JONES, DAVID R.**  
Recurrent +Gz-induced loss of consciousness  
p 42 A88-15338
- K**
- KALEPS, INTS**  
The USAF Advanced Dynamic Anthropomorphic Manikin - ADAM  
p 49 A88-13389
- KALIJZHNAIA, T. V.**  
Ultramicroforms of bacteria in soil and ocean  
p 35 A88-13695
- KANDA, S.**  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration  
p 57 N88-12261
- KAREL, M.**  
Non-conventional approaches to food processing in CELSS, 1. Algal proteins: Characterization and process optimization  
p 56 N88-12256
- KARWAN, M. H.**  
Human motor reactions to dangerous motions in robot operations [PB87-222196]  
p 59 N88-12275
- KASHIWAGI, H.**  
Vapor compression distiller and membrane technology for water revitalization  
p 57 N88-12262
- KATS, L. N.**  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment  
p 40 N88-12917
- KAZNACHEEV, SERGEI VLAIL'EVICH**  
Human adaptation and constitution  
p 43 A88-15655
- KAZNACHEEV, VLAIL' PETROVICH**  
Human adaptation and constitution  
p 43 A88-15655
- KEEFE, J. RICHARD**  
Artificial gravity - The evolution of variable gravity research [IAF PAPER 87-539]  
p 54 A88-16176
- KENNEDY, JOE**  
Low-cost prototypes for human factors evaluation of Space Station crew equipment [IAF PAPER 87-553]  
p 54 A88-16170
- KERRIDGE, JOHN F.**  
Isotopic characterisation of kerogen-like material in the Murchison carbonaceous chondrite  
p 61 A88-15438
- KHANLAROVA, T. A.**  
Fluctuation limits of the acid-base status and of the gas content of blood in healthy untrained men performing standard physical exercise  
p 41 A88-14726
- KIRILOVA, F. M.**  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment  
p 40 N88-12917
- KLEIN, EDWARD A.**  
Simulation of a highly dynamic G-time profile - A predictive algorithm for crewmember acceleration tolerance  
p 40 A88-13379
- KNIGHT, DOUGLAS R.**  
Scotopic sensitivity with 10 percent oxygen [AD-A183973]  
p 45 N88-12243
- Fire-related medical science**  
p 45 N88-12525
- KNOTT, W.**  
A review of recent activities in the NASA CELSS program  
p 57 N88-12259
- KNOTT, WILLIAM M.**  
Activation of a controlled ecological life support system (CELSS) breadboard facility - Wheat growth studies [IAF PAPER 87-557]  
p 54 A88-16172
- KOENIG, J.**  
'O<sub>2</sub>-MP' - A device for measuring the partial pressure of oxygen in capillary blood under space flight conditions [IAF PAPER 87-543]  
p 53 A88-16161
- KOMAROV, V. P.**  
Analysis of the synergistic effect of heat and radiation on bacteriophage T4 and the spores of *Bacillus subtilis*  
p 36 A88-14767
- KONDO, S.**  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration  
p 57 N88-12261
- KONKEL, CARL R.**  
Design and development of a computer-assisted ground control technique for Space Station robotics  
p 51 A88-15284
- Telerobotics and orbital laboratories - An end-to-end analysis and demonstration**  
[IAF PAPER 87-27]  
p 52 A88-15819
- KONOVALOV, V. F.**  
Effect of microwave radiation on the dopamine-dependent behavior of rabbits  
p 37 A88-14773
- KORDIUM, E. L.**  
Ultrastructure of pea meristem and root cap cells under space flight conditions [IAF PAPER 87-558]  
p 38 A88-16173
- KOSMO, JOSEPH J.**  
Space suit extravehicular hazards protection development [NASA-TM-100458]  
p 60 N88-12927
- KOWALSKI, JOSEPH F.**  
The ADAM data acquisition system  
p 50 A88-13398
- KOZHEVNIKOVA, N. A.**  
Investigation of the ability of para-aminobenzoic acid to restore the activity of alkaline ribonuclease  
p 35 A88-13697
- KRAMARENKO, ALEKSANDR IAKOVLEVICH**  
Automated learning systems for the occupational training of flight-vehicle operators  
p 47 A88-15680
- KRUKONIS, V. J.**  
Non-conventional approaches to food processing in CELSS, 1. Algal proteins: Characterization and process optimization  
p 56 N88-12256
- KRUTZ, ROBERT W., JR.**  
Decompression sickness and venous gas emboli at 8.3 psia  
p 40 A88-13401
- KULAKOV, IU. A.**  
Physiological characteristics of adaptation processes preceding activity conditions  
p 42 A88-14744
- KUROKAWA, H.**  
Vapor compression distiller and membrane technology for water revitalization  
p 57 N88-12262
- KUVSHINNIKOV, A. V.**  
The dynamics of the lipid metabolism and hormonal background during adaptation to long-term psychoemotional and physical loads  
p 41 A88-14727
- KUZ'MIN, MIKHAIL P.**  
Comparative assessment of vestibular, optokinetic, and optovestibular stimulation in the development of experimental motion sickness  
p 42 A88-15339
- KUZNETSOV, YE.**  
Eyesight trainer for pilots  
p 44 N88-12239
- L**
- LACOMBE, J. L.**  
Control of in-orbit space manipulation  
p 55 A88-16312
- LAKE, B. H.**  
The effect of radiation on the long term productivity of a plant based CELSS  
p 59 N88-12271
- LAMB, MATTHEW J.**  
United States Navy molecular sieve on-board oxygen generation (OBOG) system development efforts - A history and 1986 status report  
p 50 A88-13405
- LEE, A. T.**  
Flight simulator requirements for airline transport pilot training - An evaluation of motion system design alternatives  
p 47 A88-16679
- LEE, M.**  
A scientific workstation operator-interface for accelerator control [DE87-014689]  
p 60 N88-12278
- LEMAIGNEN, L.**  
European EVA requirements and space suit design [IAF PAPER 87-41]  
p 52 A88-15830
- LETAW, JOHN R.**  
Radiation hazards in space  
p 44 A88-16750
- LEVIN, M. IA.**  
Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity  
p 36 A88-14772
- LIBIKOVA, N. I.**  
Radioprotective activity of aminoarthythiazoles and some mechanisms of their action  
p 36 A88-14771
- LIEBERMAN, D.**  
Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems  
p 56 N88-12254
- LIGHT, I. M.**  
Immersion suit insulation - The effect of dampening on survival estimates  
p 51 A88-15340
- LIN, WEI-ZHU**  
Femtosecond laser-tissue interactions - Retinal injury studies  
p 36 A88-14548
- LINDBERG, C.**  
Support of life science research in space by the DFVLR Microgravity User Support Center (MUSC) [IAF PAPER 87-544]  
p 38 A88-16162
- LINKE-HOMMES, A.**  
Gravity effects on membrane equilibria [IAF PAPER 87-561]  
p 39 A88-16175
- LONG, RICHARD J.**  
The prospects for helicopter helmet design to meet rapidly expanding requirements  
p 50 A88-13541
- LOUHMAADI, A.**  
Modelling and simulation of distributed flexibility in a spaceborne manipulator  
p 55 A88-16309
- LUCOT, JAMES B.**  
Buspirone blocks motion sickness and xylazine-induced emesis in the cat  
p 37 A88-15344
- LURIA, S. M.**  
Scotopic sensitivity with 10 percent oxygen [AD-A183973]  
p 45 N88-12243
- Performance and preference with various VDT (Video Display Terminal) phosphors**  
[AD-A184085]  
p 60 N88-12925
- LYTE, MARK**  
Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle  
p 37 A88-15343

## M

- MACELROY, R. D.**  
A review of recent activities in the NASA CELSS program p 57 N88-12259
- MACELROY, ROBERT D.**  
Controlled Ecological Life Support System: Regenerative Life Support Systems in Space [NASA-CP-2480] p 55 N88-12251
- MACHO, L.**  
Insulin receptors and enzyme activities in liver of rats after space flight on biosatellite COSMOS 1667 [IAF PAPER 87-530] p 38 A88-16153
- MAKSIMUK, V. F.**  
Change in functional activity of cortical brain structures and their blood supply in alert rabbits in response to rocking p 39 N88-12916
- MANDEL, ADRIAN D.**  
Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle p 37 A88-15343
- MANKAMYER, MELANIE M.**  
Technology advancements to improve crew productivity in space p 51 A88-15283
- MARACHEV, A. G.**  
Acclimatized deficit of iron p 41 A88-14729
- MAROTTE, H.**  
Decompression tests of the French personal flight equipment in 439 - VHA 90 p 49 A88-13378
- MASHNEVA, N. I.**  
Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity p 36 A88-14772
- MASSIMINO, D.**  
Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat p 58 N88-12268
- MASSIMINO, J.**  
Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat p 58 N88-12268
- MATSNV, EDUARD I.**  
Comparative assessment of vestibular, optokinetic, and optovestibular stimulation in the development of experimental motion sickness p 42 A88-15339
- MATSUMOTO, K.**  
Sunlight supply and gas exchange systems in microalgal bioreactor p 57 N88-12258
- MATSUMURA, H.**  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261
- MAURETTE, M.**  
Feasibility of time delay compensation for a space teleoperation task p 55 A88-16310
- MCCORMACK, P. D.**  
Inflight combined vertical and lateral space vehicular accelerations - Human tolerances [IAF PAPER 87-531] p 43 A88-16154  
Artificial gravity - A countermeasure for zero gravity [IAF PAPER 87-533] p 53 A88-16156
- MCKENZIE, JENNIFER**  
Mass properties and inertial loading effects of head encumbering devices p 50 A88-13412
- MEDVEDEV, M. A.**  
Physiological characteristics of adaptation processes preceding activity conditions p 42 A88-14744
- MESLAND, DICK A. M.**  
Biology and microgravity [IAF PAPER 87-564] p 39 A88-16179
- MESSIER, A. A.**  
Superoxide dismutase assays [AD-A183972] p 45 N88-12242
- MILUKOV, IGOR VLADIMIROVICH**  
Automated learning systems for the occupational training of flight-vehicle operators p 47 A88-15680
- MILLER, CHRIS**  
Low-cost prototypes for human factors evaluation of Space Station crew equipment [IAF PAPER 87-553] p 54 A88-16170
- MILLER, CRAIG F.**  
Telerobotics and orbital laboratories - An end-to-end analysis and demonstration [IAF PAPER 87-27] p 52 A88-15819
- MILLER, GEORGE W.**  
Performance studies on a molecular sieve oxygen concentrator (MSOC) - Comparison of MG3, 5AMG, and 13X molecular sieves p 51 A88-13542
- MILLER, KEITH H.**  
NASA-STD-3000, Man-System Integration Standards - The new space human engineering standards [IAF PAPER 87-550] p 54 A88-16167
- MISHUSTINA, I. E.**  
Ultramicroforms of bacteria in soil and ocean p 35 A88-13695

- MITANI, K.**  
Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262
- MIZUTANI, HIROSHI**  
A large-scale perspective on ecosystems p 58 N88-12265
- MOHLER, S. R.**  
Inflight combined vertical and lateral space vehicular accelerations - Human tolerances [IAF PAPER 87-531] p 43 A88-16154
- MOHLER, S. R., JR.**  
Inflight combined vertical and lateral space vehicular accelerations - Human tolerances [IAF PAPER 87-531] p 43 A88-16154
- MOLLARD, R.**  
Importance of human factors in the conception of Hermes spacecraft [IAF PAPER 87-552] p 54 A88-16169
- MORESSI, WILLIAM J.**  
Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342
- MORI, K.**  
Sunlight supply and gas exchange systems in microalgal bioreactor p 57 N88-12258
- MOROZ, A. F.**  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917
- MORRIS, N. A.**  
Dynamic analysis of robotic manipulators for spacecraft applications p 51 A88-15524
- MURPHY, BRIAN P.**  
The design evolution of the mechanical analog of the human dynamic spine/viscera p 50 A88-13402
- MUSACCHIA, X. J.**  
Disuse atrophy, plasma corticosterone, and muscle glucocorticoid receptor levels p 38 A88-15346
- MYBURGH, D. P.**  
Apical hypertrophic nonobstructive cardiomyopathy in a pilot p 42 A88-15347

## N

- NACKE, G.**  
'O2-MP' - A device for measuring the partial pressure of oxygen in capillary blood under space flight conditions [IAF PAPER 87-543] p 53 A88-16161
- NAKHOST, Z.**  
Non-conventional approaches to food processing in CELSS. 1. Algal proteins: Characterization and process optimization p 56 N88-12256
- NEMETH, S.**  
Insulin receptors and enzyme activities in liver of rats after space flight on biosatellite COSMOS 1667 [IAF PAPER 87-530] p 38 A88-16153
- NERI, DAVID F.**  
Performance and preference with various VDT (Video Display Terminal) phosphors [AD-A184085] p 60 N88-12925
- NEUTEL, J. M.**  
Apical hypertrophic nonobstructive cardiomyopathy in a pilot p 42 A88-15347
- NIBUSH, V. A.**  
The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731
- NICHOLAS, JOHN M.**  
Small groups in orbit - Group interaction and crew performance on Space Station p 47 A88-15348
- NICOGOSSIAN, A. E.**  
Artificial gravity - A countermeasure for zero gravity [IAF PAPER 87-533] p 53 A88-16156
- NICOGOSSIAN, A. E. T.**  
Inflight combined vertical and lateral space vehicular accelerations - Human tolerances [IAF PAPER 87-531] p 43 A88-16154
- NISHI, I.**  
Fundamental study on gas monitoring in CELSS p 57 N88-12263
- NISSLEY, META**  
Health hazards of video display terminals. A comprehensive, annotated bibliography on a critical issue of workplace health and safety with sources for obtaining items and list of terminal suppliers [RSI-IAS-4] p 44 N88-12240
- NITTA, K.**  
Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262  
Fundamental study on gas monitoring in CELSS p 57 N88-12263  
The applicability of the catalytic wet-oxidation to CELSS p 58 N88-12264

- NITTA, KEIJI**  
Food production and gas exchange system using blue-green alga (spirulina) for CELSS p 56 N88-12253  
An overview of Japanese CELSS research activities p 58 N88-12267
- NIXON, DAVID**  
Low-cost prototypes for human factors evaluation of Space Station crew equipment [IAF PAPER 87-553] p 54 A88-16170
- NOLES, CHERIE J.**  
Molecular sieves for onboard storage of gaseous oxygen and nitrogen p 50 A88-13413
- NOVIKOVA, A. P.**  
Radioprotective activity of aminoarylthiazoles and some mechanisms of their action p 36 A88-14771

## O

- OGUCHI, M.**  
Fundamental study on gas monitoring in CELSS p 57 N88-12263  
The applicability of the catalytic wet-oxidation to CELSS p 58 N88-12264
- OGUCHI, MITSUO**  
Food production and gas exchange system using blue-green alga (spirulina) for CELSS p 56 N88-12253
- OHYA, H.**  
Sunlight supply and gas exchange systems in microalgal bioreactor p 57 N88-12258  
The applicability of the catalytic wet-oxidation to CELSS p 58 N88-12264
- ORZECH, MARY ANN**  
Dynamic response of the human head to +G(x) impact p 40 A88-13387
- OS'MININ, F. V.**  
The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731
- OTSUBO, K.**  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261  
Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262
- OTSUBO, KOJI**  
Food production and gas exchange system using blue-green alga (spirulina) for CELSS p 56 N88-12253
- OTSUJI, K.**  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261
- PACKER, LESTER**  
Application of photosynthetic N(2)-fixing cyanobacteria to the CELSS program p 56 N88-12257
- PADEKEN, D.**  
Support of life science research in space by the DFVLR Microgravity User Support Center (MUSC) [IAF PAPER 87-544] p 38 A88-16162
- PAINES, J. D. B.**  
Design of a force reflecting hand controller for space telemanipulation studies [IAF PAPER 87-ST-01] p 52 A88-16067
- PALETS, B. L.**  
Regulation of the hemodynamics during the simulation of weightlessness (Mathematical modeling) p 41 A88-14728
- PANCHENKO, V. S.**  
Regulation of the hemodynamics during the simulation of weightlessness (Mathematical modeling) p 41 A88-14728
- PARKER, L. E.**  
Architecture for dynamic task allocation in a man-robot symbiotic system [DEB7-013872] p 60 N88-12277
- PAVER, JACQUELINE G.**  
A computer simulation of the Hybrid II manikin head-neck system p 49 A88-13380
- PAXSON, V.**  
A scientific workstation operator-interface for accelerator control [DEB7-014689] p 60 N88-12278
- PELLEGRINO, JAMES W.**  
Computer-controlled testing of visual-spatial ability [AD-A183971] p 48 N88-12249
- PETERSEN, STEVEN E.**  
Studies of the processing of single words using positron tomographic measures of cerebral blood flow change [AD-A184058] p 45 N88-12244



- PETIN, V. G.**  
Analysis of the synergistic effect of heat and radiation on bacteriophage T4 and the spores of *Bacillus subtilis*  
[DE87-013872] p 36 A88-14767
- PIN, F. G.**  
Architecture for dynamic task allocation in a man-robot symbiotic system  
[DE87-013872] p 60 N88-12277
- PISANKO, A. P.**  
The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731
- PIVIROTTO, DONNA SHIRLEY**  
NASA's Telerobotics R & D Program - Status and future directions  
[IAF PAPER 87-24] p 51 A88-15816
- PODLUTSKII, A. G.**  
Ultrastructure of pea meristem and root cap cells under space flight conditions  
[IAF PAPER 87-558] p 38 A88-16173
- PODOL'SKII, I. IA.**  
Effect of microwave radiation on the dopamine-dependent behavior of rabbits p 37 A88-14773
- POLOZHENTSEV, S. D.**  
The dynamics of the lipid metabolism and hormonal background during adaptation to long-term psychoemotional and physical loads p 41 A88-14727
- POPOV, A. A.**  
Regulation of the hemodynamics during the simulation of weightlessness (Mathematical modeling) p 41 A88-14728
- POPOV, V. L.**  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917
- POSNER, MICHAEL I.**  
Studies of the processing of single words using positron tomographic measures of cerebral blood flow change  
[AD-A184058] p 45 N88-12244  
Effects of divided attention on identity and semantic priming  
[AD-A184289] p 48 N88-12250
- POSPELOVA, L. N.**  
Triphenyldioxane - A new powerful inducer of cytochrome P-450 p 38 A88-15696
- PRINCE, R. P.**  
A review of recent activities in the NASA CELSS program p 57 N88-12259
- PRIVITZER, EBERHARDT**  
Mass properties and inertial loading effects of head encumbering devices p 50 A88-13412
- PROVOST, DAVID E.**  
The Flight Telerobotic Servicer (FTS) - A focus for automation and robotics on the Space Station  
[IAF PAPER 87-25] p 52 A88-15817
- PUL'KOV, V. N.**  
Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity p 36 A88-14772
- PULIAFITO, CARMEN A.**  
Femtosecond laser-tissue interactions - Retinal injury studies p 36 A88-14548
- PUSHKAREV, IU. P.**  
Homosynaptic depression as a model of the habituation phenomenon p 35 A88-13699

## R

- RADMER, R.**  
Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems p 56 N88-12254
- RAICHLÉ, MARCUS**  
Studies of the processing of single words using positron tomographic measures of cerebral blood flow change  
[AD-A184058] p 45 N88-12244
- RAPOPORT, I. A.**  
Investigation of the ability of para-aminobenzoic acid to restore the activity of alkaline ribonuclease p 35 A88-13697
- RASMUSSEN, ROY R., JR.**  
The USAF Advanced Dynamic Anthropomorphic Manikin - ADAM p 49 A88-13389
- REITZ, G.**  
Support of life science research in space by the DFVLR Microgravity User Support Center (MUSC)  
[IAF PAPER 87-544] p 38 A88-16162
- RICHAUD, C.**  
Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat p 58 N88-12268

- RUDNEV, D. A.**  
The dynamics of the lipid metabolism and hormonal background during adaptation to long-term psychoemotional and physical loads p 41 A88-14727
- RUMMEL, JOHN D.**  
A modular BLSS simulation model p 57 N88-12260  
Mass balances for a biological life support system simulation model p 59 N88-12272

## S

- SALERNO, MARK D.**  
Dynamic response of the human head to +G(x) impact p 40 A88-13387
- SALISBURY, FRANK B.**  
Wheat production in controlled environments  
[UAES-PAPER-3324] p 59 N88-12270
- SANDSON, JENNIFER**  
Effects of divided attention on identity and semantic priming  
[AD-A184289] p 48 N88-12250
- SATOH, S.**  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261
- SAWADA, I.**  
Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262
- SAWADA, T.**  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261
- SCHATZ, A.**  
Gravity effects on membrane equilibria  
[IAF PAPER 87-561] p 39 A88-16175
- SCHLICHTING, CHRISTINE**  
Performance and preference with various VDT (Video Display Terminal) phosphors  
[AD-A184085] p 60 N88-12925
- SCHMIDT, E.**  
Man tended free flyer interior equipment for manned and automated operation  
[IAF PAPER 87-75] p 52 A88-15850
- SCHNEIDER, JEAN**  
The metaphysical presuppositions of the 'anthropic principle' p 35 A88-14422
- SCHOENLEIN, ROBERT W.**  
Femtosecond laser-tissue interactions - Retinal injury studies p 36 A88-14548
- SCHOTT, J. U.**  
Radiation problems with the Space Station scenario and the necessary surveillance for astronauts  
[IAF PAPER 87-542] p 53 A88-16160
- SCHUBER, M.**  
Support of life science research in space by the DFVLR Microgravity User Support Center (MUSC)  
[IAF PAPER 87-544] p 38 A88-16162
- SCHWARTZKOPF, STEVEN H.**  
Design of an elemental analysis system for CELSS research p 58 N88-12266
- SEMENIN, ALEKSEI PETROVICH**  
Automated learning systems for the occupational training of flight-vehicle operators p 47 A88-15680
- SETTECERRI, JEFFREY J.**  
Mass properties and inertial loading effects of head encumbering devices p 50 A88-13412
- SEVERIN, G. I.**  
Crewman rescue equipment in manned space missions - Aspects of application  
[IAF PAPER 87-576] p 55 A88-16187
- SHILOV, V. M.**  
Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917
- SHIPP, RUTH**  
Isotopic characterisation of kerogen-like material in the Murchison carbonaceous chondrite p 61 A88-15438
- SHUBIK, V. M.**  
Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity p 36 A88-14772
- SHUL'ZHENKO, E. B.**  
Man in space flight  
[IAF PAPER 87-527] p 43 A88-16150
- SHUSTOVA, T. I.**  
The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731
- SIEMANN, H.**  
Man tended free flyer interior equipment for manned and automated operation  
[IAF PAPER 87-75] p 52 A88-15850
- SILBERBERG, REIN**  
Radiation hazards in space p 44 A88-16750

- SIMPSON, CAROL A.**  
Integrated voice and visual systems research topics  
[NASA-CR-177417] p 47 N88-12246
- SKEPNER, BRAD**  
Low-cost prototypes for human factors evaluation of Space Station crew equipment  
[IAF PAPER 87-553] p 54 A88-16170
- SKOOG, A. I.**  
Progress in European CELSS activities p 56 N88-12252
- SKOROMNYI, N. A.**  
Change in functional activity of cortical brain structures and their blood supply in alert rabbits in response to rocking p 39 N88-12916
- SLEDKOV, A. IU.**  
Characteristics of hypothalamic self-stimulation related to the intensity of the stimulating current p 35 A88-13698
- SMART, P.**  
Heat dissipation under lower body negative pressure stress  
[IAF PAPER 87-532] p 43 A88-16155
- SMEAD, KENNETH W.**  
Decompression sickness and venous gas emboli at 8.3 psia p 40 A88-13401
- SMERNOFF, D. T.**  
A review of recent activities in the NASA CELSS program p 57 N88-12259
- SMERNOFF, DAVID T.**  
Controlled Ecological Life Support System: Regenerative Life Support Systems in Space  
[NASA-CP-2480] p 55 N88-12251  
Operation of an experimental algal gas exchanger for use in a CELSS p 56 N88-12255
- SMITH, KENT F.**  
Delethalized cyclic control stick p 50 A88-13538
- SOBOLEV, V. I.**  
Physiological mechanisms of thermoregulation in humans during adaptation to cold p 41 A88-14730
- SONNENFELD, GERALD**  
Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle p 37 A88-15343
- STECH, ERNEST L.**  
The CREST restraint system development program p 49 A88-13382
- STEFFEN, J. M.**  
Disuse atrophy, plasma corticosterone, and muscle glucocorticoid receptor levels p 38 A88-15346
- STOKOLS, DANIEL**  
Human adaptation to isolated and confined environments  
[NASA-CR-181502] p 48 N88-12248
- SULZMAN, FRANK M.**  
Artificial gravity - The evolution of variable gravity research  
[IAF PAPER 87-539] p 54 A88-16176
- SUNDERMAN, F. W., JR.**  
The toxicology and metabolism of nickel compounds  
[DE87-014801] p 46 N88-12921
- SURGENOR, D. MACN.**  
Human blood platelets at microgravity  
[IAF PAPER 87-562] p 44 A88-16177
- SUTHERLAND, B. M.**  
DNA damage and repair in human skin in situ  
[DE87-014288] p 44 N88-12241
- SUTHERLAND, J. C.**  
DNA damage and repair in human skin in situ  
[DE87-014288] p 44 N88-12241
- SVABOVA, E.**  
Insulin receptors and enzyme activities in liver of rats after space flight on biosatellite COSMOS 1667  
[IAF PAPER 87-530] p 38 A88-16153
- SVERTSHEK, V. I.**  
Crewman rescue equipment in manned space missions - Aspects of application  
[IAF PAPER 87-576] p 55 A88-16187
- SWORDER, D. D.**  
Operator multiple-tasking study for remotely operated platforms  
[AD-A184487] p 60 N88-12276
- SYTNIK, K. M.**  
Ultrastructure of pea meristem and root cap cells under space flight conditions  
[IAF PAPER 87-558] p 38 A88-16173

## T

- TAFFORIN, C.**  
Cosmonaut behaviour in orbital flight situation - Preliminary ethological analysis  
[IAF PAPER 87-528] p 47 A88-16151
- TAKAHASHI, Y.**  
The applicability of the catalytic wet-oxidation to CELSS p 58 N88-12264

## Z

## TAKANASHI, J.

- TAKANASHI, J.**  
Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth p 59 N88-12273
- TAKANO, T.**  
Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth p 59 N88-12273
- TATEISHI, T.**  
Fundamental study on gas monitoring in CELSS p 57 N88-12263
- TAYLOR, TOM**  
Low-cost prototypes for human factors evaluation of Space Station crew equipment [IAF PAPER 87-553] p 54 A88-16170
- TAYLOR, TOM C.**  
Spacehab module design project utilizes engineering services for human factors consideration [IAF PAPER 87-551] p 54 A88-16168
- THEIL, E.**  
A scientific workstation operator-interface for accelerator control [DEB7-014689] p 60 N88-12278
- THEIS, C. F.**  
Performance studies on a molecular sieve oxygen concentrator (MSOC) - Comparison of MG3, 5AMG, and 13X molecular sieves p 51 A88-13542
- THOMPSON, B. G.**  
The effect of radiation on the long term productivity of a plant based CELSS p 59 N88-12271
- THON, B.**  
Cosmonaut behaviour in orbital flight situation - Preliminary ethological analysis [IAF PAPER 87-528] p 47 A88-16151
- THOULOUSE, J.**  
Biomedical payload of the French-Soviet long duration flight [IAF PAPER 87-541] p 44 A88-16159
- TIBBITTS, T. W.**  
Utilization of potatoes in bioregenerative life support systems p 58 N88-12269
- TICE, S. E.**  
Spacehab module design project utilizes engineering services for human factors consideration [IAF PAPER 87-551] p 54 A88-16168
- TIKHONOV, M. A.**  
Regulation of the hemodynamics during the simulation of weightlessness (Mathematical modeling) p 41 A88-14728
- TOMIZAWA, G.**  
Fundamental study on gas monitoring in CELSS p 57 N88-12263
- TRAXLER, G.**  
The Solar Plant Growth Facility - An approach towards future biological life support systems [IAF PAPER 87-538] p 53 A88-16157
- TREMOR, J.**  
A review of recent activities in the NASA CELSS program p 57 N88-12259
- TROSHIKHIN, G. V.**  
Characteristics of hypothalamic self-stimulation related to the intensity of the stimulating current p 35 A88-13698
- TSAO, CHEN H.**  
Radiation hazards in space p 44 A88-16750
- TSUJI, T.**  
Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262
- TUNNICLIFFE, VERENA**  
Faunal composition and organic surface encrustations at hydrothermal vents on the southern Juan de Fuca Ridge p 39 A88-16803

## U

- URAZAEV, A. M.**  
Physiological characteristics of adaptation processes preceding activity conditions p 42 A88-14744

## V

- VAN LEEUWEN, W.**  
Control aspects of a European space manipulator system p 55 A88-16313
- VAN PATTEN, R. E.**  
Current research on an artificial intelligence-based Loss of Consciousness Monitoring System for advanced fighter aircraft p 50 A88-13404
- VANT, J. H. B.**  
Aspects of health and safety in the passenger cabin p 55 A88-16739

- VARSII, GIULIO**  
NASA's Telerobotics R & D Program - Status and future directions [IAF PAPER 87-24] p 51 A88-15816
- VASSAUX, D.**  
Biomedical payload of the French-Soviet long duration flight [IAF PAPER 87-541] p 44 A88-16159
- VINITSKAIA, R. S.**  
Fluctuation limits of the acid-base status and of the gas content of blood in healthy untrained men performing standard physical exercise p 41 A88-14726
- VLADIMIROV, V. G.**  
Radioprotective activity of aminoarythiazoles and some mechanisms of their action p 36 A88-14771
- VOGT, L.**  
Space suit systems - Technical and physiological constraints [IAF PAPER 87-540] p 53 A88-16158
- VOLK, TYLER**  
A modular BLSS simulation model p 57 N88-12260  
Mass balances for a biological life support system simulation model p 59 N88-12272
- VOROB'EV, O. A.**  
The significance of the phase mismatch of sensory signals in mechanisms of motion-sickness development p 41 A88-13696
- VOROB'EVA, M. I.**  
Analysis of the life shortening effect of chronic external gamma-irradiation - The structure of the mortality rate p 36 A88-14768  
Investigation of the life-shortening effect in an experiment with chronic external gamma-irradiation - In support of the aging hypothesis p 36 A88-14769

## W

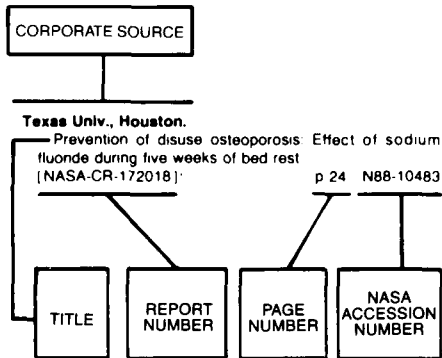
- WATKINS, STANLEY R.**  
Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342
- WATZIN, JAMES G.**  
The Flight Telerobotic Servicer (FTS) - A focus for automation and robotics on the Space Station [IAF PAPER 87-25] p 52 A88-15817
- WEBB, JAMES T.**  
Decompression sickness and venous gas emboli at 8.3 psia p 40 A88-13401
- WEIBEL, M.**  
European EVA requirements and space suit design [IAF PAPER 87-41] p 52 A88-15830
- WENZEL, J.**  
Space suit systems - Technical and physiological constraints [IAF PAPER 87-540] p 53 A88-16158
- WHARTON, ROBERT A., JR.**  
Operation of an experimental algal gas exchanger for use in a CELSS p 56 N88-12255
- WHEELER, R. M.**  
Utilization of potatoes in bioregenerative life support systems p 58 N88-12269
- WHINNERY, JAMES E.**  
Recurrent +Gz-induced loss of consciousness p 42 A88-15338
- WHITE, RICHARD P., JR.**  
ADAM - The next step in development of the true human analog p 49 A88-13386  
The design evolution of the mechanical analog of the human dynamic spine/viscera p 50 A88-13402
- WICKRAMASINGHE, D. T.**  
Discovery of organic grains in Comet Wilson p 61 A88-16324
- WILLIAMS, DOUGLAS H.**  
Integrated voice and visual systems research topics [NASA-CR-177417] p 47 N88-12246
- WILLIAMS, JOANN**  
Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle p 37 A88-15343
- WUNDER, CHARLES C.**  
Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342

## Y

- YURCZYK, ROGER F.**  
The CREST restraint system development program p 49 A88-13382

# CORPORATE SOURCE INDEX

## Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

### A

- Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).**  
Human respiratory responses during high performance flight  
[AGARD-AG-312] p 46 N88-12923
- Alberta Research Council, Edmonton (Canada).**  
The effect of radiation on the long term productivity of a plant based CELSS p 59 N88-12271

### B

- Bionetics Corp., Cocoa Beach, Fla.**  
Considerations in prescribing preflight aerobic exercise for astronauts p 42 A88-15349
- Brookhaven National Lab., Upton, N. Y.**  
DNA damage and repair in human skin in situ [DE87-014288] p 44 N88-12241

### C

- California Univ., Berkeley. Lawrence Berkeley Lab.**  
Application of photosynthetic N(2)-fixing cyanobacteria to the CELSS program p 58 N88-12257
- A scientific workstation operator-interface for accelerator control**  
[DE87-014689] p 60 N88-12278
- California Univ., Davis.**  
Artificial gravity - The evolution of variable gravity research [IAF PAPER 87-539] p 54 A88-16176
- Design of an elemental analysis system for CELSS research**  
p 58 N88-12266
- California Univ., Irvine.**  
Human adaptation to isolated and confined environments [NASA-CR-181502] p 48 N88-12248

- Large-scale neuronal circuits for selective storage and recognition of complex stimuli, a pilot study**  
[AD-A184134] p 46 N88-12920
- California Univ., Los Angeles.**  
Isotopic characterisation of kerogen-like material in the Murchison carbonaceous chondrite p 61 A88-15438
- California Univ., San Diego.**  
Operator multiple-tasking study for remotely operated platforms [AD-A184487] p 60 N88-12276
- California Univ., Santa Barbara.**  
Computer-controlled testing of visual-spatial ability [AD-A183971] p 48 N88-12249
- Civil Aviation Authority, London (England).**  
Report of the helicopter human factors working group [CAA-PAPER-87007] p 59 N88-12274
- Coe Coll., Cedar Rapids, Iowa.**  
Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342
- Commissariat a l'Energie Atomique, Cadarache (France).**  
Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat p 58 N88-12268
- Connecticut Univ., Farmington.**  
The toxicology and metabolism of nickel compounds [DE87-014801] p 46 N88-12921

### D

- Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).**  
Progress in European CELSS activities p 56 N88-12252

### E

- European Space Agency, Paris (France).**  
Investigation of pilot behavior in a training program for assessing handling qualities using a ground simulator [ESA-TT-999] p 48 N88-12247

### H

- Harvard Univ., Boston, Mass.**  
Human blood platelets at microgravity [IAF PAPER 87-562] p 44 A88-16177
- Hawaii Univ., Honolulu.**  
Organic matter on asteroid 130 Elektra p 61 A88-14294
- Hitachi Ltd., Tokyo (Japan).**  
Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262

### I

- Iowa Univ., Iowa City.**  
Femur-bending properties as influenced by gravity. V - Strength vs. calcium and gravity in rats exposed for 2 weeks p 37 A88-15342

### J

- Jet Propulsion Lab., California Inst. of Tech., Pasadena.**  
Organic matter on asteroid 130 Elektra p 61 A88-14294
- NASA's Telerobotics R & D Program - Status and future directions**  
[IAF PAPER 87-24] p 51 A88-15816
- Joint Publications Research Service, Arlington, Va.**  
JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-012] p 44 N88-12238
- Eyesight trainer for pilots**  
p 44 N88-12239
- Motion and space sickness**  
p 45 N88-12510

- JPRS report: Science and technology. USSR: Life sciences**  
[JPRS-ULS-87-009] p 39 N88-12915
- Change in functional activity of cortical brain structures and their blood supply in alert rabbits in response to rocking**  
p 39 N88-12916
- Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment**  
p 40 N88-12917

### K

- Keio Univ., Yokohama (Japan).**  
Sunlight supply and gas exchange systems in microalgal bioreactor p 57 N88-12258

### L

- Los Alamos National Lab., N. Mex.**  
Latency differences and effects of selective attention to gratings in the central and right visual fields: 2 [DE87-014730] p 46 N88-12918
- Visual evoked responses to sinusoidal gratings presented in central and right visual fields: 1**  
[DE87-014731] p 46 N88-12919
- Louisville Univ., Ky.**  
Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle p 37 A88-15343
- Disuse atrophy, plasma corticosterone, and muscle glucocorticoid receptor levels**  
p 38 A88-15346

### M

- Martek Corp., Columbia, Md.**  
Biomass recycle as a means to improve the energy efficiency of CELSS algal culture systems p 56 N88-12254
- Massachusetts Inst. of Tech., Cambridge.**  
Design of a force reflecting hand controller for space telemanipulation studies [IAF PAPER 87-ST-01] p 52 A88-16067
- Flight simulator requirements for airline transport pilot training - An evaluation of motion system design alternatives**  
p 47 A88-16679
- Non-conventional approaches to food processing in CELSS. 1. Algal proteins: Characterization and process optimization**  
p 56 N88-12256
- Massachusetts Univ., Worcester.**  
Human blood platelets at microgravity [IAF PAPER 87-562] p 44 A88-16177
- Meijo Univ., Nagoya (Japan).**  
Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth p 59 N88-12273
- Mitsubishi Heavy-Industries Ltd., Nagoya (Japan).**  
Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261
- Mitsubishi-Kasei Inst. of Life Sciences, Tokyo (Japan).**  
A large-scale perspective on ecosystems p 58 N88-12265

### N

- National Aeronautics and Space Administration, Washington, D.C.**  
NASA's Telerobotics R & D Program - Status and future directions [IAF PAPER 87-24] p 51 A88-15816
- Inflight combined vertical and lateral space vehicular accelerations - Human tolerances**  
[IAF PAPER 87-531] p 43 A88-16154
- Artificial gravity - A countermeasure for zero gravity**  
[IAF PAPER 87-533] p 53 A88-16156
- A systems engineering view of the human in space**  
[IAF PAPER 87-547] p 53 A88-16164

SOURCE

Artificial gravity - The evolution of variable gravity research  
 [IAF PAPER 87-539] p 54 A88-16176  
 Aerospace medicine and biology: A continuing bibliography with indexes  
 [NASA-SP-7011(304)] p 46 N88-12922

**National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.**

Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle  
 p 37 A88-15343  
 Isotopic characterisation of kerogen-like material in the Murchison carbonaceous chondrite p 61 A88-12255  
 Human factor design of habitable space facilities  
 [IAF PAPER 87-549] p 54 A88-16166  
 Flight simulator requirements for airline transport pilot training - An evaluation of motion system design alternatives p 47 A88-16679  
 Controlled Ecological Life Support System: Regenerative Life Support Systems in Space  
 [NASA-CP-2480] p 55 N88-12251

Operation of an experimental algal gas exchanger for use in a CELSS p 56 N88-12255  
 A review of recent activities in the NASA CELSS program p 57 N88-12259  
 A modular BLSS simulation model p 57 N88-12260  
 Mass balances for a biological life support system simulation model p 59 N88-12272  
 Research papers and publications (1981-1987): Workload research program  
 [NASA-TM-100016] p 48 N88-12924

**National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.**

The Flight Telerobotic Servicer (FTS) - A focus for automation and robotics on the Space Station  
 [IAF PAPER 87-25] p 52 A88-15817

**National Aeronautics and Space Administration, John F. Kennedy Space Center, Cocoa Beach, Fla.**

Considerations in prescribing preflight aerobic exercise for astronauts p 42 A88-15349  
 Activation of a controlled ecological life support system (CELSS) breadboard facility - Wheat growth studies  
 [IAF PAPER 87-557] p 54 A88-16172

**National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.**

Human factors - Man-machine symbiosis in space  
 [IAF PAPER 87-548] p 53 A88-16165  
 Space suit extravehicular hazards protection development  
 [NASA-TM-100458] p 60 N88-12927

**National Aerospace Lab., Tokyo (Japan).**

Food production and gas exchange system using blue-green alga (spirulina) for CELSS p 56 N88-12253  
 An overview of Japanese CELSS research activities p 58 N88-12267

**Naval Postgraduate School, Monterey, Calif.**

Assessment of fatigue in aviation crews  
 [AD-A184129] p 45 N88-12245  
 A simulation study of a speed control system for autonomous on-road operation of automotive vehicles  
 [AD-A184030] p 60 N88-12279

**Naval Submarine Medical Research Lab., Groton, Conn.**

Superoxide dismutase assays  
 [AD-A183972] p 45 N88-12242  
 Scotopic sensitivity with 10 percent oxygen  
 [AD-A183973] p 45 N88-12243  
 Fire-related medical science p 45 N88-12525  
 Performance and preference with various VDT (Video Display Terminal) phosphors  
 [AD-A184085] p 60 N88-12925

**Niigata Univ. (Japan).**

The applicability of the catalytic wet-oxidation to CELSS p 58 N88-12264

**O**

**Oak Ridge National Lab., Tenn.**

Architecture for dynamic task allocation in a man-robot symbiotic system  
 [DE87-013872] p 60 N88-12277

**P**

**Pittsburgh Univ., Pa.**

Inhibited interferon-gamma but normal interleukin-3 production from rats flown on the Space Shuttle  
 p 37 A88-15343

**Presearch, Inc., Houston, Tex.**

An assessment of clinical chemical sensing technology for potential use in space station health maintenance facility  
 [NASA-CR-172013] p 60 N88-12926

**Psycho-Linguistic Research Associates, Menlo Park, Calif.**

Integrated voice and visual systems research topics  
 [NASA-CR-177417] p 47 N88-12246

**R**

**Royal Netherlands Air Force, The Hague.**

Development, testing and evaluation of a night vision goggle compatible BO-105 for night low level operation  
 p 55 N88-11668

**Ryan Research International, Chico, Calif.**

Health hazards of video display terminals. A comprehensive, annotated bibliography on a critical issue of workplace health and safety with sources for obtaining items and list of terminal suppliers  
 [RSI-IAS-4] p 44 N88-12240

**S**

**School of Aerospace Medicine, Brooks AFB, Tex.**

Decompression sickness and venous gas emboli at 8.3 psia p 40 A88-13401

**Science Univ. of Tokyo, Chiba (Japan).**

Fundamental study on gas monitoring in CELSS p 57 N88-12263

**State Univ. of New York at Buffalo, Amherst.**

Human motor reactions to dangerous motions in robot operations  
 [PB87-222196] p 59 N88-12275

**T**

**Technology, Inc., San Antonio, Tex.**

Decompression sickness and venous gas emboli at 8.3 psia p 40 A88-13401

**U**

**Utah State Univ., Logan.**

Wheat production in controlled environments  
 [UAES-PAPER-3324] p 59 N88-12270

**W**

**Washington Univ., Seattle.**

Computer-controlled testing of visual-spatial ability  
 [AD-A183971] p 48 N88-12249

**Washington Univ., St. Louis, Mo.**

Studies of the processing of single words using positron tomographic measures of cerebral blood flow change  
 [AD-A184058] p 45 N88-12244  
 Effects of divided attention on identity and semantic priming  
 [AD-A184289] p 48 N88-12250

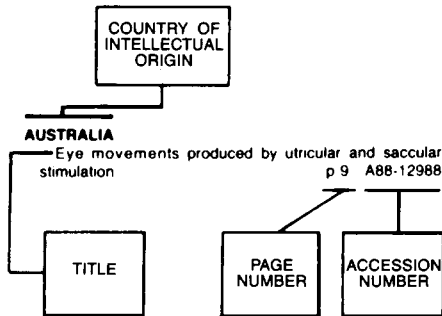
**Wisconsin Univ., Madison.**

Utilization of potatoes in bioregenerative life support systems p 58 N88-12269

**Wright State Univ., Dayton, Ohio.**

Buspirone blocks motion sickness and xylazine-induced emesis in the cat p 37 A88-15344  
 Inflight combined vertical and lateral space vehicular accelerations - Human tolerances  
 [IAF PAPER 87-531] p 43 A88-16154

## Typical Foreign Technology Index Listing



Listings in this index are arranged alphabetically by country of intellectual origin. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the citation in the abstract section.

### A

#### AUSTRALIA

- Dynamic analysis of robotic manipulators for spacecraft applications p 51 A88-15524
- Experiment on STS 51-C - Effect of weightlessness on the morphology of aggregation of human red cells in disease [IAF PAPER 87-563] p 39 A88-16178
- Discovery of organic grains in Comet Wilson p 61 A88-16324

#### AUSTRIA

- The Solar Plant Growth Facility - An approach towards future biological life support systems [IAF PAPER 87-538] p 53 A88-16157

### C

#### CANADA

- Mental and physical performance at core temperatures as low as 31.2 C p 41 A88-13411
- Faunal composition and organic surface encrustations at hydrothermal vents on the southern Juan de Fuca Ridge p 39 A88-16803
- The effect of radiation on the long term productivity of a plant based CELSS p 59 N88-12271

#### CZECHOSLOVAKIA

- Insulin receptors and enzyme activities in liver of rats after space flight on biosatellite COSMOS 1667 [IAF PAPER 87-530] p 38 A88-16153

### F

#### FRANCE

- Decompression tests of the French personal flight equipment in 439 - VHA 90 p 49 A88-13378
- The metaphysical presuppositions of the 'anthropic principle' p 35 A88-14422

- European EVA requirements and space suit design [IAF PAPER 87-41] p 52 A88-15830
- Cosmonaut behaviour in orbital flight situation - Preliminary ethological analysis [IAF PAPER 87-528] p 47 A88-16151
- A neuropharmacological approach to space motion sickness [IAF PAPER 87-529] p 43 A88-16152
- Biomedical payload of the French-Soviet long duration flight [IAF PAPER 87-541] p 44 A88-16159
- Importance of human factors in the conception of Hermes spacecraft [IAF PAPER 87-552] p 54 A88-16169
- Modelling and simulation of distributed flexibility in a spaceborne manipulator p 55 A88-16309
- Feasibility of time delay compensation for a space teleoperation task p 55 A88-16310
- Control of in-orbit space manipulation p 55 A88-16312
- Study of the relationship between photosynthesis, respiration, transpiration, and mineral nutrition in wheat p 58 N88-12268
- Human respiratory responses during high performance flight [AGARD-AG-312] p 46 N88-12923

### G

#### GERMANY DEMOCRATIC REPUBLIC

- 'O2-MP' - A device for measuring the partial pressure of oxygen in capillary blood under space flight conditions [IAF PAPER 87-543] p 53 A88-16161

#### GERMANY, FEDERAL REPUBLIC OF

- Femtosecond laser-tissue interactions - Retinal injury studies p 36 A88-14548
- Man tended free flyer interior equipment for manned and automated operation [IAF PAPER 87-75] p 52 A88-15850
- Heat dissipation under lower body negative pressure stress [IAF PAPER 87-532] p 43 A88-16155
- Space suit systems - Technical and physiological constraints [IAF PAPER 87-540] p 53 A88-16158
- Radiation problems with the Space Station scenario and the necessary surveillance for astronauts [IAF PAPER 87-542] p 53 A88-16160
- Support of life science research in space by the DFVLR Microgravity User Support Center (MUSC) [IAF PAPER 87-544] p 38 A88-16162
- Gravity effects on membrane equilibria [IAF PAPER 87-561] p 39 A88-16175
- Investigation of pilot behavior in a training program for assessing handling qualities using a ground simulator [ESA-TT-999] p 48 N88-12247
- Progress in European CELSS activities p 56 N88-12252

### I

#### INTERNATIONAL ORGANIZATION

- Biology and microgravity [IAF PAPER 87-564] p 39 A88-16179

### J

#### JAPAN

- Food production and gas exchange system using blue-green alga (spirulina) for CELSS p 56 N88-12253
- Sunlight supply and gas exchange systems in microalgal bioreactor p 57 N88-12258
- Preliminary experimental results of gas recycling subsystems except carbon dioxide concentration p 57 N88-12261
- Vapor compression distiller and membrane technology for water revitalization p 57 N88-12262
- Fundamental study on gas monitoring in CELSS p 57 N88-12263

- The applicability of the catalytic wet-oxidation to CELSS p 58 N88-12264
- A large-scale perspective on ecosystems p 58 N88-12265
- An overview of Japanese CELSS research activities p 58 N88-12267
- Trickle water and feeding system in plant culture and light-dark cycle effects on plant growth p 59 N88-12273
- Motion and space sickness p 45 N88-12510

### N

#### NETHERLANDS

- Control aspects of a European space manipulator system p 55 A88-16313
- Development, testing and evaluation of a night vision goggle compatible BO-105 for night low level operation p 55 N88-11668

### S

#### SOUTH AFRICA, REPUBLIC OF

- Apical hypertrophic nonobstructive cardiomyopathy in a pilot p 42 A88-15347

#### SWITZERLAND

- Space biologist's inflight safety considerations [IAF PAPER 87-570] p 54 A88-16182

### T

#### TAIWAN

- Decompression and occurrence of cataract in enucleated eyes of experimental animals p 37 A88-15345

### U

#### U.S.S.R.

- Ultramicroforms of bacteria in soil and ocean p 35 A88-13695
- The significance of the phase mismatch of sensory signals in mechanisms of motion-sickness development p 41 A88-13696
- Investigation of the ability of para-aminobenzoic acid to restore the activity of alkaline ribonuclease p 35 A88-13697
- Characteristics of hypothalamic self-stimulation related to the intensity of the stimulating current p 35 A88-13698
- Homosynaptic depression as a model of the habituation phenomenon p 35 A88-13699
- Fluctuation limits of the acid-base status and of the gas content of blood in healthy untrained men performing standard physical exercise p 41 A88-14726
- The dynamics of the lipid metabolism and hormonal background during adaptation to long-term psychoemotional and physical loads p 41 A88-14727
- Regulation of the hemodynamics during the simulation of weightlessness (Mathematical modeling) p 41 A88-14728
- Acclimatized deficit of iron p 41 A88-14729
- Physiological mechanisms of thermoregulation in humans during adaptation to cold p 41 A88-14730
- The role of the individual characteristics of vegetative reactions during the action of adaptogens on physical and mental work capacity p 42 A88-14731
- Physiological characteristics of adaptation processes preceding activity conditions p 42 A88-14744
- Analysis of the synergistic effect of heat and radiation on bacteriophage T4 and the spores of Bacillus subtilis p 36 A88-14767
- Analysis of the life shortening effect of chronic external gamma-irradiation - The structure of the mortality rate p 36 A88-14768
- Investigation of the life-shortening effect in an experiment with chronic external gamma-irradiation - In support of the aging hypothesis p 36 A88-14769

**UNITED KINGDOM**

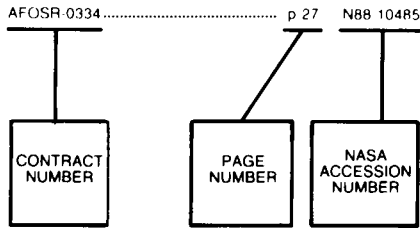
- Correlation between changes in radiosensitivity and the activity of blood lymphocyte succinate dehydrogenase effected by exogenic hypoxia p 36 A88-14770
- Radioprotective activity of aminoarylthiazoles and some mechanisms of their action p 36 A88-14771
- Combined effects of ionizing radiation and physical exercise on some indices of nonspecific bioprotection and immunity p 36 A88-14772
- Effect of microwave radiation on the dopamine-dependent behavior of rabbits p 37 A88-14773
- Comparative assessment of vestibular, optokinetic, and optovestibular stimulation in the development of experimental motion sickness p 42 A88-15339
- Results of medical investigations conducted aboard the 'Salyut-6'-'Soyuz' orbital research complex p 43 A88-15650
- Human adaptation and constitution p 43 A88-15655
- Automated learning systems for the occupational training of flight-vehicle operators p 47 A88-15680
- Triphenyldioxane - A new powerful inducer of cytochrome P-450 p 38 A88-15696
- Man in space flight [IAF PAPER 87-527] p 43 A88-16150
- Ultrastructure of pea meristem and root cap cells under space flight conditions [IAF PAPER 87-558] p 38 A88-16173
- Physico-chemical and biological aspects of weak magnetic field effects on plants [IAF PAPER 87-560] p 38 A88-16174
- Crewman rescue equipment in manned space missions - Aspects of application [IAF PAPER 87-576] p 55 A88-16187
- JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-012] p 44 N88-12238
- Eyesight trainer for pilots p 44 N88-12239
- JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-87-009] p 39 N88-12915
- Change in functional activity of cortical brain structures and their blood supply in alert rabbits in response to rocking p 39 N88-12916
- Study of certain biological characteristics of bacteria during the French-Soviet CYTOS-2 space experiment p 40 N88-12917

**UNITED KINGDOM**

- Immersion suit insulation - The effect of dampening on survival estimates p 51 A88-15340
- Wings and serpents p 44 A88-16377
- Aspects of health and safety in the passenger cabin p 55 A88-16739
- Passenger behaviour in aircraft emergencies p 47 A88-16741
- Report of the helicopter human factors working group [CAA-PAPER-87007] p 59 N88-12274

# CONTRACT NUMBER INDEX

## Typical Contract Number Index Listing

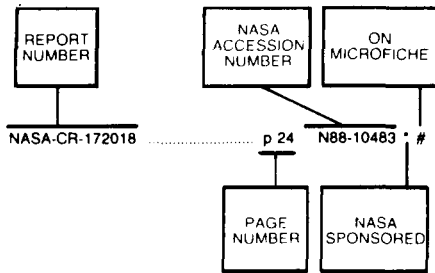


Listings in this index are arranged alpha-numerically by contract number. Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under the contract are arranged in ascending order with the AIAA accession numbers appearing first. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

CNES-82/0766	p 55	A88-16309
CNES-83/721	p 55	A88-16309
C12-134	p 60	N88-12276
DA PROJ. RRO-4206	p 48	N88-12250
DE-AC02-76CH-00016	p 44	N88-12241
DE-AC02-76EV-03140	p 46	N88-12921
DE-AC03-76SF-00098	p 60	N88-12278
DE-AC05-84OR-21400	p 60	N88-12277
F33615-85-C-0530	p 50	A88-13412
F49620-85-C-0013	p 49	A88-13380
F63-521	p 48	N88-12249
MIPR-ATEC-88-86	p 60	N88-12279
NAGW-21	p 52	A88-16067
NAGW-347	p 61	A88-15438
NAGW-70	p 38	A88-15346
NAG2-387	p 48	N88-12248
NAG9-27	p 61	A88-15438
NASA ORDER T-82071	p 40	A88-13401
NAS2-11341	p 47	N88-12246
NAS7-918	p 51	A88-15816
NAS9-17222	p 44	A88-16177
NAS9-17594	p 60	N88-12926
NCC2-139	p 59	N88-12270
NCC2-213	p 37	A88-15343
NCC2-220	p 37	A88-15344
NCC2-231	p 55	N88-12251
NGL-12-001-057	p 61	A88-14294
NGR-05-007-289	p 61	A88-15438
NGR-16-001-031	p 37	A88-15342
NIH-GM-10093	p 37	A88-15342
NIH-1-R01-GM-35459-02	p 36	A88-14548
NSC-73-0412-B0002-10	p 37	A88-15345
NSF DPP-86-08969	p 48	N88-12248
NSG-2325	p 38	A88-15346
N00014-85-K-0650	p 46	N88-12920
N00014-86-K-0289	p 45	N88-12244
	p 48	N88-12250
N0014-86-K-0117	p 36	A88-14548
N66001-85-C-0017	p 48	N88-12249
N66001-85-D-0203	p 60	N88-12276
RRO-4206	p 45	N88-12244
W-7405-ENG-36	p 46	N88-12918
	p 46	N88-12919
199-61-12	p 55	N88-12251
324-01-16	p 47	N88-12246
481-89-00-00-72	p 60	N88-12927
505-67-51	p 48	N88-12924

# REPORT NUMBER INDEX

## Typical Report Number Index Listing



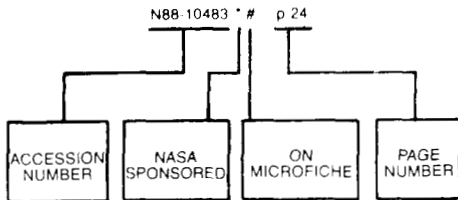
Listings in this index are arranged alpha-numerically by report number. The page number indicates the page on which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (\*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

NASA-CR-172018	.....	p 24	N88-10483	* #		
A-87196	.....	p 48	N88-12924	* #		
A-87256	.....	p 55	N88-12251	* #		
AD-A183971	.....	p 48	N88-12249	#		
AD-A183972	.....	p 45	N88-12242	#		
AD-A183973	.....	p 45	N88-12243	#		
AD-A184030	.....	p 60	N88-12279	#		
AD-A184058	.....	p 45	N88-12244	#		
AD-A184085	.....	p 60	N88-12925	#		
AD-A184129	.....	p 45	N88-12245	#		
AD-A184134	.....	p 46	N88-12920	#		
AD-A184289	.....	p 48	N88-12250	#		
AD-A184487	.....	p 60	N88-12276	#		
AGARD-AG-312	.....	p 46	N88-12923	#		
BNL-40073	.....	p 44	N88-12241	#		
CAA-PAPER-87007	.....	p 59	N88-12274	#		
CONF-870302-249	.....	p 60	N88-12278	#		
CONF-8707103-1	.....	p 44	N88-12241	#		
CONF-8708121-1	.....	p 46	N88-12918	#		
CONF-8708121-2	.....	p 46	N88-12919	#		
CONF-871163-2	.....	p 60	N88-12277	#		
DE87-013872	.....	p 60	N88-12277	#		
DE87-014288	.....	p 44	N88-12241	#		
DE87-014689	.....	p 60	N88-12278	#		
DE87-014730	.....	p 46	N88-12918	#		
DE87-014731	.....	p 46	N88-12919	#		
DE87-014801	.....	p 46	N88-12921	#		
DFVLR-MITT-86-01	.....	p 48	N88-12247	#		
DOE/EV-03140/10	.....	p 46	N88-12921	#		
ESA-TT-999	.....	p 48	N88-12247	#		
ETN-87-90962	.....	p 59	N88-12274	#		
ETN-87-91111	.....	p 48	N88-12247	#		
IAF PAPER 87-ST-01	.....	p 52	A88-16067	* #		
IAF PAPER 87-24	.....	p 51	A88-15816	* #		
IAF PAPER 87-25	.....	p 52	A88-15817	* #		
IAF PAPER 87-27	.....	p 52	A88-15819	#		
IAF PAPER 87-41	.....	p 52	A88-15830	#		
IAF PAPER 87-527	.....	p 43	A88-16150	#		
IAF PAPER 87-528	.....	p 47	A88-16151	#		
IAF PAPER 87-529	.....	p 43	A88-16152	#		
IAF PAPER 87-530	.....	p 38	A88-16153	#		
IAF PAPER 87-531	.....	p 43	A88-16154	* #		
IAF PAPER 87-532	.....	p 43	A88-16155	#		
IAF PAPER 87-533	.....	p 53	A88-16156	* #		
IAF PAPER 87-538	.....	p 53	A88-16157	#		
IAF PAPER 87-539	.....	p 54	A88-16176	* #		
IAF PAPER 87-540	.....	p 53	A88-16158	#		
IAF PAPER 87-541	.....	p 44	A88-16159	#		
IAF PAPER 87-542	.....	p 53	A88-16160	#		
IAF PAPER 87-543	.....	p 53	A88-16161	#		
IAF PAPER 87-544	.....	p 38	A88-16162	#		
IAF PAPER 87-545	.....	p 53	A88-16163	#		
IAF PAPER 87-547	.....	p 53	A88-16164	* #		
IAF PAPER 87-548	.....	p 53	A88-16165	* #		
IAF PAPER 87-549	.....	p 54	A88-16166	* #		
IAF PAPER 87-550	.....	p 54	A88-16167	#		
IAF PAPER 87-551	.....	p 54	A88-16168	#		
IAF PAPER 87-552	.....	p 54	A88-16169	#		
IAF PAPER 87-553	.....	p 54	A88-16170	#		
IAF PAPER 87-555	.....	p 47	A88-16171	#		
IAF PAPER 87-557	.....	p 54	A88-16172	* #		
IAF PAPER 87-558	.....	p 38	A88-16173	#		
IAF PAPER 87-560	.....	p 38	A88-16174	#		
IAF PAPER 87-561	.....	p 39	A88-16175	#		
IAF PAPER 87-562	.....	p 44	A88-16177	* #		
IAF PAPER 87-563	.....	p 39	A88-16178	#		
IAF PAPER 87-564	.....	p 39	A88-16179	#		
IAF PAPER 87-570	.....	p 54	A88-16182	#		
IAF PAPER 87-576	.....	p 55	A88-16187	#		
IAF PAPER 87-597	.....	p 61	A88-16199	#		
IAF PAPER 87-75	.....	p 52	A88-15850	#		
IAF PAPER 87-79	.....	p 52	A88-15854	#		
ISBN-0-86039-312-7	.....	p 59	N88-12274	#		
ISBN-0-942158-04-0	.....	p 44	N88-12240	#		
ISBN-92-835-1561-7	.....	p 46	N88-12923	#		
JPRS-ULS-87-009	.....	p 39	N88-12915	#		
JPRS-ULS-87-012	.....	p 44	N88-12238	#		
LA-UR-87-2682-1	.....	p 46	N88-12919	#		
LA-UR-87-2683-2	.....	p 46	N88-12918	#		
LBL-23206	.....	p 60	N88-12278	#		
LC-87-90423	.....	p 44	N88-12240	#		
NAS 1.15:100016	.....	p 48	N88-12924	* #		
NAS 1.15:100458	.....	p 60	N88-12927	* #		
NAS 1.21:7011(304)	.....	p 46	N88-12922	* #		
NAS 1.26:172013	.....	p 60	N88-12926	* #		
NAS 1.26:177417	.....	p 47	N88-12246	* #		
NAS 1.26:181502	.....	p 48	N88-12248	* #		
NAS 1.55:2480	.....	p 55	N88-12251	* #		
NASA-CP-2480	.....	p 55	N88-12251	* #		
NASA-CR-172013	.....	p 60	N88-12926	* #		
NASA-CR-177417	.....	p 47	N88-12246	* #		
NASA-CR-181502	.....	p 48	N88-12248	* #		
NASA-SP-7011(304)	.....	p 46	N88-12922	* #		
NASA-TM-100016	.....	p 48	N88-12924	* #		
NASA-TM-100458	.....	p 60	N88-12927	* #		
NOSC-TD-1084	.....	p 60	N88-12276	#		
NPRDC-TR-87-31	.....	p 48	N88-12249	#		
NPS52-87-020	.....	p 60	N88-12279	#		
NSMRL-M87-3	.....	p 45	N88-12242	#		
NSMRL-1093	.....	p 60	N88-12925	#		
NSMRL-1097	.....	p 45	N88-12243	#		
PB87-222196	.....	p 59	N88-12275	#		
REPT-91-6001-537	.....	p 48	N88-12249	#		
RSI-IAS-4	.....	p 44	N88-12240	#		
S-565	.....	p 60	N88-12927	* #		
TR-87-6-ONR	.....	p 48	N88-12250	#		
TR-87-7-ONR	.....	p 45	N88-12244	#		
UAES-PAPER-3324	.....	p 59	N88-12270	* #		



# ACCESSION NUMBER INDEX

## Typical Accession Number Index Listing



Listings in this index are arranged alpha-numerically by accession number. The page number listed to the right indicates the page on which the citation is located. An asterisk (\*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A88-13162	p 40	A88-15346 *	p 38
A88-13376	p 49	A88-15347	p 42
A88-13377	p 40	A88-15348	p 47
A88-13378	p 49	A88-15349 *	p 42
A88-13379	p 40	A88-15350	p 43
A88-13380	p 49	A88-15438 *	p 61
A88-13382	p 49	A88-15524 #	p 51
A88-13386	p 49	A88-15650	p 43
A88-13387	p 40	A88-15655	p 43
A88-13389	p 49	A88-15680	p 47
A88-13393	p 49	A88-15696	p 38
A88-13396	p 50	A88-15816 * #	p 51
A88-13398	p 50	A88-15817 * #	p 52
A88-13401 *	p 40	A88-15819 #	p 52
A88-13402	p 50	A88-15830 #	p 52
A88-13404	p 50	A88-15850 #	p 52
A88-13405	p 50	A88-15854 #	p 52
A88-13411	p 41	A88-16067 * #	p 52
A88-13412	p 50	A88-16150 #	p 43
A88-13413	p 50	A88-16151 #	p 47
A88-13538	p 50	A88-16152 #	p 43
A88-13541	p 50	A88-16153 #	p 38
A88-13542	p 51	A88-16154 * #	p 43
A88-13695	p 35	A88-16155 #	p 43
A88-13696	p 41	A88-16156 * #	p 53
A88-13697	p 35	A88-16157 #	p 53
A88-13698	p 35	A88-16158 #	p 53
A88-13699	p 35	A88-16159 #	p 44
A88-14294 *	p 61	A88-16160 #	p 53
A88-14422 #	p 35	A88-16161 #	p 53
A88-14548	p 36	A88-16162 #	p 38
A88-14726	p 41	A88-16163 #	p 53
A88-14727	p 41	A88-16164 * #	p 53
A88-14728	p 41	A88-16165 * #	p 53
A88-14729	p 41	A88-16166 * #	p 54
A88-14730	p 41	A88-16167 #	p 54
A88-14731	p 42	A88-16168 #	p 54
A88-14744	p 42	A88-16169 #	p 54
A88-14767	p 36	A88-16170 #	p 54
A88-14768	p 36	A88-16171 #	p 47
A88-14769	p 36	A88-16172 * #	p 54
A88-14770	p 36	A88-16173 #	p 38
A88-14771	p 36	A88-16174 #	p 38
A88-14772	p 36	A88-16175 #	p 39
A88-14773	p 37	A88-16176 * #	p 54
A88-15283	p 51	A88-16177 * #	p 44
A88-15284	p 51	A88-16178 #	p 39
A88-15338	p 42	A88-16179 #	p 39
A88-15339	p 42	A88-16182 #	p 54
A88-15340	p 51	A88-16187 #	p 55
A88-15341	p 37	A88-16199 #	p 61
A88-15342 *	p 37	A88-16309	p 55
A88-15343 *	p 37	A88-16310	p 55
A88-15344 *	p 37	A88-16312	p 55
A88-15345	p 37	A88-16313	p 55

A88-16324	p 61
A88-16377	p 44
A88-16673 *	p 47
A88-16733	p 55
A88-16741	p 47
A88-16750 #	p 44
A88-16803	p 39

N88-11668 #	p 55
N88-12238 #	p 44
N88-12239 #	p 44
N88-12240 #	p 44
N88-12241 #	p 44
N88-12242 #	p 45
N88-12243 #	p 45
N88-12244 #	p 45
N88-12245 #	p 45
N88-12246 * #	p 47
N88-12247 #	p 48
N88-12248 * #	p 48
N88-12249 #	p 48
N88-12250 #	p 48
N88-12251 * #	p 55
N88-12252 * #	p 56
N88-12253 * #	p 56
N88-12254 * #	p 56
N88-12255 * #	p 56
N88-12256 * #	p 56
N88-12257 * #	p 56
N88-12258 * #	p 57
N88-12259 * #	p 57
N88-12260 * #	p 57
N88-12261 * #	p 57
N88-12262 * #	p 57
N88-12263 * #	p 57
N88-12264 * #	p 58
N88-12265 * #	p 58
N88-12266 * #	p 58
N88-12267 * #	p 58
N88-12268 * #	p 58
N88-12269 * #	p 58
N88-12270 * #	p 59
N88-12271 * #	p 59
N88-12272 * #	p 59
N88-12273 * #	p 59
N88-12274 #	p 59
N88-12275 #	p 59
N88-12276 #	p 60
N88-12277 #	p 60
N88-12278 #	p 60
N88-12279 #	p 60
N88-12510 #	p 45
N88-12525 * #	p 45
N88-12915 #	p 39
N88-12916 #	p 39
N88-12917 #	p 40
N88-12918 #	p 46
N88-12919 #	p 46
N88-12920 #	p 46
N88-12921 #	p 46
N88-12922 *	p 46
N88-12923 #	p 46
N88-12924 * #	p 48
N88-12925 #	p 60
N88-12926 * #	p 60
N88-12927 * #	p 60

# AVAILABILITY OF CITED PUBLICATIONS

## IAA ENTRIES (A88-10000 Series)

Publications announced in *IAA* are available from the AIAA Technical Information Service as follows: Paper copies of accessions are available at \$10.00 per document (up to 50 pages), additional pages \$0.25 each. Microfiche<sup>(1)</sup> of documents announced in *IAA* are available at the rate of \$4.00 per microfiche on demand. Standing order microfiche are available at the rate of \$1.45 per microfiche for *IAA* source documents and \$1.75 per microfiche for AIAA meeting papers.

Minimum air-mail postage to foreign countries is \$2.50. All foreign orders are shipped on payment of pro-forma invoices.

All inquiries and requests should be addressed to: Technical Information Service, American Institute of Aeronautics and Astronautics, 555 West 57th Street, New York, NY 10019. Please refer to the accession number when requesting publications.

## STAR ENTRIES (N88-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code preceded by the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on NTIS PRICE SCHEDULES.

Documents on microfiche are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, Va. 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the \* symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-AppI-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report number* shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, as indicated above, for those documents identified by a # symbol.)

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26.1 reduction).

- Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)
- Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.
- Avail: ESDU. Pricing information on specific data, computer programs, and details on ESDU topic categories can be obtained from ESDU International Ltd. Requesters in North America should use the Virginia address while all other requesters should use the London address, both of which are on the page titled ADDRESSES OF ORGANIZATIONS.
- Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie, Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).
- Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.
- Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.
- Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.
- Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of \$1.50 each, postage free. (See discussion of NASA patents and patent applications below.)
- Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.
- Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.
- Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

## **PUBLIC COLLECTIONS OF NASA DOCUMENTS**

**DOMESTIC:** NASA and NASA-sponsored documents and a large number of aerospace publications are available to the public for reference purposes at the library maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

**EUROPEAN:** An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and \* from ESA – Information Retrieval Service European Space Agency, 8-10 rue Mario-Nikis, 75738 CEDEX 15, France.

## **FEDERAL DEPOSITORY LIBRARY PROGRAM**

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 50 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 50 regional depositories. A list of the regional GPO libraries, arranged alphabetically by state, appears on the inside back cover. These libraries are *not* sales outlets. A local library can contact a Regional Depository to help locate specific reports, or direct contact may be made by an individual.

## **STANDING ORDER SUBSCRIPTIONS**

NASA SP-7011 and its supplements are available from the National Technical Information Service (NTIS) on standing order subscription as PB 88-912300 at the price of \$9.00 domestic and \$18.00 foreign, and at \$16.50 domestic and \$33.00 foreign for the annual index. Standing order subscriptions do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber. Questions on the availability of the predecessor publications, *Aerospace Medicine and Biology* (Volumes I-XI), should be directed to NTIS.

## ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and  
Astronautics  
Technical Information Service  
555 West 57th Street, 12th Floor  
New York, New York 10019

British Library Lending Division,  
Boston Spa, Wetherby, Yorkshire,  
England

Commissioner of Patents and  
Trademarks  
U.S. Patent and Trademark Office  
Washington, D.C. 20231

Department of Energy  
Technical Information Center  
P.O. Box 62  
Oak Ridge, Tennessee 37830

ESA-Information Retrieval Service  
ESRIN  
Via Galileo Galilei  
00044 Frascati (Rome) Italy

ESDU International, Ltd.  
1495 Chain Bridge Road  
McLean, Virginia 22101

ESDU International, Ltd.  
251-259 Regent Street  
London, W1R 7AD, England

Fachinformationszentrum Energie, Physik,  
Mathematik GMBH  
7514 Eggenstein Leopoldshafen  
Federal Republic of Germany

Her Majesty's Stationery Office  
P.O. Box 569, S.E. 1  
London, England

NASA Scientific and Technical Information  
Facility  
P.O. Box 8757  
B.W.I. Airport, Maryland 21240

National Aeronautics and Space  
Administration  
Scientific and Technical Information  
Division (NTT-1)  
Washington, D.C. 20546

National Technical Information Service  
5285 Port Royal Road  
Springfield, Virginia 22161

Pendragon House, Inc.  
899 Broadway Avenue  
Redwood City, California 94063

Superintendent of Documents  
U.S. Government Printing Office  
Washington, D.C. 20402

University Microfilms  
A Xerox Company  
300 North Zeeb Road  
Ann Arbor, Michigan 48106

University Microfilms, Ltd.  
Tylers Green  
London, England

U.S. Geological Survey Library  
National Center - MS 950  
12201 Sunrise Valley Drive  
Reston, Virginia 22092

U.S. Geological Survey Library  
2255 North Gemini Drive  
Flagstaff, Arizona 86001

U.S. Geological Survey  
345 Middlefield Road  
Menlo Park, California 94025

U.S. Geological Survey Library  
Box 25046  
Denver Federal Center, MS914  
Denver, Colorado 80225

# NTIS PRICE SCHEDULES

(Effective January 1, 1988)

## Schedule A STANDARD PRICE DOCUMENTS AND MICROFICHE

PRICE CODE	PAGE RANGE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	Microfiche	\$ 6.95	\$13.90
A02	001-010	9.95	19.90
A03	011-050	12.95	25.90
A04-A05	051-100	14.95	29.90
A06-A09	101-200	19.95	39.90
A10-A13	201-300	25.95	51.90
A14-A17	301-400	32.95	65.90
A18-A21	401-500	38.95	77.90
A22-A25	501-600	44.95	89.90
A99	601-up	*	*
NO1		49.50	89.90
NO2		48.00	80.00

## Schedule E EXCEPTION PRICE DOCUMENTS AND MICROFICHE

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
E01	\$ 8.50	17.00
E02	11.00	22.00
E03	12.00	24.00
E04	14.50	29.00
E05	16.50	33.00
E06	19.00	38.00
E07	21.50	43.00
E08	24.00	48.00
E09	26.50	53.00
E10	29.00	58.00
E11	31.50	63.00
E12	34.00	68.00
E13	36.50	73.00
E14	39.50	79.00
E15	43.00	86.00
E16	47.00	94.00
E17	51.00	102.00
E18	55.00	110.00
E19	61.00	122.00
E20	71.00	142.00
E99	*	*

\*Contact NTIS for price quote.

### IMPORTANT NOTICE

NTIS Shipping and Handling Charges

U.S., Canada, Mexico — ADD \$3.00 per TOTAL ORDER

All Other Countries — ADD \$4.00 per TOTAL ORDER

Exceptions — Does NOT apply to:

ORDERS REQUESTING NTIS RUSH HANDLING  
ORDERS FOR SUBSCRIPTION OR STANDING ORDER PRODUCTS ONLY

NOTE: Each additional delivery address on an order  
requires a separate shipping and handling charge.

1. Report No. NASA SP-7011 (308)	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Aerospace Medicine and Biology A Continuing Bibliography (Supplement 308)		5. Report Date March, 1988	
		6. Performing Organization Code	
7. Author(s)		8. Performing Organization Report No.	
		10. Work Unit No.	
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, DC 20546		11. Contract or Grant No.	
		13. Type of Report and Period Covered	
12. Sponsoring Agency Name and Address		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract This bibliography lists 175 reports, articles and other documents introduced into the NASA scientific and technical information system in February, 1988.			
17. Key Words (Suggested by Authors(s)) Aerospace Medicine Bibliographies . Biological Effects		18. Distribution Statement Unclassified - Unlimited	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 68	22. Price * A04/HC

# FEDERAL REGIONAL DEPOSITORY LIBRARIES

## **ALABAMA**

**AUBURN UNIV. AT MONTGOMERY LIBRARY**  
Documents Department  
Montgomery, AL 36193  
(205) 271-9650

**UNIV. OF ALABAMA LIBRARY**  
Documents Dept.—Box S  
University, AL 35486  
(205) 348-6046

## **ARIZONA**

**DEPT. OF LIBRARY, ARCHIVES AND PUBLIC RECORDS**  
Third Floor—State Cap.  
1700 West Washington  
Phoenix, AZ 85007  
(602) 255-4121

**UNIVERSITY OF ARIZONA LIB.**  
Government Documents Dept.  
Tucson, AZ 85721  
(602) 621-6433

## **ARKANSAS**

**ARKANSAS STATE LIBRARY**  
One Capitol Mall  
Little Rock, AR 72201  
(501) 371-2326

## **CALIFORNIA**

**CALIFORNIA STATE LIBRARY**  
Govt. Publications Section  
P.O. Box 2037  
Sacramento, CA 95809  
(916) 324-4863

## **COLORADO**

**UNIV. OF COLORADO LIB.**  
Government Pub. Division  
Campus Box 184  
Boulder, CO 80309  
(303) 492-8834

**DENVER PUBLIC LIBRARY**  
Govt. Pub. Department  
1357 Broadway  
Denver, CO 80203  
(303) 571-2131

## **CONNECTICUT**

**CONNECTICUT STATE LIBRARY**  
Government Documents Unit  
231 Capitol Avenue  
Hartford, CT 06106  
(203) 566-7029

## **FLORIDA**

**UNIV. OF FLORIDA LIBRARIES**  
Library West  
Documents Department  
Gainesville, FL 32611  
(904) 392-0367

## **GEORGIA**

**UNIV. OF GEORGIA LIBRARIES**  
Government Reference Dept.  
Athens, GA 30602  
(404) 542-8949

## **HAWAII**

**UNIV. OF HAWAII LIBRARY**  
Govt. Documents Collection  
2550 The Mall  
Honolulu, HI 96822  
(808) 948-8230

## **IDAHO**

**UNIV. OF IDAHO LIBRARY**  
Documents Section  
Moscow, ID 83843  
(208) 885-6344

## **ILLINOIS**

**ILLINOIS STATE LIBRARY**  
Information Services Branch  
Centennial Building  
Springfield, IL 62756  
(217) 782-5185

## **INDIANA**

**INDIANA STATE LIBRARY**  
Serials Documents Section  
140 North Senate Avenue  
Indianapolis, IN 46204  
(317) 232-3686

## **IOWA**

**UNIV. OF IOWA LIBRARIES**  
Govt. Documents Department  
Iowa City, IA 52242  
(319) 353-3318

## **KANSAS**

**UNIVERSITY OF KANSAS**  
Doc. Collect—Spencer Lib.  
Lawrence, KS 66045-2800  
(913) 864-4662

## **KENTUCKY**

**UNIV. OF KENTUCKY LIBRARIES**  
Govt. Pub. Department  
Lexington, KY 40506-0039  
(606) 257-3139

## **LOUISIANA**

**LOUISIANA STATE UNIVERSITY**  
Middleton Library  
Govt. Docs. Dept.  
Baton Rouge, LA 70803  
(504) 388-2570

## **LOUISIANA TECHNICAL UNIV. LIBRARY**

Documents Department  
Ruston, LA 71272-0046  
(318) 257-4962

## **MAINE**

**UNIVERSITY OF MAINE**  
Raymond H. Fogler Library  
Tri-State Regional Documents  
Depository  
Orono, ME 04469  
(207) 581-1680

## **MARYLAND**

**UNIVERSITY OF MARYLAND**  
McKeldin Lib.—Doc. Div.  
College Park, MD 20742  
(301) 454-3034

## **MASSACHUSETTS**

**BOSTON PUBLIC LIBRARY**  
Government Docs. Dept.  
Boston, MA 02117  
(617) 536-5400 ext.226

## **MICHIGAN**

**DETROIT PUBLIC LIBRARY**  
Sociology Department  
5201 Woodward Avenue  
Detroit, MI 48202-4093  
(313) 833-1409

## **MICHIGAN STATE LIBRARY**

P.O. Box 30007  
Lansing, MI 48909  
(517) 373-1593

## **MINNESOTA**

**UNIVERSITY OF MINNESOTA**  
Government Pubs. Division  
409 Wilson Library  
309 19th Avenue South  
Minneapolis, MN 55455  
(612) 373-7870

## **MISSISSIPPI**

**UNIV. OF MISSISSIPPI LIB.**  
Documents Department  
University, MS 38677  
(601) 232-5857

## **MONTANA**

**UNIV. OF MONTANA**  
Mansfield Library  
Documents Division  
Missoula, MT 59812  
(406) 243-6700

## **NEBRASKA**

**UNIVERSITY OF NEBRASKA - LINCOLN**  
Love Library  
Documents Department  
Lincoln, NE 68588-0410  
(402) 472-2562

## **NEVADA**

**UNIVERSITY OF NEVADA LIB.**  
Govt. Pub. Department  
Reno, NV 89557-0044  
(702) 784-6579

## **NEW JERSEY**

**NEWARK PUBLIC LIBRARY**  
5 Washington Street  
Newark, NJ 07101-0630  
(201) 733-7812

## **NEW MEXICO**

**UNIVERSITY OF NEW MEXICO**  
Zimmerman Library  
Government Pub. Dept.  
Albuquerque, NM 87131  
(505) 277-5441

## **NEW MEXICO STATE LIBRARY**

Reference Department  
325 Don Gaspar Avenue  
Santa Fe, NM 87503  
(505) 827-3826

## **NEW YORK**

**NEW YORK STATE LIBRARY**  
Empire State Plaza  
Albany, NY 12230  
(518) 474-5563

## **NORTH CAROLINA**

**UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL**  
Davis Library  
BA/SS Documents Division  
Chapel Hill, NC 27515  
(919) 962-1151

## **NORTH DAKOTA**

**UNIVERSITY OF NORTH DAKOTA**  
Chester Fritz Library  
Documents Department  
Grand Forks, ND 58202  
(701) 777-4629  
In cooperation with North  
Dakota State Univ. Library

## **OHIO**

**STATE LIBRARY OF OHIO**  
Documents Department  
65 South Front Street  
Columbus, OH 43266-0334  
(614) 462-7051

## **OKLAHOMA**

**OKLAHOMA DEPT. OF LIB.**  
Government Documents  
200 NE 18th Street  
Oklahoma City, OK 73105  
(405) 521-2502, ext. 252

**OKLAHOMA STATE UNIV. LIB.**  
Documents Department  
Stillwater, OK 74078  
(405) 624-6546

## **OREGON**

**PORTLAND STATE UNIV. LIB.**  
Documents Department  
P.O. Box 1151  
Portland, OR 97207  
(503) 229-3673

## **PENNSYLVANIA**

**STATE LIBRARY OF PENN.**  
Government Pub. Section  
P.O. Box 1601  
Harrisburg, PA 17105  
(717) 787-3752

## **TEXAS**

**TEXAS STATE LIBRARY**  
Public Services Department  
P.O. Box 12927—Cap. Sta.  
Austin, TX 78711  
(512) 475-2996

**TEXAS TECH. UNIV. LIBRARY**  
Govt. Documents Department  
Lubbock, TX 79409  
(806) 742-2268

## **UTAH**

**UTAH STATE UNIVERSITY**  
Merrill Library, U.M.C. 30  
Logan, UT 84322  
(801) 750-2682

## **VIRGINIA**

**UNIVERSITY OF VIRGINIA**  
Alderman Lib.—Public Doc.  
Charlottesville, VA 22903-2498  
(804) 924-3133

## **WASHINGTON**

**WASHINGTON STATE LIBRARY**  
Documents Section  
Olympia, WA 98504  
(206) 753-4027

## **WEST VIRGINIA**

**WEST VIRGINIA UNIV. LIB.**  
Documents Department  
Morgantown, WV 26506-6069  
(304) 293-3640

## **WISCONSIN**

**MILWAUKEE PUBLIC LIBRARY**  
814 West Wisconsin Avenue  
Milwaukee, WI 53233  
(414) 278-3065

## **ST. HIST. LIB. OF WISCONSIN**

Government Pub. Section  
816 State Street  
Madison, WI 53706  
(608) 262-4347

## **WYOMING**

**WYOMING STATE LIBRARY**  
Supreme Ct. & Library Bld.  
Cheyenne, WY 82002  
(307) 777-5919