

P-53

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(NASA-SP-7011(390)) AEROSPACE
MEDICINE AND BIOLOGY: A CONTINUING
BIBLIOGRAPHY WITH INDEXES
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NASA SP-7011 (390)
July 1994

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES



National Aeronautics and Space Administration
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1994

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INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 102 reports, articles, and other documents recently announced in the NASA STI Database. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue include:

<i>Scientific and Technical Aerospace Reports (STAR)</i> (N-10000 Series)	N94-28827 — N94-31413
Open Literature (A-10000 Series)	None in this issue

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on 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. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard 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 include the original accession numbers from the respective announcement journals.

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

A cumulative index for 1994 will be published in early 1995.

Information on availability of documents listed, addresses of organizations, and CASI price schedules are located at the back of this issue.

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Category 54	Man/System Technology and Life Support Includes human engineering; biotechnology; and space suits and protective clothing.	222
Category 55	Space Biology Includes exobiology; planetary biology; and extraterrestrial life.	N.A.

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TYPICAL REPORT CITATION AND ABSTRACT

NASA SPONSORED

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ACCESSION NUMBER → N94-11045*# Pennsylvania State Univ., Hershey. Coll. of ← CORPORATE SOURCE
Medicine.
TITLE → EFFECTS OF CSF HORMONES AND IONIC COMPOSITION ON
SALT/WATER METABOLISM Final Technical Report, 1 Mar.
1981 - 31 Dec. 1992
AUTHOR → WALTER B. SEVERS 31 Dec. 1992 32 p ← PUBLICATION DATE
CONTRACT NUMBER → (Contract NCC2-127)
REPORT NUMBERS → (NASA-CR-193232; NAS 1.26:193232) Avail: CASI HC A03/MF ← AVAILABILITY AND
A01 PRICE CODE

The consequences of headward fluid shifts during manned spaceflight was studied. Such shifts were recognized early by both U.S. and Soviet scientists because of signs and symptoms referable to the head. Some of these include disturbed vision, puffiness in the face and periorbital areas, headache, vestibular dysfunction, and distended jugular veins. We posited that the fluid shift had an immediate effect on the brain and a long-term action requiring a neural interpretation of the flight environment. This would re-adjust both efferent neural as well as hormonal mechanisms to sustain cardiovascular and fluid/electrolyte balance consonant with survival in microgravity. Work along these lines is summarized. A synopsis of some of the main research is presented. The following topics were studied: (1) angiotensin and vasopressin action in the central nervous system; (2) intracranial pressure control; (3) research on subcommissural organ; and (4) research on the eye.

Author (revised)

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 390)

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LIFE SCIENCES (GENERAL)

N94-28829 Louisiana State Univ., Baton Rouge.
**EFFECTS OF PRESSURE ON MEMBRANE-ASSOCIATED
RECEPTORS AND EFFECTOR ELEMENTS** Final Report, 1
Jun. - 30 Nov. 1993

JOSEPH F. SIEBENALLER 30 Nov. 1993 2 p Limited
Reproducibility: More than 20% of this document may be affected by
microfiche quality

(Contract N00014-89-J-1865)
(AD-A275813) Avail: CASI HC A01

To identify the effects of moderate hydrostatic pressure on
receptor and effector elements involved in transmembrane signal
transduction, we examined the A1 adenosine receptor - inhibitory G
protein (G) - adenylcyclase signal transduction complex. Our
experiments were designed to identify and define at the molecular
level pressure effects on system components in isolation and on the
entire functional complex. DTIC

N94-28853# Nihon Univ., Tokyo (Japan). Dept. of Hygiene.
**EFFECT OF CHRONIC CENTRIFUGATION ON IN VITRO
FERTILIZATION AND EARLY DEVELOPMENT IN MICE OVA
[MAUSU RANSHI NO JUSEI TO SHOKI HASSEI NI OYOBOSU
JI FUKA NO EIKYO]**

MASAO ITO, RURIKO MARU, TAKASHI MAEDA, ESTER SANADA,
TAKAICHI MANO, SHINICHI HORIGOME, KENICHI IWASAKI,
YUICHI KAMEYAMA, YOSHIRO ISHIJIMA, and KAZUYOSHI
YAJIMA In Japan Society of Aerospace and Environmental
Medicine, Japanese Journal of Aerospace and Environmental Medi-
cine, Volume 30, No. 1 p 19-25 1 Mar. 1993 In JAPANESE See
also A93-49179

Avail: CASI HC A02/MF A01

The effect of chronic centrifugation on in vitro fertilization and
early development in mice ova was investigated. The results of the
study on the effect of acceleration on fertilization and early develop-
ment is discussed. The fertilization rate was lower for the ova
receiving 0.6 to 1.2 G and those receiving 1.8 G and over. The
mechanism for the impairment of fertilization, was apparently differ-
ent between two ranges. The unfertilized ova that had been sub-
jected to 0.6 to 1.2 G of acceleration ceased to grow mostly at
Metaphase 2 and sperms penetration were prevented. In the ova
receiving 1.8 G and over, sperms had penetrated the ovular cyto-
plasm and the nucleus had reached the Anaphase or Telophase.
Polyspermy and other abnormalities were frequent while normally
fertilized ova were limited in number. It was noted that centrifugation
at 2 G or less had no effect on the in vitro growth of 2-cell ova into
blastocysts. Cell number of embryos thus produced was significantly
smaller compared to the control. In the 2-cell ova receiving 3.6 or 4.0
G, most of them do not grow into blastocysts and if they do, the cell
number of these blastocysts is smaller than 60. This finding sug-
gested a delay in embryo growth and a subsequent increase in
embryo mortality. Author (NASDA)

N94-28884# Connecticut Univ., Farmington. Health Center.
**STUDIES ON BACTERIAL SPORE ULTRAVIOLET LIGHT
RESISTANCE AND REGULATION OF THE ACTIVITY OF A**

SPORE PROTEASE Final Report, 1 May 1990 - 31 Oct. 1993
PETER SETLOW 10 Dec. 1993 6 p
(Contract DAAL03-90-G-0110)
(AD-A275448; REPT-31522-LS; ARO-27956.17-LS) Avail: CASI
HC A02/MF A01

Highlights of the most significant research finding in the last few
years are: (1) alpha/beta-type SASP have been shown in vitro to be
a novel group of non-specific, double-strand DNA binding proteins
which slow DNA depurination, block hydroxyl-radical cleavage of
the backbone, and block UV induced pyrimidine dimer formation,
while promoting spore photoproduct formation; (2) the effects of
alpha/beta-type SASP in vitro are also exerted in vivo as these
proteins are important factors in spore heat and hydrogen peroxide
resistance, and the major cause of spore UV resistance; (3) studies
of the regulation and processing of the SASP specific protease have
strongly suggested that the processing of the zymogen form of this
enzyme during sporulation is an autocatalyzed event triggered by
changes in the forespore (very likely dehydration) which will block
attack of the active enzyme on SASP. In the first minutes of spore
germination spore core rehydration then allows rapid SASP
degradation. DTIC

N94-29081# Waseda Univ., Tokyo (Japan). School of Education.
**ESTIMATION OF THE NET PRODUCTION OF MOSS
COMMUNITY AT LANGHOVDE, EAST ANTARCTICA [HIGASHI
NANKYOKU RANGUHOBUDE NI OKERU SENRUI NO JUN
SEISANRYO NO SUITEI]**

YOSHIO INO In National Inst. of Polar Research, Antarctic Record,
Volume 36, No. 1 p 49-59 30 Mar. 1992 Sponsored by National
Inst. of Polar Research
Avail: CASI HC A03/MF A02

Field measurements of net photosynthesis and dark respiration
(CO₂ exchange) of moss colonies were carried out at Langhovde,
East Antarctica, 17 Jan. 1988. Each colony growing at the Yukidori
Valley, Langhovde was composed of Grimmia lawiana, Bryum
pseudotriquetrum or the mixture of Ceratodon purpureus and B.
pseudotriquetrum. Microclimatic data (photo-synthetic photon flux
density and moss temperature) in the assimilation chamber were
recorded at the same time. A simple model to estimate the net
photosynthetic rate and dark respiration rate on the basis of the
microclimatic data was developed on Kappen's model. Net primary
production of these moss colonies was calculated with the microcli-
matic data recorded separately at the Yukidori Valley Jan. 1988 -
Jan. 1989. The estimated net production rates of moss colonies
growing in the upper reaches of the Yukidori Valley ranged from 8.8
to 11.3 mol CO₂ m(exp -2)y(exp -1), or from 230 to 296 gdw
m(exp-2)y(exp -1). Author (NASDA)

N94-29082# Aichi Fisheries Research Inst., Minato (Japan).
**COPEPODS COLLECTED ALONG 33.5 DEG E LONGITUDE OF
THE ANTARCTIC OCEAN IN THE 1976 SUMMER [1976 NEN
KAKI, NANKYOKUKAI INDOYOKU NO TOKEI 33.5 DO SEN NI
SOTTE ERARETA KAIASHIRUI SHIRYO]**
SATOSHI YAMADA, ATSUSHI TANIMURA, and TAKASHI MINODA
In National Inst. of Polar Research, Antarctic Record, Volume 36,
No. 1 p 60-64 30 Mar. 1992
Avail: CASI HC A01/MF A02

Zooplankton samplings were conducted at six stations along

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33.5 deg E in the Indian sector of the Antarctic Ocean 25 Feb. - 2 Mar. 1976 by the 17th Japanese Antarctic Research Expedition. Vertical hauls from a depth of 200 m to the surface with a Norpac net (45 cm in diameter, 0.33 mm mesh openings) were performed. Copepoda occupied more than 85 percent of the total individual numbers of zooplankton at all stations. The species composition and abundance of copepods were investigated. A total of 18 species except for Oncaeidae were identified. *Calanus propinquus*, *Calanoides acutus*, *Rhincalanus gigas*, *Ctenocalanus vanus*, *Scolecithricella glacialis*, and *Oithona similis* were found commonly at almost all stations. *Miclocalanus pygmaeus*, *Lucicutia* sp., *Haloptilus ocellatus*, *Haloptilus oxycephalus* and *Metridia gerlachei* occurred south of 60 deg S and *Calanus similimus*, *Clausocalanus laticeps*, *Metridia lucens* and *Oithona frigida* occurred north of 60 deg S. *Euchaeta antarctica*, *Racovitzanus antarcticus* and *Heterorhabdus austrinus* occurred sporadically and/or in small number. Author (NASDA)

N94-29085# National Inst. of Polar Research, Tokyo (Japan).

JAPAN-CHINA COLLABORATION RESEARCH PROGRAM ON TERRESTRIAL BIOLOGY AT GREAT WALL STATION IN KING GEORGE ISLAND, IN THE SUMMER OF 1990/1991 [1990/1991 NEN KAKI, KINGU JOJITO CHOJO KICHI NI OKERU NICCHU KYODO KANSOKU (DAN 3 NENJI)]

SHUJI OTANI and TAKAYUKI NAKATSUBO In its Antarctic Record, Volume 36, No. 1 p 109-115 30 Mar. 1992 In JAPANESE Avail: CASI HC A02/MF A02

The collaboration between Japanese and Chinese biologists started in the 1988/1989 season with a three-year program at Great Wall Station, King George Island. For the third year of the program (1990/1991), two Japanese botanists carried out the field survey on freshwater algae and bryophytes in the 7th Chinese National Antarctic Expedition (CHINARE-7). Taxonomic study of freshwater algae was carried out at the Fildes Peninsula. About 110 taxa were recognized in the samples collected from a variety of freshwater habitats. Distribution of snow algae was studied with reference to micro-habitat and snow properties as a cooperative study with a Chinese scientist. The microclimate and photosynthetic activities of moss colonies around Great Wall Station were studied. Vertical cross-sections of moss colonies were examined to study the structure and dynamics of moss colonies. Author (NASDA)

N94-29156# Sveriges Lantbruksuniv., Uppsala. Dept. of Microbiology.

STABLE RNA SEQUENCES AS A TOOL FOR DNA PROBES AND PHYLOGENETIC STUDIES

J. MATSSON 1993 175 p See also PB93-201895

(ISSN 0348-4041)

(PB94-135423; SLU-MIKRO-R-57-SE; ISBN-95-576-4755-0) Copyright Avail: CASI HC A08/MF A02

In the work, several different detection systems based on 16S rRNA sequences were studied. The rRNA sequences were also used to infer phylogenetic relationships. The catalytic RNA from RNase P was studied as a potential alternative to rRNA sequences. Species-specific rDNA probes for *Mycoplasma agalactiae*, *Mycoplasma bovis*, *Mycoplasma hyopneumoniae* and *Renibacterium salmoninarum* were designed. The different probes were specific and could be used to identify their respective targets in clinical samples. It was observed that unexpected cross-hybridization of a probe to a non-target organism may depend on the type of mismatch. *M. agalactiae* is the closest relative to *M. bovis*, as was concluded from phylogenetic analysis. Group-specific rDNA probes for the detection of mycoplasma contaminated cell cultures was developed and tested on a large number of samples. NTIS

N94-29189 Helsinki Univ. of Technology, Espoo (Finland). Dept. of Chemical Engineering.

PLANT-MICROBE INTERACTIONS: PLANT HORMONE PRODUCTION BY PHYLLOPLANE FUNGI

T. TUOMI, J. ILVESOKSA, and H. ROSENQVIST 23 Jun. 1993 16 p Limited Reproducibility: More than 20% of this document may be

affected by microfiche quality

(PB94-135563; ISBN-951-22-1671-X) Avail: CASI HC A03

The molds *Botrytis cinerea*, *Cladosporium cladosporioides* and the yeast *Aureobasidium pullulans*, isolated from the leaves of three short-rotation *Salix* clones, were found to produce indole-3-acetic acid (a growth promoter of plants). Abscisic acid (a growth inhibitor of plants) production was detected in *B. cinerea*. The contents of indole-3-acetic acid and abscisic acid in the leaves of the *Salix* clones and the amounts of fungal propagules in these leaves were also measured, in order to evaluate whether the amounts of plant growth regulators produced by the fungi would make a significant contribution to the hormonal quantities of the leaves. The content of abscisic acid, and to a lesser degree that of indole-3-acetic acid, showed a positive correlation with the frequency of infection by the hormone producing organisms. The amounts of hormone producing fungi on leaves that bore visible colonies were, however, not sufficiently high to support the argument that neither the fungal production of abscisic nor indole-3-acetic acid would to a significant degree contribute to the hormonal contents of the leaves of the *Salix* clones. NTIS

N94-29190 Helsinki Univ. of Technology, Espoo (Finland). Dept. of Chemical Engineering.

PHYSIOLOGY AND MOLECULAR-GENETICS OF THERMUS AND BACILLUS

K. M. NORDSTROEM Apr. 1993 15 p See also PB93-226363

Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(PB94-135571; ISBN-951-22-1633-7) Avail: CASI HC A03

The use of the API 20 NE system for the identification of *Thermus* was evaluated and compared with results obtained for conventional microbiological identification tests. Five *Thermus* strains were studied, including *T. thermophilus* DSM 579, *T. flavus* DSM 674 and three wild strains originating from hot springs in Iceland. The results for the API 20 NE system were in accord with conventional tests with reference to nitrate reduction, beta-galactosidase production, and the absence of indole and urease production. Furthermore, acid was not produced from glucose. Thus the API 20 NE kit provides a convenient tool for the characterization of *Thermus* strains, although gelatinase and aesculin hydrolysis must be verified using conventional methodology. NTIS

N94-29401*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

LEG MUSCLE VOLUME DURING 30-DAY 6-DEGREE HEAD-DOWN BED REST WITH ISOTONIC AND ISOKINETIC EXERCISE TRAINING

J. E. GREENLEAF, P. L. LEE, S. ELLIS, R. H. SELZER, and D. A. ORTENDAHL Mar. 1994 11 p

(Contract RTOP 199-18-12-07)

(NASA-TM-4580; A-94054; NAS 1.15:4580) Avail: CASI HC A03/MF A01

Magnetic resonance imaging (MRI) was used to compare the effect of two modes of lower-extremity exercise training on the mass (volume) of posterior leg group (PLG) muscles (soleus, flexor hallucis longus, tibialis posterior, lateral and medial gastrocnemius, and flexor digitorum longus) on 19 men (ages 32-42 years) subjected to intense dynamic-isotonic (ITE, cycle ergometer, number of subjects (N) = 7), isokinetic (IKE, torque ergometer, N = 7), and no exercise (NOE, N = 5) training for 60 min/day during head-down bed rest (HDBR). Total volume of the PLG muscles decreased (p less than 0.05) similarly: ITE = 4.3 +/- SE 1.6%, IKE = 7.7 +/- 1.6%, and NOE = 6.3 +/- 0.8%; combined volume (N = 19) loss was 6.1 +/- 0.9%. Ranges of volume changes were 2.6% to -9.0% (ITE), -2.1% to -14.9% (IKE), and -3.4% to -8/1% (NOE). Correlation coefficients (r) of muscle volume versus thickness measured with ultrasonography were: ITE r = 0.79 (p less than 0.05), IKE r = 0.27 (not significant (NS)), and NOE r = 0.63 (NS). Leg-muscle volume and thickness were highly correlated (r = 0.79) when plasma volume was maintained during HDBR with ITE. Thus, neither intensive lower extrem-

ity ITE nor IKE training influence the normal non-exercised posterior leg muscle atrophy during HDBR. The relationship of muscle volume and thickness may depend on the mode of exercise training associated with the maintenance of plasma volume. Author

N94-29519# National Inst. for Resources and Environment, Ibaraki (Japan). Biomass Div.

GROWTH OF HYDROCARBON-RICH MICROALGA BOTRYOCOCCUS BRAUNII IN SECONDARILY TREATED SEWAGE AND ITS CONSUMPTION OF NITRATE ION AND PHOSPHATE ION [GESUI SHORISUI NI OKERU BOTRYOCOCCUS BRAUNII NO ZOSHOKU TO CHISSO OYOBI RIN NO SHOHI NI TSUITE]

SHIGEKI SAWAYAMA, SEIICHI INOUE, TOMOAKI MINOWA, and YUTAKA DOTE In its Journal of NIRE, Vol. 2, No. 3 p 67-71 25 May 1993 In JAPANESE

Avail: CASI HC A01/MF A02

Secondarily Treated Sewage (STS) was used as the growing medium of the green micro-alga, *B. (Botryococcus) braunii*, which produces hydrocarbon as 50 percent of its dry weight. Algal growth in STS from domestic wastewater was good in a batch system, and hydrocarbon contents of the alga grown in two types of STS were sufficiently high at 53 and 40 percent compared with 58 percent for the Chu 13 medium. *B. braunii* consumed the nitrate ions in STS, thereby causing a reduction from 7.67 and 4.48 N mg/l to a level below detection (0.01 N mg/l). Phosphate ions were also consumed by *B. braunii* from 0.02 and 0.29 P mg/l to a level below detection (0.01 P mg/l). Using STS as the growth medium of *B. braunii* could facilitate the removal of nitrate and phosphate from STS by algal consumption. Author (NASDA)

N94-29648*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

PORTABLE LINEAR SLED (PLS) FOR BIOMEDICAL RESEARCH

WILL VALLOTTON (Sverdrup Technology, Inc., Moffett Field, CA.), DENNIS MATSUHIRO, TOM WYNN, and JOHN TEMPLE In its The 27th Aerospace Mechanisms Symposium p 315-331 May 1993 (Contract RTOP 199-16-12-17; RTOP 199-16-12-19; RTOP 199-90-63-20)

Avail: CASI HC A03/MF A03

The PLS is a portable linear motion generating device conceived by researchers at Ames Research Center's Vestibular Research Facility and designed by engineers at Ames for the study of motion sickness in space. It is an extremely smooth apparatus, powered by linear motors and suspended on air bearings which ride on precision ground ceramic ways. Author

N94-29708# Ministry of Agriculture, Forestry, and Fisheries, Ibaraki (Japan). Analysis of Gear and Methods Section.

REPRODUCTION IN THE JAPANESE ANCHOVY (ENGRAULIS JAPONICA) AS RELATED TO POPULATION FLUCTUATION [KATAKUCHIIWASHI NO SEIJUKU/SANRAN TO SAIS-EISANRYOKU NO CHOSETSU NI KANSURU KENKYU]

YOSHINARI TSURUTA In its Bulletin of National Research Institute of Fisheries Engineering, No. 13 p 129-168 5 Mar. 1992 In JAPANESE

Avail: CASI HC A03/MF A02

Field surveys and laboratory experiments on the Japanese anchovy, *Engraulis japonica*, were conducted in order to identify mechanisms which promote stock size stability. Field surveys confirmed the relatively long spawning season, the short time interval between spawning episodes (interspawning interval), and the seasonal change in batch fecundity. In laboratory experiments, long photoperiod and water temperature played a leading role as a trigger of gonad maturation and spawning. A reduction in food resulted in the following: (1) a prolongation of interspawning interval; (2) a reduction in a batch fecundity; and (3) a change in egg size when the food ration was below the level required for body maintenance. The number of eggs spawned per female was reduced at

high density even when food for the individual was held constant. On the other hand, growth was better than in a low density tank. Seawater was removed from the high density tank and discharged into the low density tank. This reduced the number of eggs spawned per female in the low-density tank. However this did not apply for sea water from a low-density tank and also a high-density tank without mature fish. Therefore, some unknown organic substance may control gonad maturation. Author (NASDA)

N94-29711# Hamamatsu Univ., Shizuoka (Japan).

SPACE MOVEMENT OF TRICHINELLA SPIRALIS UNDER MICROGRAVITY [SENMOCHU NO BISHO JURYOKU NI TAISURU YUEI HANNO]

AKIRA MURAKAMI, KENJIRO YOSHIMURA, and KEIICHI TAKAHASHI In Society of Medical Research for Space Station, The MERSS 5th Symposium on Space Medicine: Medical and Physiological Experiment Utilizing Parabolic Flight p 9-13 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A01

Under microgravity, *Trichinella spiralis*, including a Paramecium, increases pace of cytokinesis, probably because disappearance of space movement reaction against gravity decreases energy consumption. If this hypothesis is true, gravity may affect various phases of fundamental activity of this microorganism. On the other hand, it is known that a Paramecium moves in the opposite direction of gravity under 1 G. This negative gravitaxis may be associated with not only a physical mechanism based on gravity, but also some physiological mechanisms. The purpose of this study is to clarify the effect of gravity on Parameciums by analyzing space movement under microgravity. In previous studies, the microgravity effect on movement of Paramecium was examined during free falling. Despite short period, the findings revealed that not only gravity but also some other effects may participate in the special movement under microgravity. This study examined the movement for longer period of microgravity using parabolic flight, in which microgravity could be achieved after hypergravity conditions. As a result, the Parameciums showed diphasic movement pace which increased under hypergravity, then decreased during change of gravity, and increased again under microgravity. This phenomenon cannot be explained by only a physical mechanism, therefore some physiological mechanisms, such as Ca ion or K ion participation, may affect the movement under microgravity. Author (NASDA)

N94-29712# Fujita Health Univ., Toyohashi (Japan). School of Hygiene.

POSTURE CONTROL OF GOLDFISHES UNDER MICROGRAVITY [BISHO JURYOKUKA NI OKERU KINGYO NO SHISEI SEIGYO]

AKIRA TAKABAYASHI In Society of Medical Research for Space Station, The MERSS 5th Symposium on Space Medicine: Medical and Physiological Experiment Utilizing Parabolic Flight p 14-18 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A01

Microgravity may cause several functional disorders mainly due to a lack of stimulation of labyrinthus. This may result in Space Adaptation Syndrome (SAS) observed during exposure to a weightless condition. The purpose of this study was to examine the effect of microgravity on statokinetic system using goldfish with or without labyrinthectomy or excision of eye balls. It is known that fish control their posture by stimulation of light and gravity; i.e. they keep the back to the direction of light and the ventral side to the direction of gravity. As a result, labyrinthectomized goldfish could adapt themselves under 1 G condition, although it took several months. Under microgravity, normal goldfish controlled their posture by light direction. While hemilateral labyrinthectomized ones showed a tendency to incline to the labyrinthectomized side, those with hemilateral and bilateral labyrinthectomy controlled their posture by the direction of light. Goldfish with excision of eye balls could keep normal posture under 1 G, however, when labyrinthectomized goldfish were exposed to microgravity in the dark, looping behavior was observed.

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These results suggest that in labyrinthectomized fish's gravireceptors other than labyrinthus may function under 1 G, however, they cannot work under microgravity, which may cause unstable posture under microgravity.
Author (NASDA)

N94-29713# Tokyo Univ. (Japan).

BEHAVIOR AND VISUAL CONTROL OF CYPRINODONTS UNDER MICROGRAVITY [BISHO JURYOKUKA NI OKERU MEDAKA NO KYODO TO SHIKAKU NI YORU SEIGYO]

KENICHI IJIRI, HOSHIO EGUCHI, YASUKO TAGUCHI, SHUNJI NAGAOKA, MASAMICHI YAMASHITA, and AKEMI KUROTANI In Society of Medical Research for Space Station, The MERSS 5th Symposium on Space Medicine: Medical and Physiological Experiment Utilizing Parabolic Flight p 19-25 Mar. 1993 In JAPANESE Avail: CASI HC A02/MF A01

In order to collect fundamental data for the experiments under microgravity in IML-2 (International Microgravity Laboratory-2), behavior of cyprinodonts was observed under microgravity, as well as with visual stimulation. Microgravity condition was achieved by parabolic flight, and cyprinodonts showed looping behavior with some twist as turning the ventral side to inside. There was a difference in looping pattern by strains of cyprinodonts in the light, while every strain of cyprinodonts showed looping behavior in the dark. This suggests that visual stimulation may be related with posture control under microgravity. For this reason, visual stimulation was given by rotating a cylinder with black and white stripes around a tank of cyprinodonts under 1 G. As a result, all strains of cyprinodonts followed the stripes, and among them, the strain with less looping behavior under microgravity showed the most remarkable ability to follow them. This suggests that the strain tolerant of microgravity have high sensitivity to visual stimulation.

Author (NASDA)

N94-29783*# Molecular Devices Corp., Menlo Park, CA.

MICROFABRICATED SILICON BIOSENSORS FOR MICROPHYSIOMETRY

L. J. BOUSSE, J. M. LIBBY, and J. W. PARCE In JPL, Proceedings of the Workshop on Microtechnologies and Applications to Space Systems p 163-182 15 Jun. 1993 (Contract MDA972-92-C-0005) Avail: CASI HC A03/MF A03

Microphysiometers are biosensor devices that measure the metabolic rate of living cells by detecting the rate of extracellular acidification caused by a small number of cells. The cells are entrapped in a microvolume chamber, whose bottom surface is a silicon sensor chip. In a further miniaturization step, we have recently fabricated multichannel flow-through chips that will allow greater throughput and multiplicity. Microphysiometer technology can be applied to the detection of microorganisms. We describe the sensitive detection of bacteria and yeast. Further applications of microphysiometry to the characterization of microorganisms can be anticipated.
Author

N94-29866# Saint Marianna Univ., Kawasaki (Japan). Dept. of Physiology.

SHORTENING VELOCITY AND CALCIUM SENSITIVITY OF SINGLE FIBERS FROM HINDLIMB SUSPENDED MUSCLE IN RATS [RATTO HAIYOSEI ISHUKU KINSENI NO TANSHUKU SOKUDO TO KARUSHIUMU KANJUSEI]

KATSUMASA YAMASHITA and TOSHITADA YOSHIOKA In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Vol. 30, No. 2 p 71-80 1 Jun. 1993 In JAPANESE See also A93-55329 Avail: CASI HC A02/MF A01

The effect of suspension hypokinesia on the maximal shortening velocity (V_{max}) and the calcium (Ca^{2+}) sensitivity (pCa_{50}) of slow and fast skinned muscle fibers in rats after two-week-tail-suspension and recovery for two weeks (two-week-recovery) was examined. Maximal tension in the fiber dissected from Extensor Digitorum Longus (EDL) muscle was significantly lower (p is less

than 0.01), but that in the fiber dissected from soleus muscle not different from the cage control. The V_{max} in soleus and EDL and Ca^{2+} sensitivity (pCa_{50}) in EDL increased following suspension. The maximal tension in EDL, V_{max} and Ca^{2+} sensitivity (pCa_{50}) in soleus and EDL were normalized after two weeks of recovery. The results demonstrate that the rate constant of cross-bridge cycle is altered during hypokinesia and the altered muscle function during hypokinesia recovered to the control level when the rats were released from suspension for the same period as tail suspension.
Author (NASDA)

N94-29943*# Ohio State Univ., Columbus. Dept. of Plant Biology. **CELLULAR POLARITY AND INTERACTIONS IN PLANT GRAVIPERCEPTION** Final Report, 1 Jun. 1991 - 17 Jun. 1993 FRED D. SACK 1993 4 p (Contract NAG10-0085) (NASA-CR-195261; NAS 1.26:195261; OSURF-724742) Avail: CASI HC A01/MF A01

Presented are results of studies on the mechanisms of gravitropic sensing in higher and lower plants. Gravitropic roots of the aquatic angiosperm, *Limnobiium*, were found to have sedimented amyloplasts in their elongation zone but not in their rootcap; nuclei were found to sediment in the elongation zone as well. Another study attempted to understand how plastid sedimentation occurs in vertical *Ceratodon* cells and how this sedimentation is regulated. To determine whether the cytoskeleton restricts plastid sedimentation, the effects of amiprofos-methyl (APM) and cytochalasin (CD) on plastid position were qualified. Results suggest that microtubules restrict the sedimentation of plastids along the length of the cell and that microtubules are load-bearing for all the plastids in the apical cell, demonstrating the importance of the cytoskeleton in maintaining organelle position and cell organization against the force of gravity. *Physcomitrella* and *Funaria* were also studied. Results suggest that gravitropism may be relatively common in moss protonemata and reinforce the idea that amyloplast mass functions in gravitropic sensing.
CASI

N94-29968*# East Carolina Univ., Greenville, NC. Anatomy and Cell Biology School of Medicine.

PHYSIOLOGICAL ANATOMICAL RODENT EXPERIMENT (PARE) .04 FEASIBILITY TEST 2

HUBERT W. BURDEN 11 Apr. 1994 85 p (Contract NCC2-810)

(NASA-CR-195210; NAS 1.26:195210) Avail: CASI HC A05/MF A01

The objective of this feasibility study was to subject pregnant rats of the same age, strain, and size that will be utilized in a shuttle flight experiment to all flight conditions except the unique microgravity of space flight and determine the feasibility of the proposed experimental design to meet the experimental objectives. The study utilized facilities at NASA, Ames Research Center, Moffett Field, CA to subject the rats to the gravitational stresses of a simulated shuttle launch and simulated shuttle landing. One hundred pregnant rats were received on gestation day (G) 2 (day 1 = day of vaginal sperm) and on G7, eighty rats were laparotomized to determine the condition of pregnancy and allow assignment to test groups. The five test groups (N=10 each group) were as follows: Group 1, Nominal Flight; Group 2, Laparotomy Control; Group 3, Hysterectomy Control; Group 4, Vivarium Control; Group 5, Delayed Recovery. On G9, animals in groups 1,2,3, and 5 were subjected to a shuttle launch simulation. On G18, groups 1,2, and 3 were subjected to a shuttle landing simulation and on this same day groups 1 and 2 were subjected to unilateral hysterectomy to obtain fetuses and placentas for evaluation. Fetal crown-rump length and fetal weight of the Nominal Flight group was significantly less than the Laparotomy Control group, but placentas were similar. On G20, group 5 was subjected to a shuttle landing simulation and on this day this group received a unilateral hysterectomy and fetuses and placentas were weighed. Animals in all groups were allowed to go to term and all animals delivered between 06:00 hours G22 and 18:00 hours G23.

After delivery, a blood sample was taken from each experimental dam, and they were euthanized and the thymus and adrenal glands weighed. The thymus weight from all experimental group dams was decreased relative to the Vivarium Control group but adrenal glands and hormone values in dam plasma was similar in all groups. Pups from experimental groups were tattooed for identification, the anogenital distance of male pups was measured, and all pups placed with foster dams and litter sizes were standardized to 10. There was no difference in anogenital distances between male pups from different test groups. Pups delivered from Delayed Recovery animals were smaller than pups delivered from Nominal Flight animals. On neonatal day 7, all pups were euthanized and pup adrenal glands and thymus weighed. There was no difference in weights of thymus and adrenal glands in pups euthanized at neonatal day 7. Collectively, these data confirm the feasibility of the experimental design to meet objectives of the studies proposed for shuttle flight. Author

**N94-30180 Michigan Biotechnology Inst., Lansing.
ONE CARBON METABOLISM IN ANAEROBIC BACTERIA:
REGULATION OF CARBON AND ELECTRON FLOW DURING
ORGANIC ACID PRODUCTION**

J. G. ZEIKUS and M. JAIN 1993 8 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality (Contract DE-FG02-87ER-13719) (DE94-004852; DOE/ER-13719/5) Avail: CASI HC A02

The project deals with understanding the fundamental biochemical mechanisms that physiologically control and regulate carbon and electron flow in anaerobic chemosynthetic bacteria that couple metabolism of single carbon compounds and hydrogen to the production of organic acids (formic, acetic, butyric, and succinic) or methane. The authors compare the regulation of carbon dioxide and hydrogen metabolism by fermentation, enzyme, and electron carrier analysis using *Butyribacterium methylotrophicum*, *Anaerobiospirillum succiniciproducens*, *Methanosarcina barkeri*, and a newly isolated triculture composed of a syntrophic butyrate degrader strain IB, *Methanosarcina mazei*, and *Methanobacterium formicicum* as model systems. To understand the regulation of hydrogen metabolism during butyrate production or acetate degradation, hydrogenase activity in *B. methylotrophicum* or *M. barkeri* is measured in relation to growth substrate and pH; hydrogenase is purified and characterized to investigate number of hydrogenases and their localization and functions; and their sequences are determined. To understand the mechanism for catabolic CO₂ fixation to succinate the PEP carboxykinase enzyme and gene of *A. succiniciproducens* are purified and characterized. Genetically engineered strains of *Escherichia coli* containing the phosphoenol pyruvate (PEP) carboxykinase gene are examined for their ability to produce succinate in high yield. To understand the mechanism of fatty acid degradation by syntrophic acetogens during mixed culture methanogenesis formate and hydrogen production are characterized by radio tracer studies. It is intended that these studies provide strategies to improve anaerobic fermentations used for the production of organic acids or methane and new basic understanding on catabolic CO₂ fixation mechanisms and on the function of hydrogenase in anaerobic bacteria. DOE

**N94-30461*# Department of Agriculture, Starkville, MS.
Forest Service.**

SEED VIABILITY DETECTION USING COMPUTERIZED FALSE-COLOR RADIOGRAPHIC IMAGE ENHANCEMENT

J. A. VOZZO and MICHAEL MARKO In NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 1 p 179-187 Feb. 1994 Avail: CASI HC A02/MF A04

Seed radiographs are divided into density zones which are related to seed germination. The seeds which germinate have densities relating to false-color red. In turn, a seed sorter may be designed which rejects those seeds not having sufficient red to activate a gate along a moving belt containing the seed source. This results in separating only seeds with the preselected densities

representing biological viability lending to germination. These selected seeds demand a higher market value. Actual false-coloring isn't required for a computer to distinguish the significant gray-zone range. This range can be predetermined and screened without the necessity of red imaging. Applying false-color enhancement is a means of emphasizing differences in densities of gray within any subject from photographic, radiographic, or video imaging. Within the 0-255 range of gray levels, colors can be assigned to any single level or group of gray levels. Densitometric values then become easily recognized colors which relate to the image density. Choosing a color to identify any given density allows separation by morphology or composition (form or function). Additionally, relative areas of each color are readily available for determining distribution of that density by comparison with other densities within the image.

Author (revised)

N94-30607# Department of Energy, Washington, DC. Office of Energy Research.

**ANNUAL REPORT AND SUMMARIES OF FY 1993 ACTIVITIES:
DIVISION OF ENERGY BIOSCIENCES**

Sep. 1993 140 p (DE94-001723; DOE/ER-0602P) Avail: CASI HC A07/MF A02

The mission of the Energy Biosciences program is to generate fundamental information about plants and non-health related microorganisms that will constitute the base for new biotechnologies as well as supply information to improve usages of such organisms in their current form. The collective aims are totally consistent with the Department of Energy's objectives of developing alternate energy sources, replacements for otherwise fossil energy derived products and providing critical fundamental information for the preservation and restoration of environmental conditions affected by energy related activities. The EB program takes full advantage of its organizational locale in the Office of Basic Energy Sciences to directly interact with such disciplines as Materials Sciences, Chemistry, Engineering and Geosciences to promote cross-disciplinary research and planning activities. One of the major specific objectives of the EB program is to probe the enormous capabilities of the specified organisms to carry out biochemical conversions. The limitation to realization of entirely new products and processes via biotechnology is the lack of basic understanding of natural processes. Such knowledge will then afford the advantage of developing procedures to the benefit of people and their society in providing new products along with providing new employment possibilities. This document consists of abstracts of projects supported in FY 1993. DOE

N94-30895 Michigan Univ., Ann Arbor.

**ROLE OF X RAY-INDUCED TRANSCRIPTS IN ADAPTIVE
RESPONSES FOLLOWING X RAYS Progress Report No. 2**

D. A. BOOTHMAN 1993 18 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality (Contract DE-FG02-91ER-61256) (DE94-005412; DOE/ER-61256/T2) Avail: Issuing Activity (Department of Energy (DOE))

The overall goal of this proposal is to clone low dose X-ray-induced genes via molecular biology cloning techniques. From previous data, certain human cells can clearly carry out adaptive survival responses (ASR's) following ionizing radiation. Research goals are to better understand how some human cells can establish ASR's, and why other cells fail to do so. The author has been successful at identifying several genes whose expressions are altered during the establishment of, and actual processes occurring in, the adaptive response of U1-Mel cells. He will, in the next year or so, investigate the kinetics of expression of these genes, and whether or not other environmental stresses affect the expressions of these genes via Northern blot analyses. Finally, he will begin to investigate the function(s) of these genes within the cell, either under normal conditions of growth or following X-irradiation, using antisense expression technologies. Antisense RNA analyses and DNA repair endpoints (i.e., survival recovery, alkaline/neutral filter elutions, and

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PFGE) will be combined to examine the effects of specific gene 'knock out' experiments on ASR's in those human cells which demonstrate this response. The author is constructing mammalian expression vectors containing cyclin A, cyclin B, p53, or xip5, and xip12 (when full-length cDNA's are available) in the 'sense' orientation to overexpress these genes in human cells which did not demonstrate ASR's, such as HTB-152 or a variety of other human fibroblasts. Since many of the xips identified by 2-D gel electrophoresis were cell cycle regulated, the factors turning them on or off within a normal cell cycle may be clearly related to the events occurring in human cells following a genetic insult. DOE

N94-31294# Florida Univ., Gainesville.
INTERNATIONAL JOURNAL OF QUANTUM CHEMISTRY. QUANTUM BIOLOGY SYMPOSIUM NUMBER 20. PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON THE APPLICATION OF FUNDAMENTAL THEORY TO PROBLEMS OF BIOLOGY AND PHARMACOLOGY Final Report, 28 Feb. 1993 - 27 Feb. 1994

RODNEY J. BARTLETT Feb. 1994 260 p Symposium held in St. Augustine, FL, 13-20 Mar. 1993

(Contract DAAH04-93-C-0072)

(AD-A276294; ARO-31084.1-PH-CF) Avail: CASI HC A12/MF A03

The format of the symposium adopted for the past few years was followed again this year with a compact eight-day schedule with an integrated program of biology, quantum chemistry, and condensed matter physics. The topics of the sessions covered by these proceedings include Modeling of Biomolecules and Intramembranal Systems, Protein-DNA Interactions, Electron Transport Mechanisms in Biological Systems, and Computational Approaches to Molecular Design. The articles have been subjected to the ordinary refereeing procedures of the International Journal of Quantum Chemistry. The articles presented in the sessions on quantum chemistry, condensed matter physics, and associated poster sessions are published in a separate volume of the International Journal of Quantum Chemistry. DTIC

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AEROSPACE MEDICINE

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

N94-28850# Japan Society of Aerospace and Environmental Medicine, Tokyo.

JAPANESE JOURNAL OF AEROSPACE AND ENVIRONMENTAL MEDICINE, VOLUME 30, NO. 1 [UCHU KOKU KANKYO IGAKU DAI 30 KAN DAI 1 GO]

MAKOTO MASUDA, ed., MASAMITSU OSHIMA, ed., KANICHI TAKAGI, ed., SAKAE YOKOBORI, ed., MITSUO SASAKI, ed., ICHIRO ASUKATA, ed., SACHIO IKAWA, ed., YUKIKO KAKIMOTO, ed., HIROSHI KANSAKU, ed., TADAAKI MANO, ed. et al. 1 Mar. 1993 58 p In ENGLISH and JAPANESE (ISSN 0387-0723)

(JTN-94-80598) Avail: CASI HC A04/MF A01

The following topics were discussed: humans, mice, gravitational effects, acceleration tolerance, microgravity, artificial gravity, physiological effects, arteries, spine, blood, oxygen saturation, ova, fertilization, embryos, early development, growth, food, meal ingestion, vasomotor response, nervous system, oculomotor nerves, head-up tilt, cardiovascular system, blood flow, blood vessel, motion sickness, space motion sickness, space adaptation syndrome, space perception, vertigo, dizziness, aircraft pilots, astronauts, flight, nystagmus, ADH (Antidiuretic Hormone), and electronystagmography. Author (NASDA)

N94-28851# Kanagawa Prefectural Coll. (Japan). Dept. of Oral and Maxillofacial Radiology.

IMAGE TECHNOLOGY AND INFORMATION ANALYSIS OF

BONE CHANGE WITH GRAVITATIONAL EXPOSURE

KOSUKE NISHIMURA In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Volume 30, No. 1 p 1-10 1 Mar. 1993 See also A93-49177

Avail: CASI HC A02/MF A01

The influences of gravitational changes (microgravity approximately equals 0 G, control: 1 G, hypergravity: 2 G) on the bone were analyzed from the point of view of imaging technology using a microfocus tube and a highly sensitive x-ray image sensor with the photostimulable phosphor. Gravitational changes markedly affected the spongy bone of the posterior vertebral joint, with bone resorption occurring at approximately equals 0 G and enhancement of bone formation at 2 G. Such changes were larger in the posterior vertebral joints that bear more weight. In the seventh posterior vertebral joint, which showed the largest bone changes, the photostimulated luminescence level increased by about 19 percent and decreased by about 4 percent at approximately equals 0 G and 2 G, respectively, compared with 1 G. These bone changes resemble those occurring during the aging process of mandibular bone trabeculae on earth. Author (NASDA)

N94-28852# Nihon Univ., Tokyo (Japan). Dept. of Anesthesiology.

ARTERIAL OXYGEN SATURATION DURING +GZ ACCELERATION BY SHORT-RADIUS CENTRIFUGE [KOGATA ENSHINKI NI YORU JINKO JURYOKU FUKACHU NO DOMYAKUKETSU SANSO HOWADO NO HENKA]

KENICHI IWASAKI, HAJIME SUZUKI, MASAO ITO, TAKAICHI MANO, CHIKAKO SAEKI, and KAZUYOSHI YAJIMA In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Volume 30, No. 1 p 11-17 1 Mar. 1993 In JAPANESE See also A93-49178

Avail: CASI HC A02/MF A01

Artificial gravity has been proposed to prevent the problems of physiological deconditioning in space. When Ground-based studies to make an artificial gravity with short-radius centrifuge were intended, it has been reported that decreases of the arterial Oxygen Saturation (SaO₂) caused by a ventilation/perfusion mismatch in human lung and a decrease in central blood volume were observed at +3 Gz or above it. However, the duration of centrifuge was only a few minutes. SaO₂ was measured during 60 min +Gz acceleration by a pulse oximeter. Seven men were studied at 1.4 G, 1.7 G, and 2.0 G. Significant decreases of SaO₂ occurred at 1.7 G from 10 min to 30 min and at 2.0 G from 10 min to 40 min. SaO₂ were improved after 35 min (1.7 G) and 45 min (2.0 G). Increases in heart rate, blood pressure, and tidal volume improved the decreases of SaO₂ during +Gz acceleration. Author (NASDA)

N94-28854# Kanazawa Woman's Junior Coll. (Japan).

EFFECT OF FOOD INTAKE ON SKIN VASOMOTOR RESPONSES TO HEAD-UP TILT IN HUMANS

ATSUO HIRAI, YOSHIE UKETA, MINORU TANABE, and SOTARO SAKURADA In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Volume 30, No. 1 p 27-29 1 Mar. 1993 See also A93-49180
Avail: CASI HC A01/MF A01

Cardiovascular responses to a 10 min head-up tilt at 60 deg were investigated in seven subjects before and after meal ingestion. The tilt increased heart rate and body core temperature, and decreased blood pressure, mean skin temperature (calculated from forehead, trunk, forearm, finger, thigh, calf and foot temperatures), and finger blood flow regardless of feeding conditions. However, finger temperature at the end of the tilt was significantly higher after food ingestion than before, which was not the case in other sites of the skin. Furthermore, the amount of reduction in finger blood flow was significantly reduced by food ingestion. These results suggest that vasoconstrictor drive to skin vessels is suppressed by food ingestion only in the fingers. Author (NASDA)

N94-28855# Nagoya City Univ. (Japan). Dept. of Otorhinolaryngology.

BASIC UNDERSTANDING OF VERTIGO [MEMAI NO KISO]
MOTOYUKI HASHIBA In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Volume 30, No. 1 p 34-37 1 Mar. 1993 In JAPANESE Presented at the Symposium of the 38th Annual Meeting of Japan Society of Aerospace and Environmental Medicine, Tokyo, Japan, 3 Oct. 1992

Avail: CASI HC A01/MF A01

Human kinesthesia is largely dependent on visual sense, vestibular sense, and somatic sense, and unbalance of these senses causes failure of integration, which may result in vertigo. Abnormal vertigo often occurs when the right and left vestibule senses different information. For example, when rotated, endolymphatic fluid in semicircular canals flows in the opposite direction in right and left, so that nerve activity is stimulated in one organ while suppressed in the other. For vertigo without rotation, a disorder must occur in one vestibular system to cause unbalanced nerve impulses. Physiological vertigo often occurs after rotation; that is, endolymphatic fluid flows by inertia after rotation, which keeps stimulating hairy cells, although visual and somatic nerves transmit contradictory information. In addition, the velocity storage mechanism in the semicircular canals may also prolong stimulation of hair cells. For other physiological vertigo, it was reported that caloric stimulation of the internal acoustic meatus causes vertigo. This phenomenon was explained by convection of endolymphatic fluid, however, in the experiment of caloric stimulation in outer space, vertigo occurred under weightless condition. Therefore, there may be mechanisms other than convection. In addition, it was known that vertigo was caused by visual stimulation alone. In studying vertigo, it is necessary to evaluate the subjective symptom by objective kinesthesia responses, however, such responses may be affected more or less by the central nervous system. Author (NASDA)

N94-28856# Japan Air Lines Co. Ltd., Tokyo. Dept. of Otorhinolaryngology.

DISTURBANCE OF EQUILIBRIUM ON JAL FLIGHT CREW [UNKO JOMUIN NI OKERU MEMAI]

TAKAKUNI KATO In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Volume 30, No. 1 p 38-40 1 Mar. 1993 In JAPANESE Presented at the Symposium of the 38th Annual Meeting of Japan Society of Aerospace and Environmental Medicine, Tokyo, Japan, 3 Oct. 1992

Avail: CASI HC A01/MF A01

Flight crew are obliged to undergo flight physical examination periodically by the Ministry of Transport. This examination must follow the flight physical examination manual that regulates standards of diagnosis for each organ disease, including acoustic and equilibrium sense. This article discusses the cases with disturbance of equilibrium and nystagmus. The subjects were 47 Japan Airlines (JAL) flight crew who were found to have either statoacoustic disorder or anamnesis in the physical examination. As a result, 19 cases were asymptomatic, and, in the other 28 cases, symptoms were recognized regardless of flight in most cases, although it happened during and after flight in some cases. A total of 8 cases were asymptomatic nystagmus. According to the standard of flight physical examination, flight crew who are found to exhibit a statoacoustic disorder must be scrutinized by electronystagmography (ENG), and if nystagmus is identified, the license will be suspended. However, it is a big loss of man-power to suspend from flight these crew who have no subjective symptoms and able to spend normal life. Author (NASDA)

N94-28857# Jikei Univ, Tokyo (Japan). Dept. of Otorhinolaryngology.

SPACE AND VERTIGO: IN RELATION TO SPACE MOTION SICKNESS [UCHU TO MEMAI: UCHUYOI TONO KANREN NI TSUITE]

MASANORI ISHII In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Volume 30, No. 1 p 41-45 1 Mar. 1993 In JAPANESE Presented at the Symposium of the 38th Annual Meeting of Japan Society of Aerospace and Environmental Medicine, Tokyo, Japan, 3 Oct. 1992

Avail: CASI HC A01/MF A01

When a man goes to outer space, he will be exposed to weightless condition, so that the sense of space must be modified to adapt himself the new situation. The space motion sickness is considered to be a process to adapt oneself to weightless condition. However, the disease causes not only nausea and vomiting, but also disorder of equilibrium sense and illusion, which may degenerate operation ability of payload specialists. In fact, several missions had to be changed due to space motion sickness. This disease occurs immediately after coming to weightless condition, peaks at one to two day, and then gradually disappears in many cases. The cause may be disintegration of senses because input to the labyrinth system and semicircular canal could be changed under weightless condition. To examine this theory, Occular Counter Rolling (OCR) has been used as an objective index of labyrinth function, and it was proposed that difference between right and left OCR may be associated with space motion sickness. On the other hand, although in the same weightless condition, the disease did not occur in about one third of crew, and the incidence was affected by frequency of flight or physical conditions. Therefore, space motion sickness may result from not only disintegration of senses, but also from other factors such as effects of Antidiuretic Hormone (ADH) and enkephalin, which are associated with long term memory and is necessary for adaptation to a new environment. Author (NASDA)

N94-28858# Tokyo Medical and Dental Univ. (Japan). Dept. of Otolaryngology.

EQUILIBRIUM DYSFUNCTION IN THE CLINICAL FIELD [RINSHO NI OKERU MEMAI]

JIN OKUBO In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Volume 30, No. 1 p 46-49 1 Mar. 1993 In JAPANESE Presented at the Symposium of the 38th Annual Meeting of Japan Society of Aerospace and Environmental Medicine, Tokyo, Japan, 3 Oct. 1992

Avail: CASI HC A01/MF A01

This article presents symptoms and diagnosis of equilibrium dysfunction in the clinical field. In general, equilibrium dysfunction is a subjective symptom so that it is difficult to objectively diagnose. It is problematic to confirm diagnosis by only nystagmus test because not only vestibular disorders but also also visual and somatic disorders may cause equilibrium dysfunction. In fact, nystagmus is not always observed in equilibrium dysfunction patients. The equilibrium dysfunction can be classified into vertigo, dizziness and blackout, and this classification is important in diagnosis to identify the causal sites. For nystagmus tests, voluntary and involuntary ocular movement is examined, however, there are a few outpatients who showed nystagmus in diagnosis. Induction and duration of nystagmus are also useful to identify the dysfunctional sites. In addition, accessory symptoms should be considered for diagnosis. It is interesting that the direction of nystagmus is related to head position. Nystagmus by caloric stimulation changes in duration or development according to the head position. These phenomena suggest that gravity may intervene in the occurrence of nystagmus. Author (NASDA)

N94-28892 Krug Life Sciences, Inc., San Antonio, TX.

RELAXED TOLERANCE FOLLOWING HSG, HIGH SUSTAINED +GZ Interim Report, Nov. 1992 - Nov. 1993

ROBERT M. SHAFFSTAFF Nov. 1993 5 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F33615-92-C-0018)

(AD-A275204; AL/CF-PC-1993-0042) Avail: CASI HC A01

Changes in relaxed +G(sub z) tolerance impact the support required from G protective measures and may affect the capability of the aircrew to reengage following exposure to HSG. During and post-HSG, simultaneous physiological events which could increase or decrease G-tolerance are activated. This study exposed 6 male centrifuge subjects to a GOR(Gradual Onset Rate = 0.067 G/second) acceleration to their subjective G-tolerance limit. Following a rest period, the subjects were exposed to a 7+G(sub z) ROR (Rapid Onset Rate = 1.0 G/second) acceleration for 60 seconds. Immediately after the ROR the subjects were reexposed to the GOR and taken to their relaxed tolerance limit. RESULTS. The subjects relaxed tolerance on the first GOR (pre-HSG) was 5.4+G(sub z)+/-0.7 (X+/-SD) and their second GOR tolerance (post-HSG) was 4.5+/-0.6. Statistical significance via Student's T Test (2 tailed) was p=0.065, but 5 of 6 subjects had a reduction in post-HSI tolerance. Electrocardiogram and heart rate evaluations provided an indicator of the cardiovascular response. This study suggests that relaxed +G(sub z) tolerance is lowered following a high G exposure. Such a post-HSG reduction in relaxed tolerance would place a greater burden on the pilot's G protective systems thereby limiting one's ability to fully utilize the capability of the aircraft. DTIC

N94-28912# Naval Health Research Center, San Diego, CA. PHYSIOLOGICAL RESPONSES DURING SHIPBOARD FIREFIGHTING Final Report

BRAD L. BENNETT, R. D. HAGAN, G. BANTA, and F. WILLIAMS
Jul. 1993 24 p
(AD-A275104; NHRC-93-9) Avail: CASI HC A03/MF A01

The findings from previous studies of men wearing firefighting clothing suggest a high potential for individual heat strain associated with firefighting. However, no study has determined the level of heat strain during actual firefighting conditions. Thus, the objective of this study was to determine the level of heat strain experienced by U.S. Navy personnel while combating fires aboard a fire research ship. Subject volunteers (n=9) were recorded for rectal and mean skin temperatures and heart rate during three fire test days. Air temperatures in the compartment containing the fire to be extinguished averaged 470 + or - 170 c, while air temperatures in the compartment from which the fire was fought ranged from 40 to 125 C. Peak values for rectal temperature averaged 39.2 + or - 1.0 C, while peak mean skin temperature averaged 39.5 + or + 0.9 C. Peak body heat storage averaged 2.02 + or - 0.77 kcal.kg-1 and peak heart rate averaged 186 + or - 13 bpm. Our findings indicate that shipboard firefighting is associated with a remarkable level of individual heat strain. These findings have applications to operational training programs, generation of exposure guidelines, and development of heat strain countermeasures. DTIC

N94-29049# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

EFFECTS OF ENDURANCE TRAINING ON HEAT-EXERCISE TOLERANCE IN MEN WEARING NBC PROTECTIVE CLOTHING Research Report

YUKITOSHI AOYAGI, TOM M. MCLELLAN, and ROY J. SHEPHARD
Aug. 1993 37 p
(AD-A275176; DCIEM-93-46) Avail: CASI HC A03/MF A01

Protective clothing imposes significant physiological and psychological stresses on the human body and may limit work tolerance, especially in hot environments. The additional strains imposed by protective clothing arise mainly because it is difficult for sweat to evaporate through relatively impermeable fabrics. Endurance training is a commonly adopted tactic to improve tolerance times when individuals must work in the heat. Potential benefits include improved physical fitness, increased sweating, and expanded plasma volume. However, it is unclear whether such responses develop and/or are helpful when wearing protective garments with limited vapor permeability. The purpose of this study was therefore to examine the influence of endurance training on exercise tolerance

in a hot environment when subjects were wearing either normal light combat clothing or clothing offering protection against nuclear, biological, and/or chemical (NBC) agents. DTIC

N94-29071 Krug Life Sciences, Inc., San Antonio, TX. DECOMPRESSION SICKNESS RISK VERSUS TIME AND ALTITUDE Interim Report, Nov. 1992 - 1993

JAMES T. WEBB and ANDREW A. PILMANIS Nov. 1993 6 p
Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F33615-92-C-0018)
(AD-A275261; AL/CF-PC-1993-0039) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

To predict altitude decompression sickness (DCS) risk with any degree of accuracy, one must weigh variables such as prebreathe time, rate of ascent/descent, time at altitude, altitude, mixed breathing gas (dependent upon altitude), and profiles with multiple ascents and descents. The length of research chamber exposures is fixed. Therefore, risk assessment is based on DCS incidence after this fixed period at simulated altitude. From an operational standpoint, variable time at altitude complicates any predictive capability, although a computer model to handle all of these variables is in development. In the interim, a retrospective study from the Armstrong Laboratory Decompression Sickness Research Database has produced risk curves which can be used to predict DCS or venous gas emboli (VGE) incidence as a function of time at various altitudes. We limited the data to: (1) zero-prebreathe exposures to less than 20,000 ft breathing 50% O₂, 50% N₂; (2) zero-prebreathe exposures to less than 20,000 ft breathing 100% O₂; and (3) 1-h prebreathe exposures to greater than 20,000 ft breathing 100% O₂. Using the curves, one can select a time/altitude of exposure and estimate the DCS and VGE percentage. DTIC

N94-29116# Army Medical Center, Aurora, CO. Dept. of Clinical Investigation.

CLINICAL INVESTIGATION PROGRAM Annual Progress Report No. 29, FY 1993

KENNETH E. SHERMAN 30 Sep. 1993 524 p
(AD-A275025) Avail: CASI HC A22/MF A04

This report identifies those individuals who are conducting investigative protocols at Fitzsimons Army Medical. An abstract of each protocol—which gives abbreviated technical approach, objectives, and progress—is presented. DTIC

N94-29150# Edgerton, Germeshausen and Grier, Inc., Albuquerque, NM.

BLAST OVERPRESSURE STUDIES WITH ANIMALS AND MAN DANIEL L. JOHNSON, JOHN T. YELVERTON, WILLIAM HICKS, and ROY DOYAL 31 Oct. 1993 245 p

(Contract DAMD17-88-C-8141)
(AD-A275038) Avail: CASI HC A11/MF A03

Anesthetized sheep were exposed to explosions generated by the detonation of various weights of C-4 ranging in size from 57 to 1361 g in three different enclosures. The dimensions of the enclosures were 3.05 x 1.52 x 2.44 m, 3.05 x 2.44 x 2.44 m, and 4.88 x 3.05 x 2.44 m or 11.3, 18.2, and 36.3 cu m, respectively. The results from these experiments were used to establish an injury prediction curve using severity of injury indices and smoothed peak pressure. It appears to be an adequate model for the data collected and correlates well with previously reported injury prediction curves. It was determined that quasi-static pressure *per se* doesn't influence non-auditory injury to any appreciable degree. However, changes in the quasi-static pressure can affect the reverberant nature of the complex wave which seems to have a role in solid intra-abdominal response. There was also a simple relationship between lung injury and loading density demonstrated. As loading density increases, lung injury increases. DTIC

N94-29211 Air Force Inst. of Tech., Wright-Patterson AFB, OH.
EVALUATION OF MONITORING AUDIOMETRY IN THE UNITED STATES AIR FORCE HEARING CONSERVATION PROGRAM Ph.D. Thesis

THERESA Y. SCHULZ 1993 27 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality (AD-A275309; AFIT/CI/CIA-93-24D) Avail: CASI HC A03

The purpose of this study is to evaluate the effectiveness and efficiency of the methods and procedures of audiometric monitoring as used in the United States Air Force (USAF) Hearing Conservation Program (HCP). These program elements are common to HCP's both in the other military services (U.S. Army and Navy) and in civilian industry. However, there are a multitude of variations in implementing these common elements of a HCP. DTIC

N94-29431# Army Armament Research, Development and Engineering Center, Watervliet, NY. Benet Lab.
SYNAPTOGENESIS, SELECTIVE STABILIZATION, AND FREE ASSOCIATION Final Report

MARK A. JOHNSON and RAYMOND D. SCANLON Nov. 1993 20 p

(AD-A275250; ARCCB-TR-93039) Avail: CASI HC A03/MF A01

This report describes the material aspects of learning through the processes of synaptogenesis, transient redundancy, and selective stabilization. Synapses are potentiated during these processes and provide channels for incoming signal energy en route to nominate motor responses. They form codons that represent the activity of a large assemblage of neurons in various cortical regions. Codons are active during a state of dynamic instability in the neocortex when the thalamus blocks sensory input. They may also alter the gating cycle of the thalamus through interaction with the thalamic reticular nucleus. A computer simulation of these processes illustrates these concepts. DTIC

N94-29709# Society of Medical Research for Space Station, Nagoya (Japan).

THE MERSS 5TH SYMPOSIUM ON SPACE MEDICINE: MEDICAL AND PHYSIOLOGICAL EXPERIMENT UTILIZING PARABOLIC FLIGHT Report No. 8 [DAI 5 KAI UCHU IGAKU SHINPOJIUMU: PARABORIKKU FURAITO NI OKERU IGAKU SEIRIGAKU JIKKEN]

Mar. 1993 71 p In JAPANESE Symposium held in Aichi, Japan, 28 Nov. 1992

(JTN-94-80588) Avail: CASI HC A04/MF A01

The following topics were discussed: parabolic flight, flight control, aircraft control, aircraft performance, aircraft equipment, fuel system, hydraulic system, engine oil system, safety management, Paramecium, microgravity, gravitational effects, gold fish, attitude control, sailing, vestibules, Cyprinodontidae, visual perception, behavior, cardiovascular system, eye movement, head movement, sensory match, information processing, autonomic nervous system, pupillary reflex, heart rate, blood pressure, blood volume, respiration rate, stomach, emesis, electrogastrogram, motion sickness, physiological effects, physiological factors, space adaptation syndrome, space commercialization, space tour, manned space flight, safety management, and economic factor. Author (NASDA)

N94-29717# National Space Development Agency, Tokyo (Japan).

HEMODYNAMIC MEASUREMENT DURING PARABOLIC FLIGHT [PARABORIKKU FURAITO NI OKERU JUNKANDOTAI NO KEISOKU]

AKIRA MIYAMOTO, SHUNJI NAGAOKA, and SEIZO ISHIKURA In Society of Medical Research for Space Station, The MERSS 5th Symposium on Space Medicine: Medical and Physiological Experiment Utilizing Parabolic Flight p 48-54 Mar. 1993 In JAPANESE Avail: CASI HC A02/MF A01

Under microgravity such as in outer space, several changes

may occur in the human body by movement of fluid. To examine the hemodynamic effect, microgravity condition was simulated by parabolic flight, and the change of hemodynamics was measured. During parabolic flight, the subject, a 28 year old healthy volunteer, experienced hypergravity of approximately 2.3 g prior to microgravity. The flight was performed from 9 to 11 times a day for six days. As a result, the measurements of blood pressure, heart rate, and stroke volume changed under microgravity. In addition, such changes were affected by time and sitting position; that is, when sitting up straight (90 deg), the change of gravity affected the heart rate and stroke volume more than when sitting in the halfway up (45 deg) position. Comparing heart rates between the first three days and later three days, the change decreased as time passed. These results suggest that hemodynamics may be affected by hypergravity and posture, as well as by experience, at least under microgravity by parabolic flight.

Author (NASDA)

N94-29718# Nagoya Univ. (Japan). Dept. of Equilibrium Adaptation Research.

MOTION SICKNESS IN PARABOLIC FLIGHT: POSSIBILITY OF ELECTROGASTROGRAPHY AS AN OBJECTIVE INDEX [PARABORIKKU FURAITO NI OKERU MOSHON SHIKKUNESU: TAKAKUTEKI KYAKKANTEKI SHIHYO TO SHITENO IDENZU NO KANOSEKI]

HIROYUKI SUZUKI, YOSHIRO WADA, and SATORU WATANABE In Society of Medical Research for Space Station, The MERSS 5th Symposium on Space Medicine: Medical and Physiological Experiment Utilizing Parabolic Flight p 55-63 Mar. 1993 In JAPANESE Sponsored by Science and Technology Agency, Tokyo, Japan Avail: CASI HC A02/MF A01

Motion sickness is a disease that causes autonomic nervous symptoms such as vomiting or nausea by vestibular stimulation in weightless condition, linear acceleration, or by visual sense. Interest is focused on the disease from the point of space sickness. The purpose of this study was to discuss the effectiveness of electrogastrography as an objective index of motion sickness under microgravity achieved by parabolic flight. The electrogastrogram obtained during parabolic flight was examined to determine if it is capable of being used as an objective index of motion sickness, whether it can predict vomiting, and whether it can reflect the change of gravity. As a result, there was a correlation between amplitude of electrogastrogram and motion sickness. In addition, electrogastrogram showed particular patterns before and during vomiting, although physiological events which are supposed to be reflected by this pattern are unknown yet. Electroastrogram also showed changes of each pattern when gravity was changed.

Author (NASDA)

N94-29863# Japan Society of Aerospace and Environmental Medicine, Tokyo.

JAPANESE JOURNAL OF AEROSPACE AND ENVIRONMENTAL MEDICINE, VOL. 30, NO. 2 [UCHU KOKU KANKYO IGAKU DAI 30 KAN DAI 2 GO]

MAKOTO MASUDA, MASAMITSU OSHIMA, KANICHI TAKAGI, SAKAE YOKOBORI, MITSUO SASAKI, ICHIRO ASUKATA, SACHIO IKAWA, YUKIKO KAKIMOTO, HIROSHI KANSAKU, TADAAKI MANO et al. 1 Jun. 1993 59 p In JAPANESE (ISSN 0387-0723)

(JTN-94-80599) Avail: CASI HC A04/MF A01

The following topics were discussed: brain, thermoregulation, regulatory mechanisms, temperature control, blood flow, facial skin, make-up, heat transfer, body temperature, muscles, musculoskeletal system, muscle atrophy, sympathetic nerve response, gravitational effects, microgravity, physiological effects, physiological factors, psychological factors, water immersion, tail suspension, skinned fiber, shortening velocity, calcium sensitivity, aircraft pilots, pilot performance, visual perception, perceptual errors, visual discrimination, dot target, target detection, aircraft structures, response time, tachistoscopes, electroencephalography, rats, and human beings. Author (NASDA)

N94-29864# Kanazawa Woman's Junior Coll. (Japan).
EFFECTS OF MAKE-UP ON THE HEAT TRANSFER FROM THE HEAD IN HYPERTHERMIC CONDITIONS [MUFU KOON KANKYO DE TOBU NO NETSU IDO NI OYOBOSU KESHO NO EIKYO]

ATSUO HIRAI, KOZO HIRATA, MASAMI HIRASHITA, and TETSUO NAGASAKA In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Vol. 30, No. 2 p 55-62 1 Jun. 1993 In JAPANESE Sponsored by the Ministry of Education, Science and Culture, Tokyo, Japan; the Decente and Ishimoto Memorial Foundation for the Promotion of Sports Science, Osaka, Japan; and Kao Co. Ltd., Tokyo, Japan Avail: CASI HC A02/MF A01

This study was performed to verify whether the make-up disturbs selective brain cooling in hyperthermic conditions. Seven male volunteers were subjected to passive body warming in a climatic chamber (air temperature, 25 C; relative humidity, 40 percent). Body warming was made for about 40 min by placing the subjects in a box-shaped body warming unit, enclosing all but the subject's head. When Esophageal Temperature (T(sub es)) reached a level 0.5 C higher than the prewarming temperature, Hand-Grip exercise (HG) at 20 percent of maximal strength commenced and continued until exhaustion. In subjects with make-up (Hyperthermia Cosmetic (HC)), increases in forehead skin blood flow and temperature were significantly less than compared with the control group (Hyperthermia Non-Cosmetic (HNC)). However, local thermal sensation of the face was significantly higher in HC than in HNC. Tympanic Temperature (T(sub ty)) was always higher than T(sub es) before body warming, but the relationship reversed about 30 min after the start of body warming. Compared with that in HNC, the difference between T(sub es) and T(sub ty) 30 min after the start of body warming became less in HC (HC: 0.05 C versus HNC: 0.09 C). There was no significant difference in blood pressure, heart rate, T(sub es), and T(sub ty) between the two groups. Endurance time for HG was also not different between the two groups. From these results, it is concluded that the make-up can disturb selective brain cooling during body warming, although the extent is small.

Author (NASDA)

N94-29865# Toyota Coll. of Technology (Japan). Lab. of Applied Physiology.

EFFECT OF WATER IMMERSION ON MUSCLE SYMPATHETIC NERVE RESPONSE DURING STATIC MUSCLE CONTRACTION [UNDOJI NO KIN KOKAN SHINKEI HANNO NI OYOBOSU SUISHIN NO KOKA]

MITSURU SAITO, TADAAKI MANO, SATOSHI IWASE, KAZUO KOGA, CHIIHIRO MIWA, and KINSAKU INAMURA In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Vol. 30, No. 2 p 63-69 1 Jun. 1993 In JAPANESE See also A93-55328 Avail: CASI HC A02/MF A01

To clarify the effects of microgravity on sympathetic nerve response to muscular exercise, Muscle Sympathetic nerve Activity (MSA) was recorded from the tibial or peroneal nerve microneurographically during Static Handgrip (SHG) exercise in a subject with a 20 degree head up tilt position under weightlessness simulated by water immersion (WET) and during dry condition (DRY). At the resting condition, MSA burst rate, which was .4 bursts/min in DRY, was strongly suppressed by 38 percent (3.6 bursts/min) of DRY under WET. This change was significant. Static handgrip increased MSA burst rate, 10.3 bursts/min in DRY and 10.7 bursts/min in WET at the second minute of SHG, while it showed insignificant change at the first minute period of SHG (-1.2 bursts/min in DRY and -1.7 in WET). The difference in delta in MSA burst rate during SHG between DRY and WET was insignificant. However, an absolute value of MSA burst rate during the second minute of SHG was higher in DRY (19.7 bursts/min) than that in WET (14.3 bursts/min). These results indicated that the MSA responsiveness to static muscle contraction was not altered under simulated weightlessness

condition, but the level of MSA was significantly suppressed at resting condition and during muscular contraction. Thus the strong suppression of sympathetic outflow to the skeletal muscle under microgravity may be related, at least in part, to reduced adaptation of skeletal muscle function and the mechanism of muscular atrophy under microgravity.
 Author (NASDA)

N94-29919# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.

TOXICITY OF CARBON MONOXIDE-HYDROGEN CYANIDE GAS MIXTURES: EXPOSURE CONCENTRATION, TIME-TO-INCAPACITATION, CARBOXYHEMOGLOBIN, AND BLOOD CYANIDE PARAMETERS Final Report

DONALD C. SANDERS, ARVIND K. CHATURVEDI, BOYD R. ENDECOTT, ROXANE M. RITTER, and NGOCOANH VU Apr. 1994 13 p

(DOT/FAA/AM-94/7) Avail: CASI HC A03/MF A01

During aircraft interior fires, carbon monoxide (CO) and hydrogen cyanide (HCN) are produced in sufficient amounts to cause incapacitation and death. Time-to-incapacitation (t(sub i)) is a practical parameter for estimating escape time in fire environments. Exposures to CO-HCN mixtures have demonstrated that these gases have additive effects (producing shorter times to incapacitation), but the resulting concentrations of carboxyhemoglobin (COHb) and blood cyanide (CN(sup -)) at incapacitation are not well defined. These undefined relationships between COHb and blood CN(sup -) levels and the onset of incapacitation make the interpretation of postmortem levels difficult for medical accident investigators. To explore these relationships, t(sub i) was determined in laboratory rats exposed to 2 CO-HCN mixtures consisting of CO and HCN concentrations that produce 5- and 35-min t(sub i) in individual gas exposures; COHb and blood CN(sup -) concentrations were determined at incapacitation. In the high concentration CO-HCN mixture, the resultant t(sub i) was shortened from 5 min to 2.6 min; COHb dropped from 81 percent to 55 percent and CN(sup -) from 2.3 mu g/mL to 1.1 mu g/mL. At the lower concentration CO-HCN mixture, where the resultant t(sub i) was reduced from 35 min to 11.1 min, COHb dropped from 71 percent to 61 percent and blood CN(sup -) decreased from 4.2 mu g/mL to 1.1 mu g/mL. Comparison of the COHb and blood CN(sup -) values with the values from our single gas exposure studies indicated that any alteration of the uptake of either gas in blood by the presence of the other was minimal. These findings suggest that changes in COHb and blood CN(sup -) may not be directly correlated with the onset of incapacitation and that postmortem blood levels should be carefully evaluated, particularly when both gases are present in fire victims.
 Author

N94-30028# Grenoble-1 Univ. (France). Techniques de l'Imagerie, de la Modelisation et de la Cognition.

COMPUTER ASSISTED MEDICAL INTERVENTIONS: APPLICATION TO CONFORMAL RADIOTHERAPY

L. BRUNIE, P. CINQUIN, L. DESBAT, N. LAIEB, Y. MENGUY, S. LAVALLEE, J. TROCCAZ, P. VASSAL, M. BOLLA, A. DUSSEERRE et al. Jun. 1993 30 p

(RR-912-I; ETN-94-95000) Avail: CASI HC A03/MF A01

Requirements and results of conformal external radiotherapy of prostatic carcinoma are presented. A system which achieves a high overall accuracy in the delivery of the prostatic boost is described. This system is based on the use of '2.5D' ultrasonic images for measuring the actual position of the prostate just before irradiation. Since these images are registered with preoperative (computer tomography (CT) or magnetic resonance imaging) images, the position and orientation of the planning target volume is computed with respect to the irradiation system, and can be corrected accordingly. A second paper refers to the accurate repositioning of a patient with respect to CT images, which is essential for high precision radiotherapy. It is shown the intraradiotherapy portable imaging devices images may be automatically registered with three dimensional pre-session examinations, thus enabling an automatic adjustment of positioning.
 ESA

N94-30029# Grenoble-1 Univ. (France). Techniques de l'Imagerie, de la Modelisation et de la Cognition.

CONFORMAL EXTERNAL RADIOTHERAPY OF PROSTATIC CARCINOMA: REQUIREMENTS AND PRELIMINARY RESULTS J. TROCCAZ, Y. MENGUY, M. BOLLA, P. CINQUIN, P. VASSAL, N. LAIEB, L. DESBAT, A. DUSSE, and S. DALSOGLIO In its Computer Assisted Medical Interventions: Application to Conformal Radiotherapy 13 p Jun. 1993 Sponsored by Digital Equipment Corp., and Siemens

Avail: CASI HC A03/MF A01

The aim of conformal radiotherapy is to deliver with a high precision a specific dose (which may be a high dose) to a planning target volume, while concurrently irradiating as little as possible healthy tissue and organs at risks. Radiation therapy may suffer from a number of problems that result in both over or undersizing the irradiation fields, simplifying the irradiation ballistics, and delivering an insufficient tumoral dose (to spare critical organs and reduce toxicity). One of these problems lies in the accurate positioning of the planning target volume with respect to the irradiation system, thence in the correct execution of the ballistics. A system aiming at achieving a higher overall accuracy in the delivery of prostatic boost for carcinoma of the prostate is described. The system is based on the use of '2.5D' ultrasonic images for measuring the actual position of the prostate just before the irradiation. Since these images are registered with preoperative (computed tomography or magnetic resonance imaging) images, the position and orientation of the planning target volume is computed with respect to the irradiation system, and can be corrected accordingly. ESA

N94-30030# Grenoble-1 Univ. (France). Techniques de l'Imagerie, de la Modelisation et de la Cognition.

PRE- AND INTRA-RADIOTHERAPY MULTIMODAL IMAGE REGISTRATION: PRINCIPLES AND FIRST EXPERIMENTS LIONEL BRUNIE, STEPHANE LAVALLEE, JOCELYNE TROCCAZ, PHILIPPE CINQUIN, and MICHEL BOLLA In its Computer Assisted Medical Interventions: Application to Conformal Radiotherapy 16 p Jun. 1993 Sponsored by Digital Equipment Corp., and Safrir-Groupe SEM

Avail: CASI HC A03/MF A01

Accurate repositioning of the patient with respect to computer tomography (CT) images is essential for high precision radiotherapy. It is shown that intraradiotherapy portable imaging device images may be automatically registered with three dimensional pre-session examinations (typically morphological images like CT or magnetic resonance images), thus enabling an automatic adjustment of the planned strategy to the actual positioning of the patient. Based on computer vision techniques, the principles of this new method of multimodal image registration is presented, and the first experiments with a model are analyzed. ESA

N94-30185# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Physics.

CHARACTERISTICS OF SECONDARY ELECTRON EMISSION FROM CSI INDUCED BY X RAYS WITH ENERGIES UP TO 100 KEV

A. GIBREKHTERMAN, A. AKKERMAN, A. BRESKIN, and R. CHECHIK Jul. 1993 16 p (DE94-608422; WIS-PH-93-60) Avail: CASI HC A03/MF A01 (US Sales Only)

Our microscopic model for low energy electron interaction in alkali-halides was used to simulate secondary electron emission from Csl, induced by X-rays of energies up to 100 keV. The integral 'current' and 'pulse' yields were calculated as a function of the X-ray energy, Csl convertor thickness and angle of incidence. We observed a decrease in true low energy (less than 50 eV) secondary electron yields at increasing X-ray energies and discuss the effectiveness of Csl convertors coupled to gaseous electron multipliers developed for fast, high resolution X-ray imaging. DOE

N94-30453# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

MICROENCAPSULATION OF ANTI-TUMOR, ANTIBIOTIC AND THROMBOLYTIC DRUGS IN MICROGRAVITY

DENNIS R. MORRISON, BENJAMIN MOSIER, and JOHN CASSANTO In NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 1 p 117-126 Feb. 1994

Avail: CASI HC A02/MF A04

Encapsulation of cytotoxic or labile drugs enables targeted delivery and sustained release kinetics that are not available with intravenous injection. A new liquid-liquid diffusion process has been developed for forming unique microcapsules that contain both aqueous and hydrocarbon soluble drugs. Microgravity experiments, on sounding rockets (1989-92) and Shuttle missions STS-52 (1992) and STS-56 (1993) using an automated Materials Dispersion Apparatus, produced multi-lamellar microcapsules containing both Cis-platinum (anti-tumor drug) and iodinated poppy seed oil (a radiocontrast medium), surrounded by a polyglyceride skin. Microcapsules formed with amoxicillin (antibiotic) or urokinase (a clot dissolving enzyme), co-encapsulated with IPO, are still intact after two years. Microcapsules were formed with the drug so concentrated that crystals formed inside. Multi-layered microspheres, with both hydrophobic drug compartments, can enable diffusion of complementary drugs from the same microcapsule, e.g. antibiotics and immuno-stimulants to treat resistant infections or multiple fibrinolytic drugs to dissolve emboli. Co-encapsulation of enough radio-contrast medium enables oncologists to monitor the delivery of anti-tumor microcapsules to target tumors using computerized tomography and radiography that would track the distribution of microcapsules after release from the intra-arterial catheter. These microcapsules could have important applications in chemotherapy of certain liver, kidney, brain and other tumors. Author

N94-30455*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

DUAL USE OF IMAGE BASED TRACKING TECHNIQUES: LASER EYE SURGERY AND LOW VISION PROSTHESIS

RICHARD D. JUDAY In NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 1 p 131-137 Feb. 1994

Avail: CASI HC A02/MF A04

With a concentration on Fourier optics pattern recognition, we have developed several methods of tracking objects in dynamic imagery to automate certain space applications such as orbital rendezvous and spacecraft capture, or planetary landing. We are developing two of these techniques for Earth applications in real-time medical image processing. The first is warping of a video image, developed to evoke shift invariance to scale and rotation in correlation pattern recognition. The technology is being applied to compensation for certain field defects in low vision humans. The second is using the optical joint Fourier transform to track the translation of unmodeled scenes. Developed as an image fixation tool to assist in calculating shape from motion, it is being applied to tracking motions of the eyeball quickly enough to keep a laser photocoagulation spot fixed on the retina, thus avoiding collateral damage. Author

N94-30456*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. **ANALYSIS AND AN IMAGE RECOVERY ALGORITHM FOR ULTRASONIC TOMOGRAPHY SYSTEM**

MICHAEL Y. JIN In NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 1 p 138-145 Feb. 1994

Avail: CASI HC A02/MF A04

The problem of an ultrasonic reflectivity tomography is similar to that of a spotlight-mode aircraft Synthetic Aperture Radar (SAR) system. The analysis for a circular path spotlight mode SAR in this paper leads to the insight of the system characteristics. It indicates that such a system when operated in a wide bandwidth is capable of achieving the ultimate resolution; one quarter of the wavelength of the carrier frequency. An efficient processing algorithm based on the exact two dimensional spectrum is presented. The results of simulation indicate that the impulse responses meet the predicted

resolution performance. Compared to an algorithm previously developed for the ultrasonic reflectivity tomography, the throughput rate of this algorithm is about ten times higher. Author

N94-30457*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

COMPOSITE REDESIGN OF OBSTETRICAL FORCEPS

SETH W. LAWSON and STAN S. SMELTZER In NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 1 p 146-150 Feb. 1994

Avail: CASI HC A01/MF A04

Due to the increase in the number of children being born recently, medical technology has struggled to keep pace in certain areas. In these areas, particular needs have arisen to which the subject of this paper is directed. In the area of obstetrics, the forceps design and function has remained relatively unchanged for a number of years. In an effort to advance the technology, NASA Marshall Space Flight Center has been asked by the obstetrical community to help in a redesign of the obstetric forceps. Traditionally the forceps design has been of tubular stainless steel, constructed in two halves which interlock and hinge to provide the gripping force necessary to aid in the delivery of an infant. The stainless steel material was used to provide for ease of cleaning and sterilization. However, one of the drawbacks of the non-flexible steel design is that excessive force can be placed upon an infant's head which could result in damage or injury to the infant. The redesign of this particular obstetric tool involves applying NASA's knowledge of advanced materials and state of the art instrumentation to create a tool which can be used freely throughout the obstetrics community without the fear of injury to an infant being delivered. Author

N94-30458*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

DEVELOPMENT OF THE NASA/BAYLOR VAD

G. S. ABER, J. W. AKKERMAN, R. J. BOZEMAN, JR., D. R. SAUCLER, J. W. BACAK, P. A. SVEJKOVSKY, G. A. DAMM, K. MIZUGUCHI, G. P. NOON, Y. NOSE et al. In NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 1 p 151-157 Feb. 1994

Avail: CASI HC A02/MF A04

A cooperative effort between the NASA/Johnson Space Center (JSC) and the Baylor College of Medicine (BCM) has been underway since 1988 to develop a long-term implantable Ventricular Assist Device (VAD). The VAD is intended to boost the cardiac output of patients with deteriorated cardiac function. For many of these patients, the best alternative is heart transplantation. Heart transplantation is a complex and expensive procedure and usually requires a long waiting period for a donor heart. The condition of the patient often deteriorates during this waiting period which complicates the pre and post-operative care. Because of these factors, the need for a long-term implantable VAD for use as a bridge-to-transplant device or as a permanent assist device has become the focus of much research. The need for a VAD has been estimated at 50,000 to 60,000 patients per year in the United States alone. A device which satisfies all the system performance and reliability requirements has yet to be achieved. However, the development of the NASA/Baylor VAD has progressed to a state in which commercial viability can be considered. The device is small, simple, efficient and reliable which meets all requirements for a totally implantable VAD. Author

N94-30459*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A FUZZY LOGIC CONTROLLER FOR HORMONE ADMINISTRATION USING AN IMPLANTABLE PUMP

L. STEPHEN COLES and GEORGE H. WELLS, JR. In NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 1 p 158-167 Feb. 1994

Avail: CASI HC A02/MF A04

This paper describes the requirements for a Fuzzy Logic Controller for the physiologic administration of hormones by means of a FDA-approved surgically implantable infusion pump. Results of a LabVIEW computer simulation for the administration of insulin for diabetic adult patients as well as human growth hormone for pediatric patients are presented. A VHS video tape of the simulation in action has been prepared and is available for viewing. Author

N94-30460*# Army Armament Research, Development and Engineering Center, Watervliet, NY. Benet Labs.

MONITOR FOR STATUS EPILEPTICUS SEIZURES

MARK JOHNSON and THOMAS SIMKINS In NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 1 p 168-175 Feb. 1994

Avail: CASI HC A02/MF A04

This paper describes the sensor technology and associated electronics of a monitor designed to detect the onset of a seizure disorder called status epilepticus. It is a condition that affects approximately 3-5 percent of those individuals suffering from epilepsy. This form of epilepsy does not follow the typical cycle of start-peak-end. The convulsions continue until medically interrupted and are life threatening. The mortality rate is high without prompt medical treatment at a suitable facility. The paper describes the details of a monitor design that provides an inexpensive solution to the needs of those responsible for the care of individuals afflicted with this disorder. The monitor has been designed as a cooperative research and development effort involving the United States Army Armament Research, Development, and Engineering Center's Benet Laboratories (Benet) and the Cerebral Palsy Center for the Disabled (Center), in association with the Department of Neurology at Albany Medical College (AMC). Benet has delivered a working prototype of the device for field testing, in collaboration with Albany Medical College. The Center has identified several children in need of special monitoring and has agreed to pursue commercialization of the device. Author

N94-30970# Ecole Nationale Supérieure des Télécommunications, Paris (France). Groupe Image.

USE OF SNAKES TO LINK EDGE POINTS TO CREATE LEFT VENTRICULAR BOUNDARIES IN ECHOCARDIOGRAPHIC IMAGES

IAIN HUNTER (Strathclyde Univ., Glasgow, Scotland.) and HENRI MAITRE 23 Sep. 1993 37 p

(Contract SERC-92314900) (ISSN 0751-1345)

(TELECOM-93-D-016; ETN-94-95976) Avail: CASI HC A03/MF A01

The use of snakes to link edge points in left ventricular echocardiographic images to create the epicardial and endocardial boundaries is described. The edge points are created by an artificial neural network based radial search algorithm. This acts as a preprocessing stage for the snake and greatly reduces the size and complexity of the snake's external energy map. The edge points are given in terms of their polar coordinates, and the snake is used to interpolate where no edge points are present and to select the correct edge points for that boundary. The minimization of the snake's energy function by both simulated annealing and dynamic programming is studied, with dynamic programming giving better performance both in terms of accuracy and speed. ESA

N94-30978 Ecole Nationale Supérieure des Télécommunications, Paris (France). Dept. Images.

ELEMENTS FOR THE RECOGNITION OF THREE DIMENSIONAL DEFORMABLE SHAPES: APPLICATION TO BIOMEDICAL IMAGERY Ph.D. Thesis [ELEMENTS POUR LA RECONNAISSANCE DE FORMES TRIDIMENSIONNELLES DEFORMABLES: APPLICATION A L'IMAGERIE BIOMEDICALE]

NICOLAS ROUGON 1993 248 p In FRENCH Limited

Reproducibility: More than 20% of this document may be affected by

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(ISSN 0751-1353)

(TELECOM-93-E-006; ETN-94-95981) Avail: CASI HC A11

The kinematics of closed nonsingular deformable manifolds with a codimension of one when their local instantaneous evolution obeys a first order dynamics is presented. A mathematical characterization of the complex phenomena modifying differential and integral properties of nonsingular manifolds during an arbitrary deformation is given. In particular, reactive diffusive propagative processes controlling the evolution of curvature features along the manifold are identified. A multidimensional deformable model, called a *membrane/thin plate stabilizer under pressure* or *g-snake*, is developed. Dealing with 2D (two dimensional) sequences or 3D images consisting of parallel slices, a model of 2D coupled g-snakes which preserves the intrinsic geometry of data is developed. To extend the scope of g-snakes to highly noisy imaging, a cooperation between deformable manifolds and regional filtering processes is introduced; the concept of 'deformable marker' for segmentation, focused on the 'interaction' process between a deformable model and image data. Exploiting controlled morphological techniques developed in mathematical morphology, a specific interaction process based on numerical geodesic reconstruction and automated initialization procedures is proposed. To increase segmentation accuracy, the 2D g-snake model is further generalized resulting in a fully adaptive deformable model which is invariant with respect to rigid transformations within the image space. The models were applied to segmentation and global tracking of deformable anatomical structures in medical images from various modalities within the framework of quantitative functional studies. ESA

N94-31195# Ecole Nationale Supérieure des Telecommunications, Paris (France).

INTERACTIVE RECONSTRUCTION OF ANATOMICAL STRUCTURES WITH FREE-FORM SURFACES Ph.D. Thesis [RECONSTRUCTION INTERACTIVE D'ELEMENTS ANATOMIQUES A L'AIDE DE SURFACES DE FORME LIBRE] RENE EBEL 1993 318 p In FRENCH

(ISSN 0751-1353)

(TELECOM-93-E-002; ETN-94-95980) Avail: CASI HC A14/MF A03

An approach to the mathematical description of the surface of a three dimensional (3D) reconstruction of an anatomical structure from a set of 3D data point samples is described. The approach could be compared to CAGD (Computer Aided Geometric Design) insofar as it is based on interactivity and on the use of free form patches to describe the surfaces. The advantage of this approach lies in the quality of the surfaces obtained (G(sup 1) continuity or tangent plane continuity is satisfied) and in the possibility of performing reconstructions from arbitrary sets of 3D points. It is assumed that the elements to be reconstructed are smooth and that they are simple enough to enable interactivity. Reconstruction of treelike structures such as blood vessels are addressed, distinguishing three constituent elements: tubular parts, 'caps,' and 'junctions'. For each one, a particular method of reconstruction is developed. The modeling of a tubular element begins with an interactive step of estimation of axial positions. The next steps consist of automatically fitting a right generalized cylinder on the data by an iterative optimization technique. The resulting surface is composed of B spline patches. Elements like 'caps' and 'junctions' are created automatically, by the prolongation of the tubular surface with Bezier-Gregory patches. The reconstruction method proposed for tubular surfaces is extended to organs with more general forms. This time, the user is requested to associate a predefined polyhedral structure with the data. After this interactive operation, the computer produces automatically a surfacic approximation of the data by means of triangular and rectangular Bezier-Gregory patches joined with G(sup 1) continuity. ESA

N94-31323# California Univ., Berkeley. Lawrence Berkeley Lab. **HYDROGENATED AMORPHOUS SILICON (A-SI:H) BASED**

GAMMA CAMERA: MONTE CARLO SIMULATIONS

H. LEE, J. S. DREWERY, W. S. HONG, T. JING, S. N. KAPLAN, A. MIRESHGHI, and V. PEREZ-MENDEZ Jan. 1994 12 p Presented at the SPIE Medical Imaging Conference, Newport Beach, CA, 13-18 Feb. 1994

(Contract DE-AC03-76SF-00098)

(DE94-007042; LBL-35050; CONF-940254-1) Avail: CASI HC A03/MF A01

A new gamma camera using a-Si:H photodetectors has been designed for the imaging of heart and other small organs. In this new design, the photomultiplier tubes and the position sensing circuitry are replaced by 2-D array of a-Si:H p-i-n pixel photodetectors and readout circuitry which are built on a substrate. Without the photomultiplier tubes this camera is light weight, hence, it can be made portable. To predict the characteristics and the performance of this new gamma camera, we did Monte Carlo simulations. In the simulations, 128 x 128 imaging array of various pixel sizes were used. Tc-99m (140keV) and Tl-201 (70keV) were used as radiation sources. From the simulations, we could obtain the resolution of the camera and the overall system, and the blurring effects due to scattering in the phantom. Using the Wiener filter for image processing, restoration of the blurred image could be achieved. Simulation results of a-Si:H based gamma camera were compared with those of a conventional gamma camera. DOE

N94-31363# Clemson Apparel Research, Pendleton, SC.

MINIMIZATION OF CARPAL TUNNEL SYNDROME Final Report,

12 Dec. 1989 - 30 Jun. 1993

ED HILL 13 Jan. 1994 26 p

(Contract DLA900-87-D-0017)

(AD-A276409) Avail: CASI HC A03/MF A01

The objectives of this report was to develop an attachment and method to reduce the risk of Carpal Tunnel Syndrome on a side seam operation called French Felling. In addition, the research assisted in identifying the cause of the high incidence of CTS in French Felling operators and a workstation device was designed to minimize its occurrence. DTIC

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BEHAVIORAL SCIENCES

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

N94-28860# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.

NON-INTRUSIVE GAZE TRACKING USING ARTIFICIAL NEURAL NETWORKS

SHUMEET BALUJA and DEAN POMERLEAU 5 Jan. 1994 14 p

(Contract N00014-93-1-0806)

(AD-A275186; CMU-CS-94-102) Avail: CASI HC A03/MF A01

An artificial neural network based gaze tracking system which can be customized to individual users was developed. A three layer feedforward network, trained with standard error back propagation, is used to determine the position of a user's gaze from the appearance of the user's eye. Unlike other gaze trackers, which normally require the user to wear cumbersome headgear or to use a chin rest to ensure head mobility, the system is entirely nonintrusive. Currently, the best intrusive gaze tracking systems are accurate to approximately 0.75 degrees. An accuracy of 1.5 degrees was achieved with the nonintrusive system, while allowing head mobility. In its current implementation, the system works at 15 Hz. An empirical analysis of the performance of a large number of artificial neural network architectures is presented. Suggestions for further explorations for neurally based gaze trackers are provided, and are related to other similar artificial neural network applications such as autonomous road following. DTIC

N94-28887# Air Force Test Pilot School, Edwards AFB, CA.
HUMAN PILOT RESPONSE DURING SINGLE- AND MULTI-AXIS TRACKING TASKS Final Report, 8-11 Oct. 1993
 CRAIG R. EDKINS, BENJAMIN J. COFFEY, JOHN KRUZINAUSKAS, JR., DARCY GRANLEY, and MARY MCNEELY
 Dec. 1993 193 p
 (AD-A275080; AFFTC-TLR-93-41) Avail: CASI HC A09/MF A03

This report presents the results of a limited evaluation of human pilot response during single and multi-axis tracking tasks. A five member team from the USAF Test Pilot School conducted this evaluation at Buffalo, New York, from 8-11 October 1993. Five sorties totalling 7.6 hours were flown in the Calspan variable stability Lear 2 aircraft. Ground simulations in Lear 2 were also performed. Four different pitch and four different roll dynamics were evaluated using three different single and multi-axis tracking tasks. For each set of dynamics, primary pilot response parameters were recorded and examined using Fourier transform analysis in an attempt to provide a data base for pilot model development and validation. Pilot comments and Cooper-Harper ratings were also recorded. This report serves as a guide for flight test data and gives an initial look at the test results. DTIC

N94-29027 Massachusetts Inst. of Tech., Cambridge.
STRATEGIES TO SUSTAIN AND ENHANCE PERFORMANCE IN STRESSFUL ENVIRONMENTS Final Report, 15 Dec. 1990 - 15 Dec. 1992

RICHARD J. WURTMAN, ANDREW B. DOLLINS, HARRIS B. LIEBERMAN, and HARRY J. LYNCH 14 Dec. 1993 83 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
 (Contract AF-AFOSR-0125-90)
 (AD-A275223; AFOSR-94-0038-TR) Avail: CASI HC A05

This report contains the five manuscripts (one published, two in-press, one in-review, and one in-preparation) and six published abstracts completed during the three year grant period. These include descriptions of the four original research projects completed during the grant period. STUDY 1 was designed to test the effects of illumination on human nocturnal serum melatonin levels and performance. Results indicate that overnight exposure to 300, 1500, or 3000 lux of light significantly diminished serum melatonin levels in a dose-dependent manner. Performance on vigilance, reaction time, and other tasks deteriorated throughout the night, consistent with known circadian variations in these parameters, but independent of ambient light intensity and circulating melatonin levels. DTIC

N94-29154# City Univ. of New York, NY.
TEMPORAL AND QUALITATIVE DECOMPOSITION OF PLAUSIBLE REASONING Final Technical Report, 15 Mar. 1991 - 15 Jun. 1993

DAVID A. SWINNEY and EDWARD E. SMITH 15 Dec. 1993 12 p
 (Contract AF-AFOSR-0225-91)
 (AD-A275073; AFOSR-94-0002TR) Avail: CASI HC A03/MF A01

The goal of this work is to detail the temporal course of information integration during plausible reasoning, with a focus on: (1) the component processes in terms of their time-courses and information content; (2) the degree to which reasoning consists of 'modular' (autonomous, independent, informationally encapsulated) stages of processing; and (3) how components of reasoning are drawn together to eventuate in a single answer to a reasoning problem. This work has involved three relevant lines of inquiry: (1) Conceptual Combination. The set of studies in this area demonstrated that claims by Springer and Murphy to the effect that conceptual combination takes place such that initial components of the combination are not activated and processed separately, are not supported. (2) Reasoning and Categorization. These studies have demonstrated that evidence from Rips that categorization can take place based on reasoning as well as on similarity, seems to be true, but only under conditions where the informational basis for categorization is quite sparse and when the subject is aware that his/her basis for the categorization must be defended. (3) Modularity and

Discourse. A claim by Marslen-Wilson and Tyler purporting to demonstrate an important lack of modularity of processing during discourse/sentence comprehension was examined in detail utilizing a more sensitive task. It was demonstrated that modularity between semantic and syntactic information was maintained during this (particularly critical) stage of language processing. (4) Reasoning and Cognition in Neurologically Involved Populations. A series of studies focussing on the role of language in plausible reasoning, studied the degree to which early modular processes are disrupted by brain damage and aging. It was demonstrated that the early cognitive/language processing is robustly modular. DTIC

N94-29313# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.

AN ARCHITECTURALLY-BASED THEORY OF HUMAN SENTENCE COMPREHENSION Ph.D. Thesis

RICHARD L. LEWIS 18 Dec. 1993 259 p
 (Contract F33615-93-1-1330)

(AD-A275380; CMU-CS-93-226) Avail: CASI HC A12/MF A03

This thesis presents NL-Soar, a detailed computational model of human sentence comprehension that accounts for a broad range of psycholinguistic phenomena. NL-Soar provides in-depth accounts of structural ambiguity resolution, garden path effects, unproblematic ambiguities, parsing breakdown on difficult embeddings, acceptable embeddings, immediacy of interpretation, and the time course of comprehension. The model explains a variety of both modular and interactive effects, and shows how learning can affect ambiguity resolution behavior. In addition to accounting for the qualitative phenomena surrounding parsing breakdown and garden path effects, NL-Soar explains a wide range of contrasts between garden paths and unproblematic ambiguities, and difficult and acceptable embeddings: the theory has been applied in detail to over 100 types of structures representing these contrasts, with a success rate of about 90%. The account of real-time immediacy includes predictions about the time course of comprehension and a zero-parameter prediction about the average rate of skilled comprehension. Finally, the theory has been successfully applied to a suggestive range of cross-linguistic examples, including constructions from head-final languages such as Japanese. DTIC

N94-29715# Nagoya Univ. (Japan). Space Medicine Research Center.

A DISCUSSION OF EYE-HEAD COORDINATIVE MOVEMENT UNDER MICROGRAVITY DURING PARABOLIC FLIGHT [PARABORIKKU FURAITO NI YORU TEI JURYOKU KANKYOKA DENO HITO NO TOBU/GANKYU KYOUOU UNDO NO KENTO]
 KAZUO KOGA In Society of Medical Research for Space Station, The MERSS 5th Symposium on Space Medicine: Medical and Physiological Experiment Utilizing Parabolic Flight p 34-41 Mar. 1993 In JAPANESE

Avail: CASI HC A02/MF A01

The labyrinth can sense gravity as a mechanical stimulation of statoliths. In addition, some muscles which are always forced to be strained against gravity, baroreceptor and tactor on skin surface, and deep sensitivity of arthrosis can also sense gravity as a secondary information. There is a possibility that visual information may be indirectly related with sensing gravity. This multi-modal sensory is integrated in normal condition, however, the integration may be lost when environment is changed, such as in weightless condition. Therefore, it is meaningful to study man's adaptation to the microgravity by using visually up-down reversing mirror, and to study impression of a person he meets, with up-down position with or without the up-down reversing mirror. It can be predicted that the up-down reversing and front-back reversing have more eccentric cue other than visual sense so that the adaptation will be achieved more smoothly, than right-left reversing. For these reasons, eye-head coordination is going to be examined under microgravity achieved by parabolic flight. The measurement devices necessary for such experiment was discussed. This report explained the potential of parabolic flight, and measuring instrument of head

movement, such as miniaturized three-axis acceleration sensor and optical position sensor. Author (NASDA)

N94-29716# Toyohashi Univ. of Technology, Aichi (Japan). Information and Computer Sciences.

ANALYSIS OF VARIOUS BIOLOGICAL ACTIVITY PARAMETERS DURING PARABOLIC FLIGHT [PARABORIKKU FURAITO NI OKERU KAKUSHU SEITAI SHINGO NO KAISEKI] SHIRO USUI and YUTAKA HIRATA In Society of Medical Research for Space Station, The MERSS 5th Symposium on Space Medicine: Medical and Physiological Experiment Utilizing Parabolic Flight p 42-47 Mar. 1993 In JAPANESE Prepared in cooperation with NASDA, Tokyo, Japan; the Research Inst. of Environmental Medicine, Nagoya Univ., Aichi, Japan; and Nihon Univ., Tokyo, Japan Avail: CASI HC A02/MF A01

Whether a man can keep vital activity in weightless condition largely depends on homeostasis, and the homeostasis is controlled by autonomic nervous system. Because pupillary response is also related with autonomic nervous system, it has been used as an index of autonomic nervous activity. In this study, the pupillary response as well as other biological activity parameters were measured in order to examine whether the response is useful for monitoring autonomic nervous activity during microgravity achieved by parabolic flight. As a result, heart rate, blood pressure and spirogram changed according to the change of gravity, and psychogalvanic response showed mental tension during parabolic flight. For pupillary response, diameter of the pupil, degree of miosis, delay of response time, maximum miosis velocity and maximum mydriasis velocity were determined as parameters. All of these parameters were changed according to change of gravity, which implies that these parameters can indicate autonomic nervous activity under microgravity. Author (NASDA)

N94-29867# Kyorin Univ., Tokyo (Japan). Dept. of Physiology. **PSYCHOPHYSIOLOGICAL STUDY ON THE EFFECTS OF COEXISTENCE OF LINES FOR DETECTING DOT TARGET [TEN SHIHYO NO SHININSEI NI OYOBOSU KINBO SENBUN NO EIHYO NI KANSURU SHINRI SEIRIGAKUTEKI KENKYU]** KIYOSHI MIZUMOTO In Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Vol. 30, No. 2 p 81-91 1 Jun. 1993 In JAPANESE See also A93-55330 Avail: CASI HC A03/MF A01

The following two experiments were carried out in normal subjects to verify the difficulty to detect the small target near the frame of windshield in the airplane: (1) using a tachistoscope, small black dot stimulus was exposed for 10, 30, 50, 70 and 0 msec at either side of and at either of 1.83, 2.24 and 2.65 degrees from the central fixation point with or without a pair of vertical lines. Nine subjects pushed a key to answer the side of the dot exposed. The correct response rates increased while the reaction time decreased with the exposure time. Detectability of the dot stimulus near lines was poorer than that in the white background, especially for 0 msec stimulus exposure time; and (2) visual event-related potentials in response to the dot stimuli exposed for 0 msec were recorded from six scalp electrode sites in eight subjects. Two dots were exposed simultaneously at both sides of the fixation point with or without lines. The position of dots was 1.83 and 2.65 degrees and lines 1.32 and 3.15 degrees apart from the fixation point respectively. Dots were exposed 128 times (50 percent) randomly per each condition. Subjects were directed to count the number of the exposure with dots. The difference of the amplitude of P300 components between dot exposure and no-exposure was largest when the dots were exposed without lines. These results suggest the difficulty to detect targets near the frame of aircraft windshield. Author (NASDA)

N94-29918# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.

SCANNING AND MONITORING PERFORMANCE: EFFECTS OF THE REINFORCEMENT VALUES OF THE EVENTS BEING

MONITORED Final Report

P. G. RASMUSSEN and A. M. REVZIN Apr. 1994 9 p (DOT/FAA/AM-94/8)

Avail: CASI HC A02/MF A01

We formulated a hypothesis suggesting that operators could make scanning and monitoring errors if they tended to concentrate on a 'high-value' display sub-area while ignoring 'low-value' problems elsewhere on the display. Such 'data' would have application to Air Traffic Control Specialist (ATCS) jobs. We tested the hypothesis in an experiment rewarding good performance in a laboratory task. Subjects monitored two visual display 'work areas' with defined task difficulty. In the high-value work area, each error cost the subjects four or ten times as much as in the low-value work area. The data obtained suggest that differing task error penalties, or reinforcement values, can induce a greater than usual frequency of errors in some subjects. Rewarding good performance in two-work area tests without differing error penalties did not induce significant error rate differences, nor did such rewards significantly affect total task performance levels. This was true even in tests where such differential attention could benefit the subject's overall performance score, thereby increasing subject's performance bonus. However, about 15 percent of our subjects showed a marked tendency to concentrate their attention on a display sub-area having high-value events while periodically ignoring events elsewhere on the display. Such information may be useful in reducing the frequency of scanning errors by revising training protocols or personnel selection criteria. Author

N94-30969 National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

SPECTRAL ANALYSIS OF HEART RATE AND PSYCHOLOGICAL STATE: A REVIEW OF ITS VALIDITY AS A WORKLOAD INDEX

P. G. A. M. JORNA (Institute for Perception RVO-TNO, Soesterberg, Netherlands.) 25 Feb. 1993 25 p Submitted for publication Limited Reproducibility: More than 20% of this document may be affected by microfiche quality (AD-B179387; NLR-TP-93034-U; ETN-94-95975) Avail: CASI HC A03

Background information on concepts of mental workload and stress and the possibility of indexing them by means of spectral analysis of heart rate is presented. A literature review of practical implementations of the technique in laboratory and field studies is provided with the purpose of evaluating its utility as a tool in the study of mental workload and stress. ESA

N94-31243# Southeastern Center for Electrical Engineering Education, Inc., Saint Cloud, FL.

SITUATIONAL AWARENESS: A FEASIBILITY INVESTIGATION OF NEAR-THRESHOLD SKILLS DEVELOPMENT Final Report, 27 Jul. 1987 - 31 May 1991

GRANT E. SECRIST and BRYCE O. HARTMAN Jan. 1994 75 p (Contract F33615-87-C-0614) (AD-A276467; AL/AO-TR-1994-0002) Avail: CASI HC A04/MF A01

A decisive capability possessed by superior fighter-attack pilots is keen situational awareness. In this report, we examine the trainability of near-threshold information acquisition and processing skills that appear to be vital to heightened situational awareness. The investigation served two purposes: (1) determine the effects of near-threshold training on target detection, recognition, and identification performance; and (2) assess the general transfer of this training to velocity discrimination and peripheral vision two-flash threshold performance. Ten flight-qualified AFOTC cadets served as trainees. Each trainee received 5,040 near-threshold training trials over five consecutive days. The findings indicate that near-threshold skills are trainable. Group and individual learning curves reflected consistent improvement in target detection, recognition, and identification accuracy at target durations down to 33 ms. Statistically significant differences were found between group baseline and post-training performance. DTIC

N94-31291# Naval Command, Control and Ocean Surveillance Center, San Diego, CA. Research, Development, Technology and Evaluation.

TOWARDS SIMPLICITY: NOISE AND COOPERATION IN THE PERFECT INTEGRATOR Professional Paper

A. R. BULSARA Feb. 1994 19 p

(AD-A276256) Avail: CASI HC A03/MF A01

Neuroscientists have known for decades that sensory information is encoded in the intervals between the action potentials or spikes characterizing neural firing events. Statistical analyses of experimentally obtained spike trains have shown the existence of a significant random component in the inter-spike intervals. There has been speculation, of late, that the noise may actually facilitate the transmission of sensory information; certainly there exists evidence that noise in networks of neurons can dynamically alter the properties of the membrane potential and the time constants. This paper describes the recent rekindling of interest in the Stochastic Resonance phenomenon leading to speculation that such nonlinear cooperative effects may occur naturally in living systems. DTIC

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

N94-28861# Klein Associates, Inc., Fairborn, OH.

DESIGNING FOR PERFORMANCE: A COGNITIVE SYSTEMS ENGINEERING APPROACH TO MODIFYING AN AWACS HUMAN COMPUTER INTERFACE Final Report, Jan. 1991 - Feb. 1993

DAVID W. KLINGER, STEPHEN J. ANDRIOLE, LAURA G. MILITELLO, LEONARD ADELMAN, and GARY KLEIN Mar. 1993 109 p

(Contract F33615-90-C-0533)

(AD-A275187; AL/CF-TR-1993-0093) Avail: CASI HC A06/MF A02

Cognitive systems engineering (CSE) is primarily a blend of technological opportunities, findings from cognitive research, and cognitive task analysis. Using CSE, we were able to produce an efficient and effective redesign of the AWACS weapons director (WD) station. The revised WD station was tested using 17 WD's. These WD's performed defensive counter air missions with both the current interface and the revised interface. The training of the participants on the revised interface was quite brief (4.5 hours). As a result, the WD's did not achieve the same degree of familiarity or automation with the revised interface that they have with the current interface. Yet, when WD's were using the revised system, their performance improved. This is indicated by an increase in performance for a number of process and outcome measures. Also, a skilled WD provided blind ratings of WD performance. These global ratings were significantly higher for the revised interface. The effectiveness of the revised interface suggests that it is possible to pinpoint cognitive task requirements and to make these the driving factors in a design effort. The use of CSE may be a feasible aspect of the design process, enabling system developers to achieve a much stronger effectiveness at relatively low cost. DTIC

N94-28902# Naval Health Research Center, San Diego, CA.

COMPARISON OF TWO COOL VESTS ON HEAT-STRAIN REDUCTION WHILE WEARING A FIREFIGHTING ENSEMBLE IN A HOT/HUMID ENVIRONMENT Final Report

BRAD L. BENNETT, R. D. HAGAN, K. A. HUEY, C. MINSON, and D. CAIN Jul. 1993 27 p (AD-A275103; NHRC-93-10) Avail: CASI

HC A03/MF A01

Understanding the impact of heat strain on the performance of naval personnel has important application to shipboard fire-suppression activities. Firefighting is associated with heat strain as demonstrated by large increases in skin and core temperatures and near maximal heart rates (Duncan et al., 1979; Romet and Frim, 1987; Bennett et al., 1992). These responses can attribute to body heat production caused by wearing 30 to 40 pounds of personnel protection equipment, the physical effort associated with carrying equipment (e.g., fire hose, ventilation fans), and the heat gain due to exposure to high ambient temperature and humidity. DTIC

N94-28918# Air Force Inst. of Tech., Wright-Patterson AFB, OH. **AN INVESTIGATION OF STEREOPSIS WITH AN/AVS-6 NIGHT VISION GOGGLES AT VARYING LEVELS OF ILLUMINANCE AND CONTRAST M.S. Thesis**

JEFFREY J. ARMENTROUT 1993 81 p

(AD-A275332; AFIT/CI/CIA-93-160) Avail: CASI HC A05/MF A01

The increased reliance on night operations by the military over the last few decades has led to the development of various night imaging devices. Night vision goggles (NVG's) are one device which have gained widespread use in nighttime helicopter operations. However, rotorcraft accident data have indicated an increased occurrence of 'pilot error' type accidents when NVG's are in use. NVG related accidents often can be linked to extremely poor ambient lighting and contrast conditions during nighttime operations as well as the imaging limitations of the NVG's. Research has shown that NVG's reduce visual acuity and depth perception when compared to unaided daylight viewing conditions. In this study the effects of illumination and contrast on stereoscopic vision with and without AN/AVS-6 goggles were investigated. Stereoacuity was measured using a modified Howard-Dolman apparatus with four levels of illumination and three levels of contrast. DTIC

N94-28996# Aerospace Medical Research Labs., Brooks AFB, TX. Crew Systems Directorate.

COMPARATIVE CENTRIFUGE EVALUATION OF THE AIR FORCE ADVANCED TECHNOLOGY ANTI-G SUIT (ATAGS) AND THE NAVY ENHANCED ANTI-G LOWER ENSEMBLE (EAGLE) Final Report, Sep. 1992 - Dec. 1993

JOHN W. BURNS and RONALD C. HILL 30 Dec. 1993 6 p

(AD-A275348; AL/CF-PC-1993-0052) Avail: CASI HC A02/MF A01

The centrifuge evaluation of the ATAGS and EAGLE was undertaken to determine which extended coverage anti-G suit would enter engineering and manufacturing development for joint service use. Eight male centrifuge subjects were used. The subjects were wearing either an ATAGS, with or without pressure socks, or an EAGLE. Pressure breathing during G (COMBAT EDGE) was used with all three combinations. The combinations were randomized to eliminate any order effect. The arms of all subjects were wrapped from the wrist to the axilla with 3 in. wide elastic bandage to reduce the possibility that subjects might stop the +G(sub z) exposure for arm pain rather than for fatigue or light loss. GOR, ROR, and 5-9 SACM +G(sub z) profiles were used to compare the suits. Although not significantly different, the average number of 9G plateaus completed for the ATAGS with socks, the ATAGS without socks, and the EAGLE were 8.0, 7.8, and 6.5, respectively. Subject HR, while wearing the ATAGS with pressure socks, was significantly ($p = .03$) lower than HR while wearing the EAGLE during the 5G plateaus of the 5-9 +G(sub z) SACM. The perceived effort involved in the straining maneuver during the 5-9 SACM with the EAGLE was consistently, but not significantly, greater across the 9G plateaus compared to the ATAGS with pressure socks. However, there was a significant ($p = .032$) suit/time interaction between the ATAGS with pressure socks and the EAGLE. There was no significant difference in subject HR or +G(sub z) tolerance between the three G-suit combinations during the GOR or ROR +G(sub z) exposures. DTIC

N94-28997# Krug Life Sciences, Inc., San Antonio, TX.
PROCEDURES AND METRICS FOR ANTI-G SUIT EVALUATIONS Interim Report, Nov. 1992 - Nov. 1993
 GRADY L. RIPLEY, RICHARDO PEREZ, III, and DANIEL H. BAUER
 Nov. 1993 5 p
 (Contract F33615-92-C-0018)

(AD-A275349; AL/CF-PC-1993-0043) Avail: CASI HC A01/MF A01
 The ATAGS (Advanced Technology Anti-G Suit) design process initially relied on comments made by human test subjects to subjectively evaluate the effects of design changes on inflation characteristics. A standardized test method was needed to objectively quantify the effects of the design changes and also to compare the inflation characteristics of other anti-G suits. Therefore, a test was designed to measure the filling characteristics of different anti-G suits fitted to a standard mannikin. Several factors had to be considered in developing a test method that was both operationally significant and provided consistently valid data. The factors considered were as follows: don/doff requirements, the effects of evacuation of the anti-G suits prior to testing, mannikin position, and additional life support equipment worn with the anti-G suit. Parameters measured to assess the inflation characteristics were flow rate, fill times, and differential pressures in the suit. DTIC

N94-29029 Southeastern Center for Electrical Engineering Education, Inc., Saint Cloud, FL.

REMOTE CONTROL OF TRANSCRANIAL DOPPLER (TCD) PROBE DURING CENTRIFUGE EXPOSURES UP TO 9 +GZ Final Report, Oct. 1987 - Dec. 1993

ULF I. BALDWIN, PAUL WERCHAN, and TRAVIS EDDY Jan. 1994
 6 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
 (Contract F33615-87-D-0609)

(AD-A275253; AL/CF-PC-1993-0046) Avail: CASI HC A02
 TCD systems have been successfully used in clinical practice for estimating cerebral perfusion by registering blood flow velocity in the middle cerebral artery. However, when used in centrifuges, probe movement during high +Gz have resulted in the loss of Doppler signal making interpretations of data very difficult. To solve this problem, the Doppler probe and three electrical motors were mounted on a tightly fitted helmet. Remote control of these motors allows precise tilting and sliding of the probe during G exposures. Vertical movement of the probe is recorded when a good flow velocity signal is achieved. On succeeding G-exposures, the probe is moved to the predicted positions for different G-loads when the G-load changes. A computer program to automate this process is currently under development. With this device, blood flow velocity in the middle cerebral artery can be registered at G-loads up to 9 +Gz with increased accuracy. DTIC

N94-29034# Air Force Systems Command, Wright-Patterson AFB, OH. Crew Systems Directorate.

STRESS AND ERGONOMIC DESIGN AND EVALUATION OF PERSON-MACHINE SYSTEMS Final Report, Jan. 1992 - May 1993

HERSCHEL C. SELF May 1993 35 p
 (Contract AF PROJ. 7184)
 (AD-A275156; AL/CF-SR-1993-0008) Avail: CASI HC A03/MF A01

This report was written to make system designers and developers more stress-conscious and more alert to sources of potentially harmful operator stress. They are then more capable of designing person-machine systems in which stress is optimized, in which equipment and operating procedures are a good fit to system operators. In such systems, worker morale and performance are maintained, and the lifecycle system costs are less. Despite careful design efforts aided by preproduction tests and evaluations, person-machine systems often come into wide use with unanticipated and potentially harmful stress-related operator problems. How this can happen is made evident by examining stress in general and stress

in and out of the workplace. Examples of stress and strain are given. Stress from inadequate visual conditions is given special emphasis. The presentation is from ergonomic or application viewpoint. A stress checklist is given in the appendix. DTIC

N94-29093 Materials Research Labs., Ascot Vale (Australia).
PORTABLE VENTILATORY RESUSCITATION SYSTEMS
 WAI-MAN LAU and MARGARET DOWLING Nov. 1993 15 p
 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
 (AD-A274984; MRL-TN-649; DODA-AR-008-575) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

A review on the commonly used resuscitators in Australia was conducted. Their specifications, capability, and limitations are examined and discussed. Some products are modified for operations in chemically contaminated environments and one of them will soon undergo clinical trials. DTIC

N94-29184 Navy Experimental Diving Unit, Panama City, FL.
ADVANCED SEAL DELIVERY SYSTEM LIFE SUPPORT PARAMETERS Technical Report, May - Dec. 1993

M. E. KNAFELC Dec. 1993 14 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
 (AD-A275304; NEDU-2-94) Avail: CASI HC A03

The purpose of this document is to provide a guideline to the technical evaluation board when reviewing the proposals for the Advanced SEAL Delivery System (ASDS). These guidelines are based upon a design that consists of at least two habitable compartments. The pilot and navigator will occupy one compartment, and its internal pressure will be maintained at 1 ATA. Another habitable compartment will hold the divers, and its inside pressure can be adjusted to permit controlled compression and decompression, or be maintained at a constant 1 ATA. The habitable chambers will be kept dry. Because of safety, environmental, and human factors' considerations, it is desirable for the lock-out chamber to be separate from the habitable compartments. DTIC

N94-29302# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

INSULATIVE PROPERTIES OF TWO THERMO-METAL NEOPRENES Research Report

MICHAEL B. DUCHARME and JOHN FRIM Dec. 1993 17 p
 (AD-A275209; DCIEM-93-53) Avail: CASI HC A03/MF A01

The objective of the present study was to compare the thermal resistance of two thermo-metal neoprenes (titanium and stainless steel coated) to the current Canadian Forces Arctic diving suit neoprene (CF-N) in dry and wet environment. The test in the dry environment were conducted using a Rapid-k thermal conductivity instrument, and in the wet environment using a custom-made apparatus. The dry tests were conducted at 1 atmosphere in the laboratory, and the wet tests were done in a hyperbaric water chamber maintained at 5 C and at depths of 0, 10, 25, 50, and 100 m. Pre- and post-dive tests were performed on the same samples to investigate the effects of two dives on the thermal resistance of the neoprenes. It was found that the thermal insulation of the two thermo-metal neoprenes tested was significantly higher than that of the CF-N in both the dry and the wet environments. The best thermo-metal neoprene, the stainless steel coated neoprene, averaged an improvement of 53% in the dry and 60% in the wet environment (ranging from 70% at 0 m to 34% at 100 m). The insulative properties of the thermo-metal neoprenes were affected, however, by the dives, decreasing by about 12% after two dives. It was concluded that the stainless steel thermo-metal neoprene could be a potential alternative to the current CF Arctic diving suit neoprene but further testing is needed on the long term effects of dives and aging on the insulative properties of the material. DTIC

N94-29710# Diamond Air Service, Inc. (Japan).
MICROGRAVITY BY PARABOLIC FLIGHT WITH MU-300 AIRCRAFT [MU-300 BIJINESU JETTOKI NI YORU MAIKURO G FURAITO]

MITSUO SATO In Society of Medical Research for Space Station, The MERSS 5th Symposium on Space Medicine: Medical and Physiological Experiment Utilizing Parabolic Flight p 1-8 Mar. 1993 In JAPANESE

Avail: CASI HC A02/MF A01

Parabolic flight has an advantage to achieve microgravity with ease and at a low-cost, as well as to enable the performance of science experiments by payload specialists themselves. This report summarizes results of a simulation study and actual flight for microgravity. Model flight pattern was determined on the basis of the most appropriate values for recovery gravity, maximum rising degree, maximum descending degree and pull-up gravity which were obtained by results of simulating calculation and test flights measuring gravity every 5 deg during chandelling and nose driving. In the test flights, the plane was controlled by manual steering, assuming that the stabilizer trim was out of order. As a result, 1/100 to 5/100 G was achieved for an average of 20 seconds, maximum 24 seconds. The safety was confirmed in simulation calculation, determination of flight pattern, and structure and checking of the airframe. The microgravity experiments have been utilized for various fields, such as life science, material engineering, and physics.

Author (NASDA)

N94-29729 Vanderbilt Univ., Nashville, TN.

EVA GLOVE EVALUATION METHODOLOGY AND TEST PROTOCOL Ph.D. Thesis

ELAINE MARIE HINMAN-SWEENEY 1993 244 p

Avail: Univ. Microfilms Order No. DA9324440

One of the most critical components of a spacesuit is the gloves, yet gloves have traditionally presented significant design challenges. With the continued and varied efforts at glove development, a method for evaluating glove performance is needed. This dissertation presents a pressure glove evaluation protocol. A brief history of extra-vehicular activity (EVA) glove development and test procedures is given. A description of this evaluation protocol, and its development is provided. The protocol allows comparison of one glove design to another, or any one design to bare handed performance. Gloves for higher pressure suits may be evaluated at current and future design pressures to drive out differences in performance due to pressure effects. Using this protocol, gloves may be evaluated during design to drive out design problems and determine areas for improvement or fully mature designs may be evaluated with respect to mission requirements. Several different test configurations are presented to handle these cases. A glovebox, set of tasks, and a methodology to evaluate glove performance was developed. Evaluating comfort has been a difficulty in glove testing. A technique for quantifying comfort data is presented. This protocol was run on a prototype glove. The prototype was evaluated at two operating pressures and in the unpressurized state, with results compared to bare-handed performance. Results and analysis from this test series are provided, as is a description of the test configuration used for this test.

Dissert. Abstr.

N94-29950 Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Applied Thermodynamics.

MAINTAINING ACCEPTABLE THERMAL COMFORT WITH A LOW AIR TEMPERATURE BY MEANS OF LOCAL HEATING

R. SOERLIE 13 Jul. 1993 11 p See also DE85750802

(PB94-138526; STF15-A93053) Avail: Issuing Activity (National Technical Information Service (NTIS))

The main objective was to assess (1) the lower room temperature for acceptable thermal comfort of the person seated at the desk, and (2) to assess the energy-saving qualities of the local heater. During the experiments various temperatures, air velocity, radiant flux and thermal asymmetry were all measured. The thermal mannequin was used in order to verify the level of thermal comfort and was constructed in such a way as to be thermally equivalent to a

human. The local heater creates a local microclimate with satisfactory thermal comfort for the person seated at the desk, while the temperature in the rest of the room can be as low as 17-18 C. Supplementary thermal simulations carried out on computer showed that it is possible to save heating energy by reducing the general room temperature.

NTIS

N94-30000 Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Refrigeration Engineering.

CONTROL OF HEATING, VENTILATION AND AIR CONDITIONING (HVAC) SYSTEMS

M. C. SVENSSON 11 Aug. 1993 40 p

(PB94-138807; STF11-A93056) Avail: Issuing Activity (National Technical Information Service (NTIS))

The report contains the English version of chapter 9 in a new book which will be published in German (Bauverlag). Chapter 9 discusses different aspects regarding control of heating, ventilation, and air-conditioning (HVAC) systems. The book project coordinator is Dring S. Nowotny, and the preliminary book title is: Technische Gebaudeausrustungen.

NTIS

N94-30122*# George Washington Univ., Washington, DC. Science Communication Studies.

PUBLICATIONS OF THE NASA CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM (CELSS) PROGRAM 1989-1992

JANET V. POWERS Mar. 1994 46 p

(Contract NASW-4324)

(NASA-CR-4603; NAS 1.26:4603) Avail: CASI HC A03/MF A01

Publications of research sponsored by the NASA Controlled Ecological Life Support System (CELSS) program are listed. The CELSS program encompasses research and technology with the goal of developing an autonomous bioregenerative life support system, which is based upon the integration of biological and physical/chemical processes, that will produce nutritious and palatable food, potable and hygienic water, and a breathable atmosphere by recycling metabolic and other wastes. This research and technology development is being performed in the areas of biomass production/food processing, waste management, and systems management and control. The bibliography follows these divisions. Principal investigators whose research tasks resulted in publication are identified by an asterisk. Publications are identified by a record number corresponding with their entry in the Life Sciences Bibliographic Database, maintained at the George Washington University.

Author (revised)

N94-30132# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

THE USE OF TASK NETWORK SIMULATION IN WORKLOAD PREDICTION

MARY MARGARET SCHUCK and KEITH C. HENDY 1992 7 p

(DCIEM-92-32; CTN-94-61138) Avail: CASI HC A02/MF A01

As aviation systems become increasingly complex, it becomes more important to design these systems within the capabilities and limitations of their operators. Practical workload and performance prediction techniques are thus required for the design of systems. One technique which has proven useful is task network simulation. This approach produces a simulated task timeline for the given mission, but must be linked with some model of human information processing in order to make workload or performance predictions. The use of task network simulation within the Canadian Department of National Defence for the prediction of workload during the early design of complex man-machine systems is reviewed. The measures of workload used within the simulation are detailed, with particular emphasis on the use of task rating scales and task conflict matrices. The modifications to these two tools made at the Defence and Civil Institute of Environmental Medicine are presented as well as their present and future applications.

Author (CISTI)

N94-30188*# Rush-Presbyterian-Saint Luke's Medical Center, Chicago, IL.

CIRCADIAN COUNTERMEASURES FOR SHIFTWORKERS

**DURING USMP-2: A REPORT TO MISSION MANAGEMENT
Final Report**

KAREN T. STEWART and JULIE HAYES Apr. 1994 30 p
(Contract NASA ORDER H-13012-D)
(NASA-CR-195260; NAS 1.26:195260) Avail: CASI HC A03/
MF A01

People who must work at night experience a number of physiological and psychological difficulties. These include sleepiness and fatigue at work, poor daytime sleep, gastrointestinal distress, impaired concentration and performance, disturbed mood, and increased health complaints and risk of disease. These difficulties arise because nocturnal work and daytime sleep take place at inappropriate phases of the body's circadian rhythms. Intense artificial light can shift the phase of human circadian rhythms, and can thus be used to promote adaptation to shifted work schedules. The first attempts to investigate the efficacy of light treatment for MSFC POCC shiftworkers took place during USML-1 and ATLAS-2. The findings from these studies led to the development of a *Circadian Countermeasures Program* that was implemented during USMP-2. Light treatment and other circadian countermeasures were employed to promote adjustment to mission shiftwork in POCC cadre volunteers. Treatment protocols were designed and customized for each volunteer's work hours and personal preferences. Treatment protocols included some or all of the following: scheduled self-administration of intense light, scheduled avoidance or attenuation of sunlight at other times, and sleep schedules. Data from post-mission questionnaires indicated that volunteers found the program to be effective, convenient, and beneficial. Author

N94-30210* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

TACTILITY AS A FUNCTION OF GRASP FORCE: EFFECTS OF GLOVE, ORIENTATION, PRESSURE, LOAD, AND HANDLE
RAM R. BISHU (Nebraska Univ., Lincoln.), LISA A. BRONKEMA (Nebraska Univ., Lincoln.), DISHAYNE GARCIA (Wichita State Univ., KS.), GLENN KLUTE, and SUDHAKAR RAJULU May 1994 23 p
(NASA-TP-3474; S-761; NAS 1.60:3474) Avail: CASI HC A03/
MF A01

One of the reasons for reduction in performance when gloves are donned is the lack of tactile sensitivity. It was argued that grasping force for a weight to be grasped will be a function of the weight to be lifted and the hand conditions. It was further reasoned that the differences in grasping force for various hand conditions will be a correlate of the tactile sensitivity of the corresponding hand conditions. The objective of this experiment, therefore, was to determine the effects of glove type, pressure, and weight of load on the initial grasping force and stable grasping force. It was hypothesized that when a person grasps an object, he/she grasps very firmly initially and then releases the grasp slightly after realizing what force is needed to maintain a steady grasp. This would seem to be particularly true when a person is wearing a glove and has lost some tactile sensitivity and force feedback during the grasp. Therefore, the ratio of initial force and stable force and the stable force itself would represent the amount of tactile adjustment that is made when picking up an object, and this adjustment should vary with the use of gloves. A dynamometer was fabricated to measure the grasping force; the tests were performed inside a glove box. Four female and four male subjects participated in the study, which measured the effects of four variables: load effect, gender effect, glove type, and pressure variance. The only significant effects on the peak and stable force were caused by gender and the weight of the load lifted. Neither gloves nor pressure altered these forces when compared to a bare-handed condition, as was suspected before the test. It is possible that gloves facilitate in holding due to coefficient of friction while they deter in peak grasp strength. Author (revised)

N94-30304 Alberta Research Council, Edmonton. Dept. of Advanced Computing and Engineering.
ASPECTS OF THE OPERATOR INTERFACE FOR

MILITARY ROBOTIC APPLICATIONS IN UNSTRUCTURED ENVIRONMENTS

P. FEIGHAN, P. WOJCIK, and K. CHRYSTALL In Defence Research Establishment Suffield, Proceedings of the 3rd Conference on Military Robotic Applications p 220-226 1991
Avail: Issuing Activity (Defence Research Establishment Suffield, P.O. Box 4000, Medicine Hat, AB T1A 8K6 Canada)

The major challenges facing a designer of a military robotics operator interface are discussed. These include operating in unstructured environments, coping with restricted communications between operator and remote robotic system, defining the level of autonomy of the robotic system; and monitoring system health. Currently available operator interface technologies for remote robotic systems are reviewed which have been developed and tested in industrial or research laboratories. This overview includes discussion of the level of autonomy of telerobotic systems and its impact on the operator interface design, as well as description of the best ways of displaying information from the remote system and of inputting necessary commands and controls for telerobots. The concepts of military robotics operator interfaces are then introduced, based on two scenarios: simple teleoperation and remote control of a semiautonomous robotic system. Both use synthetic graphics to help the operator understand the work environment. This technology has recently been found very useful and its importance in operating remote robotic systems is expanding. Further areas of research are recommended. Author (CISTI)

N94-30320 Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Algorithmics and Architecture.
THE ERGONOMICS OF COMPUTER INTERFACES: DESIGNING A SYSTEM FOR HUMAN USE

LAMBERT G. L. T. MEERTENS and STEVEN PEMBERTON Dec. 1992 29 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(ISSN 0169-118X)

(CWI-CS-R9258; ETN-94-95540) Copyright Avail: CASI HC A03
A discussion on the ergonomic problems with currently available software products and what in general is necessary in order to make an application pleasant to use is presented. The application of these principles to an open architecture user interface system, Views, is described. ESA

N94-30390 National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.

AIDING THE OPERATOR IN THE MANUAL CONTROL OF A SPACE MANIPULATOR

J. F. T. BOS, H. G. STASSEN, and A. VANLUNTEREN 29 Jun. 1992 11 p Presented at the 5th IFAC/IFIP/IFORS/IEA Symposium on Analysis, Design and Evaluation of Man-Machine Systems, The Hague, Netherlands, 9-11 Jun. 1992 Sponsored by Netherlands Technology Foundation Prepared in cooperation with Fokker Space and Systems Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB94-125549; NLR-TP-92261-U; ETN-94-95586) Avail: Issuing Activity (European Space Agency (ESA))

Three problems faced by an operator when controlling a space manipulator manually were investigated: lack of direct vision, up to six degrees of freedom to be controlled, and slow and complex dynamics. The results showed that reference lines enhance the three dimensional perception; further automation of the insert task led to a more efficient task execution; the display of the stopping configuration can lead to a faster and safer task execution. The display of the predicted trajectory led to less energy consumption due to a more calm control behavior. The length of the prediction horizon should equal half of the stopping time. ESA

N94-30422 National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

SAMPLING BEHAVIOUR IN A FOUR INSTRUMENT MONITORING TASK: EFFECTS OF SIGNAL BANDWIDTH AND

NUMBER OF EVENTS PER SIGNAL

H. G. M. BOHNEN, M. A. M. LEERMAKERS, and P. J. VENEMANS
31 Dec. 1992 35 p Submitted for publication Sponsored by the Co-Operation Centre of Tilburg and Eindhoven Universities Limited
Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-B179613; NLR-TP-92386-U; ETN-94-95960) Avail: CASI HC A03

The effect of global signal characteristics, such as bandwidth and number of events on human sampling behavior, is investigated. Whether or not the influence of these characteristics on sampling strategy is affected by local (actually observed) signal features, such as the degree with which a sampled signal value falls short of an event region and the rate of change, is examined. Four independent, numerically displayed signals were used; two different bandwidths and two different event numbers were chosen. To take a sample, subjects had to use a mouse. The mouse key responses were used as an index of sampling. It was demonstrated that both bandwidth and number of events equally affected the distribution of samples over signals. In addition, it was shown that global signal characteristics determine sampling behavior less prominently when the attentional demands brought about by the local features become of greater importance. This indicates that not predictability as governed by global signal characteristics as such, but rather predictability given certain local signal features is a crucial factor in determining sampling behavior. ESA

N94-30799 Vanderbilt Univ., Nashville, TN.

ANALYSIS AND DESIGN OF INFLATABLE AEROSPACE STRUCTURES Ph.D. Thesis

JOHN ALAN MAIN 1993 227 p

Avail: Univ. Microfilms Order No. DA9324454

This dissertation presents a new structural model for the bending behavior of inflated cylindrical fabric structures that are used as beams. The goal of this investigation was twofold: to perform a fundamental investigation into the static and dynamic bending behavior of the inflated fabric beam and to apply the results to practical problems faced in the design of aerospace inflated structures. Fundamental work was done in development of a model for the static and dynamic bending behavior of the inflated beam. The bending analysis of the inflated beam resulted in a differential equation of bending for the unwrinkled regions of the beam that is identical to the Euler Bernoulli solution. A more complex differential equation was found when the fabric wrinkled due to the applied moments. Experimental work was performed to verify the bending model for the inflated beam. Excellent agreement was found between the model and experimental results in static bending tests of a number of inflated cantilever beams. Dynamic tests were performed and mode shapes, natural frequencies, and damping mechanisms for the inflated beam examined. A series of dynamic tests were also performed on the NASA KC-135 Low Gravity Simulator aircraft to determine the sensitivity of the dynamics of inflated beam structures to changes in gravitation level. Large changes in structural damping were found to occur across G level. This basic research was used to predict the dynamics of a complex inflated structure, a mockup of an inflated solar concentrator. Structural modeling was performed using a finite element software package and the lower modes of vibration of the inflated structure were accurately predicted by the finite element model. The inflated beam bending model also proved itself immediately useful in aerospace applications since many of the current space suit components are essentially fabric tubes. Recommendations for improving space suit flexibility that have arisen from this research include reducing the modulus and increasing the Poisson's ratio of the fabric. A series of experiments were performed to prove these concepts. The results of those tests and the space suit glove design recommendations arising from them are included in this work. Dissert. Abstr.

N94-31224# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Thermal Control and Life Support Div.

ATMOSPHERE QUALITY STANDARDS IN MANNED SPACE VEHICLES

Jun. 1992 238 p

(ISSN 0379-4059)

(ESA-PSS-03-401-ISSUE-1; ETN-94-95872) Copyright Avail: CASI HC A11/MF A03

The various parameters which define the physical, chemical, and biological status of the atmospheres of space vehicles are described. Each of these atmospheric parameters is given standard values as required for the different situations encountered in space missions. Data on the following are given: respiration physiology; decompression physiology; atmospheric parameters; atmospheric contamination; environmental control and safety aspects. ESA

N94-31302# Naval Health Research Center, San Diego, CA.
A REVIEW OF MICROCLIMATE COOLING SYSTEMS IN THE CHEMICAL, BIOLOGICAL, RADIOLOGICAL ENVIRONMENT
T. DERION and R. S. POZOS 22 Sep. 1993 29 p

(Contract NR PROJ. M33-P-30)

(AD-A276446; NHRC-93-23) Avail: CASI HC A03/MF A01

Soldiers may work in hot environments and under conditions posing a biological, chemical, or nuclear threat. Chemical protective overgarments are worn to prevent contact with toxins; however, they prevent dissipation of body heat. This review addresses the effectiveness of microclimate cooling systems in alleviating thermal strain in personnel encapsulated in protective overgarments during exertion in the heat. Air, liquid, and passive ice cooling systems are primarily reviewed, but other methodologies are also discussed. Air cooling can increase tolerance time fourfold, but high ambient temperature air cooling may be dangerous. Liquid cooling is effective in reducing heat strain at light to moderate work loads and is beneficial when applied to the thighs during lower-body exercise. Overcooling and discomfort can occur with a liquid-cooled system due to cutaneous vasoconstriction. Liquid-cooled systems are heavy and require excessive maintenance, and tube compression can result in interrupted coolant flow. Air cooling is inefficient compared to liquid cooling because of air's lower specific heat. Ice cooling may only be suitable for short-term work and is generally less effective than either air or liquid cooling although the wearer can move about untethered. The best cooling system design approach may be indicated by consideration of the unique cooling needs of personnel performing specific tasks in various environments. DTIC

N94-31380*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

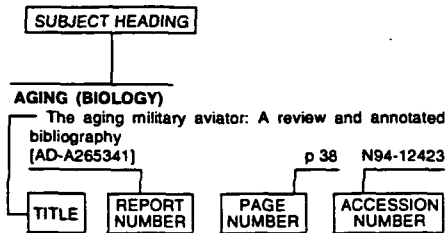
TECHNICAL ASSESSMENT OF MIR-1 LIFE SUPPORT HARDWARE FOR THE INTERNATIONAL SPACE STATION

K. L. MITCHELL, R. M. BAGDIGIAN, R. L. CARRASQUILLO, D. L. CARTER, G. D. FRANKS, D. W. HOLDER, JR., C. F. HUTCHENS, K. Y. OGLE, J. L. PERRY, and C. D. RAY Mar. 1994 183p Original contains color illustrations

(NASA-TM-108441; NAS 1.15:108441) Avail: CASI HC A09/MF A02; 7 functional color pages

NASA has been progressively learning the design and performance of the Russian life support systems utilized in their Mir space station. In 1992, a plan was implemented to assess the benefits of the Mir-1 life support systems to the Freedom program. Three primary tasks focused on: evaluating the operational Mir-1 support technologies and understanding if specific Russian systems could be directly utilized on the American space station and if Russian technology design information could prove useful in improving the current design of the planned American life support equipment; evaluating the ongoing Russian life support technology development activities to determine areas of potential long-term application to the U.S. space station; and utilizing the expertise of their space station life support systems to evaluate the benefits to the current U.S. space station program which included the integration of the Russian Mir-1 designs with the U.S. designs to support a crew of six. Author (revised)

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, a title extension is added, separated from the title by three hyphens. The 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.

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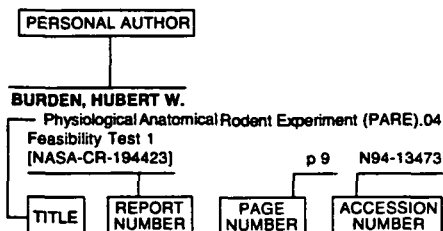
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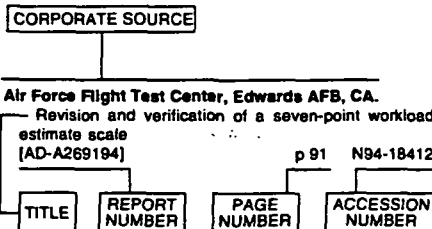
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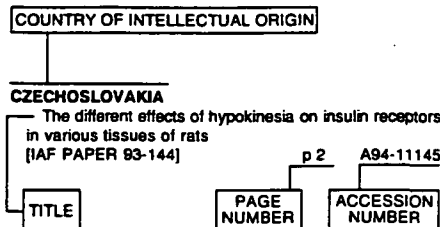
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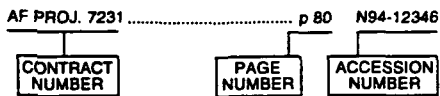
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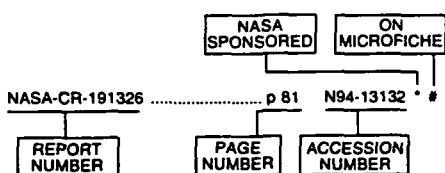


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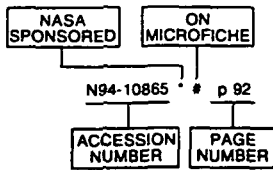


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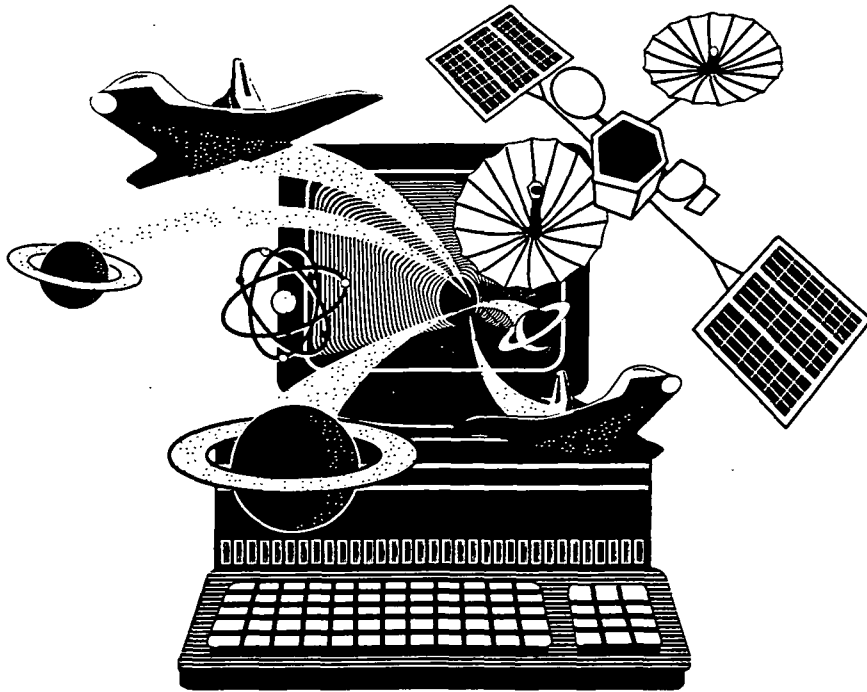
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UNIV. OF HAWAII
Hamilton Library
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IDAHO

UNIV. OF IDAHO LIBRARY
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ILLINOIS

ILLINOIS STATE LIBRARY
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(217) 782-7596 Fax: (217) 524-0041

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Govt. Documents & Map Library
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Lawrence, KS 66045-2800
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257-8379

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Baton Rouge, LA 70803
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305 Wisteria Street
Ruston, LA 71270-9985
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TRI-STATE DOCUMENTS DEPOS.
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Univ. of Maine
Orono, ME 04469
(207) 581-1680

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Hornbake Library
Govt. Documents/Maps Unit
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Wilson Library
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Minneapolis, MN 55455
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University, MS 38677
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Maureen & Mike Mansfield Library
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Reno Library
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General Library
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Albuquerque, NM 87131-1466
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NEW MEXICO STATE LIBRARY

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Santa Fe, NM 87503
(505) 827-3826 Fax: (505) 827-3820

NEW YORK

NEW YORK STATE LIBRARY
Documents/Gift & Exchange Section
Federal Depository Program
Cultural Education Center
Albany, NY 12230
(518) 474-5563 Fax: (518) 474-5786

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UNIV. OF NORTH CAROLINA - CHAPEL HILL
CB#3912, Davis Library
BA/SS Dept. - Documents
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(919) 962-1151 Fax: (919) 962-0484

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Oklahoma City, OK 73105-3298
(405) 521-2502, ext. 252, 253
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Cooper Library
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(901) 678-2586 Fax: (901) 678-2511

TEXAS

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Austin, TX 78711
(512) 463-5455 Fax: (512) 463-5436

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Documents Dept.
Logan, UT 84322-3000
(801) 750-2684 Fax: (801) 750-2677

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Morgantown, WV 26506
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