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January 13, 1997

# **AEROSPACE MEDICINE AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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# Typical Report Citation and Abstract

- ❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

## Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
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# AEROSPACE MEDICINE AND BIOLOGY

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*A Continuing Bibliography (Suppl. 430)*

JANUARY 13, 1997

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## LIFE SCIENCES (GENERAL)

**1997000077** Atomic Energy Control Board, Ottawa, Ontario Canada

**The observed and predicted health effects of the Chernobyl accident**

Mar. 1996; 33p; In English

Report No.(s): INFO-0623E/REV-1; GMA-10; DE96-631850; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Due to poor design, operator error and the absence of an established 'safety culture' the worst accident in the history of nuclear power involving the Unit 4 RBMK reactor occurred at Chernobyl in the Ukraine in the early morning of 26 April 1986. This accident led to the contamination of large tracts of forest and agricultural land (in the former Soviet Union) and the evacuation of a large number of people. Thirty-one people died at the time of the accident or shortly afterwards, and 203 people were treated for the Acute Radiation Syndrome. From about 1990 a significant increase in the number of childhood thyroid cancers has been noted in Belarus and Ukraine. Because of the social, political and economic situation in the Soviet Union soon after the accident, the anxiety and stress induced in the general population has been enhanced to the point where it may well be the single most important indirect health effect of the accident. Contamination outside the former Soviet Union was largely confined to Europe, where it was extremely patchy and variable. Contamination in the rest of the Northern Hemisphere was insignificant. The health effects in the general population in the contaminated regions in the former USSR and Europe, are predicted to be low and not discernible. However, there may be subgroups within, for example, the accident workers, which if they can be identified and followed, may show adverse health effects. Health effects in the rest of the Northern Hemisphere will be inconsequential.

DOE

*Accidents; Radiation Injuries; Radiation Effects; Nuclear Power Plants; Public Health; Psychological Effects; Physiological Effects*

**19970000729** Institute of Space Medico, Beijing, China

**Space Medicine and Medical Engineering, Volume 9**

Wei, Jinhe, Editor, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; ISSN 1002-0837; Volume 9, No. 3; 83p; In English; In Chinese; Also announced as 19970000730 through 19970000742

Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This issue contains articles on the numerical simulation of flame spread over a vertical wall in a microgravity environment, a training method for increasing orthostatic tolerance in humans, morphological changes of cortical neurons after repeated positive Gz exposure in rats, a mathematical model for desaturation and resaturation of N2 in humans, effects of simulated weightlessness on acute hypoxic tolerances in humans, effect of suspension time on mass and biomechanical properties of vertebra in rats, changes of Ca(exp 2 plus) in Mitochondria and Ca(exp 2 plus)- ATPase activity in sarcoplasmic reticulum in rates after simulated weightlessness, influence of simulated weightlessness on rabbit hematological system, relationship between anaerobic threshold and cardiac functions in native Tibetans and Han migrators at 3417 meters altitude, effects of 2 kPa lower body negative pressure on cardiovascular autonomic regulation in humans, effects of Rhodiola like medicines on enhancing sportsmen's stamina, simultaneous determination of serotonin and catecholamine in the plasma of rabbits, and a special article on the challenges in gravitational physiology at the end of this century.

Derived from text

*Aerospace Medicine; Autonomic Nervous System; Cardiovascular System; Enzyme Activity; Flame Propagation; Lower Body Negative Pressure; Orthostatic Tolerance; Weightlessness Simulation; Microgravity Applications*

**19970000732** Fourth Military Medical Univ., Xi'an, China

**Morphological Changes of Cortical Neurons After Repeated +Gz Exposures in Rats**

Sun, Xiqing, Fourth Military Medical Univ., China; Zhang, Lifan, Fourth Military Medical Univ., China; Wu, Xingyu, Fourth Military Medical Univ., China; Jiang, Shizhong, Fourth Military Medical Univ., China; Zhang, Zhihong, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 173-178; In English; Also announced as 19970000729; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Little is known about the pathophysiological effects of repeated positive Gz exposures on the brain. In the present study, morphological changes of cortical neurons in rats immediately, 1 hour, 6 hours, and 12 hours after successive exposures to positive 10 Gz/3 minutes were observed by light and electron microscopy. The results are: (1) Ischemic changes in a few neurons in the parietal cortex were found under light microscopy after repeated positive Gz exposures. They returned to normal 24 hours after the exposures. (2) Electron microscopy observations showed that, after repeated positive Gz exposures, the swollen mitochondria with blurred cristae was observed in a few pyramidal cells and some showed degenerative changes with decreased endoplasmic reticulum and ribose nuclear protein as well as increased lysosomes. The amount of extended endothelial projections into the lumen of the capillaries increased. The cortical ultrastructural changes returned to normal 24 hours later. It is suggested that the changes in cortical neurons after three positive 10 Gz/3 minute exposures are reversible, and may result from the cerebral ischemia and mechanical stress caused by acceleration.

Author

*Gravitational Effects; Acceleration Stresses (Physiology); Cerebrum; Ischemia; Rats*

**19970000735** Institute of Space Medico, Beijing, China

**Effect of Suspension Time on Mass and Biomechanical Properties of Vertebra in Rats**

Cui, Wei, Institute of Space Medico, China; Shi, Zhizhen, Institute of Space Medico, China; Zheng, Qiang, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 190-194; In Chinese; Also announced as 19970000729; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

To determine the effects of suspension time on bone mass and biomechanical properties of the third lumbar vertebra (L3) in rats, 42 male S.D. rats were randomly divided into 6 groups, 7 rats in each group. Three groups were suspended by the tail for 7, 14, and 21 days respectively, the rest served as control. As compared with the controls, the suspended groups showed that mineral density of L3 was significantly increased in the 14 day group, but was significantly decreased in the 24 day group. Collagen density showed no significant change in all the three suspended groups. Maximum load and elastic load were significantly decreased in 7, 14, and 21 day groups. Elastic deformation was significantly decreased in the 7 day group. Cross sectional area was significantly decreased in the 7 and 14 day groups. Elastic stress and elastic strain were significantly decreased in the 7 day group. Bone strength was significantly decreased in the 7 and 14 day groups, and returned to control level in the 21 day group. Maximum stress, Young's modulus, and compressive stiffness were significantly decreased in the 21 day group.

Author

*Time Dependence; Modulus of Elasticity; Rats; Biodynamics; Vertebrae; Bone Demineralization; Weightlessness Simulation*

**19970000736** Institute of Space Medico, Beijing, China

**Changes of Ca (sup 2+) in Mitochondria and Ca (sup 2+) - ATPase Activity in Sarcoplasmic Reticulum (SR) in Rat after Simulated Weightlessness**

Sun, Yazhi, Institute of Space Medico, China; Huang, Liyun, Institute of Space Medico, China; Zhang, Qian, Institute of Space Medico, China; Yang, Guanghua, Institute of Space Medico, China; Zhang, Min, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 195-197; In Chinese; Also announced as 19970000729; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In order to observe changes of Ca (sup 2+) transport in skeletal muscle during simulated weightlessness, Ca (sup 2+) content in mitochondria and sarcoplasmic reticulum (SR)Ca(sup 2+) -ATPase activity in SR were determined before and after simulated weightlessness. The results showed that the mitochondria Ca(sup 2+) increased and SRCA(2+) -ATPase activity decreased. This indicated that the cellular calcium transport function was changed. This change may be one of the important factors causing the decrease of muscular contractive function in simulated weightlessness.

Author

*Sarcoplasmic Reticulum; Enzyme Activity; Mitochondria; Musculoskeletal System; Rats; Muscular Function*

**19970000737** Institute of Space Medico, Beijing, China

**Influence of Simulated Weightlessness on Hematological System of Rabbit**

Shen, Xianyun, Institute of Space Medico, China; Chen, Jianhe, Institute of Space Medico, China; Meng, Jingrui, Institute of

Space Medico, China; Dong, Xin, Institute of Space Medico, China; Xiang, Qiulu, Institute of Space Medico, China; Jin, Yongjuan, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 198-203; In Chinese; Also announced as 19970000729; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In order to study the influence of weightlessness on the hematological system and to investigate its causes, 19 hematological indices in control rabbits and minus 20 degrees head-down tilt rabbits were compared during a six day experiment. The results showed an increase in endothelial cell count and the appearance of abnormal red blood cells, decreased red blood cell deformation and membrane fluidity, disorder of hematopoiesis function of bone marrow and decreased hemo-rheological parameters in head-down tilt rabbits. The results demonstrated that the changes of hematological indices in head-down rabbits were similar to the changes in human body and animals during space flight. So rabbits in a minus 20 degree head-down tilt may be a good model for space hematological study. The causes of the above changes during simulated weightlessness were also discussed.

Author

*Physiological Responses; Rabbits; Hematopoiesis; Hypokinesia; Aerospace Medicine; Head Down Tilt; Weightlessness Simulation*

**19970000741** Institute of Space Medico, Beijing, China

**Simultaneous Determination of Serotonin and Catecholamine in Plasma of Rabbits**

Yang, Yuhua, Institute of Space Medico, China; Li, Qi, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 217-221; In Chinese; Also announced as 19970000729; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The concentration of serotonin and atecholamine in plasma of rabbits was measured using an improved Keating's method high performance liquid chromatography with a electrochemical detection technique. This method is more specific, sensitive, and simple than other methods. The concentration of serotonin was measured by a reversed-phase, high performance liquid chromatographic method, in which YWG ODS was used as a solid-phase column phi4x250 mm (10 micrometers). The recovery of the serotonin was 93% and the coefficient of variation was 3.3%. The concentration of catecholamine was measured using a reversed-phase ion-pair high performance liquid chromatography technique. It is better to be adsorbed by aluminum oxide than washed by 0.5mol/L H3PO4. The recovery of catecholamine was 79.9% (NE) 95.5% (E) and 85.5% (DA) respectively.

Author

*Liquid Chromatography; Rabbits; Serotonin; Catecholamine; Blood Plasma*

**19970000825** San Jose State Univ., Dept. of Biological Sciences, CA USA

**NASA Rat Acoustic Tolerance Test 1994-1995 Final Report**

Holley, Daniel C., San Jose State Univ., USA; Mele, Gary D., San Jose State Univ., USA; Naidu, Sujata, San Jose State Univ., USA; Jan. 30, 1996; 60p; In English

Contract(s)/Grant(s): NCC2-822

Report No.(s): NASA-CR-202404; NAS 1.26:202404; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The major objective of this Cooperative Agreement was to develop a noise level specification for laboratory rats in the Centrifuge Facility Specimen Chambers (Space Station Biological Research Project), and to validate the specification for 3 noise octave bands: center frequencies 8 kHz, 16, kHz, and 32 kHz. This has been accomplished. Objective measures were used to verify that the chronic noise exposure was not harmful to the animals from physiological and behavioral perspectives. These measures were defined in the Stress Assessment Battery Validation for the Rat Acoustic Tolerance Test. In addition, the effects of the chronic noise exposure on rat hearing was assessed by the Brainstem Auditory Evoked Potential Method (BAER).

Derived from text

*Rats; Noise Intensity; Exposure; Hearing*

**19970001042** Rutherford Appleton Lab., Chilton, UK

**HCM Large Facilities Access Programme Soft X-ray Radiation Effects on Sacaromices Cerevisiae Yeast Cells**

Batani, D., Milan Univ., Italy; Milani, M., Milan Univ., Italy; Conti, A., Milan Univ., Italy; Masini, A., Milan Univ., Italy; Casati, R., Milan Univ., Italy; Bonadio, R., Milan Univ., Italy; Correale, N., Milan Univ., Italy; Costato, M., Modena Univ., Italy; Pozzi, A., Modena Univ., Italy; Turcu, I. C. E., Rutherford Appleton Lab., UK; Allott, R., Rutherford Appleton Lab., UK; Lisi, N., Rutherford Appleton Lab., UK; Oct. 1996; ISSN 1358-6254; 26p; In English; Original contains color illustrations

Contract(s)/Grant(s): CHGE-CT93-0032

Report No.(s): RAL-TR-96-082; Copyright; Avail: Issuing Activity (The Central Lab. of the Research Councils, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11 0QX, UK), Hardcopy, Microfiche

This report described the experiment entitled 'Soft X-ray Radiation Effect on Sacaromices Cerevisiae Yeast Cells', carried out in the Central Laser Facility (CLF) at the Rutherford Appleton Laboratory over a five week period during September/ October 1995. The experiment, funded by the Framework 3 large facility Access Scheme, was conducted by a team consisting of both young and established italian scientists derived from the Universita' di Milano and Universita' di Modena, together with UK scientists from the CLF.

Derived from text

*Yeast; Cells (Biology); Radiation Effects*

**19970001053** International Centre for Theoretical Physics, Trieste, Italy

**Pollinators, geitonogamy and a model of pollen transfer**

Di Pasquale, C., International Centre for Theoretical Physics, Italy; Dec. 1995; 18p; In English

Report No.(s): IC-95/421; DE96-628840; No Copyright; Avail: Issuing Activity (Department of Energy (DOE)) (US Sales Only), Microfiche

A model of pollination that considers the amount of geitonogamous pollen transfer in different flowers and plants is presented. We assumed in this work self-incompatible plant species and we studied how pollination is affected by different round trips described by pollinator from its nest, taking into account the fraction geitonogamy and the fraction pollen export. A deterministic model and a stochastic model of pollen transfer were developed from which we found that when pollinators describe a uniform sequence (visit the same number of flowers in each plant), individuals receive the maximum outcross pollen or minimum self pollen. That is, from the point of view of fertilization, the optimal number of flowers visited in each plant depends on the number of flowers of the plant, the length of the visit and the number of individuals.

DOE

*Migration; Pollen; Mathematical Models*

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**AEROSPACE MEDICINE**

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

**19970000551** Argonne National Lab., IL USA

**Bone Sarcoma in Humans Induced by Radium: A Threshold Response?**

Rowland, R. E., Argonne National Lab., USA; 1996; 10p; In English; 27th; European Society for Radiation Biology, 2 - 4 Sep. 1996, Montpellier, France

Contract(s)/Grant(s): W-31109-eng-38

Report No.(s): ANL/ER/CP-90343; CONF-9609230-1; DE96-013598; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The radium 226 and radium 228 have induced malignancies in the skeleton (primarily bone sarcomas) of humans. They have also induced carcinomas in the paranasal sinuses and mastoid air cells. There is no evidence that any leukemias or any other solid cancers have been induced by internally deposited radium. This paper discusses a study conducted on the dial painter population. This study made a concerted effort to verify, for each of the measured radium cases, the published values of the skeletal dose and the initial intake of radium. These were derived from body content measurements made some 40 years after the radium intake. Corrections to the assumed radium retention function resulted in a considerable number of dose changes. These changes have changed the shape of the dose response function. It now appears that the induction of bone sarcomas is a threshold process.

DOE

*Radium 226; Radium Isotopes; Musculoskeletal System; Cancer; Mastoids; Paranasal Sinuses*

**19970000570** China Nuclear Information Centre, Beijing, China

**Study on qualitative imaging diagnosis of human brain glioma with immuno-radionuclide**

Qiang, Huang, Suzhou Medical Coll., China; Qing, Lan, Suzhou Medical Coll., China; Xiaonan, Li, Suzhou Medical Coll., China; Guangren, He, Suzhou Medical Coll., China; Weilian, Yang, Suzhou Medical Coll., China; Wenyu, Zhu, Suzhou Medical Coll., China; Ziwei, Du, Suzhou Medical Coll., China; Mar. 1996; 16p; In Chinese

Report No.(s): CNIC-01049; SMC-0125.; DE96-634028; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The target imaging agent (sup 131)I-SZ39 was made by labelling to monoclonal antibody SZ39 with I-131 using modified chloramine T method. On the basis of the biodistribution and pharmacokinetics study in glioma-bearing nude mice and the

patients, the qualitative diagnosis of 40 cases with intracranial space-occupying lesion was compared with that of X-CT. The results were satisfactory. SZ39 could deliver (sup 131)I to the target cells specifically. The ratio of target tissues to nontarget tissues was 5.73(approx)144.8 in the glioma-bearing animals and 2.97(approx)3.25 in the patients at 72 h. The half life of the imaging agent in blood were 1.6 h ( $T_{1/2}(\alpha)$ ) and 39 h ( $T_{1/2}(\beta)$ ). The clearing rate was 54% in blood and 80% in urine at 72 h. The sensitivity of target qualitative diagnosis was 92%. The accuracy was 82%. The positive prediction rate was 81% and the negative prediction rate was 91%. Those of X-CT were 46%, 45%, 57% and 33% respectively (P less than 0.01(approx)0.005).  
DOE

*Iodine 131; Imaging Techniques; Antibodies; Brain; Cranium; Radioactive Isotopes*

**19970000731** Institute of Space Medico, Beijing, China

**A Study on Training Method for Increasing Orthostatic Tolerance in Humans**

Yan, Xiaoxia, Institute of Space Medico, China; Shen, Xianyun, Institute of Space Medico, China; Sun, Yazhi, Institute of Space Medico, China; Zhang, Fusheng, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 167-172; In English; Also announced as 19970000729; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Since weightlessness decreases an astronaut's orthostatic tolerance, a training method for increasing orthostatic tolerance was designed and its effects studied. Nine healthy male volunteers aged 19 - 20 were selected as the test subjects. They were divided into two groups: group A (5 men) received both physical training consisting of physical exercise two hours/day for six weeks, and body position change training (head down and head-up tilts, 4 series a week for six weeks). Group B (4 men) received physical training only. Before and after training, orthostatic tolerance tests were made in the two groups. The results indicated that the orthostatic tolerance was not changed in group B (P less than 0.5), while the orthostatic tolerance was enhanced significantly in group A (P greater than 0.05). During standing head-up position after training, the regulating ability of the cardiovascular system in group A was better than that in group B. It is possible that training in body position change enhanced the reflex regulating ability of the cardiovascular system and thus improved the adaptability to orthostasis.

Author

*Astronaut Training; Cardiovascular System; Orthostatic Tolerance; Physical Exercise; Head Down Tilt*

**19970000733** Institute of Space Medico, Beijing, China

**A Mathematical Model for the Process of Desaturation and Resaturation of N<sub>2</sub> in Human Body**

Yang, Tiande, Institute of Space Medico, China; Zhang, Ruguo, Institute of Space Medico, China; Zhang, Baolan, Institute of Space Medico, China; Qi, Zhangnian, Institute of Space Medico, China; Qi, Zhangnian, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 179-183; In Chinese; Also announced as 19970000729; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

N<sub>2</sub> content changes in the human body were studied in the process of N<sub>2</sub> desaturation during preoxygenation or decompression and N<sub>2</sub> resaturation during compression. It was found that the N<sub>2</sub> content change observed the exponential law with time and a corresponding mathematical model was established. A differential equation was written that indicates the change rate of N<sub>2</sub> content at a certain moment is proportional to the difference between the instantaneous value and final-steady value of N<sub>2</sub> content in the human body. The mathematical model may be applied to prevent decompression sickness in aviation, navigation, and space flight.

Author

*Decompression Sickness; Differential Equations; Desaturation; Saturation*

**19970000734** Institute of Space Medico, Beijing, China

**Effects of Simulated Weightlessness on Acute Hypoxic Tolerance in Humans**

Fu, Hongwei, Institute of Space Medico, China; Zhang, Ruguo, Institute of Space Medico, China; Zhang, Baolan, Institute of Space Medico, China; Zhang, Jinxue, Institute of Space Medico, China; Wang, Chengmin, Institute of Space Medico, China; Liu, Zhiqiang, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 184-189; In Chinese; Also announced as 19970000729; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

To study the effects of simulated weightlessness on hypoxic tolerance in humans, minus 4 degree head down bed rest (HDBR) for 7 days was performed on 6 healthy male subjects aged 19-21 years. Hypoxic tolerance (5,000 m, 30 minutes) and orthostatic tolerance (standing at 75 for 20 minutes) were tested on each subject pre- and post-HDBR. At the same time, ECG, blood pressure (BP), heart rate (HR) were recorded. Results show that amplitude of the ECG T wave decreased and the potential of S-T went down, while fluctuation of HR (greater than 20 bpm) increased in 3 cases (50%). It indicates that after HDBR, hypoxic tolerance decreased. Orthostatic tolerance decreased in all the subjects after HDBR. Three subject with decreased hypoxic tolerance showed

more serious orthostatic intolerance. This implies that the post-HDBR decrease in hypoxic tolerance is consistent with cardiovascular deconditioning.

Author

*Bed Rest; Cardiovascular System; Orthostatic Tolerance; Weightlessness Simulation; Heart Rate; Hypoxia; Head Down Tilt*

**19970000738** Institute of Space Medico, Beijing, China

**Relationship between Anaerobic Threshold and Cardiac Function in Native Tibetans and Han Migrators at 3417m Altitude**

Wang, Xiaozhen, Institute of Space Medico, China; Ge, Rili, Institute of Space Medico, China; Chen, Quihong, Institute of Space Medico, China; Wu, Tianyi, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 204-208; In Chinese; Also announced as 19970000729; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Cardiac and pulmonary functions were examined at an altitude of 3417 meters in 18 healthy male native Tibetans and 16 Han immigration male residents (matched for age, height and weight). The results showed that: (1) there was a significant decrease in anaerobic threshold (AT) at the altitude of 3417 meters as compared with that at sea level, (2) At AT the Tibetans had greater O<sub>2</sub> uptake, exercise workload, minute Volume (MV), heart rate (HR), cardiac output (CO) and stroke volume (SV) as compared with the Hans, but pre-ejection-period/lift ventricular ejection time) was shorter for the Hans, (3) peak SV appeared at AT or behind AT was 72% in the Tibetans but only 31% in the Hans (P is less than 0.05), (4) at maximum workload, SaO<sub>2</sub> was 82.47% in the Tibetans and 76.5% in the Hans (P is less than 0.01). These results suggest that cardiac function was one of the important factors affecting AT. The increase of cardiac-pulmonary reserve function in the Tibetans might reflect the genetic adaptation of the Tibetans to a hypoxic environment.

Author

*Cardiac Output; Physical Exercise; Pulmonary Functions; Sea Level; Workloads (Psychophysiology); Hypoxia; Altitude Acclimatization*

**19970000739** Institute of Space Medico, Beijing, China

**Effect of - 2 kPa Lower Body Negative Pressure on Cardiovascular Autonomic Regulation in Humans**

Zheng, Jun, Institute of Space Medico, China; Zhang, Rong, Institute of Space Medico, China; Zhang, Lifan, Institute of Space Medico, China; Zhang, Lening, Institute of Space Medico, China; Wang, Shouyan, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 209-213; In Chinese; Also announced as 19970000729; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The effect of minus 2 kPa (minus 15 mmHg) lower body negative pressure (LBNP) in the supine position on cardiovascular autonomic regulation was studied in 10 healthy young male subjects. Baseline thoracic impedance (Z<sub>o</sub>) was increased and stroke volume (SV) was reduced significantly during the first 1 approx. 7 minutes of LBNP. As the result of unloading of cardiopulmonary baroreceptors, the forearm vascular resistance (FVR) increased and the forearm blood flow (FBF) decreased significantly, whereas heart rate and heart rate variability power spectral components were unchanged. It is further suggested that a functional dissociation of cardiopulmonary baroreceptors regulation on peripheral sympathetic outflow and cardiac autonomic activity may exist in humans. Although there was increase in sympathetic nerve outflow to peripheral blood vessels during LBNP, significant changes in relevant systolic and diastolic blood pressure variability power spectral components was not observed.

Author

*Autonomic Nervous System; Baroreceptors; Cardiovascular System; Lower Body Negative Pressure; Stroke Volume; Heart Function*

**19970000740** Institute of Space Medico, Beijing, China

**Study on Effects of Rhodiola Like Medicines on Enhancing Sportsmen's Stamina**

Zhang, Hongzhi, Institute of Space Medico, China; Wang, Chunquan, Institute of Space Medico, China; Sun, Shuping, Institute of Space Medico, China; Dong, Youchang, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 214-216; In Chinese; Also announced as 19970000729; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

To study the possibility of recovering the physique from exhaustion after athletic sports and enhancing the stamina of sportsmen by Chinese herbal medicine (non-prohibited medicine), the effects of Radix et Rhizome Rhodiolae, Ginseng Sapeains, Essence of Deer's Tail and Rhodiolae Composite on the physical powers of athletes were observed. Both Radix et Rhizome Rhodiolae and Ginseng Sapeains are plants with characteristics of adaptive elements that can greatly enhance the stamina of the human body against various factors. Thirty athletes of either gender were randomly divided into four groups taking Radix et Rhizome Rhodiolae, Ginseng Sapeains, Essence of Deer's Tail, and Rhodiolae Composite respectively. The drugs were taken twice per day for 75 days.

Before and after the drug treatment, athletes were asked to run to the maximum load, then the hemato chrome, CPK and total protein were measured. The results show that Radix et Rhizome Rhodiolae and Ginseng Sapeains do have the functions of adaptive elements which are essential for recovering the human body from excess fatigue and improving the sportsmen's stamina.

Author

*Athletes; Chemotherapy; Workloads (Psychophysiology); Exhaustion; Human Performance; Drugs*

**19970000742** Institute of Space Medico, Beijing, China

**Challenges in Gravitational Physiology at the End of This Century**

Zhang, Lifan, Institute of Space Medico, China; Space Medicine and Medical Engineering; Jun. 1996; Volume 9, No. 3, pp. 222-227; In Chinese; Also announced as 19970000729; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Challenges in gravitational physiology at the end of this century were discussed in the following four aspects: (1) Even after several decades of extensive research, gravitational physiology as a whole is still in its infancy; though important phenomena of microgravity-induced changes have been described, the basic mechanisms are still not well elucidated. (2) recently, in space flights devoted to the life sciences, some important findings have been reported, that are unexpected from Earth-bound studies and hard to explain according to the traditional theories in physiology. (3) to ensure the health, safety, and productivity of humans in space for extended missions in the future, long-term microgravity-induced physiological changes and appropriate countermeasures should be elucidated and further developed. (4) How can investigations conducted in microgravity be integrated with important biomedical research make contributions toward improving the health of humans on Earth.

Author

*Microgravity Applications; Gravitational Physiology; Human Performance; Gravitational Effects; Long Duration Space Flight*

**19970000867** East Carolina Univ., School of Medicine, Greenville, NC USA

**Evaluation of Dried Storage of Platelets for Transfusion with Emphasis on Physiologic Integrity and Hemostatic Functionality Final Report, 1 Feb. 1992 - 30 Jun. 1995**

Bode, Arthur P., East Carolina Univ., USA; Read, Marjorie S., North Carolina Univ., USA; Jan. 24, 1996; 40p; In English Contract(s)/Grant(s): N00014-92-J-1244

Report No.(s): AD-A307278; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project was a follow-on to the original phase of development of freeze-dried platelets for transfusion under prior ONR grant N00014-89-J-1712. During the 3 1/2 year performance period, we met our goals of evaluation of a standard method of stabilizing and lyophilizing blood platelets from human or animal sources in several in vitro and in vivo test systems. The mechanism of platelet adhesion was found to be intact in our lyophilized platelet preparations, and evidence of residual metabolic capability was demonstrated. Two different long-term storage studies (up to 1 year) were carried out at various temperatures, which showed some instability at 22 deg C but none at 4 deg C or -70 deg C. Scale-up of production with sterile technique was begun in our research labs but transferred to Armour Pharmaceutical Corp, as they entered the ATD program. The in vivo hemostatic efficacy of rehydrated platelet preparations was demonstrated in several animal models involving normalization of a prolonged bleeding time in thrombocytopenic rats or rabbits, and in von Willebrand's disease or normal dogs. Labelled rehydrated platelets were found histologically in wound sites in infused dogs. These findings show the potential utility of these preparations in transfusion medicine.

DTIC

*Transfusion; Platelets; Adhesion; Hemostatics; Clinical Medicine; Freeze Drying; Thrombosis*

**19970000868** East Carolina Univ., School of Medicine, Greenville, NC USA

**Preclinical Investigations of Lyophilized Platelet Preparations Annual Report No. 2, 1 Jan. - 30 Apr. 1995**

Bode, Arthur P., East Carolina Univ., USA; Read, Marjorie S., North Carolina Univ., USA; Jul. 05, 1995; 24p; In English Contract(s)/Grant(s): N00014-93-I-1034

Report No.(s): AD-A307279; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During this period of activity, we published our first comprehensive journal article from results in this project: see Proceedings of the National Academy of Sciences 92:397-401, 1995 (attached). A no-cost extension of the project was approved to extend activities to 31 Aug 96. At the ECU performance site, four trials of hemostatic efficacy of our rehydrated lyophilized platelet preparations were carried out in live pigs according to the Letterman Army Institute animal model of hemorrhagic shock. The results were quite variable and showed the need to adapt this model to emphasize the role of platelets and control other physiologic parameters related to the effects of hypovolemic shock. Attempts in vitro to load rehydrated platelets with calcium ion flux indicator dyes were finally successful, and studies are now underway to measure the responsiveness of these platelet preparations to thrombin and other agonists that rely on Ca(2+) for signal transduction. Experiments conducted at UNC showed serotonin uptake and

release by rehydrated platelets and surface-related changes in activation. It will be important to continue to define the extent of activation and its control in our rehydrated lyophilized platelet preparations.

DTIC

*Clinical Medicine; Platelets; Blood Coagulation; Hypovolemia; Hemostatics; Shock (Physiology)*

**19970000874** East Carolina Univ., School of Medicine, Greenville, NC USA

**Preclinical Investigations of Lyophilized Platelet Preparations Annual Report No. 2, 1 Oct. 1994 - 30 Sep. 1995**

Bode, Arthur P., East Carolina Univ., USA; Read, Majorie S., North Carolina Univ., USA; Jan. 31, 1996; 5p; In English  
Contract(s)/Grant(s): N00014-93-I-1034

Report No.(s): AD-A307280; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This project is a collaborative effort between UNC-Chapel Hill and East Carolina University to test the efficacy and safety of preparations of lyophilized blood platelets for transfusion. The development and testing of these preparations is an extension of previous work done under grants N00014-92-J-1244 and N00014-89-J-1712 from the U.S. Office of Naval Research. The present emphasis has been on infusions of rehydrated platelet preparations into animal models of hemostasis for the arrest of hemorrhage and/or correction of bleeding time test results. Functionality comparable to liquid stored platelet concentrates was obtained and no adverse effects were noted. Experiments in vitro demonstrated the adhesion of rehydrated platelets to exposed blood vessel subendothelium, and evidence of activation response (Thromboxane formation, neoantigen expression) as a result. These findings are encouraging for the eventual pharmaceutical production and clinical trial of our lyophilized platelet preparations under an FDA IND. Armour Pharmaceutical Corp. (now Centeon Corp.) has been licensed to carry out this goal.

DTIC

*Blood Vessels; Clinical Medicine; Transfusion; Hemostatics; Adhesion; Platelets*

**19970000923** Dalhousie Univ., Dept. of Psychology., Halifax, Nova Scotia Canada

**Neurophysiological Analysis of Circadian Rhythm Entrainment Final Report, 1 Jan. 1993-31 Jan 1996**

Rusak, Benjamin, Dalhousie Univ., Canada; Jan. 31, 1996; 13p; In English

Contract(s)/Grant(s): F49620-93-1-0089; AF Proj. 2312

Report No.(s): AD-A307404; AFOSR-TR-96-0175; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This program of research identified a number of novel roles for peptides and neurotransmitters found in the Suprachiasmatic Nuclei (SCN), in the regulation of SCN neuronal activity and behavioral circadian rhythms. Major findings included the observations of changes in SCN cell firing rates and behavioral phase shifts induced by Gastrin Releasing Peptide (GRP) when applied to SCN cells. GRP was demonstrated not to act primarily in concert with other peptides in a manner proposed by an earlier publication. Similar combinations of neurophysiological and behavioral studies have been completed using another peptide, substance P, and are partially completed using VIP. Other studies have investigated the neurophysiological role of metabotropic glutamate receptors, and the behavioral effects of their activation or blockade. Neurophysiological studies investigated the effects of melatonin and of serotonin on photic responses of SCN cells and evaluated putative antagonists for these effects. Antagonists that acted selective on the melatonin and serotonin receptors in the SCN were identified. Additional studies examining the neurophysiological effects of opiate drugs, histamine and redox agents were also completed.

DTIC

*Circadian Rhythms; Human Behavior; Activation*

**19970000924** Pennsylvania Univ., Dept. of Bioengineering., Philadelphia, PA USA

**Receptive Field Neural Network Analysis of Color Constancy and Color Contrast Final Report, 1 Jul. 1992- 30 Jun. 1995**

Buchsbaum, Gershon, Pennsylvania Univ., USA; Jun. 30, 1995; 3p; In English

Contract(s)/Grant(s): F49620-92-J-0316; AF Proj. 3484

Report No.(s): AD-A307405; AFOSR-TR-96-0167; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Color constancy, or the ability of the visual system to perceive color independently of the ambient illumination, was investigated in the context of a biologically-based neural network. In particular, the role of retinal adaptation and higher level visual operations in mediating color constancy was investigated. The study incorporated properties of individual cells and how they combine to make complex color and spatial operations. The neural network simulations indicate how early visual stages complement each other to compensate and maintain relatively constant color perception under conditions of varying illumination and spatial context -in the image. The network takes advantage of several mechanisms in the human visual system, including retinal adaptation, spectral opponency, and spectrally-specific long-range inhibition. This last stage is a novel mechanism based on cells which have been described in cortical area V4. All stages include non-linear response functions. The model emulates human performance in several psychophysical paradigms designed to test color constancy and color induction. We measured the amount of constancy

achieved with both natural and artificial simulated illuminants, using homogeneous gray back-grounds and more complex back-grounds, such as Mondrians. On average, the model performs well or better than the average human color constancy performance index.

DTIC

*Color Vision; Evaluation; Simulation; Spatial Distribution; Neural Nets; Human Performance*

**19970000994** Institute for Human Factors TNO, Soesterberg, Netherlands

**Stress Resistance Training: An Evaluation Interim Report Grensverleggende activiteiten: Een evaluatie**

Wientjes, C. J. E., Institute for Human Factors TNO, Netherlands; Aug. 12, 1996; 26p; In Dutch

Contract(s)/Grant(s): A95/KL/303

Report No.(s): TNO-TM-96-A033; RP-96-0170; Copyright; Avail: Issuing Activity (TNO Human Factors Research Institute, Kampweg 5, 3769 De Soesterberg, The Netherlands), Hardcopy, Microfiche

This report evaluates the stress resistance training course of the Royal Netherlands Army (RNLA) with respect to the literature on 'development training' (DT) and 'Learned resourcefulness' (LR). DT refers to a variety of training courses for groups which employ the principles of 'experiential learning' and which are commonly organized outdoors. The positive influence of DT on stress tolerance may be explained on the basis of the concept of LR which refers to a set of beliefs, cognitive/behavioral skills and self regulation techniques that provide the ability to successfully cope with internal and environmental stresses. The evaluation suggests that the stress resistance training course of the RNLA shares many features of DT, but that more emphasis could be given to the formation of cognitive and behavioral coping techniques. Additionally, the existing possibilities for teamwork and leadership training are not optimized. It is recommended that a number of changes in the training course be implemented which revolve around: (1) the setup of the course and the nature of the exercises, (2) measures to enhance the quality of the formative aspects, (3) better collaboration between the participants, and (4) the possibilities for leadership training and team building.

Derived from text

*Education; Stress (Physiology); Exercise Physiology; Leadership; Training Analysis; Group Dynamics*

**19970001244** Lawrence Livermore National Lab., Livermore, CA USA

**Estimated long-term health effects**

Okeanov, A. E., Akademiya Nauk BSSR, Russia; Anspaugh, L. R., Lawrence Livermore National Lab., USA; Mabuchi, K., Radiation Effects Research Foundation, Japan; Cardis, F., International Agency for Research on Cancer, France; Likhthariev, I., All-Union Scientific Centre for Radiation Medicine, Ukraine; Ivanov, V. K., Russian Academy of Medical Sciences, Russia; Prisyazhniuk, A., All-Union Scientific Centre for Radiation Medicine, Ukraine; FC/WHO/IAFA International Conference: One Decade After Chernobyl, Background Paper; Apr. 1996; 31p; In English; 1st; One Decade After Chernobyl: Summing Up the Radiological Consequences, 9-12 Apr. 1996, Vienna, Austria

Contract(s)/Grant(s): W-7405-eng-48

Report No.(s): UCRL-JC-123710; CONF-960404-2; DE96-012156; No Copyright; Avail: Issuing Activity (Department of Energy (DOE)), Microfiche

Apart from the dramatic increase in thyroid cancer in those exposed as children, there is no evidence to date of a major public health impact of the radiation exposure from the Chernobyl accident in the three most affected countries. Although some increases in the frequency of cancer in exposed populations have been reported, these results are difficult to interpret, mainly because of differences in the intensity and method of follow-up between exposed populations and the general population to which they are compared. If the experience of atomic bomb survivors and of other exposed populations is applicable, the major radiological impact of the accident will be cancer and the total lifetime numbers of excess cancers will be greatest among the liquidators and among the residents of contaminated territories, of the order of 2,000 to 2,500. These increases would be difficult to detect epidemiologically against an expected background number of 41,500 and 433,000 respectively (size of the exposed populations: 200,000 and 3,700,000, respectively). It is noted, however, that the exposures received by populations exposed as a result of Chernobyl are different (in type and pattern) from those of atomic bomb survivors. Predictions derived from these populations are therefore uncertain. Indeed, the extent of the increase in thyroid cancer incidence in persons exposed as children was not foreseen. In addition, only ten years have passed since the accident. It is essential therefore that monitoring of the health of the population be continued in order to assess the public health impact of the accident, even if, apart from leukemia among liquidators, little detectable increase of cancers due to radiation from the Chernobyl accident is expected.

DOE

*Cancer; Radiation Effects; Public Health*

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

**19970000538** Defence Science and Technology Organisation, Electronics and Surveillance Research Lab., Melbourne, Australia  
**Mechanisms and Properties of Long-Term Synaptic Plasticity in the Brain: Relationships to Learning and Memory**  
 Hashemi-Sakhtsari, Ahmad, Defence Science and Technology Organisation, Australia; Jul. 1996; 79p; In English; Original contains color illustrations

Report No.(s): DSTO-TR-0345; AR-009-720; Copyright; Avail: Issuing Activity (DSTO Electronics and Surveillance Research Lab., PO Box 1500, Salisbury, South Australia, 5108, Australia), Hardcopy, Microfiche

Functional and structural changes in synapses, specific regions for communication between nerve cells, are thought to be the basis for storing information, and modulating neuronal behavior. This continuous remodelling is defined as synaptic plasticity. The process of learning involves stable changes in synaptic efficacy. Long-term potentiation in the hippocampus and long-term depression in the cerebellum are two forms of long-lasting synaptic plasticity that currently serve as our primary experimental models of learning and memory formation. In recent years, there have been considerable advances in understanding the cellular and molecular mechanisms of these forms of synaptic plasticity. This report presents an overview of these developments, considers the relationship of long-term synaptic plasticity mechanisms to learning and memory in view of these developments, and suggests future directions for research in this rapidly growing area of neuroscience. Amongst these proposals, any artificial neuronal network model should contain elements that imitate the use-dependent increase (or decrease) of synaptic efficiency.

Author

*Neurophysiology; Memory; Learning; Synapses; Plastic Properties; Hippocampus; Cerebellum*

**19970000555** Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia  
**Subjective Factors in Combat Simulation: Correlation between Fear and the Perception of Threat**

Russell, R. A., Defence Science and Technology Organisation, Australia; Russell, J. R., Defence Science and Technology Organisation, Australia; Benke, K. K., Defence Science and Technology Organisation, Australia; Sep. 1996; 23p; In English  
 Report No.(s): DSTO-TR-0410; AR-009-877; Copyright; Avail: Issuing Activity (DTSO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche

The gap in realism between a simulator for training and actual combat conditions is an issue requiring further attention. This preliminary study is the first part of a long term investigation aimed at developing quantitative methods for evaluating the effect of fear on combat performance. The relationship between subjective ratings of fear and the appearance and perception of threat were investigated using psychophysical experiments. It was found that fear was more strongly correlated with the perception of threat rather than the actual appearance of the threatening object. Data were used from experiments comparing observer ratings of a variety of animals known to evoke emotional responses in humans.

Author

*Fear; Psychophysiology; Perception; Combat; Human Performance; Simulation*

**19970000596** Thomson Training and Simulation Ltd., Crawley, UK

**Simulated Visual Scenes: Which are the Critical Cues?**

McIntyre, H. M., Thomson Training and Simulation Ltd., UK; Roberts, M. E. C., Thomson Training and Simulation Ltd., UK; Apr. 1996; 8p; In English; Also announced as 19970000594; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Research has shown that pilots can extract information from relatively impoverished visual scenes. However, performance of a variety of simulated flight tasks improves with greater scene complexity. Simulator visual systems cannot replicate the real world. Further, it is not possible to optimize visual system performance in all areas simultaneously. Some improvements in flight simulator visual cueing will come inevitably, as technology advances. Others present a research challenge, particularly where the likely effects of missing, contradictory or distorted information are not fully understood. These include: The luminance dynamic range of the display; this is far less than that encountered in reality. Relative luminances between objects cannot be maintained. Luminance variations with range will therefore be distorted. Maintaining accurate colour ratios at low luminances is also difficult. By careful mapping, detection ranges could be adjusted to be nominally accurate under specific conditions but not continuously accurate. The implications need to be considered carefully. The simulation of night scenes, with some illuminated areas may require the simultaneous mixing of 2 or 3 models in the same scene, creating unusual data base management demands. This requires further investigation. Distance judgments may be observed to be inaccurate in the simulator. To prevent this leading to degraded simulator performance and deficiencies in training it may be possible to compensate for the absence of some cues by

enhancing the effect of others. Further investigation is required to establish whether such compensation is truly possible, to what degree it enhances simulator effectiveness and to identify associated costs.

Author

*Visual Discrimination; Visual Perception; Pilots (Personnel); Visual Stimuli; Cues; Flight Crews; Flight Simulators; Luminance; Flight Simulation*

**19970000597** Cranfield Univ., Dept. of Applied Psychology, Bedford, UK

**Visual Scenes for Battlefield Helicopter Operations: Evaluation of Requirements and How to Specify Them**

Deighton, C. D. B., Cranfield Univ., UK; Woodfield, Alan A., Woodfield Aviation Research, UK; Apr. 1996; 12p; In English; Also announced as 19970000594; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

The structured specification and evaluation of simulated visual scenes for training pilots in tasks such as Battlefield Helicopter operations is required to ensure that cost-effective flight simulator training is being achieved. Historically this has been a difficult process because of a lack of consistent and prioritized descriptions of different visual flight activities within the intended training missions; limited evaluations of the contributions and relative importance of different scene features within appropriate operational scenes; and a lack of any structured way of collating and presenting such information to those who specify and design visual scene databases for flight training simulators. A research program funded by the UK Defence Research Agency was conducted in collaboration with Cranfield University, UK to address these challenges. Specific aims were to identify and prioritize visual flight activities in the context of a battlefield nap-of-the-earth (NoE) attack mission; to determine the relative importance of visual scene components (e.g. woods, farm buildings, roads, livestock) to the achievement of visual flight activities; and to assess the impact of removing or adding information to the scene upon the achievement of visual flight activities in a mission simulator. The purpose of the paper is twofold: firstly to describe the human factors procedures and techniques used to address these aims and secondly to describe the proposed structure of a computer based relational database to integrate the results of the program. Selected findings from the study are used to highlight the structure of the database.

Author

*Visual Flight; Nap-Of-The-Earth Navigation; Helicopters; Flight Training; Flight Simulators; Combat; Visual Discrimination*

**19970000598** Aeronautical Systems Div., Training Systems Product Group, Wright-Patterson AFB, OH USA

**Visual System Operational Evaluation**

Brown, James E., Aeronautical Systems Div., USA; Poe, Don R., Aeronautical Systems Div., USA; Lincourt, Timothy J., Aeronautical Systems Div., USA; Leos, Melissa J., Aeronautical Systems Div., USA; Apr. 1996; 12p; In English; Also announced as 19970000594; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper presents the results of an operational evaluation of the training effectiveness of three different visual technologies. Purpose of the program was to determine (1) trainability of low altitude tasks on available visual display technology; (2) demonstrate current visual simulation technology to users; (3) get feedback from those users to help define future visual requirements; and (4) provide information and data to support future simulation acquisition decisions. Three visual simulation display technologies at three different sites were evaluated: (1) a dome display with head tracked area-of-interest, (2) a rear-projection display, and (3) a fiber optic helmet mounted display. A team of highly experienced F-16C and F-16E instructor pilots evaluated each of the three display technologies. Three evaluation missions were flown by each pilot. At the completion of each evaluation mission, extensive questionnaires were completed and de-briefings were conducted to rate the training capability of the visual system for each task. Results are presented for each of the three display systems evaluated. The results are expressed in terms of tasks that were rated trainable and those tasks that were not trainable in the system.

Author

*Display Devices; Training Evaluation; Helmet Mounted Displays; Flight Simulation; Visual Acuity; Visual Perception*

**19970000599** NASA Ames Research Center, Moffett Field, CA USA

**Yaw Motion Cues in Helicopter Simulation**

Schroeder, Jeffrey A., NASA Ames Research Center, USA; Johnson, Walter W., NASA Ames Research Center, USA; Apr. 1996; 16p; In English; Also announced as 19970000594; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

A piloted simulation that examined the effects of yaw motion cues on pilot-vehicle performance, pilot workload, and pilot motion perception was conducted on the NASA Ames Vertical Motion Simulator. The vehicle model that was used represented an AH-64 helicopter. Three tasks were performed in which only combinations of vehicle yaw and vertical displacement were allowed. The commands issued to the motion platform were modified to present the following four motion configurations for a pilot located forward of the center of rotation: (1) only the linear translations, (2) only the angular rotation, (3) both the linear translations and the angular rotation, and (4) no motion. The objective data indicated that pilot-vehicle performance was reduced

and the necessary control activity increased when linear motion was removed; however, the lack of angular rotation did not result in a measured degradation for almost all cases. Also, pilots provided subjective assessments of their compensation required, the motion fidelity, and their judgment of whether or not linear or rotational cockpit motion was present. Ratings of compensation and fidelity were affected only by linear acceleration, and the rotational motion had no significant impact. Also, when only linear motion was present, pilots typically reported the presence of rotation. Thus, linear acceleration cues, not yaw rotational cues, appear necessary to simulate hovering flight.

Author

*Yawing Moments; Cues; AH-64 Helicopter; Motion Perception; Motion Simulation; Vertical Motion Simulators; Flight Simulation*

**19970000618** Thomson Training and Simulation Ltd., Crawley, UK

**Issues in the Development of Training Analysis Methodologies**

Simpson, Terry, Thomson Training and Simulation Ltd., UK; Apr. 1996; 8p; In English; Also announced as 19970000594; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Training analysis is a topic that is often talked about and less often carried out. Various methods have been proposed in the past, but many of these have been too complex and too prescriptive for practical purposes. Major system procurements on cost-plus contracts in the past may have justified detailed methodologies, but the majority of modern training analysis is required on small fixed price contracts. The training analyst is often solely responsible for the work, or working in a small group of 2 or 3. Consequently, the analyst has to use techniques that can be easily applied and be flexible enough to carry over from one contract to another. This paper describes a range of issues that affect training analysis and presents a simple methodology that can be easily adopted by analysts and applied to commercial situations.

Author

*Training Analysis; Education*

**19970000619** Technische Univ., Inst. of Flight Guidance and Control, Brunswick, Germany

**Delayed Pilot Response in Windshear**

Schaenzer, G., Technische Univ., Germany; Krueger, J., Technische Univ., Germany; Apr. 1996; 10p; In English; Also announced as 19970000594; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Windshear can cause fatal accidents. To pass windshear situations safely, the automatic flight control should be employed. This advice is in contrast to an FM recommendation to switch off the autopilot in a windshear and to perform a go-around procedure. With conventional instrumentation and manual approach extremely large time delays up to 40 seconds could be identified. It is still unclear what the psychological reasons for this delay are. There are some indications that the human being reacts like a band pass filter. With proper display information a thrust command director can be realized that may force the pilot to react correctly and safely in windshear situations.

Author

*Wind Shear; Time Lag; Delay; Automatic Pilots*

**19970000799** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Human Responses to Thermal Stress**

Wagner, C. Bruce, Army Research Inst. of Environmental Medicine, USA; Apr. 1996; 70p; In English  
Report No.(s): AD-A307502; USARIEM-TN-96-3; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The body of a homeotherm may be divided into a core, whose temperature is maintained within narrow limits, regardless of environmental temperature, and a peripheral shell, whose temperature is strongly influenced by the environment. Homeotherms regulate core temperature in order to provide a stable physical-chemical environment for metabolic and other physiological processes. Heat content of the body depends on the balance between metabolic heat production and heat exchange with the environment by convection, radiation, and evaporation which, in humans, is largely evaporation of sweat. Heat exchange by convection and radiation depends on the temperature difference between skin and environmental temperatures, heat exchange by evaporation of sweat depends on the wetness and temperature of the skin and the ambient water vapor pressure, and both convection and evaporation depend on air movement. Animals control heat exchange behaviorally, through the willed, conscious use of any means available; and physiologically, through responses which ordinarily function independently of consciousness. Thermoregulation is the name given to these processes for controlling body heat balance. Physiological means of thermoregulation include control of metabolic heat production, control of skin temperature through skin blood flow, and control of skin wetness through sweating. The physiological control of these responses according to core and skin temperatures, and the effects of various physiological processes - including circadian rhythms, the menstrual cycle, exercise and acclimatization to heat and cold - on the control

are discussed. Clothing affects heat by creating a microenvironment between the clothing and the skin. Finally there is a discussion of clinical and pathological issues.

DTIC

*Physiological Responses; Thermoregulation; Skin Temperature (Biology); Temperature Control; Regulatory Mechanisms (Biology); Temperature Effects*

**19970000815** Institute for Human Factors TNO, Soesterberg, Netherlands

**Evidence for a Multi-Stage Model of Practice in Sequential Movement Tasks *Final Report***

Verwey, W. B., Institute for Human Factors TNO, Netherlands; Aug. 01, 1996; 45p; In English

Contract(s)/Grant(s): B95-008

Report No.(s): TNO-TM-96-B011; RP-96-0165; Copyright; Avail: Issuing Activity (TNO Human Factors Research Institute, Kampweg 5, P.O. Box 23, 3769 ZG Soesterberg, The Netherlands), Hardcopy, Microfiche

While many models of practice describe the effects of practice, they are not able to predict in great detail the changes that occur in perceptual motor tasks with practice. The results of the present study demonstrate that the notion of independent, additive processing stages does a good job of describing the phenomena found with sequential production and the changes that occur with practice. That is, the present results are in line with a multi-stage model of practice. The present data demonstrates that advanced versions of traditional 'box' thinking, including notions such as concurrent processing and chunk development, yield useful insights into the mechanisms underlying skilled sequence production.

Derived from text

*Concurrent Processing; Psychomotor Performance; Activation (Biology); Learning Theory; Human Performance; Human Factors Engineering*

**19970001021** Massachusetts Inst. of Tech., Artificial Intelligence Lab., Cambridge, MA USA

**On the Physiology of Bistable Percepts**

Logothetis, N. K., Massachusetts Inst. of Tech., USA; Leopold, D. A., Massachusetts Inst. of Tech., USA; Nov. 1995; 19p; In English; Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

Contract(s)/Grant(s): N00014-95-1-0600

Report No.(s): AD-A307222; AIM-1553; CBCL-125; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Binocular rivalry refers to the alternating perceptions experienced when two dissimilar patterns are stereoscopically viewed. To study the neural mechanism that underlies such competitive interactions, single cells were recorded in the visual areas V1, V2, and V4, while monkeys reported the perceived orientation of rivaling sinusoidal grating patterns. A number of neurons in all areas showed alternating periods of excitation and inhibition that correlated with the perceptual dominance and suppression of the cell's preferred orientation. The remaining population of cells were not influenced by whether or not the optimal stimulus orientation was perceptually suppressed. Response modulation during rivalry was not correlated with cell attributes such as monocularity, binocularity, or disparity tuning. These results suggest that the awareness of a visual pattern during binocular rivalry arises through interactions between neurons at different levels of visual pathways, and that the site of suppression is unlikely to correspond to a particular visual area, as often hypothesized on the basis of psychophysical observations. The cell-types of modulating neurons and their overwhelming preponderance in higher rather than in early visual areas also suggests - together with earlier psychophysical evidence - the possibility of a common mechanism underlying rivalry as well as other bistable percepts, such as those experienced with ambiguous figures.

DTIC

*Visual Perception; Binocular Vision; Neurons; Cells (Biology); Dominance; Pattern Recognition; Orientation*

**19970001054** Institute for Human Factors TNO, Soesterberg, Netherlands

**The Influence of Stress Resistance Training on Situational Coping and Physiological Reactivity *Interim Report De invloed van grensverleggende activiteiten op situationele coping en fysiologische reactiviteit***

Wientjes, C. J. E., Institute for Human Factors TNO, Netherlands; Wisman, F., Institute for Human Factors TNO, Netherlands; van Orden, C. Y. D., Institute for Human Factors TNO, Netherlands; Gaillard, A. W. K., Institute for Human Factors TNO, Netherlands; Aug. 12, 1996; 40p; In Dutch

Contract(s)/Grant(s): A94/KL/345

Report No.(s): TNO-TM-96-A032; RP-96-0169; Copyright; Avail: Issuing Activity (TNO Human Factors Research Institute, Kampweg 5, 3769 De Soesterberg, The Netherlands), Hardcopy, Microfiche

This report describes a study conducted among participants of the stress tolerance training course in rock climbing of the Royal Netherlands Army (RNLA). The goals of the study were to assess: (1) the effects of the training course on situational coping, group functioning, and physiological reactivity, (2) the influence of personality measures on these effects, and (3) the degree to which acute stress responses can be predicted on the basis of the scores on a number of personality questionnaires which are assumed to measure different aspects of stress tolerance. The study included state- and trait-questionnaires, and physiological measurements carried out before and after the training course, as well as during a stressful exercise, (i.e., crossing of an 80 meter ravine via a rope bridge). Thirty-two cadets of the Royal Military School participated in the study. The course resulted in a modest improvement in the problem-oriented situational coping repertoire, but there were no changes in emotion-oriented coping or in indices of group functioning. After the course, there was a reduction in the reactivity of heart rate and respiration rate to a mental stressor, but it is not entirely clear whether this can be ascribed to the influence of the training course. The results suggest that the course indeed serves to enhance stress tolerance, but that the degree to which the course contributes to the development of cognitive/behavioral coping skills is limited. Moreover, generalizing the learning experience to specific military stress-situations appears to be limited, and aspects of group functioning appear to receive too little attention. These findings agree with the results of a theoretical evaluation of the course. The validation study indicates that certain aspects of the personality characteristic 'hardiness' may contribute to the prediction of the physiological response to an acute stressor. The research is being continued in order to obtain data from more subjects.

Derived from text

*Physiological Responses; Physical Exercise; Stress (Physiology); Education; Human Performance; Blood Pressure; Heart Rate*

**19970001137** Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA

**Stress and Women's Health: Combat, Deployment, Contingency Operations and Trauma Annual Report, 1 Dec. 1994 - 30 Sep. 1995**

Ursano, Robert J., Uniformed Services Univ. of the Health Sciences, USA; Oct. 1995; 211p; In English; Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

Contract(s)/Grant(s): MIPR-95MM5516

Report No.(s): AD-A307578; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

This multi-study, programmatic project was directed to understanding the effects of the stress of combat, trauma, and extreme environments on women's health and performance. It identified critical health and performance issues related to women in the extreme environments of combat, peace-keeping, peace-making, humanitarian operations, and deployment. The project proceeded in three stages and addressed tri-service overlapping areas of the effects of these stressors in operational environments as follows: The development of a computer accessible database; the analysis of already existing datasets; and a consensus meeting of experts and a series of seminars and written reviews of selected topics in order to address the data accumulated and formulate recommendations.

DTIC

*Females; Combat; Health; Stress (Psychology); Data Bases*

**19970001139** Battelle Memorial Inst., Columbus, OH USA

**An Exploration of Psychological and Psychophysiological Measures as Predictors of Successful Performance Under Stress Final Report, Sep. 1993 - Jun. 1995**

Heslegrave, Ronald J., Battelle Memorial Inst., USA; Colvin, Caran, Battelle Memorial Inst., USA; Jan. 1996; 85p; In English; Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

Contract(s)/Grant(s): DAAL03-86-D-0001; DA Proj. 2O3-63007-A-792

Report No.(s): AD-A306788; ARI-TR-1035; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Based on a review of the literature and the development of a new psychophysiological model to account for individual coping responses to stress, two investigations were conducted. The first investigation developed and validated a new Occupational Stress Assessment Inventory that better examined stress in an occupational context with measures of active coping and ability to deal with stress built into the same instrument. In the second investigation this new inventory as well as other personality measures were employed in a psychophysiological stress paradigm to directly assess the predictive power of personality and psychophysiological measures with respect to predicting performance under stress. The second investigation showed that several psychophysiological variables, such as heart rate, vagal tone and mean arterial and diastolic blood pressures, predicted performance on both simple and more complex tasks with correlations as high as .67. These results demonstrated that there are marked individual differences in psychophysiological responses under stress that reliably predict performance. In terms of personality measures, the data indicated that those individuals who perceived themselves as having more of an ability to cope with stress and who more actively

cope with stressful situations indeed are more successful performers. These investigations support the contention that selection and classification for stressful occupations can be improved by the integration of specific personality and psychophysiological measures. It was recommended that a full field evaluation of these methods be conducted to assess the validity of these findings in specific populations of interest and to evaluate their practical feasibility.

DTIC

*Stress (Physiology); Stress (Psychology); Psychophysiology; Human Performance; Performance Prediction*

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### MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

*Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.*

**1997000044** BRTRC, Inc., Vienna, VA USA

**Program Documentation for the Lightweight Water Purifier (LWP) Final Report**

Mar. 15, 1996; 333p; In English

Contract(s)/Grant(s): DAAK70-92-D-0003

Report No.(s): AD-A306816; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

The Mission Need Statement (MNS) for the Lightweight Water Purifier (LWP) was approved on 6 October 1993. to provide assistance in this program, BRTRC Incorporated was commissioned on 27 May 1994 to support development of program documentation for a Milestone 1/2 Decision Review, which was originally scheduled for March 1995. Because of delays in obtaining approval of the Operational Requirements Documents, the Milestone 1/2 Decision Review was postponed and is now scheduled for Second or Third Quarter FY96. Documentation prepared under this contract has been revised as the program has changed and is currently in review and staffing.

DTIC

*Purification; Water; Light Water*

**19970000854** Oregon Univ., Eugene, OR USA

**Real Time Control of Reasoning Final Report, 1 Jul. 1992 - 30 Jun. 1995**

Ginsberg, Matthew L., Oregon Univ., USA; Sep. 08, 1995; 10p; In English

Contract(s)/Grant(s): F49620-92-J-0384; AF Proj. 2304

Report No.(s): AD-A307643; AFOSR-TR-96-0162; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This award led to six major technical advances during the contract period. Several of these (approximate planning, dynamic backtracking and limited discrepancy search) promise to substantially change the way various AI subcommunities solve problems. Approximate planning formalizes an approach to planning that, instead of being correct (every plan returned achieves the goal) and complete (all such plans are returned), is approximately correct and complete, in that most plans returned achieve the goal and that most such plans are returned. The cached plans used by case-based planners are best thought of as approximate as opposed to exact, and the approximate approach can be used to attack planning subgoals separately and then combine the plans generated to produce a plan for the original goal. The computational benefits of working with subgoals separately have long been recognized, but attempts to do so using correct and complete planners have failed. Dynamic backtracking and limited discrepancy search are new approaches to solving constraint-satisfaction problems of the sort that arise in scheduling and other applications. Both allow the flexibility of 'lateral' movements in the search space, enabling far more efficient searches and leading to significant performance improvements in systems solving realistic problems.

DTIC

*Real Time Operation; Algorithms; Scheduling; Contract Management*

**19970001062** Prins Maurits Lab. TNO, Rijswijk, Netherlands

**The Effectiveness of Water Purification Devices for Small Units: Removal of Chemical Warfare Agents Final Report De effectiviteit van de zuiverende werking van groepswaterzuiveringssets ten aanzien van chemische strijdmiddelen**

vanSwieten, S. C., Prins Maurits Lab. TNO, Netherlands; Sep. 1996; 19p; In Dutch; Original contains color illustrations

Contract(s)/Grant(s): A96KL409

Report No.(s): TNO-PML-1996-A38; TD96-0015; Copyright; Avail: Issuing Activity (TNO Prins Maurits Laboratory, P.O. Box 45, 2280 AA Rijswijk, The Netherlands), Hardcopy, Microfiche

The results of chemical removal testing of two commercially available water purification devices is reported. The efficiency of the purification is determined with chemical contaminants (strontium, cyanide, Lewisite, and VX) added to potable water during a 100 liter test. The Survivor, using reverse osmosis, is able to remove strontium, Lewisite and VX at more than 99.7, 99.7, and 95 percent respectively. VX and Lewisite slightly exceeded the limits for potable water. Cyanide was not removed at all. The PWP device, using adsorption, removes cyanide very well, but strontium is not removed at all. For Lewisite and VX the capacity is far too low to fulfill the requirements. That is the production of 100 liters of purified water. After the purification of a few liters of water, the concentration of Lewisite exceeds the requirements. The contribution of an optional filter to the final results is minimal.

Derived from text

*Chemical Warfare; Reverse Osmosis; Potable Water; Adsorption; Water Treatment; Purification*

**19970001169** Institute for Human Factors TNO, Soesterberg, Netherlands

**Evaluation of a BMW Motorcycle Suit for use by the Royal Netherlands Marechaussee Final Report Beoordeling motorpak BMW ten behoeve van de Koninklijke Marechaussee**

Havenith, G., Institute for Human Factors TNO, Netherlands; Kistemaker, J. A., Institute for Human Factors TNO, Netherlands; Sep. 23, 1996; 17p; In Dutch

Contract(s)/Grant(s): A96/KL/346

Report No.(s): TNO-TM-96-A038; RP-96-0178; Copyright; Avail: Issuing Activity (TNO Human Factors Research Institute, Kampweg 5, 3769 De Soesterberg, The Netherlands), Hardcopy, Microfiche

A motorcycle suit is tested for rain and cold (winter conditions) protection, summer heat, ergonomics, and visibility. The suit was exposed in a laboratory to rain and wind, a low temperature of -8 C with wind, and 27 C with sunshine. Water intake of the suit outer layers, the impact of the collar, the role of underwear are investigated along with the effects of the temperatures, overall design, and visibility of the suit in daylight and at night.

CASI

*Protective Clothing; Temperature Effects; Motor Vehicles; Performance Tests*

**19970001172** Institute for Human Factors TNO, Soesterberg, Netherlands

**The Physiological Basis for Thermal Comfort in Different Climates: A Preliminary Study Final Report De fysiologische basis voor thermisch comfort onder diverse klimatologische omstandigheden; een voorstudie**

Heus, R., Institute for Human Factors TNO, Netherlands; Havenith, G., Institute for Human Factors TNO, Netherlands; Aug. 07, 1996; 48p; In Dutch

Contract(s)/Grant(s): A93/KL/317

Report No.(s): TNO-TM-96-A030; RP-96-0167; Copyright; Avail: Issuing Activity (TNO Human Factors Research Institute, Kampweg 5, 3769 De Soesterberg, The Netherlands), Hardcopy, Microfiche

Human body's thermal comfort is addressed. A large diversity of the subjective scales used in the research associated with the thermal comfort is reviewed and analyzed for applicability to the existing thermoregulatory models. Global sensations are described as linear functions, and local sensations are described as power functions which are based on psycho-physical functions. It is noted that the temperatures of the core, extremities and environment are main dependent variables in the global thermal comfort, and the skin temperature is the main variable in the local thermal comfort. It is also stated that the core temperature, sweat and the local relative humidity of the skin determine humidity sensation of the skin.

CASI

*Thermoregulation; Thermal Comfort; Thermal Environments; Physiology; Temperature Effects; Body Temperature*

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