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# **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
9. Subject Terms

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# AEROSPACE MEDICINE AND BIOLOGY

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A Continuing Bibliography (Suppl. 441)

JUNE 16, 1997

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## LIFE SCIENCES (GENERAL)

**19970015672** New Energy and Industrial Technology Development Organization, Tokyo, Japan  
**Investigations on a Global Environment Improving Technology Utilizing Biological Functions. 2. Structuring A Ligno-Bioprocess** *Seibutsu kino wo riyoshita chikyu kankyo kaizen gijutsu ni kansuru chosa. 2. Riguno bio process no kochiku*  
Mar. 1996; 181p; In Japanese

Report No.(s): NEDO-GET-9514; DE97-703056; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Discussions were given to reserve global environments on reducing dependence on fossil resources and more effectively utilizing wood resources. Economically utilizable amount of wastes from lumbering factories reaches about five million tons annually. Discussions were made on a ligno-bioprocess that uses these wastes. The current quantitative production efficiency of cellulase by means of bacterial breeding is very high. A problem is production of ligninolytic enzymes, to which application of the recombinant DNA method is indispensable. Combination of steam explosion with biological decomposition or the organosolv process is an effective method for lignin decomposition. Decomposition of cellulose by using the ultra critical water method is worth noticing. With respect to hemicellulose utilization, production of cellulose derivatives, biodegradable polymers and oligosaccharides would be conceivable by means of esterification and etherification. Vanillic acid, adhesives, resins and lignin-based polymer materials could be manufactured from lignin. Material cost for these products accounts for about 35% of the product price, thus making the lignochemicals promising commercial products.

DOE

*Biodegradability; Bioprocessing; Lignin*

**19970016061** North Carolina Univ., Dept. of Chemistry, Chapel Hill, NC USA  
**Structure and Dynamics of Aqueous Solutions Next to and Between Membrane Surfaces** *Final Report, 1 Jul. 1989 - 30 Nov. 1995*

Berkowitz, Max L., North Carolina Univ., USA; Jan. 1997; 3p; In English

Contract(s)/Grant(s): N00014-89-J-3002

Report No.(s): AD-A320872; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of this research is to investigate structural and dynamical properties of aqueous solutions next to and between surfaces of biological macromolecules, particularly membranes.

DTIC

*Aqueous Solutions; Macromolecules; Membranes; Tissues (Biology); Molecular Structure*

**19970016183** Kansas Univ., Medical Center, Kansas City, KS USA  
**Circadian Rhythms in Zebrafish** *Final Report, 1 Aug. 1994 - 31 Jul. 1996*

Besharse, Joseph C., Kansas Univ., USA; Cahill, Gregory M., Kansas Univ., USA; Sep. 30, 1996; 11p; In English

Contract(s)/Grant(s): F49620-94-1-0314; AF Proj. 2312

Report No.(s): AD-A315299; AFOSR-TR-96-0452; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this project was to determine whether the zebrafish would be a useful system for genetic analysis of the cellular and molecular mechanisms that comprise vertebrate circadian clocks. An understanding of biological clock mechanisms will aid in the treatment of the performance deficits, sleep disorders and other problems associated with jet lag, shift work and organic clock deficits in humans. Experiments were performed to characterize behavioral, physiological and molecular circadian rhythms that can be used to screen for genetic clock mutations and to investigate the roles of mutant genes. Robust circadian rhythms of behavior in both larval and adult zebrafish were found and characterized. In addition, the exceptionally strong circadian rhythms

of melatonin release by cultured zebrafish pineal glands were characterized. The results indicate that genetic analysis of vertebrate clock mechanisms will be feasible using this model system.

DTIC

*Circadian Rhythms; Vertebrates; Activity Cycles (Biology)*

**19970016196** Woods Hole Oceanographic Inst., MA USA

**Dispersal and Retention of Benthic Invertebrate Larvae in Flows Near a Seamount *Final Report, 1 Oct. 1988 - 31 May 1996***

Mullineaux, Lauren, Woods Hole Oceanographic Inst., USA; Sep. 14, 1996; 6p; In English

Contract(s)/Grant(s): N00014-89-J-1431

Report No.(s): AD-A315229; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Anecdotal reports of dense aggregations of fish and zooplankton in the water column near seamounts, and of abundant benthic communities on seamount summits have spawned a great deal of speculation over whether seamount-current interactions might be responsible for distinct biological signatures. The general goals of this project were: (1) to investigate effects of mesoscale flows on retention and dispersal of benthic invertebrate larvae near seamounts, and (2) to define the influences of flow-mediated dispersal on population ecology and gene flow in isolated benthic habitats. The primary goal was to test the hypothesis that hydrodynamic features associated with seamounts, such as Taylor Caps, retain larvae and cause them to accumulate near their source. If larval retention occurs on sufficiently long time scales, then we expect larvae to recolonize the source populations, possibly leading to reduced gene flow between adjacent seamounts. A secondary goal of the project (funded as an AASERT Award) was to examine gene flow among seamount populations by characterizing the population genetic structure of seamount-dwelling corals.

DTIC

*Dispersing; Larvae; Seamounts; Ribonucleic Acids; Mesoscale Phenomena*

**19970016197** Woods Hole Oceanographic Inst., MA USA

**Dispersal Between Isolated Seamount Populations: A Molecular Approach *Final Report, 1 Jun. 1992 - 31 May 1996***

Mullineaux, Lauren, Woods Hole Oceanographic Inst., USA; Sep. 14, 1996; 3p; In English

Contract(s)/Grant(s): N00014-89-J-1431

Report No.(s): AD-A315228; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This AASERT has supported a graduate student, Ewann Agenbroad, in her studies of population genetics, gene flow and phylogeny of seamount corals. The project was initially organized around three Pisces IV submersible cruises (operated through NOAA's Hawaiian Underwater Research Laboratory), scheduled for summers of 1993, 1994 and 1995. The 1993 cruise was completed, allowing us to collect multiple individuals of more than 20 coral species from three seamounts in the Northern Hawaiian Ridge. These initial samples allowed us to conduct pilot studies on genetic variation in the mitochondrial 16S rRNA among individuals and species from these three seamounts. Although variation within species was low in this genomic region, further studies are underway using other, more variable regions in the target species *Narella nuttingi*. The species-level variation in 16S rRNA, however, was very intriguing, and spawned a promising phylogenetic study.

DTIC

*Dispersing; Seamounts; Deoxyribonucleic Acid; Underwater Acoustics; Ribonucleic Acids*

**19970016331** Purdue Research Foundation, IN USA

**Structure-Function Analysis of the v-Myc Oncoprotein *Annual Report, 9 May 1995 - 8 May 1996***

Taparowsky, Elizabeth J., Purdue Research Foundation, USA; Echlin, Deborah, Purdue Research Foundation, USA; Jun. 1996; 19p; In English

Contract(s)/Grant(s): DAMD17-94-J-4037

Report No.(s): AD-A314259; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The amino terminus of the Myc oncoprotein is important for many of the biological activities of the protein including transcriptional activation and repression, cellular transformation, and apoptosis. The amino terminus of Myc also contains highly conserved domains necessary for these varied functions of the oncoprotein. A yeast two-hybrid screen of a human cDNA library performed in our lab has yielded a novel factor that interacts with one of these conserved domains, Myc Homology Region II (MHR II). Analysis of this novel protein to discern potential effects on Myc function has yielded interesting results. Since MHR II is required by Myc to bring about cellular transformation, the effect of this clone on activated H-ras transformation was assessed. C3H10T1/2 fibroblasts were stably transfected with both activated human H-ras and the MHR II-associating protein, and focus formation was determined. The novel factor appears to be able to cooperate with H-ras to transform this cultured cell line. Another surprising potential effect on Myc function is its apparent ability to repress the transcriptional activity of Myc. Transient transfection

tions in C3H10OT1/2 cells utilizing the GAL4 reporter system and various deletion mutants of the v-Myc amino terminus have initially implicated the novel protein as a general repressor of transcription, since it not only suppresses Myc transactivation but also that of the potent activator vP16. Further analysis to assess what contribution this new factor has on Myc's other functions is under way.

DTIC

*Proteins; Carboxylic Acids; Deoxyribonucleic Acid; Genes; Biological Effects*

**19970016937** Alabama Univ., Dept. of Psychology, Birmingham, AL USA

**Theoretical and Experimental Determination of the Robust Biological Mechanism of Directional Selectivity Final Report, 15 Dec. 1990 - 14 Jun. 1994**

Amthor, Franklin R., Alabama Univ., USA; Aug. 06, 1996; 149p; In English

Contract(s)/Grant(s): N00014-91-J-1280

Report No.(s): AD-A312588; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Physiological experimentation, electrotonic modeling and simulation of On-Off directionally selective ganglion cells of the rabbit retina were interactively conducted to determine: (1) the computational algorithms used by these cells to achieve their robust selectivity for direction of motion, and (2) the synaptic circuitry which biophysically implements the directional-selective mechanism. The research showed that retinal directional selectivity was based on both a fast facilitative and slower, sustained inhibitory mechanism involving asymmetric contacts from retinal interneurons (amacrine cells). The research showed that this combination of interacting mechanisms could produce robust directionality independent of stimulus contrast sign and amount, speed, and shape. The mechanisms used by these cells perform direction selectivity more precisely and robustly than prior, extant theoretical mechanisms such as Reichardt correlation detectors. As such, artificial mechanisms built to detect direction of motion may fruitfully use the biological mechanisms studied in this research.

DTIC

*Retina; Correlation Detection; Rabbits; Cells (Biology)*

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### AEROSPACE MEDICINE

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

**19970015616** Armed Forces Radiobiology Research Inst., Bethesda, MD USA

**AFRRI Reports: First - Second Quarters 1996 Topical Report**

Jul. 1996; 54p; In English

Report No.(s): AD-A310526; AFRRI-SR96-1; AFRRI-SR96-4; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The relationship between ionizing radiation-induced cell killing and DNA damage measured by the micronucleus and apoptosis assays was determined in three established cell lines (L929, HL-60, and Chang). Irradiation experiments revealed a dose-dependent increase of micronucleated cells until a certain dose was reached. Above this dose no further increase of the micronucleus frequency was observed, but in HL-60 and Chang cells additional DNA fragmentation was detected by morphological criteria, characteristic of apoptosis. This change was detected at different doses for the three cell lines examined, suggesting the existence of a cell-type-dependent upper limit for the employment of the micronucleus assay. However, the sum of both kinds of cellular DNA damage (e.g. micronucleation and morphological-like apoptosis) led to a significant cell-type-independent correlation with cell survival, even above the dose where micronuclei levels saturated. Therefore, a total cell damage assay, involving the inclusion of micronuclei and morphological-like apoptotic events, should be considered when evaluating the use of a predictor assay for ionizing radiation-induced cell killing, especially in conditions when apoptosis (-like) processes may occur.

DTIC

*Deoxyribonucleic Acid; Ionizing Radiation; Cells (Biology); Damage*

**19970015638** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France

**Echocardiography in NATO Aircrew: A Multi-National Study l'Enchocardiographie chez les pilotes de l'OTAN- une etude multinationale**

Apr. 1997; 104p; In English

Report No.(s): AGARD-AR-351; ISBN-92-836-1052-0; Copyright Waived; Avail: CASI; A06, Hardcopy; A02, Microfiche

Based on physiologic considerations and observations in animal experiments, a serious concern was raised: that repeated exposures to increased radial acceleration forces (+Gz) might have a deleterious effect on the pilot's heart. This concern was sup-

ported by the results of a preliminary echocardiographic (heart ultrasound) study carried out by French researchers and reported to AGARD in 1985. There were a number of uncontrolled variables in that initial study, including the amount of exercise and smoking. The investigators cautioned against forming any definite conclusion and recommended further studies. Because of these potentially serious occupational concerns and the findings of the preliminary study, the AGARD Aerospace Medical Panel initiated a carefully controlled study using echocardiography to compare current NATO pilots flying high-sustained G (HSG) aircraft with a control group of transport and rotary wing pilots. HSG aircraft were arbitrarily defined as those designed to maintain greater than +7Gz for at least 15 seconds, e.g. F-15, F-16, F-18, Mirage 2000, Hawk. Working Group 13 designed a protocol by which investigators from many NATO countries could contribute data to a central database. The study was carried out by Working Group 18 and involved over 30 investigators from 13 NATO countries. Data were collected and transmitted for analysis and quality control to a central database at the USAF Armstrong Laboratory at Brooks Air Force Base, Texas. Over 1600 echocardiograms were entered into the database. Data analyses compared 289 pilots of high sustained G (HSG) aircraft with 254 control pilots. The results conclusively show that there is no effect of HSG flight on the heart. The conclusions are limited to the resolution of the technology employed (echocardiography) and to the flight envelopes utilized in the current generation of NATO HSG fighter aircraft. The study serves as a model by which other military occupational medical questions may be addressed quickly and efficiently by the AGARD Aerospace Medical Panel.

Author

*Aerospace Medicine; Echocardiography; Fighter Aircraft; Heart; Pilots (Personnel); High Gravity Environments*

**19970016043** Air Force Inst. of Tech., National Air Intelligence Center, Wright-Patterson AFB, OH USA

**Research on Human Skin Injury Thresholds for Pulsed Carbon Dioxide Lasers**

Chen, Ji; Shi, Liang-Shun; Qian, Huan-Wen; Li, En-Jiang; Zhang, Jian-Jun; Jiguang Jishu (Laser Technology); Aug. 20, 1996; Volume 12, No. 2, pp. 39-42; Transl. into ENGLISH of Jiguang Jishu (Laser Technology), (China), v12 n2 p39-42, Apr 88; In English

Contract(s)/Grant(s): F33657-84-D-0165

Report No.(s): AD-A315113; NAIC-ID(RS)T-0153-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

These experiments made use of pulsed carbon dioxide lasers to irradiate the flexor side skin of people's forearms. Observations were made of the occurrence rate of cutaneous erythema and the appearance times for erythema. Cutaneous erythema occurrence rates and irradiation doses present linear relationships. When doses are large, cutaneous erythema occurrence rates are high. When irradiation doses are low, erythema occurrence rates are low. MRD50 irradiation dosage was obtained as approximately 0.4 J/sq cm.

DTIC

*Skin (Anatomy); Injuries; Carbon Dioxide Lasers; Research and Development*

**19970016150** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Relationship of Peroneal Muscle Fatigue to Functional Ankle Instability**

Linscomb, Subrina V., Air Force Inst. of Tech., USA; Jan. 1996; 98p; In English

Report No.(s): AD-A312368; AFIT-96-033; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The purposes of this study were (1) to determine if personal muscle fatigue in extremities with Functional ankle Instability (FI) is significantly greater than fatigue in control extremities; and (2) to determine the reliability of testing the ankle evertors using the Kin-Com isokinetic dynamometer.

DTIC

*Muscles; Fatigue (Biology); Muscular Fatigue*

**19970016182** Purdue Research Foundation, IN USA

**Electrically Mediated Trauma Repair Annual Report, 22 Aug. 1995 - 21 Aug. 1996**

Borgens, Richard B., Purdue Research Foundation, USA; Sep. 1996; 20p; In English

Contract(s)/Grant(s): DAMD17-94-J-4242

Report No.(s): AD-A315230; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the second year of this contract period we have made substantial progress in experiments designed to facilitate recovery of functions following severe acute spinal cord injury in the adult mammal. The intervention is through the use of applied voltage gradients. We have shown that this technique can be used in conjunction with polymeric tubes to induce and guide regenerating axons. We have also developed novel two and three-dimensional reconstruction techniques and morphometry to assay our biologi-

cal responses to treatment between control and experimental groups. Using these, we have assayed the level of macrophage infestation of acute and subacute spinal cord injuries.

DTIC

*Wound Healing; Injuries; Central Nervous System; Spinal Cord*

**19970016317** Naval Research Lab., Washington, DC USA

**Dose-Response Correlation of Methadone and its Metabolite EDDP in Human Hair. Completion of the Second and Preparation of the Third Test Series, 1 Nov. - 31 Dec. 1995**

Dec. 31, 1995; 2p

Contract(s)/Grant(s): N00014-95-K-2000

Report No.(s): AD-A309899; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Analogous to the first test series, the following steps were undertaken with each of the subjects of the Methadone distribution center in Saarbruecken: (a) Five sweat patches were applied and then removed after one, two, three, four, and six days respectively. Contrary to the patients of Dr. Franta's practice, none of the subjects complained about allergic reactions or irritations. Yet, several of the sweat patches were lost, and a few subjects commented on poor adhesion of the patches to their skin. (b) One strand of hair was bleached and simultaneously, another unbleached strand was removed as a reference. The bleaching procedure was performed with a conventional hair bleaching - - agent over a distance of at least 1 cm from the scalp. The bleaching agent was kept on the hair strand for 45 minutes and was then washed out with shampoo. (c) After four weeks the bleached hair strand as well as an unbleached agent was kept on the hair strand (for reference) were removed.

DTIC

*Hair; Allergic Diseases; Dosage*

**19970016321** Air Force Inst. of Tech., National Air Intelligence Center, Wright-Patterson AFB, OH USA

**Study of Retinal Injury Thresholds of Q-Switched Ruby Lasers**

Shan, Qing, Academia Sinica, China; Cheng, Zong-Li, Academia Sinica, China; Zhang, Gui-Su, Academia Sinica, China; Shao, Jian-Qiang, Academia Sinica, China; Gao, Guang-Huang, Academia Sinica, China; Xu, Gui-Dao, Academia Sinica, China; Zhou, Shu-Ying, Academia Sinica, China; Wang, Deng-Long, Academia Sinica, China; Xu, Jie-Min, Academia Sinica, China; Laser Technology; Jan. 21, 1997, pp. 89-92; Transl. into ENGLISH of Laser Technology, (China) p89-92; In English; Translated by Leo Kanner Associates

Contract(s)/Grant(s): F33657-88-D-2188

Report No.(s): AD-A320844; NAIC-ID(RS)T-0516-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The thresholds of retinal injury of rabbit eye is experimentally determined by means of exposing the eye to Q-switch ruby laser light. The results show that the coagulating-bleeding threshold (ED50) of retinal injury is 361 microJ/sq cm, the bleeding damage threshold (ED50) is 481 microJ/sq cm. The 95% confidence levels are 330 microJ/sq cm to approximately 394 microJ/sq cm to approximately 451 microJ/cm to approximately 514 microJ/sq cm, respectively.

DTIC

*Q Switched Lasers; Ruby Lasers; Light Beams; Retina; Rabbits; Laser Damage; Laser Outputs*

**19970016428** Naval Health Research Center, San Diego, CA USA

**The Effects of a Passive Microclimate Cooling System on Human Thermoregulation in the Heat at Rest**

Heaney, J. H., Naval Health Research Center, USA; Banta, G. R., Naval Health Research Center, USA; Bulbulian, R., Kentucky Univ., USA; Buono, M. J., San Diego State Univ., USA; Burr, R. G., Naval Health Research Center, USA; Nov. 03, 1995; 19p; In English

Report No.(s): AD-A310451; NHRC-95-28; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

U.S. Navy personnel are often subjected to extreme thermal environments that may produce marked thermal strain. The purpose of this investigation was to evaluate the effectiveness of a passive microclimate cooling vest in reducing thermal strain during 4-hours of seated rest in a hot environment. Eleven male volunteers completed a 4-hour heat exposure on four consecutive days in a climatic chamber with a thermal environment of 43 deg C dry bulb and 45% relative humidity. The activity level consisted of seated rest. A passive microclimate, cooling garment was worn during two of the heat exposures. Physiological variables measured included heart rate, rectal temperature, mean skin temperature, mean arterial pressure, whole-body sweating rate, forearm blood flow, and skin blood flow. Heart rate, rectal temperature, mean skin temperature, and whole-body sweating rate were significantly- lower in the vest condition compared to the non-vest condition by 17 bpm, 0.3 C, 2.6 C, and 0.27 L/hr respectively. The remaining variables did not differ by vest condition. The ice vest was effective in reducing thermal strain and use of this ice vest

will provide a safer work environment for naval personnel exposed to high-heat conditions by reducing the potential for heat-related injuries.

DTIC

*Cooling; Microclimatology; Thermoregulation; Temperature Effects; Thermal Stresses; Personnel; Physiological Effects; Cooling Systems*

**19970016450** Armed Forces Radiobiology Research Inst., Bethesda, MD USA

**Estimation of Radiation Risk Based on the Concept of Individual Variability of Radiosensitivity**

Kovalev, E. E., Research Center of Space Craft Radiation Safety, Russia; Smirnova, O. A., Research Center of Space Craft Radiation Safety, Russia; Jun. 1996; 202p; In English

Contract(s)/Grant(s): DNA001-93-C-0152

Report No.(s): AD-A310666; AFRR-1-96-1; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This report was prepared for the Defense Nuclear Agency under contract number DNA001-93-C-0152. A description and analysis of mathematical models developed for two critical systems, the hematopoietic and intestinal systems, are presented. The models, based on modern theories of regulation of the hematopoietic and intestinal epithelium systems, describe the dynamics of these systems in nonirradiated mammals and in mammals exposed to acute and chronic radiation. The first model uses the radiosensitivity indices of hematopoietic cells as its principal parameters. The key parameter of the second model is the radiosensitivity index of precursors of principal crypt cells. The variable parameters of the models are represented by the dose of acute radiation and the dose rate of chronic radiation. These models can be used for quantitative prediction of the effects of acute and chronic radiation on the hematopoietic and intestinal systems of mammals.

DTIC

*Hematopoietic System; Radiation Tolerance; Radiobiology; Biological Effects; Mathematical Models; Intestines; Radiation Effects*

**19970016738** New England Deaconess Hospital, Lab for Cell and Molecular Biology, Boston, MA USA

**In Vivo Studies of Hematopoietic Growth Factors for Use in Military Personnel Interim Report, 1 Jun. - 30 Sep. 1995**

Sytkowski, Arthur J., New England Deaconess Hospital, USA; Oct. 25, 1995; 8p; In English

Contract(s)/Grant(s): N00014-93-1-0776

Report No.(s): AD-A311176; Rept. 04-3-02196-04838; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The secondary structures and thermal denaturation/renaturation of recombinant human erythropoietins were compared using UV circular dichroism. Marked differences were observed between proteins expressed by different host cell lines, presumably due to dissimilar glycosylation patterns. A pharmacokinetic study of monomeric erythropoietin carried out in baboons demonstrated a very short plasma half-life of three hours. The proper formulation of the protein for these studies was established. Work on erythropoietin + dimers progressed, but high yields in each reaction were difficult to achieve. Knowledge of the differing glycosylation patterns will help improve these yields. Work on erythroid colony stimulation factor was resumed, and rodent bone marrow cultures were established.

DTIC

*Hematopoietic System; Proteins; Bone Marrow; Hematopoiesis; Cells (Biology); Physiological Effects*

**19970016807** Civil Aeromedical Inst., Federal Aviation Administration, Oklahoma City, OK USA

**Effects of Mild Hypoxia on Pilot Performance at General Aviation Altitudes Final Report**

Nesthus, Thomas E., Civil Aeromedical Inst., USA; Rush, Ladonna L., Civil Aeromedical Inst., USA; Wreggit, Steven S., Civil Aeromedical Inst., USA; Apr. 1997; 50p; In English

Report No.(s): DOT/FAA/AM-97/9; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

General aviation pilots may fly continuously at altitudes up to 12,500 ft. without the use of supplemental oxygen. However, hypoxia is a condition that can develop at altitudes under 12,500 ft. Research has shown highly variable tolerance and performance of individuals during low altitude laboratory exposures with simple and complex tasking. This study evaluated the physiological and subjective responses, as well as the simulated flight performance of general aviation pilots during a cross-country flight scenario. Ten pilots of a mild hypoxia group were compared with 10 pilots of a normoxic control group. Measurements of flight performance from the Basic General Aviation Research Simulator (BGARS) and of flight-following procedures were gathered during a 3-day, 2 hr. per day, cross-country flight scenario. Determined by group membership and terrain elevation during the cross-country flight, subjects breathed either oxygen mixtures simulating sea level, 8,000 ft., 10,000 ft., and 12,500 ft. altitudes or compressed air, throughout. The physiological measures of oxygen and carbon dioxide partial pressures (PtcO<sub>2</sub> and PtcCO<sub>2</sub>), heart rate (HR), and blood oxygen saturation (SaO<sub>2</sub>), provided significant results differentiating the 2 pilot groups and the 4 altitude conditions

of the hypoxia group. No significant deviations from assigned altitude, VOR radials, or heading were found during cruise flight. However, significantly more procedural errors were committed by the hypoxia group during cruise flight at 10,000 ft. and during the descent and approach phases of flight from 10,000 ft. on Day 3 and during descent from 12,500 ft. on Day 4. Subjective measures of symptoms, workload, and stress provided limited evidence of hypoxic effects, although the hypoxia group reported significantly greater demands on their time during flight, compared to the control group. Also, significant group differences were found in flight following procedural errors, particularly during the descent and approach phases of flight. Recommendations are made to encourage GA pilots to plan their descents from flights above 10,000 ft. to allow sufficient recovery time as a routine precaution to the often undetectable effects of mild hypoxia.

Author

*Hypoxia; Pilot Performance; General Aviation Aircraft; Physiological Responses; Altitude; Physiological Tests*

**19970016813** NASA Langley Research Center, Hampton, VA USA

**Astronaut Protection from Solar Event of August 4, 1972**

Wilson, John W., NASA Langley Research Center, USA; Cucinotta, Francis A., NASA Langley Research Center, USA; Jones, T. D., Oak Ridge National Lab., USA; Chang, C. K., Christopher Newport Coll., USA; Apr. 1997; 20p; In English

Contract(s)/Grant(s): RTOP 199-45-16-11

Report No.(s): NASA-TP-3643; NAS 1.60:3643; L-17590; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The dose rates in the blood-forming organ of a typical astronaut for four space shielding conditions are used to study the astronaut health effects of the solar particle event which began on August 4, 1972. This event was chosen as it was the most hazardous event for which detailed measurements have been made and for which dire predictions of the potential health effects have at times been suggested. The code used for health effects is the biological model developed for tactical nuclear weapons warfare survival of young adults in a 1 g environment. We find the risks of early lethality to be very small especially if appropriate medical action (antibiotics and blood transfusions) is taken soon after the exposure. The primary concern would then be for the development of cancer later in life. Although leukemia could occur relatively soon after the exposure, the risk of solid tumors might be best controlled by using mature individuals for the mission, and thereby offset cancer risk by balancing life span remaining against the long latency periods associated with solid tumors. Use of genetic selection criteria could further reduce health risks during the mission. A possible space experiment to evaluate synergistic effects of the microgravity environmental stress and other space-related stress factors is discussed.

Author

*Shielding; Astronauts; Dosage; Radiation Effects; Aerospace Medicine; Exposure; Radiation Dosage; Lethality; Organs*

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### BEHAVIORAL SCIENCES

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

**19970014928** Tennessee Univ., Knoxville, TN USA

**The Effects of Color to the Eye and its Importance for Heliport Lighting**

Ernst, Craig A., Tennessee Univ., USA; Aug. 1996; 53p; In English; Original contains color plates

Report No.(s): AD-A311260; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The objective of this thesis is to determine the optimum color for heliport approach lighting. Changes in air navigation from terrestrial based navigation aids to satellite based navigation aids will provide heliports with a precision instrument approach capability never realized before. This advancement in air navigation has created a requirement for better heliport approach lighting systems. By studying the physiological and psychophysical capabilities of the eye and its imperfections, a scientific selection of color that enhances the eye's performance can be achieved. The results of field testing, using an experimental heliport, has shown that light at a wavelength of approximately 525 microns (green-blue) could very well be the best color for heliport approach lighting systems.

DTIC

*Lighting Equipment; Aircraft Landing; Air Navigation*

**19970016188** Armstrong Lab., Brooks AFB, TX USA

**Active Duty Air Force Behavioral Risk Factor Surveillance Pilot Project, 1995 Final Report, Jul. - Aug. 1995**

Robbins, Anthony S., Armstrong Lab., USA; Jul. 1996; 100p; In English

Report No.(s): AD-A310663; AL/PS-TR-1996--0060; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Active Duty' Air Force (ADAF) Behavioral Risk Factor Surveillance Pilot Project, 1995, provides results of a survey on the prevalence of behavioral risk factors among ADAF members. This study, conducted during July and August 1995, is the first USAF-wide survey to provide such data at the major command level. Results showed that the Air Force is currently meeting these national Healthy People 2000 goals: overweight by body mass index, safety belt usage, child safety seat usage, ever having had a mammogram and breast exam, ever having had a Pap smear, and having had a Pap smear in the past three years. One major finding was the lower than expected prevalence of current smoking (reported by 22.4% of ADAF members). A second major finding concerned alcohol abuse behaviors. The prevalence of self-reported binge drinking was 26%. Chronic drinking (4.1% vs. 3.0% nationally) and drinking and driving (2.6% vs. 2.4% nationally) were not markedly different from US findings. Data also indicated that the Air Force has not met Healthy People 2000 goals for periodic cholesterol testing, suggesting another opportunity for improvement. The recommendation is to institute an annual behavioral risk factor survey for the Air Force.

DTIC

*Body Weight; Physiological Factors; Aircraft Pilots*

**19970016416** Naval Submarine Medical Research Lab., Groton, CT USA

**Conspicuity of Aids to Navigation, Part 2, Spatial Configurations for Flashing Lights *Interim Report***

Wagner, Sandra L., Naval Submarine Medical Research Lab., USA; Laxar, Kevin V., Naval Submarine Medical Research Lab., USA; Aug. 09, 1996; 17p; In English

Contract(s)/Grant(s): MIPR-Z51100-1-E27A57

Report No.(s): AD-A315176; NSMRL-1202; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Lights used as aids to navigation are typically point sources that are easily confused with the background clutter of lights on shore. This study investigated the conspicuity, or how well lights of various spatial configurations stand out from a background of lights, and serves as a basis for the design of lighted aids to navigation. The measure of conspicuity was the response time for an observer to find a flashing target among backgrounds of steady lights on a CRT display. Twenty observers participated. There were nine targets tested, each at three temporal flash patterns and four background light densities. ANOVAS showed significant effects of target, flash pattern, and background. Simultaneously flashing the target elements of two horizontal bars of lights produced the greatest conspicuity, followed by two diagonal bars and a triad of lights. Search time increased with the density of background lights.

DTIC

*Navigation Aids; Point Sources; Flash Lamps*

**19970016731** Marine Biological Lab., Woods Hole, MA USA

**Workshop in Computational Neuroscience *Final Report, 1 May 1992 - 30 Apr. 1994***

Sejnowski, Terrance J., Salk Inst. for Biological Studies, USA; Aug. 1995; 18p; In English; 10th, 22-28 Aug. 1994, Woods Hole, MA, USA

Contract(s)/Grant(s): N00014-92-J-1442

Report No.(s): AD-A310704; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Woods Hole Workshop on Computational Neuroscience at the Marine Biological Laboratory was held for one week each August in 1992 to 1994. Each year, twenty investigators who are concerned with the computational functions of nervous systems had intense discussion on a wide range of topics in computational neuroscience, including neural mechanisms for computation, neural systems for long-term memory, neural decisions, and active perception. In addition, some members of the workshop lectured in the concurrent Computational Neuroscience Course at MBL, and students were invited to attend the workshop.

DTIC

*Nervous System; Computation; Neurophysiology*

**19970016885** Army Aeromedical Research Lab., Fort Rucker, AL USA

**Physiological and Psychological Effects of Thermally Stressful UH-60 Simulator Cockpit Conditions on Aviators Wearing Standard and Encumbered Flight Uniforms *Final Report***

Reardon, Matthew, Army Aeromedical Research Lab., USA; Smythe, Nicholas, III, Army Aeromedical Research Lab., USA; Omer, Julia, Army Aeromedical Research Lab., USA; Helms, Beth, Army Aeromedical Research Lab., USA; Hager, J. Darrell, Army Aeromedical Research Lab., USA; Freeze, Marjorie, Army Aeromedical Research Lab., USA; Buchanan, Donna, Army Aeromedical Research Lab., USA; Dec. 1996; 117p; In English

Contract(s)/Grant(s): DA Proj. 3M1-62787-A-879

Report No.(s): AD-A320166; USAARL-97-06; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This study evaluated the effects of the four combinations of unencumbered MOPPO aviator battle dress uniform (ABDU) and encumbered MOPP4 over ABDU flight ensembles in cool (70 F, 50 percent relative humidity (RH)) and hot (100 F, 50 percent RH) UH-60 cockpit conditions. This report describes the physiological and psychological responses. The most striking, operationally relevant result was that none of the crews in the encumbered MOPP4 hot condition were able to complete the first two 2-hour sorties movements. The results of this evaluation suggest that future rotary-wing aviator flight uniform components should be designed to be lighter weight and allow greater evaporation of sweat. Methods should be sought to improve fit and comfort, particularly for the mask and helmet combination, as well as prevent pressure discomfort over the back due to the life raft. The 11.7 lb ballistic protective plate also should be lighter weight and reduced in thickness. Forced dry air microclimate cooling into the ensemble should be considered for reducing heat accumulation in the encumbered MOPP4 aviator ensemble by enhancing evaporative cooling and thereby increasing endurance times during hot weather operations.

DTIC

*Physiological Effects; Psychological Effects; Aircraft Pilots; Cockpits; Psychological Tests; Physiological Tests; Helicopters; Temperature Effects; Pilot Performance; Evaporative Cooling*

## 54

### MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

**19970016191** Army Aeromedical Research Lab., Fort Rucker, AL USA

**U.S. Army Aviation Epidemiology Data Register: Distribution of Sitting Heights Among Army Aviation Training Applicants, 1986 to 1995 Final Report**

Mason, Kevin T., Army Aeromedical Research Lab., USA; Shannon, Samuel G., Army Aeromedical Research Lab., USA; Jul. 1996; 15p; In English

Contract(s)/Grant(s): DA Proj. 301-62787-A-878

Report No.(s): AD-A314708; USAARL-96-31; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Aviation Training Brigade, U.S. Army Aviation Center, Fort Rucker, Alabama, and the U.S. Army Aeromedical Center, Fort Rucker, Alabama, requested an analysis of the distribution of sitting heights among male and female applicants for entry into the Army Aviation Branch. They may revise the current sitting height entry standard of 'less than or equal to 102 centimeters' to a new qualification standard as low as 'less than or equal to 97 centimeters.' The analysis was conducted with a query of the U.S. Army Aviation Epidemiology Data Register. Flying duty medical examination data on applicant status, class of officer commissioning, gender, and sitting height were extracted for all Army aviator training applicants for the period 1 January 1986 to 31 December 1995. The analysis showed that adoption of the lower standard (97 centimeters) would reduce the aviator training applicant pool by as much as 9.57 percent. Warrant officer applicants have a slightly greater risk for aeromedical disqualifications due to sitting heights exceeding the proposed standard than commissioned officer applicants (Relative risk (Katz) = 1.13, CI 0.95 = 1.06, 1.23). Male applicants would carry almost the entire burden of the increased risk for aeromedical disqualification if the sitting standard was changed (Relative risk (Katz) = 19.6, CI 0.95 = 9.83, 39.3).

DTIC

*Aerospace Medicine; Physical Examinations; Aircraft Pilots; Height; Standards*

## 55

### SPACE BIOLOGY

*Includes exobiology; planetary biology; and extraterrestrial life.*

**19970016838** NASA Ames Research Center, Moffett Field, CA USA

**Final Science Reports of the US Experiments Flown on the Russian Biosatellite Cosmos 2229**

Connolly, James P., Editor, NASA Ames Research Center, USA; Skidmore, Michael G., Editor, NASA Ames Research Center, USA; Helwig, Denise A., Editor, NASA Ames Research Center, USA; Apr. 1997; 384p; In English

Contract(s)/Grant(s): RTOP 106-30-43

Report No.(s): NASA-TM-110439; NAS 1.15:110439; A-976106; No Copyright; Avail: CASI; A17, Hardcopy; A03, Microfiche

Cosmos 2229 was launched on December 29, 1992, containing a biological payload including two young male rhesus monkeys, insects, amphibians, and cell cultures. The biosatellite was launched from the Plesetsk Cosmodrome in Russia for a mission

duration of 11.5 days. The major research objectives were: (1) Study of adaptive response mechanisms of mammals during flight; and (2) Study of physiological mechanisms underlying vestibular, motor system and brain function in primates during early and later adaptation phases. American scientists and their Russian collaborators conducted 11 experiments on this mission which included extensive preflight and postflight studies with rhesus monkeys. Biosamples and data were subsequently transferred to the USA. The U.S. responsibilities for this flight included the development of experiment protocols, the fabrication of some flight instrumentation and experiment-specific ground-based hardware, the conducting of preflight and postflight testing and the analysis of biospecimens and data for the U.S. experiments. A description of the Cosmos 2229 mission is presented in this report including preflight, on-orbit and postflight activities. The flight and ground-based bioinstrumentation which was developed by the U.S. and Russia is also described, along with the associated preflight testing of the U.S. hardware. Final Science Reports for the experiments are also included.

Author

*Biosatellites; Physiological Responses; Vestibules; Brain; Gravitational Effects; Radiation Effects; Postflight Analysis; Metabolism; Spaceborne Experiments; Biological Effects*

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