

# AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(NASA-SP-7011(368)) AEROSPACE  
MEDICINE AND BIOLOGY: A CONTINUING  
BIBLIOGRAPHY WITH INDEXES  
(SUPPLEMENT 368) (NASA) 93 p

N93-14603

Unclas

00/52 0128375

NASA SP-7011 (368)

November 1992

# **AEROSPACE MEDICINE AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY WITH INDEXES



National Aeronautics and Space Administration  
Scientific and Technical Information Program  
Washington, DC

1992



# TABLE OF CONTENTS

	Page
<b>Category 51 Life Sciences (General)</b>	<b>327</b>
<b>Category 52 Aerospace Medicine</b> Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.	<b>332</b>
<b>Category 53 Behavioral Sciences</b> Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.	<b>339</b>
<b>Category 54 Man/System Technology and Life Support</b> Includes human engineering; biotechnology; and space suits and protective clothing.	<b>359</b>
<b>Category 55 Space Biology</b> Includes exobiology; planetary biology; and extraterrestrial life.	<b>372</b>
<b>Subject Index</b> .....	<b>A-1</b>
<b>Personal Author Index</b> .....	<b>B-1</b>
<b>Corporate Source Index</b> .....	<b>C-1</b>
<b>Foreign Technology Index</b> .....	<b>D-1</b>
<b>Contract Number Index</b> .....	<b>E-1</b>
<b>Report Number Index</b> .....	<b>F-1</b>
<b>Accession Number Index</b> .....	<b>G-1</b>
<b>Appendix</b> .....	<b>APP-1</b>

## TYPICAL REPORT CITATION AND ABSTRACT

NASA SPONSORED  
ON MICROFICHE

↓ ↓

ACCESSION NUMBER → N92-28671\*# Iowa State Univ. of Science and Technology, ← CORPORATE SOURCE  
Ames. Dept. of Chemical Engineering.

TITLE → SPACE LIFE SUPPORT ENGINEERING PROGRAM Annual  
Progress Report, 1 Jul. 1991 - 30 Jun. 1992

AUTHOR → RICHARD C. SEAGRAVE 30 Jun. 1992 36 p

CONTRACT NUMBER → (Contract NAG2-722) ← PUBLICATION DATE

REPORT NUMBERS → (NASA-CR-190448; NAS 1.26:190448) Avail: CASI HC A03/MF ← PRICE CODE  
A01 ← AVAILABILITY SOURCE

A comprehensive study to develop software to simulate the dynamic operation of water reclamation systems in long-term closed-loop life support systems is being carried out as part of an overall program for the design of systems for a moon station or a Mars voyage. This project is being done in parallel with a similar effort in the Department of Chemistry to develop durable accurate low-cost sensors for monitoring of trace chemical and biological species in recycled water supplies. Aspen-Plus software is being used on a group of high-performance work stations to develop the steady state descriptions for a number of existing technologies. Following completion, a dynamic simulation package will be developed for determining the response of such systems to changes in the metabolic needs of the crew and to upsets in system hardware performance.

Author

## TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

ACCESSION NUMBER → A92-10353

TITLE → EFFECTS OF HYPOXIA AND COLD ACCLIMATION ON  
THERMOREGULATION IN THE RAT

AUTHORS → H. GAUTIER, M. BONORA, S. B. M'BAREK, and J. D. SINCLAIR  
(Paris VI, Universite, France; Auckland, University, New Zealand) ← AUTHORS' AFFILIATION

JOURNAL TITLE → Journal of Applied Physiology (ISSN 0161-7567), vol. 71, Oct. 1991, ← PUBLICATION DATE  
p. 1355-1363. Research supported by Institut National de la Sante  
et de la Recherche Medicale. refs

Copyright

Results are reported from an experimental study tracing the effects of hypoxia on thermoregulation and on the different sources of thermogenesis in rats before and after periods of 1-4 wk of cold acclimation. Measurements of the metabolic rate ( $VO_2$ ) and body temperature ( $T_b$ ) were made at 5-min intervals, and shivering activity was recorded continuously in groups of rats subjected to three protocols. Recordings were made in normoxia and in hypoxia on different days in the same animals. The results show that: (1) in noncold-acclimated (NCA) rats, cold exposure induced increases in  $VO_2$  and shivering that were proportional to the decrease in  $T_a$ ; (2) in cold-acclimated (CA) rats in normoxia, for a given ambient temperature,  $VO_2$  and  $T_b$  were higher than in NCA rats, whereas shivering was generally lower; and (3) in both NCA and CA rats, hypoxia induced a transient decrease in shivering and a sustained decrease in nonshivering thermogenesis associated with a marked decrease in  $T_b$  that was about the same in NCA and CA rats. It is concluded that hypoxia acts on  $T_b$  control to produce a general inhibition of thermogenesis.

P.D.

# AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 368)

November 1992

51

## LIFE SCIENCES (GENERAL)

A92-45817

### EFFECT OF HYPOBARIC HYPOXIA ON FIBER TYPE COMPOSITION OF THE SOLEUS MUSCLE IN THE DEVELOPING RAT

M. ITOH, K. ITOH, S. TAGUCHI, C. HIROFUJI, H. TAKEUCHI, and A. ISHIHARA (Kyoto University, Japan) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 583-587. refs

Copyright

The fiber type composition of the soleus muscle was investigated in male Sprague-Dawley rats exposed to hypobaric hypoxia of 460 mm Hg from 5 to 12 weeks of age. The muscle fibers were classified as fast-twitch oxidative (FO) and slow-twitch (S) on the basis of adenosine triphosphatase (ATPase) and succinate dehydrogenase (SDH) reactions. Intermediate fibers (INT) with intermediate ATPase and high SDH reaction intensities were also examined. A type shift of muscle fibers from FO to INT and S was found in the control group during development. After exposure to hypoxia, the hypoxia group had a significantly greater percentage of FO fibers than the age-matched control group. There was no significant change in the total number of fibers in the muscle during development and after exposure to hypoxia. These results indicate that the increased percentage of FO fibers found in the developing rat under hypoxic conditions is due to a hypoxia-induced inhibition of the type shift of muscle fibers from FO to S during development. Author

A92-45949

### OBSERVATION OF DYNAMIC CHANGES OF RAT SOLEUS DURING TAIL SUSPENSION

JUN-MING ZHU (Institute of Space Medico-Engineering, Beijing, People's Republic of China) *Space Medicine & Medical Engineering* (ISSN 1002-0837), vol. 5, no. 1, 1992, p. 49-54. In Chinese. refs

The effect of tail suspension for varying time on the weight, protein content, and biomechanical parameters of rat's soleus were investigated in rats subjected to 3, 7, 13, 21, or 30 days of suspension. It was found that the weight and the absolute protein content of soleus decreased in the early days of suspension, but then increased gradually. The types of changes observed in the weight, total protein content, and biomechanical properties of soleus suggested that hypokinesia/hypodynamia resulted in the atrophy of the muscle. The degree of atrophy did not increase with the duration of suspension, and recovery was observed during later periods of suspension. Changes in the biomechanical properties of soleus indicated that, as a result of suspension, slow twitch fibers were being converted to fast twitch fibers. I.S.

A92-45983

### MULTIPLE DIPOLE MODELING AND LOCALIZATION FROM SPATIO-TEMPORAL MEG DATA

JOHN C. MOSHER (TRW, Inc., Systems Engineering and

Development Div., Redondo Beach; Southern California, University, Los Angeles, CA), PAUL S. LEWIS (Los Alamos National Laboratory, NM), and RICHARD M. LEAHY (Southern California, University, Los Angeles, CA) *IEEE Transactions on Biomedical Engineering* (ISSN 0018-9294), vol. 39, no. 6, June 1992, p. 541-557. Research supported by TRW, Inc. and University of Southern California. refs

(Contract W-7405-ENG-36)

Copyright

General descriptive models for spatiotemporal magnetoencephalogram (MEG) data are presented and the separability of the linear moment parameters and nonlinear location parameters in the MEG problem are shown. A forward model with current dipoles in a spherically symmetric conductor is used as an example. A subspace methodology and computational approach to solving the conventional least-squares problem is presented. A new scanning approach equivalent to the statistical MUSIC method is developed. This subspace method scans 3D space with a one-dipole model, making it computationally feasible to scan the computer head volume. It is shown how PCA dipole fitting fails while the new scanning method generally succeeds. C.D.

A92-46601

### EFFECT OF VIBRATION ON THE METABOLISM OF GAMMA-AMINOBUTYRIC ACID IN THE BRAIN FOR DIFFERENT FUNCTIONAL STATES OF THE ADRENAL CORTEX [VLIANIE VIBRATSII NA OBMEN GAMMA-AMINOMASLIANOI KISLOTY MOZGA PRI RAZLICHNYKH FUNKTSIONAL'NYKH SOSTOIANIIAKH KORY NADPOCHECHNIKOV]

S. A. KERIMOV and M. I. SAFAROV (AN Azerbaidzhana, Institut Fiziologii, Baku, Azerbaijan) *Fiziologicheskii Zhurnal* (Kiev) (ISSN 0201-8489), vol. 38, no. 3, May-June 1992, p. 3-7. In Russian. refs

Copyright

The effect of 30-min-long low-frequency (20 Hz, A = 0.4 mm) vibration on the components of the gamma-aminobutyric acid (GABA) system and of dicarbonic amino acids in the brain of male rats with hypofunctional (due to injections of chloridan) or hyperfunctional (due to injections of adrenocorticotrophic hormone) adrenal cortex was investigated. It was found that, under both conditions, exposures to vibration led to increased levels of the GABA system components and of glutamatedecarboxylase. However, rats with adrenal hyperfunction exhibited relatively smaller increases in the contents of GABA components than untreated rats (vibration only) or rats with inhibited adrenal function. I.S.

A92-46602

### EFFECT OF WEAK, EXTREMELY LOW-FREQUENCY MAGNETIC FIELDS ON THE TIME ORGANIZATION OF EXCHANGE BETWEEN THIOL GROUPS AND LIPID PEROXIDATION PRODUCTS [VPLIV SLABKIKH MAGNITNIKH POLIV INFRANIZ'KIKH CHASTOT NA CHASOVU ORGANIZATSIIU OBMINU TIOLOVIKH GRUP TA PRODUKTIV PEREKISNOGO OKISLENNIA LIPIDIV U GOLOVNOMU MOZKU MISHEI]

V. S. MARTINIUK, A. N. KOPILOV, and A. M. STASHKOV (Simferopol'skii Gosudarstvennyi Universitet, Simferopol, Ukraine) *Fiziologicheskii Zhurnal* (Kiev) (ISSN 0201-8489), vol. 38, no. 3,

ABSTRACTS

## 51 LIFE SCIENCES (GENERAL)

May-June 1992, p. 7-11. In Ukrainian. refs

Copyright

The effect of an exposure to a weak (30 microT) magnetic field of low-frequency (0.08 and 8 Hz) on the dynamics of lipid peroxidation and the content of total thiol groups in the brain of mice was investigated. It is shown that exposures to magnetic fields cause changes in the time organization and in interrelations of the redox processes, which depend on the magnetic-field frequency. I.S.

**A92-46603**

**EFFECT OF THE BLOCKING OF BETA RECEPTORS ON THE STATE OF THE LYSOSOMAL APPARATUS IN NEUTROPHILIC LEUKOCYTES IN THE PERIPHERAL BLOOD OF RABBITS SUBJECTED TO IMMOBILIZATION STRESS [VPLIV BLOKADI BETA-RETSEPTORIV NA STAN LIZOSOMAL'NOGO APARATU NEITROFIL'NIKH LEIKOTSITIV PERIFERICHNOI KROVI KROLIV PRI IMMOBILIZATSII NOMU STRESI]**

N. V. LUNINA and S. V. VOVK (Luganskii Gosudarstvennyi Pedagogicheskii Institut, Lugansk, Ukraine) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 38, no. 3, May-June 1992, p. 43-49. In Ukrainian. refs  
Copyright

**A92-47309**

**EVIDENCE THAT EUKARYOTES AND EOCYTE PROKARYOTES ARE IMMEDIATE RELATIVES**

MARIA C. RIVERA and JAMES A. LAKE (California, University, Los Angeles) Science (ISSN 0036-8075), vol. 257, no. 5066, July 3, 1992, p. 74-76. Research supported by NSF, NIH, and Alfred P. Sloan Foundation. refs

Copyright

The phylogenetic origin of eukaryotes was unclear because eukaryotic nuclear genes have diverged substantially from prokaryotic ones. The genes coding for elongation factor EF-1-alpha were compared among various organisms. The EF-1-alpha sequences of eukaryotes contained an 11-amino-acid segment that was also found in eocytes (extremely thermophilic, sulfur-metabolizing bacteria) but that was absent in all other bacteria. The related (paralogous) genes encoding elongation factor EF-2 and initiation factor IF-2 also lacked the 11-amino-acid insert. These data imply that the eocytes are the closest surviving relatives (sister taxon) of the eukaryotes. Author

**A92-48096\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**LANGUAGE RESEARCH CENTER'S COMPUTERIZED TEST SYSTEM (LRC-CTS) - VIDEO-FORMATTED TASKS FOR COMPARATIVE PRIMATE RESEARCH**

DUANE M. RUMBAUGH, DAVID A. WASHBURN, E. S. SAVAGE-RUMBAUGH, WILLIAM D. HOPKINS, and W. K. RICHARDSON (Georgia State University, Atlanta) IN: Primatology Today. Amsterdam, Elsevier Science Publishers, 1991, p. 325-328. refs

(Contract NAG2-438)

Copyright

Automation of a computerized test system for comparative primate research is shown to improve the results of learning in standard paradigms. A mediational paradigm is used to determine the degree to which criterion in the learning-set testing reflects stimulus-response associative or mediational learning. Rhesus monkeys are shown to exhibit positive transfer as the criterion levels are shifted upwards, and the effectiveness of the computerized testing system is confirmed. C.C.S.

**A92-48097\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**CHIMPANZEE COUNTING AND RHESUS MONKEY ORDINALITY JUDGMENTS**

DUANE M. RUMBAUGH, DAVID A. WASHBURN, WILLIAM D. HOPKINS, and E. S. SAVAGE-RUMBAUGH (Georgia State University, Atlanta; Yerkes Regional Primate Research Center, Decatur, GA) IN: Primatology Today. Amsterdam, Elsevier Science

Publishers, 1991, p. 701, 702.

(Contract NIH-RR-00165; NIH-HD-06016; NAG2-438)

Copyright

An investigation is conducted to address the questions of whether chimpanzees can count and whether rhesus monkeys can differentiate written numbers. One investigation demonstrates the capacity of a chimpanzee to produce a quantity of responses appropriate to a given Arabic numeral. Rhesus monkeys are shown to have the capability for making fine differentiations between quantities of pellets and Arabic numerals. C.C.S.

**A92-48399** National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.

**CARBON DIOXIDE EFFECTS ON POTATO GROWTH UNDER DIFFERENT PHOTOPERIODS AND IRRADIANCE**

RAYMOND M. WHEELER (NASA, Kennedy Space Center, Cocoa Beach, FL), THEODORE W. TIBBITTS, and ANN H. FITZPATRICK (Wisconsin, University, Madison) Crop Science (ISSN 0011-183X), vol. 31, no. 5, Sept.-Oct. 1991, p. 1209-1213. Research supported by University of Wisconsin. refs

(Contract NCC2-136; NCC2-301)

Copyright

The effects of atmospheric CO<sub>2</sub> concentration, photosynthetic photon flux (PPF), and the length of the photoperiod on the tuber yield were investigated for three potato cultivars (Norland, Russet Burbank, and Denali), by growing these cultivars for 90 days in atmospheres containing 350 or 1000 micromol/mol CO<sub>2</sub>, at photoperiods of 12- or 24-hr, and at PPFs of 400 or 800 micromol/sq m per sec. Air temperatures and relative humidity were kept at 16 C and 70 percent, respectively. It was found that the tuber yield of Denali potatoes showed the greatest increase (21 percent) in response to increased CO<sub>2</sub> across all irradiance treatments, while the tuber yields of Russet and Norland were increased 18 and 9 percent, respectively. Greater plant growth from CO<sub>2</sub> enrichment was observed under lower PPF and the shorter (12 hr) photoperiod. I.S.

**A92-48624**

**THE MEMBRANE-ELECTROLYTE SYSTEM - MODEL OF THE INTERACTION OF GRAVITY WITH BIOLOGICAL SYSTEMS AT THE CELLULAR LEVEL [DAS MEMBRAN-ELEKTROLYT SYSTEM - MODELL ZUR WECHSELWIRKUNG DER SCHWERKRAFT MIT BIOLOGISCHEN SYSTEMEN AUF ZELLULAERER EBENE]**

ALBRECHT SCHATZ, RAVEN REITSTETTER, WOLFGANG BRIEGLEB, and ASTRID LINKE-HOMMES (DLR, Institut fuer Flugmedizin, Cologne, Federal Republic of Germany) DLR-Nachrichten (ISSN 0937-0420), no. 67, May 1992, p. 24-28. In German.

Copyright

The effect of gravity on the concentration and composition of electrolytes in the boundary layer of the cellular membrane-electrolyte system is investigated. Attention is given to the effects of gravity on membranes in positions parallel and perpendicular to the gravitational force and to the effects of microgravity on membranes. C.D.

**A92-48630**

**THE EFFECTS OF MICROGRAVITY ON THE CHARACTER OF PROGENY OF DROSOPHILA MELANOGASTER**

XIANG-GAO LI and GONG-ZHI WANG (Institute of Space Medico-Engineering, Beijing, People's Republic of China) Microgravity Science and Technology (ISSN 0938-0108), vol. 5, no. 2, July 1992, p. 94-97. refs

Copyright

To study how the microgravitational environment influences the character of the progeny of *Drosophila melanogaster*, the S1 insects produced during the 8-days of space flight were self-bred for four generations. Higher variational rate was found in S2. After removing the variant flies, the variational rate of the remaining *Drosophila* progeny decreased generation by generation. There was no notable sex-linked recessive lethal mutation of parent flies and no gene mutation found in their test-cross examination. It

indicates that the germ-cell of parent adult flies were not much influenced by microgravity, but the embryo of filial generation bread in space were greatly influenced by microgravity. Therefore, the mutagenesis during the embryogenic development should be taken into account in the bio-breeding under the space microgravitational environment. Author

A92-48631

**THEORETICAL AND EXPERIMENTAL INVESTIGATIONS ON THE FAST ROTATING CLINOSTAT**

M. AYED, O. PIRONNEAU (Paris VI, Universite, France), H. PLANEL, G. GASSET, and G. RICHOLLEY (Toulouse III, Universite, France) Microgravity Science and Technology (ISSN 0938-0108), vol. 5, no. 2, July 1992, p. 98-102. Research supported by CNES. refs  
Copyright

The paper investigates, both theoretically and experimentally, the validity of the fast rotating clinostat to simulate microgravity for a free-swimming single-cell organism such as the paramecium. Computer simulations show that cells on suspension move as cells cultivated in space. However, rotated paramecia are still affected by gravity, as shown by the variations in the rate of paramecium rotation on their axis. Using a fast clinostat, which allows to investigate simultaneously twenty cultures, a stimulating effect on cell growth rate was observed, similar to that previously reported in space. Author

**N92-28247#** Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ.

**EFFECTS OF EXTREMELY HIGH G ACCELERATION FORCES ON NASA'S CONTROL AND SPACE EXPOSED TOMATO SEEDS Special Publication**

ROGER WENTLING and CARL DEFRANCO Dec. 1991 76 p (AD-A247488; ARAED-SP-91002) Avail: CASI HC A05/MF A01

An experiment to expose tomato seeds to high levels of mechanical shock after they had spent six years in space aboard NASA's Long Duration Exposure Facility was conducted in the High 'G' Air gun Test Facility at Picatinny Arsenal. A group of control seeds that did not go into space were also exposed to high levels of shock. The object of this test was to determine if high levels of gravity affected the growth of the plants grown from this seed or the seeds from these plants. The tomato seeds were exposed from 1,258 times gravity (g) to 119,380 times gravity. Germination occurred at every level of testing and seeds from these plants will be saved to grow plants next year. In general, seeds from the higher shock levels produced higher quality tomatoes, and some abnormalities in developing of green tomatoes were observed at intermediate levels. Genetic effects, if any, are expected to be observed in the next generation which will be grown next year. GRA

**N92-28382#** Oak Ridge National Lab., TN.

**PRIMER ON MOLECULAR GENETICS**

Apr. 1992 28 p Prepared in cooperation with DOE, Washington, DC

(Contract DE-AC05-84OR-21400)

(DE92-010680; ORNL/M-2026) Avail: CASI HC A03/MF A01

This report is taken from the April 1992 draft of the DOE Human Genome 1991-1992 Program Report, which is expected to be published in May 1992. The primer is intended to be an introduction to basic principles of molecular genetics pertaining to the genome project. The material contained herein is not final and may be incomplete. Techniques of genetic mapping and DNA sequencing are described. DOE

**N92-29089#** Naval Oceanographic and Atmospheric Research Lab., Bay Saint Louis, MS.

**BIOLUMINESCENCE IN THE WESTERN ALBORAN SEA IN APRIL 1991 Final Report**

D. M. LAVOIE, D. K. YOUNG, and M. S. HULBERT Feb. 1992 99 p

(AD-A250016; NOARL-TN-212) Avail: CASI HC A05/MF A02

This document reports on the results of an expedition to study

bioluminescence in the western Alboran Sea of the Mediterranean in April of 1991. Two oceanographic research vessels and a research submersible were involved in making extensive measurements of bioluminescence and optical properties, as well as related biological and physical parameters. The primary research tool used was the HIDEK, a high resolution, state-of-the-art bathyphotometer. The results reported here cover only bioluminescence and related biological measurements made from the USNS Bartlett. Recommendations are given for survey requirements needed to extend measurements seasonally and geographically in this region of the Mediterranean. GRA

**N92-29397\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

**IN VITRO MEASUREMENT OF NUCLEUS PULPOSUS SWELLING PRESSURE: A NEW TECHNIQUE FOR STUDIES OF SPINAL ADAPTATION TO GRAVITY**

A. R. HARGENS, M. G. GLOVER (California Univ., San Diego.), M. M. MAHMOOD (California Univ., San Diego.), S. GOTT (California Univ., San Diego.), S. R. GARFIN (California Univ., San Diego.), R. BALLARD, G. MURTHY, and M. D. BROWN (Miami Univ., FL.) Jan. 1992 10 p (Contract RTOP 199-14-12-04)

(NASA-TM-103853; A-91108; NAS 1.15:103853) Avail: CASI HC A02/MF A01

Swelling of the intervertebral disc nucleus pulposus is altered by posture and gravity. We have designed and tested a new osmometer for in vitro determination of nucleus pulposus swelling pressure. The functional principle of the osmometer involves compressing a sample of nucleus pulposus with nitrogen gas until saline pressure gradients across a 0.45 microns Millipore filter are eliminated. Swelling pressure of both pooled dog and pooled pig lumbar disc nucleus pulposus were measured on the new osmometer and compared to swelling pressures determined using the equilibrium dialysis technique. The osmometer measured swelling pressures comparable to those obtained by the dialysis technique. This osmometer provides a rapid, direct, and accurate measurement of swelling pressure of the nucleus pulposus. Author

**N92-29410#** Johns Hopkins Univ., Baltimore, MD. School of Medicine.

**EFFECTS OF IONIZING RADIATION ON AUDITORY AND VISUAL THRESHOLDS Technical Report, 9 Oct. 1987 - 28 May 1991**

ROBERT D. HIENZ Mar. 1992 47 p

(Contract DNA001-87-C-0277)

(AD-A248199) Avail: CASI HC A03/MF A01

An experimental analysis of the effects of low-dose ionizing radiation on sensory and motor function was conducted in baboons. Animals were trained using a reaction time procedure to respond to near-threshold acoustic and visual stimuli, and quantitative assessments were made of radiation-induced changes in absolute auditory and visual thresholds and reaction times. Animals received multiple exposures at single fractionated dose levels of 1, 2, and 5 Gy. Single exposures at higher exposure levels of 10 and 15 Gy were also examined. 100-200 cGy exposures produced transient changes in reaction times. Transient increases in reaction times occurred following low-dose exposures, usually within 1-3 weeks following the exposure. These increases typically recovered to normal baseline levels within 2-3 weeks. 1000 and 1500 cGy exposures produced long-term hearing deficits which were not frequency-specific. The severe hearing loss was most likely due to a sensorineural deficit, since complete loss of function of the tympanic membrane or middle ear ossicles would be expected to produce a hearing loss about 50-55 dB. These higher radiation doses have had less of an effect on visual intensity thresholds, producing a 5-10 dB deficit in visual thresholds. No physical damage to the cornea, iris, lens, or retina was observed. GRA

**N92-29732#** Technische Univ., Delft (Netherlands). Dept. of Biochemical Engineering.

**METHODOLOGY ON MONITORING AND MODELLING OF**

**MICROBIAL METABOLISM Ph.D. Thesis**

HENDRIK JAN NOORMAN 1991 255 p

(ETN-92-91745) Avail: CASI HC A12/MF A03

The methodology to obtain mechanistical, dynamical microbial system descriptions is described. The energetics and regulation of the metabolism of *Acinetobacter calcoaceticus*, grown in the presence of acetate and xylose are investigated. Mathematical modeling and experimental verification are combined. The reactor is considered and the development of some practical tools is described. Mathematical methods to analyze microbial system descriptions and experimental data are given. The stoichiometric and kinetic parameters of the *Acinetobacter* system are studied.

ESA

**N92-29733#** Technische Univ., Delft (Netherlands).

**LINEAR RELATIONS IN MICROBIAL REACTION SYSTEMS: A GENERAL OVERVIEW OF THEIR ORIGIN, FORM, AND USE**

HENDRIK JAN NOORMAN, J. J. HEIJNEN, and K. C. A. M. LUYBEN *In its* Methodology on Monitoring and Modelling of Microbial Metabolism p 25-61 1991 Submitted for publication

Avail: CASI HC A03/MF A03

In microbial reaction systems, there are a number of linear relations among net conversion rates, useful in the analysis of experimental data. A general approach for the formulation and application of the linear relations is provided. Two types of system descriptions, one considering the biomass as a black box and the other based on metabolic pathways, are defined in a linear vector and matrix algebra framework. A correct a priori description can be obtained by three useful tests: the independency, consistency and observability tests. The sets of linear relations obtained from the two system descriptions are different. Conservation relations, derived from element, electrical charge, energy and Gibbs energy balances are provided by the black box approach. In addition to the conservation relations, metabolic and reaction relations are provided by the metabolic approach. A number of different types of linear relations given in the literature are reviewed. They are classified according to the different categories that result from the black box or the metabolic system description. Validation of hypotheses related to metabolic pathways are supported by experimental validation of the linear metabolic relations. ESA

**N92-29734#** Technische Univ., Delft (Netherlands).

**MODELLING AND EXPERIMENTAL VALIDATION OF CARBON DIOXIDE EVOLUTION IN ALKALOPHILIC CULTURES**

HENDRIK JAN NOORMAN, G. C. A. LUIJKX, K. C. A. M. LUYBEN, and J. J. HEIJNEN *In its* Methodology on Monitoring and Modelling of Microbial Metabolism p 65-93 1991 Submitted for publication

Avail: CASI HC A03/MF A03

The chemical reactions involving carbon dioxide in mineral culture media are considered. A mathematical model is set up. The reactions were studied in three different aqueous solutions, being water, mineral salt medium and a suspension with nongrowing bacterial cells. For each situation, three methods were compared for the determination of the bicarbonate concentration on the solution: equilibrium state total carbon analysis, dynamic monitoring of the rate of acid or alkali addition, and dynamic measurement of the carbon dioxide gas phase mole fraction. In a batch stirred tank reactor, the equilibrium constant agreed with the published value, and the three bicarbonate analysis methods gave the same results. A real alkalophilic process, using *Acinetobacter calcoaceticus* in a continuous stirred tank reactor at steady state, gave results in accord with the literature. However, the results do not allow validation of the equation expressing the nonideality. The steady state in the batch system and in continuous culture is well described with the mathematical model. However, in the transient state some unexplained differences between simulation and measurement, are noted. ESA

**N92-29735#** Technische Univ., Delft (Netherlands).

**MICROBIAL ALDONOLACTONE FORMATION AND HYDROLYSIS: KINETIC AND BIOENERGETIC ASPECTS**

HENDRIK JAN NOORMAN, J. L. L. RAKELS, J. G. KUENEN, K. C. A. M. LUYBEN, and J. J. HEIJNEN *In its* Methodology on Monitoring and Modelling of Microbial Metabolism p 97-126 1991 Submitted for publication

Avail: CASI HC A03/MF A03

During growth in mixtures of acetate and aldose sugars, the growth yield of the bacterium *Acinetobacter calcoaceticus* was increased when aldonolactone hydrolysis occurred. The underlying mechanism was investigated by studying the relationship between cellular yield and lactone hydrolysis in a quantitative way. The literature on the kinetics of acid formation from aldonolactones was reviewed. The reaction pattern is composed of lactone isomerization and hydrolysis steps which occur in series. In the acid pH range, lactone interconversion is the slowest step, whereas above pH 7 hydrolysis is rate/limiting for acid formation. Only for D-gluconolactone could a detailed mechanistic model be constructed. For a number of other aldonolactones including D-xylo and D-galactono lactone, an empirical kinetic equation was derived. The rate constants of these lactones are much smaller than for gluconolactone. The kinetic model of the hydrolysis of xylonolactone was tested, using the electrical charge balance in the *Acinetobacter* system. The published biomass yield data and the rate of lactone hydrolysis were compared. The observed relation seems to be only apparent. The electrical charge balance in the study of processes in which charged compounds are being converted is shown to be powerful. ESA

**N92-29736#** Technische Univ., Delft (Netherlands).

**THE BIOREACTOR OVERFLOW DEVICE: AN UNDESIRED SELECTIVE SEPARATOR IN CONTINUOUS CULTURES?**

HENDRIK JAN NOORMAN, J. BAKSTEEN, J. J. HEIJNEN, and K. C. A. M. LUYBEN *In its* Methodology on Monitoring and Modelling of Microbial Metabolism p 129-145 1991 Submitted for publication

Avail: CASI HC A03/MF A03

Nonhomogeneous cell suspensions in a continuous culture may result in a difference between the biomass concentrations in the culture vessel and the effluent. This will have important consequences for values calculated for stoichiometric and kinetic coefficients. For the bacterium *Acinetobacter calcoaceticus*, the cells were shown to tend to be buoyant, and because of this, if the vessel overflow device is not designed properly, cells will be selectively removed from the reactor. Two different effluent removal devices were compared, only one of which functioned well. The experimental results obtained for this microbial system are described. ESA

**N92-29737#** Technische Univ., Delft (Netherlands).

**CLASSIFICATION, ERROR DETECTION, AND RECONCILIATION OF MEASUREMENTS IN COMPLEX BIOCHEMICAL SYSTEMS**

HENDRIK JAN NOORMAN, K. C. A. M. LUYBEN, and J. J. HEIJNEN. *In its* Methodology on Monitoring and Modelling of Microbial Metabolism p 149-178 1991 Submitted for publication

Avail: CASI HC A03/MF A03

The applicability of the balancing method to a relatively complex microbial reaction system was investigated. The bacterium is used as a model system for energetic studies because its cellular energy balance can be manipulated. The balancing method, comprising rate classification measurement error detection and data reconciliation, is outlined. A black box and a metabolic description of the *Acinetobacter* system are made. Experiments using continuous cultures in steady state are described and the results are reported. The balancing method is applied to the experimental data. ESA

**N92-29738#** Technische Univ., Delft (Netherlands).

**ON THE ESTIMATION OF BIOENERGETIC PARAMETERS**

HENDRIK JAN NOORMAN, B. ROMEIN, K. C. A. M. LUYBEN,

and J. J. HEIJNEN *In its* Methodology on Monitoring and Modelling of Microbial Metabolism p 181-203 1991 Submitted for publication

Avail: CASI HC A03/MF A03

The occurrence and magnitude of the cell yield increase was studied over a broad range of specific growth rates. The effect was described with a mathematical model, where the energetics are covered by three basic parameters: the efficiency of oxidative phosphorylation, the yield of biomass in Adenosine Triphosphate (ATP), and the ATP turnover constant. The Acinetobacter system is described, leading to the formulation of the ATP balance. Experiments, using continuous cultures in steady state, are described. Macroscopic parameters and ATP coefficients are estimated for the Acinetobacter systems. The results are interpreted in physiological terms. ESA

**N92-29739#** Technische Univ., Delft (Netherlands).

**FLUX-CAPACITY RELATIONSHIPS OF ACINETOBACTER CALCOACETICUS ENZYMES DURING XYLOSE OXIDATION**

HENDRIK JAN NOORMAN, G. LUKITO, J. J. HEIJNEN, and K. C. A. M. LUYBEN *In its* Methodology on Monitoring and Modelling of Microbial Metabolism p 207-225 1991 Submitted for publication

Avail: CASI HC A03/MF A03

The regulation of acetate consumption, xylose oxidation via glucose dehydrogenase, Isocitrate Lyase (ICL) activity and NADPH dependent Isocitrate Dehydrogenase (ICDPH) activity on Acinetobacter is described as a function of the specific growth rate and the presence of xylose. The ability to oxidize xylose was constitutively present, but could be further induced by the supply of xylose. The maximum acetate conversion rate increased with increasing specific growth rates, and showed an overcapacity at low dilution rates. The substrate flow through ICDPH and ICL increased at higher increasing specific growth rates, although only 20 percent of the capacity was used. Under some conditions, ICDPH activity was reduced by the supply of xylose to the culture. The results are discussed in relation to the cellular energy budget, and simple kinetic expressions are developed to describe the observations. ESA

**N92-29740#** Technische Univ., Delft (Netherlands).

**ANALYSIS AND EXPERIMENTAL TESTING OF A BOTTLENECK MODEL FOR THE DESCRIPTION OF MICROBIAL DYNAMICS**

HENDRIK JAN NOORMAN, J. A. C. LANGERAK, M. G. MUSCH, J. J. HEIJNEN, and K. C. A. M. LUYBEN *In its* Methodology on Monitoring and Modelling of Microbial Metabolism p 229-257 1991 Submitted for publication

Avail: CASI HC A03/MF A03

Cellular control mechanisms play an important role in the productivity of large scale biotechnological processes. They can be studied in isolation in small scale reactors, by monitoring the microbial response after a deliberate disturbance of a steady state. Generally, a two phase response is observed, involving a rapid utilization of a metabolic overcapacity and a slow subsequent reorganization of the macromolecular composition. This was quantified in a mathematical bottleneck model, with a simple representation of enzyme activation and deactivation phenomena. Steady and transient states were described with the same model, where, for each substrate, the dynamic state allows the separate determination of the activation and deactivation parameters which are pumped on the steady state. This model was experimentally tested, using Acinetobacter calcoaceticus in continuous cultures, supplied with acetate and xylose. Transient states were obtained by a stepwise shift of the dilution rate and the xylose/acetate feed ratio. A strong dependency of the regulatory parameters of acetate and xylose conversion on the presence of xylose is reported. ESA

**N92-29754#** Technische Univ., Delft (Netherlands).

**STATE ESTIMATION AND ERROR DIAGNOSIS FOR BIOTECHNOLOGICAL PROCESSES Ph.D. Thesis**

REINIER THOMAS JACOB VANDERHEIJDEN 1991 192 p (ETN-92-91744) Avail: CASI HC A09/MF A02

A means of obtaining a more accurate and reliable characterization of the process state, without additional process information, and an improvement of the possibilities for process control are discussed. The currently available methods for state estimation are overviewed. The application of a state estimation within a process controller is described. An analytical approach is used to develop an insensitive state estimator. Systematic methods to check the consistency of the measurements are discussed. ESA

**N92-29755#** Technische Univ., Delft (Netherlands).

**THE USE OF STATE ESTIMATORS (OBSERVERS) FOR ON-LINE ESTIMATION OF NON-MEASURABLE PROCESS VARIABLES**

REINIER THOMAS JACOB VANDERHEIJDEN, C. HELLINGA, K. C. A. M. LUYBEN, and G. HONDERD *In its* State Estimation and Error Diagnosis for Biotechnological Processes p 17-29 1991

Avail: CASI HC A03/MF A02

An approach to the measurement of key variables in bioprocess control, which uses direct online measurements made in conjunction with a computational model of the process to obtain estimates for the values of less easily measurable variables, is considered. This information can be used to control the process. The combination of model and measurement is known as an observer. The measurements taken are used to correct the state estimates provided by the model. The art of using observers lies in the development of good models and appropriate corrections. Several alternatives for the tuning of observers are presented. Attention is paid to the effect of model errors. Adaptive structures, used to correct the model, may be helpful in solving the bias caused in the estimates. Some recent developments are discussed. ESA

**N92-29756#** Technische Univ., Delft (Netherlands).

**STATE ESTIMATION AND CONTROL OF THE IBE-FERMENTATION WITH PRODUCT RECOVERY**

REINIER THOMAS JACOB VANDERHEIJDEN, W. J. GROOT, C. HELLINGA, G. HONDERD, and K. C. A. M. LUYBEN *In its* State Estimation and Error Diagnosis for Biotechnological Processes p 31-45 1991

Avail: CASI HC A03/MF A02

The control of the combined process for the continuous production of Isopropanol, Butanol, and Ethanol (IBE) from whey permeate is discussed. This process consists of a fluidized bed reactor coupled with a product recovery unit. Immobilized clostridia are used for this fermentation. The process combined a high biomass retention with relatively low product concentrations. The experimental setup is described. The mathematical model is presented and the state observer is examined. The two different control strategies are developed and the results of both control strategies are compared. ESA

**N92-29757#** Technische Univ., Delft (Netherlands).

**A LOW SENSITIVITY OBSERVER FOR COMPLEX BIOTECHNOLOGICAL PROCESSES**

REINIER THOMAS JACOB VANDERHEIJDEN, P. F. W. GOVERDE, C. HELLINGA, K. C. A. M. LUYBEN, and G. HONDERD *In its* State Estimation and Error Diagnosis for Biotechnological Processes p 47-66 1991

Avail: CASI HC A03/MF A02

Process monitoring and control are frequently hindered by a lack of on-line information. State estimators may be used to estimate the actual values of unmeasurable process variables. However, errors in the process model incorporated in the estimator can easily cause a bias in the estimated variables. Sometimes, these errors are successfully reduced by implementation of a parameter estimator. An alternative approach: the low sensitivity observer is presented. This estimator is so tuned as to minimize sensitivity to certain errors in the process model. A low sensitivity observer was developed for a relatively complex process with five

## 51 LIFE SCIENCES (GENERAL)

state variables, fourteen model parameters, and two online measurements. A numerical solution is presented. The problem of analyzing the large amount of simulation data was solved. An example of how such a low sensitivity observer can be made insensitive with respect to the given model errors is presented. This low sensitivity observer is used with experimental data to show that it is insensitive as required during the steady state. This result indicates that the theory of low sensitivity observers is more generally applicable than thought. ESA

**N92-29758#** Technische Univ., Delft (Netherlands).

### **ANALYTICAL TUNING OF A LOW SENSITIVITY OBSERVER APPLIED TO A CONTINUOUS ETHANOL FERMENTATION WITH PRODUCT RECOVERY**

REINIER THOMAS JACOB VANDERHEIJDEN, B. ROMEIN, C. HELLINGA, G. HONDERD, and K. C. A. M. LUYBEN *In its* State Estimation and Error Diagnosis for Biotechnological Processes p 67-86 1991

Avail: CASI HC A03/MF A02

The influence of parameter errors in the process model used in an observer is described. In controlling a biotechnological process, the process variables of primary interest can often not be measured online. To estimate these primary control variables, an observer can be applied. However, errors may reduce the quality of the estimates. An observer insensitive to certain parameter errors in a process model was constructed. Such an observer is referred to as a low sensitivity observer. The conditions for low sensitivity were derived analytically. The general solution obtained was applied for any possible working point and parameter set. The applicability of the analytical solution was tested by using the low sensitivity observer in a feedback control loop. The process under consideration was a bench scale, continuous ethanol fermentation with product recovery. The nonmeasured substrate concentration was controlled by modifying the dilution rate. The substrate estimate obtained from this system remained correct, irrespective of the occurrence of specific model errors. A gradual decrease of the dilution rate had no significant influence on the quality of the estimate. The analytical solution is shown to function well for control purposes. ESA

**N92-29759#** Technische Univ., Delft (Netherlands).

### **IMPROVED BALANCING METHODS AND ERROR DIAGNOSIS FOR BIO(CHEMICAL) CONVERSIONS**

REINIER THOMAS JACOB VANDERHEIJDEN, J. J. HEIJNEN, B. ROMEIN, C. HELLINGA, and K. C. A. M. LUYBEN *In its* State Estimation and Error Diagnosis for Biotechnological Processes p 87-131 1991

Avail: CASI HC A03/MF A02

Balancing techniques to systematically check measurement data for the presence of errors are described. A number of equality constraints are used. The development of a new method to obtain a set of equations for balancing the measured conversion rates is described. The procedure provides an equation to give estimates of the nonmeasured conversion rates, after the measurements are balanced. A new and efficient method to determine whether or not the conversion rates are balanceable and calculable is described. The method differs from the graph/theoretical method and is implemented into a computer program. The residuals of the redundancy relations are tested by means of a chi square test, to decide whether there are significant errors in the data. A new and powerful method to locate the source of an error is presented. This method for error diagnosis is both powerful and numerically efficient. The methods described are illustrated by applying them to several sets of published data. ESA

**N92-29760#** Technische Univ., Delft (Netherlands).

### **SEQUENTIAL APPLICATION OF DATA RECONCILIATION FOR SENSITIVE DETECTION OF SYSTEMATIC ERRORS**

REINIER THOMAS JACOB VANDERHEIJDEN, B. ROMEIN, J. J. HEIJNEN, and K. C. A. M. LUYBEN *In its* State Estimation and Error Diagnosis for Biotechnological Processes p 133-182 1991

Avail: CASI HC A03/MF A02

A method to test for the presence of relatively small systematic

measurement errors (bias) is described. A balancing technique is used to check and improve the consistency of the measurements. The primary measurements are translated into observed conversions. The balancing technique was applied sequentially in time. By combining the result of the individual tests, the sensitivity of the method to measurement errors was improved. Accordingly, a rather sensitive statistical test for systematic errors was obtained. The means by which conversion terms can be obtained from primary measurements were analyzed. The expression of individual errors in the primary measurements within the vector of residuals was investigated. The error diagnostic method was adapted so as to test directly for errors in the primary measurements. A quantitative measure for error sensitivity was developed. The methods described are illustrated by applying them to data from an industrial process. ESA

## 52

### AEROSPACE MEDICINE

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

**A92-45007**

#### **ALCOHOLISM - AN EQUAL OPPORTUNITY DISEASE**

JOHN M. MANNING (Skywest Airlines, Inc., Saint George, UT) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 712-717. refs

Approximately 10 percent of pilots are alcoholics. The present survey of the current scientific understanding of the neurophysiological bases of alcohol addiction is presented in the autobiographical framework of the career experiences of a licensed pilot who is a recovering alcoholic. Basic research in brain chemistry is discussed in the context of clinical observations of alcoholic behavior. O.C.

**A92-45008**

#### **PSYCHOACTIVE DRUGS - EFFECTS ON COCKPIT PERFORMANCE**

E. D. NELSON (Cincinnati, University, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 718-727.

A particularly insidious problem in airline safety is presented by the fact that psychoactive drugs (PADs), which encompass many prescription and nonprescription drugs as well as alcohol, nicotine, and illegally traded narcotics, affect not only pilot psychomotor-task abilities, but pilot judgment, as well. The capacity for assimilation of large amounts of information, as well as for swift, critical decisions, is significantly impaired. A comprehensive characterization is made of the effects of the various commonly encountered PADs. O.C.

**A92-45010**

#### **COGSCREEN - PERSONAL COMPUTER-BASED TESTS OF COGNITIVE FUNCTION FOR OCCUPATIONAL MEDICAL CERTIFICATION**

RICHARD L. HORST (Man-Made Systems Corp., Ellicott City, MD) and GARY G. KAY (Georgetown University, Washington, DC) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 734-739. refs (Contract DTFA02-87-C-87069; DTFA02-90-C-90118)

A series of FAA-funded studies has led to the development of a PC-based battery of cognitive function tests for medical certification of individuals, designated 'COGSCREEN'. The sensitivity, specificity, and usability of COGSCREEN has been suggested by the ability of such testing to distinguish groups of

licensed pilots and nonpilot 'normal' subjects from a group of neuropsychological patients. COGSCREEN is currently being standardized on a population of healthy pilots. O.C.

**A92-45011**  
**HEART RATE VARIABILITY AND AUDITORY WORKLOAD DURING NOISE STRESS - SPEAKER SEX AND BANDPASS EFFECTS ON SPEECH INTELLIGIBILITY**

RICHARD W. BACKS (Wright State University, Dayton, OH) and LARRY C. WALRATH (McDonnell Douglas Corp., Saint Louis, MO) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 740-745. refs

The use of female voices for aircraft verbal warning systems is a result of historical accident. An effort has accordingly been made to experimentally evaluate the relative effectiveness of male and female voice-based warning systems under realistic cockpit conditions. It has been observed that under conditions of high noise stress, female speakers were less intelligible than males, and were associated with a higher mental workload than male voices. It is also noted that cardiovascular measures were sensitive to auditory workloads under test conditions. O.C.

**A92-45012**  
**HEART RATE VARIABILITY AS AN INDEX FOR PILOT WORKLOAD**

PETER G. A. M. JORNA (National Aerospace Laboratory, Amsterdam, Netherlands) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 746-751. refs

A key factor in prospective progress toward excessive pilot workload strategy development is the establishment of standardized methods for workload assessment and analysis, in conjunction with validated workload-prediction algorithms. Attention is presently given to one such candidate for standardization, the spectral analysis of heart rate variability (HRV), in view of the results of a simulator study that compared the theoretical evaluation of flight-task difficulty with heart-rate variability. HRV is found to correlate consistently and meaningfully with variations in aviation workloads. O.C.

**A92-45014**  
**EEG CORRELATES OF CRITICAL DECISION MAKING IN COMPUTER SIMULATED COMBAT**

GINA R. POE, BRANDALL Y. SUYENOBU (USVA, Medical Center, Sepulveda; California, University, Los Angeles), CHERYL A. BOLSTAD (Northrop Corp., Aircraft Div., Hawthorne, CA), MICA R. ENDSLEY (Texas Tech University, Lubbock), and MAURICE B. STERMAN (USVA, Medical Center, Sepulveda; California, University, Los Angeles) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 758-763. Research supported by Northrop Corp. and USVA. refs

Suppression of the dominant EEG frequency, defined as that frequency displaying the highest spectral density within an eyes-closed resting period, could be attributed to increased cortical processing of external information and might therefore be indicative of pilot overwork. An effort is presently made to confirm such findings in the context of a controlled flight simulation in which the performance of experienced pilots was quantified in a technically demanding context. As predicted, simulated combat engagements were indicated by decreased activation across the sensorimotor strip; there was a trend toward increased laterality, with greater activation along the right sensorimotor strip in positive-outcome interactions. O.C.

**A92-45015**  
**TOPOGRAPHIC EEG CORRELATES OF PERCEPTUAL DEFENSIVENESS**

MAURICE B. STERMAN (USVA, Medical Center, Sepulveda, CA) and MIRANDA OLFF (Utrecht, State University, Netherlands) IN:

International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 764-769. refs

It has been theorized that psychological defense mechanisms disturb perception in highly threatening situations to an extent that compromises judgment and performance; this disturbance presumably arises from an aberrant cognitive response to the situation. An effort is presently made to evaluate this hypothesis through the study of corresponding EEG response patterns, using Kragh's (1960) Defense Mechanism Test (DMT). Subjects who scored highest on the DMT showed a significantly greater attenuation of 8-12 Hz activity at midcentral and parietal cortical sites with threat perception than those with low DMT scores. This overloading of neural resources for psychologically defensive purposes may leave less of them available for critical decisionmaking. O.C.

**A92-45016**  
**SOME FACTORS ASSOCIATED WITH PILOT AGE IN GENERAL AVIATION CRASHES**

RUDOLF G. MORTIMER (Illinois, University, Champaign) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 770-775. refs

A sample of 1034 NTSB Accident Brief reports for 1985/86 were analyzed to discern age differences of pilots in the characteristics of general aviation airplane accidents. Pilots aged 60 or more were more involved in taxiing accidents and those under 30 more in the maneuvering phase. In combination with pilot exposure data from another study and FAA accident data for 1986, the accident rates of pilots aged 60 or more and younger pilots were estimated. Those aged 60 or more had an accident rate about twice that of the younger pilots. Author

**A92-45020**  
**THE UTILIZATION OF THE AVIATION SAFETY REPORTING SYSTEM - A CASE STUDY IN PILOT FATIGUE**

AILEEN L. LOGAN and ROLF J. BRAUNE (Boeing Commercial Airplane Group, Seattle, WA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 793-798. refs

The extent to which the optimal safety and efficiency of airline operations are affected by whether their aircrews are well rested and alert is presently evaluated in light of data from the Aviation Safety Reporting System's questionnaires. Attention is drawn to the apparently counterintuitive finding that the majority of reported incidents occurred within the first two hours of the pilots' scheduled flying time. More specialized and intensive research on this factor is called for. O.C.

**A92-45021**  
**VIGILANCE OF AIRCREWS DURING LONG-HAUL FLIGHTS**

PH. CABON, R. MOLLARD, A. COBLENTZ, J. P. FOUILLOT (Paris V, Universite, France), C. STOUFF, and G. MOLINIER (Direction Generale de l'Aviation Civile, Paris, France) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 799-804. Research supported by Direction Generale de l'Aviation Civile and Airbus Industrie. refs

An effort is made to identify the factors that can modify pilot vigilance and performance during long-haul flights, in order to either institute measures for the reinvigoration of pilots or propose rest and nap periods. A data base encompassing such quantitative physiological data as pilot EEGs, EOGs, and EKGs were used to compile a data base for further evaluation. Vigilance, as indicated by the increase in the slow bands of EEG and in blink frequency, shows important variations during the low workload/monotonous activity cruising phase of a long-range flight. O.C.

**A92-45029**  
**VARIABLES AFFECTING SIMULATOR SICKNESS - REPORT OF A SEMI-AUTOMATIC SCORING SYSTEM**

ROBERT S. KENNEDY, MARTIN G. SMITH (Essex Corp., Orlando, FL), and SHERRIE A. JONES (U.S. Navy, Naval Training Systems Center, Orlando, FL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 851-856. refs

The Simulator Sickness Questionnaire (SSQ) has been implemented on a portable computer and fielded at a number of simulator sites to provide a relatively inexpensive, maintenance-free way of collecting simulator-sickness data. Attention is presently given to the results of a 20-month data-acquisition program in which SSQ was fielded at each of two TH-57 helicopter flight trainers. The self-scoring SSQ software furnishes pilots with immediate feedback through which to enhance awareness of systems and their associated performance limitations. O.C.

**A92-45813****YELLOW LENS EFFECTS UPON VISUAL ACQUISITION PERFORMANCE**

WAYNE F. PROVINES, ALTON J. RAHE, MICHAEL G. BLOCK, THOMASINA PENA, and THOMAS J. TREDICI (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 561-564. refs

Copyright

Twenty subjects made a total of 400 threshold visual acquisitions of T-38 aircraft approaching from 9 miles out. Half of the acquisitions were made with the subjects wearing yellow ophthalmic filters, and the other half without filters. No overall statistically significant difference in acquisition performance due to the use of yellow filters was found. Author

**A92-45815****DETERMINATION OF A PRESSURE BREATHING SCHEDULE FOR IMPROVING +GZ TOLERANCE**

M. PECARIC and F. BUICK (Defence and Civil Institute of Environmental Medicine, North York, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 572-578. refs

Copyright

A base of empirical data for developing optimal pressure breathing during +Gz (PBG) schedules is lacking. Relaxed +Gz-intensity tolerance with PBG was measured during gradual +Gz-onset rate centrifuge profiles, using standard light bar criteria. Constant PBG levels ranging from 18-73 mm Hg were randomly assigned. G-suit pressure followed the standard or an increased inflation schedule. Nine subjects wore a jerkin, CSU-15/P G-suit, and TLSS helmet and mask. With mean mask cavity pressures of 0, 18, 38, 60, and 73 mm Hg, corresponding +Gz-tolerances (mean +/- S.E.M.) were 5.3 +/- 0.2, 5.8 +/- 0.1, 6.6 +/- 0.2, 7.3 +/- 0.3, and 7.5 +/- 0.3 Gz (linear correlation,  $r = 0.994$ ). Increased G-suit pressure did not change the +Gz-tolerance improvement with PBG. The inverse of individual subject regression slopes ranged from 22.6 to 58.1 mm Hg/+Gz. Considering additional factors and adequate +G protection for all subjects while relaxed, the proposed schedule would apply 42 mm Hg PBG/+Gz beginning at +3.3 Gz with a maximum pressure of at least 73 mm Hg. Author

**A92-45816****HISTAMINERGIC RESPONSE TO CORIOLIS STIMULATION - IMPLICATION FOR TRANSDERMAL SCOPOLAMINE THERAPY OF MOTION SICKNESS**

EN-TONG WANG, DING-RONG ZHOU, and LING-HAN HE (Air Force, General Hospital, Beijing, People's Republic of China) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 579-582. refs

Copyright

The blood levels of histamine and 5-hydroxytryptamine (5-HT) in 10 subjects, with or without administration of the transdermal therapeutic system of scopolamine (TTS-S), were measured following motion sickness (MS) induced by Coriolis stimulation. Histamine and 5-HT were assayed using the fluorometric method.

The results demonstrated that the blood levels of histamine increased significantly following MS and were even higher in the subjects using the TTS-S, but no significant changes were found in the blood levels of 5-HT following MS nor any effect on TTS-S on it. The results suggest that histamine contributes to the development of MS, and scopolamine may exert its anti-MS action by affecting the histaminergic system as well as the acetylcholinergic system; there may not be a definite relation between 5-HT and the development of MS. Author

**A92-45818****USE OF A MOTION SICKNESS HISTORY QUESTIONNAIRE FOR PREDICTION OF SIMULATOR SICKNESS**

ROBERT S. KENNEDY (Essex Corp., Orlando, FL), JENNIFER E. FOWLKES (Enzian Technology, Inc., Orlando, FL), KEVIN S. BEHBAUM (Iowa, University, Iowa City), and MICHAEL G. LILIENTHAL (U.S. Navy, Naval Air Systems Command, Washington, DC) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 588-593. refs

(Contract N61339-85-D-0044; N61339-81-C-0105)

Copyright

This research assessed the usefulness of the Motion History Questionnaire (MHQ) for the prediction of simulator sickness, a form of motion sickness experienced by pilots training in ground-based flight simulators. Four MHQ scoring keys were compared: (1) the original MHQ key which had been validated on a sample of U.S. Navy student pilots exposed to Coriolis forces, (2 and 3) two keys which had been validated on a sample of civilian college students exposed to simulated ship motions, and (4) a simulator sickness key empirically derived in the present research and cross-validated. Navy and Marine Corps aviators ( $N = 456$ ) filled out the MHQ prior to their regularly scheduled flight simulator training and were divided into validation and cross-validation samples. All scoring keys were predictive of reported symptoms of sickness, but highest correlations were obtained with the empirically derived simulator sickness (SS) key. It is suggested that the SS key be used for self-testing so that pilots may be made aware of their risk for developing simulator sickness. Author

**A92-45819****SUSTAINED ATTENTION AND SERIAL RESPONDING IN HEAT - MENTAL EFFORT IN THE CONTROL OF PERFORMANCE**

SHAHRAM RAZMJOU and ANDERS KJELLBERG (National Institute of Occupational Health, Solna, Sweden) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 594-601. refs

Copyright

The effects of heat (40 C) on sustained attention and serial responding were studied in a simple reaction time task and a serial four-choice reaction time task, respectively. Core temperature ( $T_c$ ), heart rate variability (HV), and subjective reactions were monitored during the 80 min of exposure time. Simple reaction time performance and accuracy in the serial choice reaction time task deteriorated significantly in heat. In the serial choice reaction time task, the effects of heat on response times and on HV were correlated. Performance and level of  $T_c$  were not correlated, but a relationship was found between performance and the rate of  $T_c$  change. Results are discussed in relation to the thermophysiological status of the subjects and the compensatory mechanism of effort allocation. It is proposed that task characteristics regulate the degree of activity of this compensatory mechanism. Author

**A92-45820****CERVICAL INJURIES DURING HIGH G MANEUVERS - A REVIEW OF NAVAL SAFETY CENTER DATA, 1980-1990**

DAVID W. YACAVONE and R. BASON (U.S. Navy, Naval Safety Center, Norfolk, VA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 602-605. refs

Copyright

As aircraft capable of sustaining high-G maneuvers enter the U.S. Navy Fleet, the reported incidence of cervical injury to aircrew seems to have increased. To determine the extent of the problem,

personal injury reports submitted to the Naval Safety Center were reviewed for the 10-year period from 1980 to 1990. In addition, confidential questionnaires were sent to flight surgeons supporting fighter/or fighter-attack units. The data collected were statistically analyzed. The incidence of cervical injuries, defined as at least one day's absence from the flight schedule, was computed. Other subjective factors, such as the type helmet worn, the cockpit position flown, and the type of mission profile completed, were examined. As might be expected, the most common offender was air combat maneuvering. The most common aircraft was the F/A18, but the radar intercept officer position of the the F14B was also a significant contributor. The most common injury pattern reported was a simple muscle strain. Cervical pain after high -G- missions poses a potential threat to combat readiness. However, the use of the newer light-weight helmet seems to have reduced the severity. *Muscle strengthening exercises appear to help in prevention. Treatment is successful in most cases with minimal or no residuals noted. As yet, there exist little official data to support the notion of a major problem.* Author

A92-45821

#### INNER EAR BAROTRAUMA - A CASE FOR EXPLORATORY TYMPANOTOMY

DEANA H. ASHTON and LAURANCE A. WATSON (Royal Australian Air Force, Directorate of Health Services, Canberra, Australia) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 612-615. refs

Copyright

A case of inner ear barotrauma (IEBT) due to an hypobaric chamber experience is presented. IEBT is an exceedingly rare condition in aviation. In the case described, the diagnosis was initially unsuspected due to accompanying middle ear barotrauma. The underlying etiology, the diagnosis, and management of IEBT are discussed. Author

A92-45822

#### MENSTRUAL HISTORY IN ALTITUDE CHAMBER TRAINEES

JENNIFER U. SCHIRMER and WILBUR T. WORKMAN (USAF, Armstrong Laboratory, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 616-618. refs

Copyright

Menstrual history in women completing altitude chamber training is analyzed. After completing altitude chamber flights, data on age, day of menstrual cycle, birth control pill (BCP) use, and mean durations of menstrual cycle and menses were collected. No differences were found between mean duration of menstrual cycle and menses in the Yes and No BCP groups. Women completing altitude chamber training without developing altitude-induced decompression sickness (DCS) appear to be evenly distributed across their menstrual cycle, with the use of BCPs not affecting their susceptibility to DCS. P.D.

A92-45823

#### LASER SURGERY PROCEDURES IN THE OPERATIONAL KC-135E AVIATION ENVIRONMENT

MICHAEL COLVARD (USAF, Strategic Air Command Clinic, Chicago, IL), PAUL KUO (Loyola University, Maywood, IL), RICHARD CALEEL (Chicago College of Osteopathic Medicine, Downers Grove, IL), JACK LABO (USAF, Armstrong Laboratory, Brooks AFB, TX), and ROBERT SELF (National Guard Bureau, Andrews AFB, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 619-623. refs

Copyright

The operational aviation and space environments present a potential for surgical trauma to aircrew and passengers. Current wound care techniques for trauma in the aviation and space medicine environment focus on classical surgical management of wounds. Medical lasers used in these environments can provide rapid control of bleeding wounds, reduce aircraft environmental contamination from body fluids and secretions, and faster rapid triage of injured personnel. Self-contained and reusable medical lasers have the potential to reduce the material supply of medical

kits in the aviation and space environment. A miniaturized carbon dioxide laser was used to establish protocols and procedures for use on operational military KC-135E aircraft. Laser surgery was performed to demonstrate laser efficacy and safety in flight.

Author

A92-45946

#### CHANGES OF SERUM CORTISOL, INSULIN, GLUCAGON, THYROXINES AND CYCLIC NUCLEOTIDES PRE- AND POST-FLIGHT IN PILOTS

CHANG-TAI XU, YU-MIN WANG (Air Force Hospital, Lanzhou, People's Republic of China), and BO-RONG PAN (Fourth Military Medical University, Xian, People's Republic of China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 1, 1992, p. 1-5. refs

The effect of flight on the levels of blood-serum hormones in humans was investigated by measuring serum levels of cortisol, insulin, glucagon, thyroxines (T3 and T4), and cyclic nucleotides (cAMP and cGMP) in serums of ground crew members before and after a working day and of fighter pilots before and after a flight. Results of radioimmuno assays showed that pilots who completed 0.5 to 3.5 hr flights on a J-6 fighter, at air speeds from 400 to 800 km/hr, exhibited significantly lower levels of cortisol and cAMP and higher levels of insulin than they did before flights, whereas the levels of T3, T4, and cGMP did not change. The groundcrew members showed only slight decreases of insulin as a result of maintenance work. I.S.

A92-45947

#### ANALYSIS OF THE MECHANISM AND PROTECTION OF UPPER LIMB WINDBLAST FLAILING INJURY

YUN-RAN ZHANG (Institute of Space Medico-Engineering, Beijing, People's Republic of China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 1, 1992, p. 19-24. In Chinese. refs

The mechanism of the upper limb windblast flailing injury of pilots during ejection was investigated analytically. The constraining equations for steady states were developed and were used to calculate the value of constraining force needed for the protection of the upper limb at steady-state ejection. Calculations of the lowest constraining forces needed for the upper limb, under the configuration of hands on the top of the thighs and hands on alternate firing handle showed that the optimal location to exert minimal constraining forces on upper limbs is close to the elbow joints and the carpus joints. The design of an arm-restraint plate and the optimum ejection attitude are discussed. I.S.

A92-45950

#### COLD AND HYPOXIA

CHENG PANG (Institute of Space Medico-Engineering, Beijing, People's Republic of China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 1, 1992, p. 61-66. In Chinese. refs

The combined effects of cold and hypoxia on the thermoregulation, tolerance to hypoxia, and water exchange parameters were examined. It is pointed out that hypoxia may reduce the capacity of thermoregulation and to cause difficulties in maintaining the work capacity of workers in cold environment. On the other hand, cold can decrease the limit of tolerance to hypoxia and speed up the development of hypoxia symptoms at high altitudes. It was also found that the exposures to cold and hypoxia can cause dehydration, although their effects on water exchange may not be additive. I.S.

A92-46297

#### THE EFFECT OF ACCOMMODATION ON RETINAL IMAGE SIZE

GEORGE SMITH (Melbourne, University, Parkville, Australia), JAMES W. MEEHAN (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris, France), and ROSS H. DAY (Monash University, Clayton, Australia) Human Factors (ISSN 0018-7208), vol. 34, no. 3, June 1992, p. 289-301. refs

Copyright

Using schematic eyes, the change in retinal image size caused by a change in accommodation micropsia is investigated. The use of schematic eyes is also discussed and is justified. The calculated magnitude of this diminution for four schematic eyes ranged from unity at infinity to a maximum of 0.98 (-2 percent) at about 12.0 diopters (D). For distances at which accommodation micropsia is typically observed (about 2.0 D), retinal minification is less than 0.997 (-0.3 percent). Thus changes in the size of the retinal image attributable to accommodation are virtually negligible when compared with the observed reduction of 3 percent to 33 percent. This suggests that accommodation micropsia is mediated almost entirely by processes other than those involving the optics of the eye. Author

A92-47500

**THE ANTHROPOMETRIC SURVEY FOR JASDF MEN AND WOMEN - 1988. I - METHODS AND STATISTICS OF BODY DIMENSIONS**

YUKIKO KAKIMOTO, ATSUSHI KADOO, SHUJI NISHI, ZOJIRO KATOH, KIYOSHI MIZUMOTO, YOSHINORI TAKEUCHI, and YUKO NAGASAWA Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 32, no. 3, Sept. 1991, p. 53-104. In Japanese. refs

A92-48536

**SELF-PROTECTIVE ANTI-GZ STRAINING MANEUVERS (AGSM) PHYSIOLOGY**

EARL H. WOOD (Mayo Medical Center, Rochester, MN) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 857-864. Research supported by Waters Instrument Co. refs

Copyright

Results on anti-G straining maneuvers (AGSM), which utilize the 3-5 second duration increase in arterial pressure which can be produced by a proportionate increase in airway pressures, are presented. Recent studies have confirmed that the successive Valsalva and positive pressure breathing maneuvers can be performed safely when used simultaneously with a G suit and are as effective and less fatiguing than the M-1, particularly when used with a counter-pressure chest jerkin; this has established these two as the AGSMs of choice for pilot training. It is further noted that, although the M-2 maneuver is very revealing concerning the neurogenic, hemodynamic determinants of Gz tolerances in relaxed healthy humans, it is not practical for tactical, operational use. A safer, effective self-protective strategem, the F-1 maneuver, is recommended for training purposes and operational trails. I.E.

A92-49229

**KEY PROBLEMS OF MEDICAL EXAMINATIONS BY AVIATION PHYSICIANS [AKTUAL'NYE VOPROSY VRACHEBNO-LETNOI EKSPERTIZY]**

P. L. SLEPENKOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), no. 2, Feb. 1992, p. 25-27. In Russian.

Copyright

It was calculated that hundreds of millions of rubles could be saved by increasing the professional service of 1000 pilots by five years. This paper discusses key problems related to predicting the years of service of a pilot. It is emphasized that this prediction must take into consideration not only the health of the individual but also his physiological and psychological conditions and relevant sociological and technological factors. An individual approach in medical examinations is recommended where normally disabling conditions may be found to have been compensated for by unusual psychological fitness, citing several examples where lower-limb amputees were permitted to continue as fighter pilots during World War II. I.S.

**N92-28242#** Army Biomedical Research and Development Lab., Fort Detrick, MD.

**ENVIRONMENTAL TESTING OF THE XI SCAN 1000, PORTABLE FLUOROSCOPIC AND RADIOGRAPHIC IMAGING SYSTEM Final Report, Dec. 1990 - Oct. 1991**

DAVID D. BAKER, JR., JAMES H. NELSON, and DAVID L. DANLEY 14 Feb. 1992 32 p

(Contract DA PROJ. 3M1-62787-A-874)

(AD-A247167; USABRD-9201) Avail: CASI HC A03/MF A01

The Xi Scan 1000, Portable Fluoroscopic and Radiographic Imaging System is a hand-held unit which can be configured as a 2.6 inch, direct view fluoroscope or a standard X-ray machine for 8 by 10 inch film. This study used the System 3 package including a C-arm, cassette tray, image Intensifier, and rechargeable battery power supply which weigh 30 pounds in the commercial carrying case. Although this system could not replace existing military radiography equipment, it could enhance current capability. The fluoroscope would benefit surgeons during procedures in far-forward facilities and it could provide instant feedback to other medical personnel as to the severity of common injuries. Although the Xi Scan 1000 appears robust, it was not designed for harsh environmental conditions. For this study, a container was procured that meets the Deployable Medical Systems (DEPMEDS) packaging standard (MIL-D-42048). With this container, the system was subjected to environmental tests IAW MIL-STD-810E, Environmental Test Methods and Engineering Guidelines, to include: storage and operation at high and low temperatures, transit shock, and vibration. After each environmental insult, performance tests were conducted to determine whether the system continued to meet specifications. Whereas the results showed the system susceptible to damage from temperature extremes and shock, the failure modes were related to design features currently being addressed. GRA

**N92-28278#** California Univ., Berkeley. Lawrence Berkeley Lab.

**PROBLEMS IN MECHANISTIC THEORETICAL MODELS FOR CELL TRANSFORMATION BY IONIZING RADIATION**

A. CHATTERJEE and W. R. HOLLEY Oct. 1991 8 p Presented at the Workshop on Biophysical Modelling of Radiation Effects, Padua, Italy, 2-5 Sep. 1991

(Contract DE-AC03-76SF-00098)

(DE92-010265; LBL-31398; CONF-9109107-5) Avail: CASI HC A02/MF A01

A mechanistic model based on yields of double strand breaks has been developed to determine the dose response curves for cell transformation frequencies. At its present stage the model is applicable to immortal cell lines and to various qualities (x-rays, neon and iron) of ionizing radiation. Presently, we have considered four types of processes which can lead to activation phenomena: (1) point mutation events on a regulatory segment of selected oncogenes; (2) inactivation of suppressor genes, through point mutation; (3) deletion of a suppressor gene by a single track; and (4) deletion of a suppressor gene by two tracks. DOE

**N92-28288#** Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA.

**EFFECTS OF HIGH TERRESTRIAL ALTITUDE ON MILITARY PERFORMANCE**

LOUIS E. BANDERET and RICHARD L. BURSE 1991 31 p Submitted for publication

(AD-A246695; USARIEM-T2-92) Avail: CASI HC A03/MF A01

When people travel to terrestrial altitudes greater than 3000 m, their well being is usually compromised. At high altitude, the decreased atmospheric pressure results in a reduction of the partial pressure of oxygen and lowers the rate at which oxygen can diffuse into the blood. This decreases the oxygen supply to the brain, muscles, and other parts of the body and reduces the maximum rate at which the body can use oxygen to perform physical work. The main medical programs at high altitude which impact physical and mental performance are acute mountain sickness, high altitude cerebral edema (HACE), and high-altitude pulmonary edema. These disorders can usually be prevented by

ascending slowly to 3000 m and then climbing 500 m on each subsequent ascent, allowing 1-2 days to acclimatize at each altitude. High altitude exposure can have profound effects on mental processes. Judgment may be severely impaired, especially if an individual is exposed to an extremely high altitude or has signs of HACE. Typically, the rate of performance on many tasks slows. On others, people more frequently neglect conceptual, computational, and procedural strategies. The use of optimal ascent profiles, medications, psychological strategies, and nutrients can facilitate coping and functioning in high-altitude environments.

GRA

**N92-28397#** Arizona Univ., Tucson.  
**THE COORDINATED NONINVASIVE STUDIES (CNS) PROJECT, PHASE 1 Final Report, 8 Sep. 1988 - 7 Sep. 1991**  
 JUDITH L. LAUTER Dec. 1991 86 p  
 (Contract AF-AFOSR-0352-88)  
 (AD-A247159; AFOSR-92-0146TR-PHASE-1) Avail: CASI HC A05/MF A01

The CNS Project combines several noninvasive methods for monitoring brain structure and function in a test battery. Phase One (1988-1991) focussed on neuroanatomical and neurophysiological correlates of behavioral ear advantages for two sets of complex sounds. Fifteen subjects neurologically normal according to conventional standards were tested with dichotic listening (2 measures), NM (2 measures), evoked potentials (2 measures), and qEEG (4 measures). One subject was also tested under similar conditions with PET. Results indicated: (1) Each individual had a distinct sidedness bias articulated in terms of a combination of anatomical and physiological variables; (2) These individual patterns cut across conventional categories such as gender and handedness; (3) In some of the subjects, these CNS profiles comprised internally consistent patterns of asymmetries linking subcortical physiology, cortical anatomy and cortical physiology; (4) In others, departures from such consistency signalled evidence of a variety of subtle neuropathologies, such as stuttering, mild learning disorder, central auditory dysfunction, or a history of hyperactivity and/or substance abuse. GRA

**N92-28420\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**THERMOREGULATION DURING SPACEFLIGHT**  
 JOHN E. GREENLEAF and SUZANNE M. FORTNEY (National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.) Jan. 1992 34 p  
 (Contract RTOP 199-18-12-07)  
 (NASA-TM-103913; A-92043; NAS 1.15:103913) Avail: CASI HC A03/MF A01

The purpose of this flight proposal is to investigate human thermoregulatory parameters during exercise in microgravity. The hypothesis to be tested is that microgravity-adopted astronauts will exhibit accentuated increases in their core temperature (excess hyperthermia) during exercise because of altered heat loss responses due to reduced sweating and/or accentuated vasodilation. The specific aims are (1) to compare core and skin temperature responses during moderate exercise before flight and inflight; (2) to determine whether the hypothesized inflight excessive hyperthermia is due to increased heat production, reduced, sweating, impaired peripheral vasodilation, or to some combination of these factors; and (3) to determine whether heat production at an exercise load of 60 percent of the maximal working capacity is similar preflight and inflight. It is expected that the astronauts will exhibit excessive hyperthermia during exposure to microgravity which will be caused by decreased sweating and decreased skin blood flow. Author

**N92-28515#** Oregon Health Sciences Univ., Portland. Dept. of Biochemistry and Molecular Biology.  
**STRUCTURAL CHARACTERIZATION OF CROSS-LINKED HEMOGLOBINS DEVELOPED AS POTENTIAL TRANSFUSION SUBSTITUTES Final Report, 1 Nov. 1988 - 31 Oct. 1991**  
 RICHARD T. JONES 30 Nov. 1991 101 p

(Contract DAMD17-89-C-9002; DA PROJ. 3M1-62787-A-874)  
 (AD-A246777) Avail: CASI HC A06/MF A02

Structural and functional studies of chemically modified hemoglobins have been done in an effort to find reagents and conditions that are suitable to produce cross-linked hemoglobin derivatives that would be suitable for use as acellular substitutes for the transfusions of erythrocytes. The effects of modifying hemoglobin with five different dicarboxylic bis(methyl phosphate) and three tricarboxylic tris(methyl phosphate) reagents provided by Professor Ronald Kluger have been examined by ion exchange separation of hemoglobin products, globin chain separation, peptide pattern analysis, and oxygen equilibrium measurements. The extent of reaction varied depending on the conformational state of the hemoglobin and the size of the reagent. Both cross-linked and uncross-linked products have been found and characterized structurally and functionally. Several have reduced oxygen affinities. *A strong correlation was found between the oxygen affinities and the bridging distances of the beta1-x-82beta crosslinked hemoglobins.* GRA

**N92-28534#** Netherlands Aerospace Medical Centre, Soesterberg.

**G-TOLERANCE AND SPATIAL DISORIENTATION: CAN SIMULATION HELP US?**

J. SMIT and ROBERT E. VANPATTEN (Van Patten, Robert E., Bellbrook, OH) /n AGARD, Piloted Simulation Effectiveness 7 p Feb. 1992

Copyright Avail: CASI HC A02/MF A03

Pilots of modern fighter aircraft are endangered by high G-forces, loss of situational awareness, and spatial disorientation. In order to prepare aircrew for these factors, ground based training facilities simulating some aspects of the relevant phenomena are used. The human centrifuge has proven to be rather effective in increasing G-tolerance, especially in conditions of high onset rate. Unrealistic simulations caused by the small radius of rotation in centrifuges can generate disturbing vestibular stimulation. During the development of the human centrifuge at the Netherlands Aerospace Medical Center an investigation was undertaken to find methods to suppress these detrimental effects. Smoothing of centrifuge motion and a realistic, computer-generated outside-vision system proved to be effective measures. Realistic target tracking and a cockpit-like environment are factors which enhance transfer of training. Author

**N92-28685#** Lawrence Livermore National Lab., CA.  
**SOMATIC GENE MUTATION IN THE HUMAN IN RELATION TO RADIATION RISK**

M. L. MENDELSON Jan. 1992 10 p Presented at the 27th National Council on Radiation Protection and Measurements Annual Meeting on Genes, Cancer and Radiation Protection, Washington, DC, 2-3 Apr. 1991

(Contract W-7405-ENG-48)

(DE92-009459; UCRL-JC-109513; CONF-9104298-2) Avail: CASI HC A02/MF A01

This report discusses the measurement of somatic gene-mutation frequencies in the human. Questions were asked concerning their measurement, response to radiation, ability to function as a dosimeter, and what they tell us about the somatic mutation theory of carcinogenesis. DOE

**N92-28755\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**PORTABLE DYNAMIC FUNDUS INSTRUMENT Patent**

GERALD R. TAYLOR, inventor (to NASA), RICHARD T. MEEHAN, inventor (to NASA), NORWOOD R. HUNTER, inventor (to NASA), MICHAEL P. CAPUTO, inventor (to NASA), and C. ROBERT GIBSON, inventor (to NASA) 30 Jun. 1992 9 p Filed 29 Jun. 1990 Supersedes N91-13865 (29 - 5, p 694)

(NASA-CASE-MS-21675-1; US-PATENT-5,125,730;

US-PATENT-APPL-SN-562095; US-PATENT-CLASS-351-206;

US-PATENT-CLASS-351-221; INT-PATENT-CLASS-A61B-3/14)

Avail: US Patent and Trademark Office

A portable diagnostic image analysis instrument is disclosed

for retinal funduscopy in which an eye fundus image is optically processed by a lens system to a charge coupled device (CCD) which produces recordable and viewable output data and is simultaneously viewable on an electronic view finder. The fundus image is processed to develop a representation of the vessel or vessels from the output data.

Official Gazette of the U.S. Patent and Trademark Office

**N92-28844#** Office National d'Etudes et de Recherches Aeronautiques, Paris (France). Direction de l'Energetique.  
**STUDY OF THE LOSS OF CONSCIOUSNESS INFLIGHT BY FIGHTER AIRCRAFT PILOTS [ETUDE THEORIQUE DE LA PERTE DE CONNAISSANCE EN VOL DES PILOTES D'AVIONS DE CHASSE]**

DANIEL GAFFIE and P. QUANDIEU (Centre d'Enseignement et de Recherches de Medecine Aeronautique, Paris, France ) 15 Nov. 1990 64 p In FRENCH  
(Contract DRET-89-1208)  
(ONERA-RTS-11/3446-EY; ETN-92-91328) Avail: CASI HC A04/MF A01

A model for studying the blood flow in a flexible blood vessel is proposed. From the symptotic analysis of the flow equations, a one dimensional simplified equation is obtained. In this simplified equation, the flow mean velocity, the blood vessel cross section, and the blood vessel wall mean shear stress are considered. A numerical solution is calculated, by means of a finite volume method, which includes a flow decomposition technique. The results show that the rate of the acceleration of the voluminal force induced by the motion of the aircraft is one of the most important parameters concerning the pilot's loss of consciousness. ESA

**N92-28886#** Jewish Hospital of Brooklyn, NY.  
**STUDY OF SCN NEUROCHEMISTRY USING IN VIVO MICRODIALYSIS IN THE CONSCIOUS BRAIN: CORRELATION WITH OVERT CIRCADIAN RHYTHMS** Annual Report, 1 Nov. 1990 - 31 Oct. 1991

DAVID J. GLASS 31 Oct. 1991 9 p  
(Contract AF-AFOSR-0047-90)  
(AD-A247172; AFOSR-92-0104TR) Avail: CASI HC A02/MF A01

We have completed the assessment of the diurnal variation in serotonergic activity in the SCN and its temporal relationship to wheel-running behavior under lightentrained (LD 14:10) and free-running (DD) conditions. First, under LD there was a marked diurnal rhythm in serotonergic activity with peak levels occurring at lightoff during the animals' initial bout of wheel-running activity. Thereafter, serotonergic activity decreased to daytime levels by the next morning, despite robust bouts of nocturnal wheel running behavior. Also, daytime periods of activity exhibited by some individuals was not associated with increased serotonergic activity. From these results, it is hypothesized that serotonin in the SCN does not acutely trigger motor activity. Instead, it appears that serotonin is involved in coordinating light-entrained activity rhythms with the LD cycle, which is consistent with the findings of other researches using lesions or pharmacological approaches. Our second original finding is that the diurnal rhythm is serotonergic activity that is lost, or greatly diminished, in free-running hamsters held under DD for 3 wks. Thus, the rhythm in serotonergic activity seen under LD probably is not circadian in nature, but is passively driven by an external influence, i.e., the light-dark cycle. GRA

**N92-28920#** Texas Univ. Health Science Center, San Antonio.  
**INVESTIGATION OF LASER-INDUCED RETINAL DAMAGE** Annual Report, 1 Apr. 1991 - 31 Mar. 1992

RANDOLPH D. GLICKMAN and KWOK-WAI LAM 22 Apr. 1992 34 p  
(Contract AF-AFOSR-0208-91)  
(AD-A250173; AFOSR-92-0316TR) Avail: CASI HC A03/MF A01

Laser-induced, photooxidative damage in ocular tissue was studied with a quantitative assay using high performance liquid chromatography (HPLC) to separate oxidized and reduced ascorbic acid in exposed tissue components. We demonstrated that ascorbic acid, incubated with whole, bovine retinal pigment epithelial (RPE) cells, was oxidized when the reaction mixture was exposed to the

output of an argon-ion continuous wave laser. The amount of ascorbic acid oxidized was proportional to the irradiance of the sample, and the reaction was wavelength-dependent, with short-wavelength visible light more effective than long-wavelengths in driving the reaction. The photosensitizing activity was associated with the RPE melanin pigment granules, and was not lost after disrupting or heating the RPE cells. Because melanin was known to form free radicals when illuminated, we hypothesized that ascorbic acid detoxified the light-activated melanin free radicals while being itself oxidized in process. If the supply of reduced ascorbic acid were exhausted, however, the activated melanin could have been the source of tissue-damaging radicals. This model was consistent with a photochemical damage mechanism involving light-activated melanin. GRA

**N92-29123#** Arizona Univ., Tucson.  
**THE CHRONIC EFFECTS OF JP-8 JET FUEL EXPOSURE ON THE LUNGS** Annual Report, 1 Apr. 1991 - 1 Apr. 1992  
MARK L. WITTEN 23 Apr. 1992 17 p  
(AD-A250308; AFOSR-92-0314TR) Avail: CASI HC A03/MF A01

This research has resulted in four separate projects. The first was the exposure of Fischer 344 rats to JP-8 jet fuel for 7 or 28 days. This exposure resulted in changes in pulmonary function and lung chemical mediators, specifically Substance P, after 28 days of exposure. The second project dealt with blocking the increase in SP in these rats by a pretreatment regimen with capsaicin before jet fuel exposure. Capsaicin caused a further increase in lung permeability and a million-fold increase in airway sensitivity to histamine after the 7-day jet fuel exposure. The third project dealt with the effects of a 7-day jet fuel exposure in congenic mice who are deficient in the inducibility of the aryl hydrocarbon hydroxylase enzyme. These mice are relatively resistant to the effects of jet fuel-induced lung injury. The fourth project investigated the effects of the jet fuel exposure on secondary organs, specifically the liver, spleen, and kidneys. There were pathological differences in the liver, spleen, and kidneys between the 7-day jet fuel exposure group and baseline controls. However, some of these differences were not apparent in the 28-day exposure group, possibly indicating compensatory mechanisms to the exposure. GRA

**N92-29179#** Massachusetts Univ., Worcester. Dept. of Neurology.

**NON-LINEAR ANALYSIS OF VISUAL CORTICAL NEURONS** Final Report, 1 Jan. 1989 - 31 Dec. 1991

LOWELL D. JACOBSEN, JAMES P. GASKA, and DANIEL A. POLLEN 7 Apr. 1992 26 p  
(Contract AF-AFOSR-0247-89)  
(AD-A250233; AFOSR-92-0307TR) Avail: CASI HC A03/MF A01

Quantitative procedures were developed for testing block-structured models for multi-input nonlinear visual circuits studied with spatiotemporal white noise. A linear-nonlinear (LN) model test index was found to be suitable for classifying cells as simple versus complex. Although simple cells were better modeled as LN systems than complex cells, most simple cells deviated considerably from LN behavior. A nonlinearity of cortical origin would appear to be responsible, possibly activated more strongly by broadband noise than by sinewave grating stimuli. Also, two classes of binocular complex cells were identified. Whereas all binocular complex cells necessarily have a non-zero second-order same-eye interaction kernel, their second-order cross-eye interaction kernel could, it was found, be either non-zero or identically zero. GRA

**N92-29341\*#** George Washington Univ., Washington, DC. Science Communication Studies.

**PUBLICATIONS OF THE ENVIRONMENTAL HEALTH PROGRAM: 1980-1990**

JANICE WALLACE-ROBINSON, ELIZABETH HESS, and KATHERINE J. DICKSON Washington NASA Jul. 1992 42 p

(Contract NASW-4324)  
(NASA-CR-4455; NAS 1.26:4455) Avail: CASI HC A03/MF A01

A 10-year cumulative bibliography of publications resulting from

research supported by the Environmental Health Program of the Life Sciences Division of NASA is given. The goals of this program are to utilize ground based studies to understand the effects of the spacecraft and EVA environments on humans and other organisms; to specify, measure, and control these environments; and to develop countermeasures, where necessary, to optimize crew health, safety, and productivity. The primary subjects encompassed are barophysiology, toxicology, and microbiology. Principal Investigators whose research tasks resulted in publication are identified.

Author

**N92-29347#** Army Aeromedical Research Lab., Fort Rucker, AL.

**TEST AND EVALUATION REPORT OF THE PHYSIO CONTROL DEFIBRILLATOR/MONITOR MODEL LIFEPAK (TRADEMARK) 8 Final Report**

JEFFREY D. HAUN, JOSEPH R. LICINA, and BILL OLDING Dec. 1991 75 p

(Contract DA PROJ. 3M4-63807-D-836)

(AD-A248283; USAARL-92-5) Avail: CASI HC A04/MF A01

Physio Control Defibrillator/Monitor Model LIFEPAK 8 was tested for electromagnetic interference/compatibility in the UH-60A helicopter under the U.S. Army Program for Testing Evaluation of Equipment for Aeromedical Operations. The tests were conducted using rent military and industrial standards and procedures for electromagnetic interference/compatibility and human factors. The LIFEPAK 8 was found to be compatible with U.S. Army medical evacuation UH-60A Blackhawk.

GRA

**N92-29577#** Gordon Research Conferences, Inc., Kingston, RI. **GORDON RESEARCH CONFERENCE ON BARRIER FUNCTION OF MAMMALIAN SKIN Final Report, 1 Jul. - 31 Dec. 1991**

RUSSELL O. POTTS 31 Dec. 1991 31 p Conference held in Plymouth, NH, 12-16 Aug. 1991

(Contract AF-AFOSR-0290-91)

(AD-A248556; AFOSR-92-0261TR) Avail: CASI HC A03/MF A01

The objective of this conference was to bring together scientists so they could exchange recent research results and the conference provided a mechanism for the development of close interactions between these scientists. The quality of all of the lectures was exceptionally high and considerable discussion followed each lecture. Many of the conferees expressed very favorable comments about the intellectual stimulation provided by this conference.

GRA

**N92-30216#** Naval Health Research Center, San Diego, CA.

**EXERCISE AND THREE PSYCHOSOCIAL VARIABLES: A LONGITUDINAL STUDY Final Report**

LINDA STEVENS and TERRY L. CONWAY 19 Nov. 1991 44 p

(AD-A250649; NHRC-91-31) Avail: CASI HC A03/MF A01

A predominant opinion in research and society today maintains that exercise is beneficial for the reduction of depression and enhancement of self-esteem and quality of life. Yet, controversy still exists over the populations in which these phenomena occur. The purpose of this study was to identify in whom, when, and where exercise participation (EX) has significant effects on depression (DEP), self-esteem (SE), and quality of life (QOL). Data were collected on 1,292 male and female, active-duty Navy personnel in 1988 and 1989 as part of an on-going evaluation of the Navy's Health and Physical Readiness Program. Pearson's product-moment correlations revealed that EX was significantly related cross-sectionally to DEP, SE, and QOL, in the expected directions, at two separate points in time. Correlations among residualized gain scores revealed that changes in EX were significantly, negatively related to changes in DEP, and significantly, positively related to changes in SE and QOL over a one-year period, across the entire Navy sample. Tests which assessed the differences in the magnitudes of the change (i.e., residualized gain) correlations indicated significantly stronger relationships between EX and DEP SE and/or QOL in individuals with a high school education than college graduates.

GRA

## 53

### BEHAVIORAL SCIENCES

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

#### A92-44901

**INTERNATIONAL SYMPOSIUM ON AVIATION PSYCHOLOGY, 6TH, COLUMBUS, OH, APR. 29-MAY 2, 1991, PROCEEDINGS. VOLS. 1 & 2**

RICHARD S. JENSEN, ED. (Ohio State University, Columbus) Symposium sponsored by Ohio State University and Association of Aviation Psychologists. Columbus, OH, Ohio State University, 1991, p. Vol. 1, 639 p.; vol. 2, 623 p. For individual items see A92-44902 to A92-44974, A92-44976 to A92-45081.

This symposium presents papers in the fields of cockpit information management, automated checklists, information transfer and crew performance, the assessment of flightcrew behavior, and cockpit resource management. Also presented are ATC personnel factors and station design, military and civilian accident investigation, the design and use of simulators for flight training, and low-cost simulation for training.

R.E.P.

#### A92-44902

**A WORKSHOP ON UNDERSTANDING AND PREVENTING AIRCREW ERROR**

ALAN E. DIEHL (USAF, Inspection and Safety Center, Norton AFB, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 28-37. refs

A review is presented of a workshop concerning: an understanding of the factors which contribute to aircrew error accidents and incidents, the methodology being employed to investigate such events, and prevention measures currently available to decrease the probability of mishaps. It is shown how these activities are closely interrelated in today's aviation. This workshop examined training procedures used in accident prevention as well as case studies of major aircraft accidents.

R.E.P.

#### A92-44903

**STRESS MANAGEMENT FOR THE THIRD REVOLUTION AVIATOR**

MICHAEL THOMAS IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 38-43. refs

It is noted that the field of aviation safety is presently witnessing a movement that can be characterized as nothing less than a revolution. The two preceding revolutionary movements are first marked by the recognition of the importance of human factors technology and second the introduction of cockpit resource management that emphasized the need for safer and improved interaction between human beings in the cockpit environment. The 'third revolution' is observed to be the greater psychological awareness among aviators, revealing professional aviators who are more open to information and feedback from others.

R.E.P.

#### A92-44904

**CRM SCENARIO DEVELOPMENT - THE NEXT GENERATION**

J. N. KOMICH (Trump Shuttle, Boston, MA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 53-59.

A review is presented of the evolutionary development of cockpit resource management and the continuing search for clear definition of the various programs conducted by different carriers. Attention is given to the development of an effective CRM program that includes key attributes such as situational awareness, assertiveness, communication, fatigue, and stress. Consideration is given to scenario topics including weather, windshear, mental preparation, incapacitation etc.

R.E.P.

## 53 BEHAVIORAL SCIENCES

**A92-44907\*** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **THE ROLE OF BEHAVIORAL DECISION THEORY FOR COCKPIT INFORMATION MANAGEMENT**

JON E. JONSSON (Douglas Aircraft Co., Long Beach, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 72-77. refs (Contract NAS1-18028)

The focus of this report is the consideration of one form of cognition, judgment and decision making, while examining some information management issues associated with the implementation of new forms of automation. As technology matures and more tasks become suitable to automation, human factors researchers will have to consider the effect that increasing automation will have on operator performance. Current technology allows flight deck designers the opportunity to automate activities involving substantially more cognitive processing. R.E.P.

**A92-44911**

### **HUMAN PERFORMANCE IN COMPLEX TASK ENVIRONMENTS - A BASIS FOR THE APPLICATION OF ADAPTIVE AUTOMATION**

JEFFREY G. MORRISON, JONATHAN P. GLUCKMAN, and JOHN E. DEATON (U.S. Navy, Naval Air Development Center, Warminster, PA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 96-101. refs

There are a number of human performance issues that are highlighted by the application of adaptive automation technology to complex task environments. Few of these issues have received empirical human performance research. This paper describes those issues that have arisen with the Naval Air Development Center's Adaptive Function Allocation for Intelligent Cockpits (AFAIC) program. Author

**A92-44912\*** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **EFFECTS OF SHIFTS IN THE LEVEL OF AUTOMATION ON OPERATOR PERFORMANCE**

RAJA PARASURAMAN, TOUFIK BAHRI, ROBERT MOLLOY, and INDRAMANI SINGH (Catholic University of America, Washington, DC) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 102-107. Research supported by U.S. Navy and NASA. refs

The results of two experiments examining the effects of shifts in the type and level of automation on operator performance are presented. The first examines the costs and benefits of adaptive-automation shifts on operator performance, while the second experiment examines the effects of variations in automation reliability on operator detection of automation failures. Performance consequences of complacency in system monitoring are shown to be related to characteristics of the monitoring task automation, i.e., automation reliability and consistency. R.E.P.

**A92-44916**

### **WHEN HIGH IS BIG AND LOW IS SMALL, DECISIONS AREN'T THAT HARD AT ALL - ANALOG ENCODING OF ALTITUDE IN C.D.T.I. REVISITED**

DENNIS B. BERINGER (New Mexico State University, Las Cruces) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 126-132. refs

Analog and digital encoding of altitude in plan-view traffic situation displays was examined using nonpilots and pilots. The nonpilots were exposed to conditions from a mixed 2 x 2 x 2 factorial design to assess the impact of altitude representation (analog/digital), altitude reference point (absolute/relative), and altitude prediction (present/absent). Pilots were exposed to conditions from a 2 x 2 within-subjects factorial design derived from the nonpilot design by deleting prediction as a factor (always present). Subjects examined traffic situations as presented through

the display and responded with maneuvers they deemed necessary to maintain horizontal and vertical separation from other aircraft. Dependent variables were response time and 'correctness' of maneuver. Overall response times were governed by an interaction between reference point and predictor presence with significant main effects and a significant interaction, but analog/digital format was not a significant factor. Accuracy results were not straightforward. Preliminary results for the small pilot sample indicated slightly shorter response times and slightly higher accuracy rates using analog representations and a qualified preference for the analog-relative display. Author

**A92-44917\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### **TRAINING AND COCKPIT DESIGN TO PROMOTE EXPERT PERFORMANCE**

SHERYL L. CHAPPELL (NASA, Ames Research Center, Moffett Field, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 133-138. refs

The behavior of expert pilots in familiar situations is explored and the implications for better training programs and cockpit designs are stated. Experts in familiar operational situations performing highly practiced tasks are said to recognize and respond to complex situations using pattern recognition or intuition. For some tasks this class of behaviors is desirable; performance can be improved by reducing cognitive load and increasing speed and accuracy. Part-task training, training for monitoring and techniques for the transfer of knowledge can facilitate the development of these skills. Methods for promoting pattern recognition through pilot-aircraft interface design include the use of spatial presentations of information and providing triggering events. In some instances, the familiar, well-practiced behavior is not appropriate and it is desirable to prevent the response. When prevention is necessary, barriers can be constructed in the interface to remind the pilot of the inappropriateness of the response. Author

**A92-44921**

### **THE EMERGENCY CHECKLIST, TESTING VARIOUS LAYOUTS**

HANS DE REE and GERT VAN DER MEULEN (KLM Royal Dutch Airlines, Schiphol, Netherlands) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 160-165.

Based on recommendations from a previous study two new versions were made of the Airbus A-310 emergency checklist (ECL). These were compared to the current checklist in an experimental setup. Pilots were asked to search and read three emergency procedures in one of the three versions of the checklist. Search and reading time and number of errors were recorded. Subjects were asked to judge various aspects of the checklists on a five-point scale. The number of errors was too small to use in the analysis, confirming the hypothesis that the strategy of pilots is to maximize accuracy. Search and reading time showed only small differences between the three versions, but subjective judgments were in favor of the new version of the checklist. These results may be explained by the impossibility to create truly realistic emergency situations, whereas pilots do have a clear idea of such situations. Author

**A92-44926**

### **PILOT ATTITUDES TO COCKPIT AUTOMATION**

M. JAMES, A. MCCLUMPHA, R. GREEN, P. WILSON, and A. BELYAVIN (RAF, Institute of Aviation Medicine, Farnborough, England) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 192-197. refs

A study has been conducted to assess the opinions and attitudes of UK commercial pilots to advanced automated aircraft. General findings indicate that pilots believe that flying skills are reduced by automation and that there is an over-reliance on automation. Nevertheless, it is felt that automation on flight decks

is advantageous as it reduces crew fatigue, and the majority of pilots enjoy flying automated aircraft. R.E.P.

**A92-44930\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**THE EFFECTS OF SPEECH CONTROLS ON PERFORMANCE IN ADVANCED HELICOPTERS IN A DOUBLE STIMULATION PARADIGM**

MICHAEL R. BORTOLUSSI (Western Aerospace Laboratories, Inc., Moffett Field, CA) and MICHAEL A. VIDULICH (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 216-221. refs (Contract NCC2-486)

The potential benefit of speech as a control modality has been investigated with mixed results. Earlier studies suggests that speech controls can reduce the potential of manual control overloads and improve time-sharing performance. However, these benefits were not without costs. Pilots reported higher workload levels associated with the use of speech controls. To further investigate these previous findings, an experiment was conducted in a simulation of an advanced single-pilot, scout/attack helicopter at NASA-Ames' ICAB (interchangeable cab) facility. Objective performance data suggested that speech control modality was effective in reducing interference of discrete, time-shared responses during continuous flight control activity. Subjective ratings, however, indicated that the speech control modality increased workload. Post-flight debriefing indicated that these results were mainly due to the increased effort to speak precisely to a less than perfect voice recognition system. Author

**A92-44933**

**THE FLIGHT MANAGEMENT SYSTEM - 'RUMORS AND FACTS'**

NADINE B. SARTER and DAVID D. WOODS (Ohio State University, Columbus) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 241-246. refs

It is noted that recent incidents and accidents involving 'glass-cockpit' aircraft indicate that improvements of the design of the Flight Management System (FMS) are needed. A research program to collect data on the interaction between the pilot and the FMS is described. The basic theme of the studies conducted is the analysis of pilot's understanding of the FMS and the assessment of their system awareness. R.E.P.

**A92-44934\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**COMMUNICATION VARIATIONS RELATED TO LEADER PERSONALITY**

BARBARA G. KANKI, MARK T. PALMER, and ELIZABETH S. VEINOTT (NASA, Ames Research Center, Moffett Field, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 253-259. refs

While communication and captain personality type have been separately shown to relate to overall crew performance, this study attempts to establish a link between communication and personality among 12 crews whose captains represent three pre-selected personality profiles (IE+, I-, Ec-). Results from analyzing transcribed speech from one leg of a full-mission simulation study, so far indicate several discriminating patterns involving ratios of total initiating speech (captain to crew members); in particular commands, questions and observations. Author

**A92-44935\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**COORDINATION STRATEGIES OF CREW MANAGEMENT**

SHARON CONLEY, YVONNE CANO (Arizona, University, Tucson), and DON BRYANT (Bionetics, Inc.; NASA, Ames Research Center, Moffett Field, CA) IN: International Symposium on Aviation

Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 260-265. refs

An exploratory study that describes and contrasts two three-person flight crews performing in a B-727 simulator is presented. This study specifically attempts to delineate crew communication patterns accounting for measured differences in performance across routine and nonroutine flight patterns. The communication patterns in the two crews evaluated indicated different modes of coordination, i.e., standardization in the less effective crew and planning/mutual adjustment in the more effective crew. R.E.P.

**A92-44936\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**EXPERT DECISION-MAKING STRATEGIES**

KATHLEEN L. MOSIER (Stanford University, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 266-271. refs (Contract NCC2-327)

A recognition-primed decisions (RPD) model is employed as a framework to investigate crew decision-making processes. The quality of information transfer, a critical component of the team RPD model and an indicator of the team's 'collective consciousness', is measured and analyzed with respect to crew performance. As indicated by the RPD model, timing and patterns of information search transfer were expected to reflect extensive and continual situation assessment, and serial evaluation of alternative states of the world or decision-response options. R.E.P.

**A92-44937\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**INFORMATION TRANSFER AND SHARED MENTAL MODELS FOR DECISION MAKING**

JUDITH ORASANU (NASA, Ames Research Center, Moffett Field, CA) and UTE FISCHER (Vassar College, Poughkeepsie, NY) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 272-277. refs

A study to determine how communication influences flight crew performance is presented. This analysis focuses on the content of communication, principally asking what an utterance does from a cognitive, problem solving viewpoint. Two questions are addressed in this study: how is language utilized to manage problems in the cockpit, and are there differences between two- and three-member crews in their communication and problem solving strategies? R.E.P.

**A92-44938\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**COLLABORATION IN PILOT-CONTROLLER COMMUNICATION**

DANIEL MORROW, ALFRED LEE, and MICHELLE RODVOLD (Decision Systems, Los Altos, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 278-283. Research supported by NASA. refs

A field study of pilot-controller communication that is expected to improve communication accuracy and efficiency in at least two ways is presented. Types of problems that disrupt routine communication and how often they occur during operations are identified. By identifying factors associated with problems, it is suggested why they occur and how to eliminate them. R.E.P.

**A92-44939**

**AIRCREW COORDINATION FOR ARMY HELICOPTERS - RESEARCH OVERVIEW**

DENNIS K. LEEDOM (U.S. Army, Research Institute, Fort Rucker, AL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 284-289.

An overview is presented of an on-going research project of the U.S. Army to provide their aviation community with improved

## 53 BEHAVIORAL SCIENCES

procedures and techniques for training and evaluating aircrew coordination skills in rotary wing aviators. This research responds to that portion of the human error problem represented by inadequate coordination of crew decisions and actions in the cockpit. It is shown that training for the complex aviation weapon systems must increasingly address total system performance, with particular emphasis on the demanding environments unique to the Army aviator. R.E.P.

### **A92-44940** **AIRCREW COORDINATION FOR ARMY HELICOPTERS - AN EXPLORATION OF THE ATTITUDE-BEHAVIOR-PERFORMANCE RELATIONSHIP**

ROBERT SIMON, EUGENE A. PAWLIK, SR., and TINA M. BRONKHORST (Dynamics Research Corp., Wilmington, MA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 290-295. refs  
(Contract DAHC35-89-D-0030)

The relationships between aircrew coordination attitudes, behavior, and mission performance were examined using data obtained from a flight-simulator testbed. The behavior-performance link, previously established by Povenmire et al. (1989), was confirmed with aircrew coordination-related behavioral ratings accounting for approximately 50 percent of the variance in performance. An attitude measure was factor-analyzed, and the factors obtained were similar to those identified in the Gregorich et al. (1990) study. Various weight combinations of crew-attitude scores were investigated with a coefficient of agreement (absolute difference score) determined as best explaining the variance in the behavior and mission performance measures. Attitude and behavior measures combined to account for approximately 65 percent of the variance in mission performance. Author

### **A92-44941** **TRAINING IMPLICATIONS OF A TEAM DECISION MODEL**

MARVIN L. THORSDEN and GARY A. KLEIN (Klein Associates, Inc., Fairborn, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 296-301. refs  
(Contract MDA903-89-C-0032)

A team decision model was used to design training for crew coordination in the tactical helicopter domain. Ten aircrews are studied while conducting a tactical mission in a UH-60 Blackhawk simulator facility. Several opportunities for training were identified: (1) improving commander's intent and mental rehearsal of functional mission segments during premission planning; (2) improving recognition of time horizons; (3) improving resource allocation and performance monitoring; and (4) improving anticipation of information needs. Author

### **A92-44942** **INSTRUCTIONAL STRATEGY FOR AIRCREW COORDINATION TRAINING**

ROBERT W. SWEZEY, ROBERT E. LLANERAS (InterScience America, Sterling, VA), CAROLYN PRINCE, and EDUARDO SALAS (U.S. Navy, Naval Training Systems Center, Orlando, FL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 302-307. refs

A review is presented of research conducted by the Naval Training Systems Center (NTSC) on training strategies designed to enhance coordination and management in the cockpit that can be employed to provide skill practice and feedback to aircrews. This work has led NTSC to develop an Aircrew Coordination Training program that specifically provides crew coordination training that is skill-based, behavioral, mission specific, and capable of integration into existing training programs. NTSC's skill-based training approach is shown to be behavioral, designed to change performances, rather than attitudes or knowledge of trainees. R.E.P.

### **A92-44943** **THE ASSESSMENT OF COORDINATION DEMAND FOR HELICOPTER FLIGHT REQUIREMENTS**

CLINT A. BOWERS, BEN B. MORGAN, JR. (Central Florida, University, Orlando, FL), and EDUARDO SALAS (U.S. Navy, Naval Training Systems Center, Orlando, FL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 308-313. refs

An overview is presented of a military aircrew coordination training program that focuses on the training of the specific skills and behaviors that comprise aircrew coordination. For this program, a questionnaire was prepared to measure pilot's perceptions of the coordination demand imposed by a sample of CH-46 flight tasks. In addition to rating the coordination demand associated with each coordination skill dimension, pilots were requested to provide their perceptions of the amount of overall workload and total coordination demand imposed by each task. R.E.P.

### **A92-44944** **DEVELOPMENT OF AIRCREW COORDINATION EXERCISES TO FACILITATE TRAINING TRANSFER**

DAVID P. BAKER (U.S. Navy, Naval Training Systems Center, Orlando, FL), MITCH BAUMAN (U.S. Marine Corps, Washington, DC), and MARY D. ZALESNY (Kent State University, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 314-319. refs

This paper describes and reports the trainee reactions to two new exercises that have been pilot tested in an Aircrew Coordination Training (ACT) program. The exercises were developed to allow for the active practice of aircrew coordination skills. Both quantitative and qualitative reactions to the exercises were collected. These data indicated positive reactions by the trainees. In addition a review of the qualitative responses suggested that trainees who participated in these exercises could cite specific ways in which they planned to use this information during subsequent missions as opposed to pilots who had not participated in these exercises during training. Author

### **A92-44945** **AIRCREW COORDINATION FOR ARMY HELICOPTERS - IMPROVED PROCEDURES FOR ACCIDENT INVESTIGATION**

EUGENE A. PAWLIK, SR., ROBERT SIMON, and DENNIS J. DUNN (Dynamics Research Corp., Wilmington, MA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 320-325. refs  
(Contract DAHS35-89-D-0030)

Army accident investigation boards required an adequate definition and a comprehensive classification and coding system of aircrew coordination (AC) errors to assist in their investigation and reporting of AC-related accidents. To meet this requirement, the U.S. Army Research Institute (ARI) tasked DRC to develop a set of procedures for identifying, classifying, and reporting AC errors as a causal factor in aviation accidents. Building upon the taxonomy of AC errors identified in a previous phase of ARI research, specific investigation and reporting procedures were developed and documented in the form of a supplemental handbook containing revised reporting forms for Army accident investigators. Army accident investigators were provided training in the definition of AC errors and use of the new procedures. The new procedures were subjected to a field demonstration and evaluation as part of three Class A helicopter accident investigations conducted during the Summer of 1990. Author

**A92-44946\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### **LESSONS FROM CROSS-FLEET/CROSS-AIRLINE OBSERVATIONS - EVALUATING THE IMPACT OF CRM/LOFT TRAINING**

ROY E. BUTLER (NASA/University of Texas Crew Performance Project, Austin) IN: International Symposium on Aviation

Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 326-331. Research supported by FAA. refs  
(Contract NCC2-286)

A review is presented of the crew resource management/line oriented flight training (CRM/LOFT) program to help determine the level of standardization across fleets and airlines in the critical area of evaluating crew behavior and performance. One of the goals of the project is to verify that check airmen and LOFT instructors within organizations are evaluating CRM issues consistently and that differences observed between fleets are not a function of idiosyncracies on the part of observers. Attention is given to the research tools for crew evaluation. R.E.P.

**A92-44947\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**BEHAVIORAL INTERACTIONS ACROSS VARIOUS AIRCRAFT TYPES - RESULTS OF SYSTEMATIC OBSERVATIONS OF LINE OPERATIONS AND SIMULATIONS**

CATHY C. CLOTHIER (NASA/University of Texas Crew Performance Project, Austin) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 332-337. refs

The NASA/UT Line/LOS checklist is designed to capture critical components of crew interaction. The behaviors deemed critical to flight crew interaction include briefings, communications, inquiry, assertion/advocacy, and decisions communicated and acknowledged. Data shows significant behavioral interaction differences as a function of aircraft type, indicating that crew size and technology level were at least partly driving that difference. R.E.P.

**A92-44948\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**STRATEGIES FOR THE STUDY OF FLIGHTCREW BEHAVIOR**

ROBERT L. HELMREICH (NASA/University of Texas Crew Performance Project, Austin) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 338-343. Research supported by FAA. refs  
(Contract NCC2-286)

The performance of any flightcrew at any given time is determined by multiple factors ranging from characteristics of individual crewmembers to the regulations governing flight operations. Attention is given to microcoding of communications, survey data on crewmember attitudes as indicators of culture and crew resource management (CRM) training effects, and systematic observation of crew behavior. Consideration is given to advanced CRM training of evaluators, analyses of crew behavior by aircraft type and characteristics, and survey data on crew reactions to line oriented flight training. R.E.P.

**A92-44949\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**THE IMPACT OF INITIAL AND RECURRENT COCKPIT RESOURCE MANAGEMENT TRAINING ON ATTITUDES**

CHERYL M. IRWIN (Texas, University, Austin) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 344-349. refs  
(Contract NCC2-286)

It is noted that previous analyses of the boomerang effect (attitude change as a result of training in the direction opposite of that intended) in aviation training environments were limited in that each subscale of the cockpit management attitudes questionnaire (CMAQ) was examined independently. This study develops and utilizes a new algorithm for grouping subjects such that a global attitude change score is derived from the attitude change scores on each CMAQ subscale. By evaluating global attitude change in addition to the more specific attitude change on each subscale, it might be possible to better comprehend the

effects of crew resource management training on pilot attitudes.

R.E.P.

**A92-44950\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**MICROCODING OF COMMUNICATIONS IN ACCIDENT INVESTIGATION - CREW COORDINATION IN UNITED 811 AND UNITED 232**

STEVEN C. PREDMORE (NASA/University of Texas Crew Performance Project, Austin) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 350-355. Research supported by FAA. refs  
(Contract NCC2-286)

Two recent airline accidents that underscored the value of cockpit resource management (CRM) to line operations, especially under stressful, high workload conditions are reviewed. An analysis of the verbal behavior of each crew was conducted to explore how catastrophic events impact upon the dynamics of crew interaction. In both cases the Captain stated that training in CRM contributed significantly to the overall effectiveness of the crews. R.E.P.

**A92-44951\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**ADVANCED CRM TRAINING FOR INSTRUCTORS AND EVALUATORS**

WILLIAM R. TAGGART (NASA/University of Texas Crew Performance Project, Austin) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 356-361. Research supported by FAA.  
(Contract NCC2-286)

It is seen that if the maximum operational benefit of crew resource management (CRM) is to be achieved, the evaluator group is the principal key and specialized training that is ongoing is necessary for this group. The training must be customized to fit the needs of a particular organization, and the training must address key topical issues that influence organizational dynamics. Attention is given to the use of video and full length scripted NASA research LOFTS, behavioral markers and debriefing skills, the importance of policy and written CRM standards, and line oriented simulations debriefing performance indicators. R.E.P.

**A92-44952\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**CREW MEMBER AND INSTRUCTOR EVALUATIONS OF LINE ORIENTED FLIGHT TRAINING**

JOHN WILHELM (NASA/University of Texas Crew Performance Project, Austin) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 362-367. refs  
(Contract NCC2-286)

Results obtained from the NASA/UT/LOFT survey of 8300 crew members from four airlines is presented. As simulator training is very expensive and excellence in training is the objective, some effort is justified in evaluating LOFT and in determining what it is about the best scenarios that creates positive effects. Attention is given to the effects of different scenarios, self reports of crew resource management behaviors, organization, fleet and crew position differences. R.E.P.

**A92-44953  
U.S. NAVY AIRCREW COORDINATION TRAINING - A PROGRESS REPORT**

ROBERT A. ALKOV (U.S. Navy, Naval Safety Center, Norfolk, VA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 368-371.

A review is presented of the Navy's aircrew coordination training (ACT) program to change the attitudes of naval aviators toward safety. 150 incident and accident reports were abstracted to be

used for training aircrews as part of a human factors problems course presented in a seminar discussion setting. The synopses are 'sanitized' to delete all references to names, squadrons, locations, and dates so that the seminars may be conducted in a nonconfrontational style to prevent the development of hostile attitudes towards the training. R.E.P.

**A92-44954****PILOT REACTION TO ULTRA-LONG-HAUL FLYING**

JOHN COSTLEY (Interaction Trainers, Ltd., St. Ives, England) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 372-376. refs

A study is presented of a series of interviews conducted with 34 pilots, all of whom were regularly flying sectors of 12-15 hours duration. The most significant result from these interviews was that 23 of the pilots (67.7 percent) had a very strong dislike for long-haul flying while the remaining 11 (32.3 percent) believed it to be an excellent type of operation for them. Thus, ultralong-haul flights brought out strong positive or strong negative feelings with no compromises. R.E.P.

**A92-44955****TEAM BUILDING FOLLOWING A PILOT LABOUR DISPUTE - EXTENDING THE CRM ENVELOPE**

BRENT HAYWARD and NEIL ALSTON (Australian Airlines, Melbourne, Australia) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 377-383. refs

An overview is presented of the problems created by the shutdown of Australia's domestic airline industry in 1989 and some of the programs initiated to alleviate the damaging effects of the closure. Team building workshops were developed to provide a forum for open discussion of the key issues involved in the shutdown as experienced by participants. These workshops promoted an increased awareness of the human factors, crew performance and flight safety implications of the pilot's new work environment. R.E.P.

**A92-44956****EXOGENOUS AND ENDOGENOUS DETERMINANTS OF COCKPIT MANAGEMENT ATTITUDES**

HANS-JUERGEN HOERMANN and PETER MASCHKE (DLR, Institut fuer Flugmedizin, Hamburg, Federal Republic of Germany) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 384-390. refs

During a selection campaign of cockpit crews for a charter airline 768 licensed airline pilots were examined with a temperament-structure-scales (TSS) multidimensional personality questionnaire and the cockpit management attitudes questionnaire. The TSS-scales and prior flight experience data were compared as determinants of differing cockpit management attitudes. Implications for the predictive power and construct validity of the TSS and the CMAQ are discussed. R.E.P.

**A92-44957****TAXONOMY OF CREW RESOURCE MANAGEMENT - INFORMATION PROCESSING DOMAIN**

CHARLOTTE FREEMAN (Samford University, Birmingham, AL) and DAVID A. SIMMON (United Airlines, Chicago, IL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 391-397. refs

A taxonomy has been developed for crew resource management in an effort to identify specific types of errors and the corresponding training skills and strategies to reduce human error. Information processing was chosen for domain development following an analysis of over 500 incidents and accidents showed that in most cases information was available that could have been employed to prevent the incident. The taxonomy also reinforces the primary role of the pilot as an information processor. R.E.P.

**A92-44958****COCKPIT RESOURCE MANAGEMENT - A SOCIAL PSYCHOLOGICAL PERSPECTIVE**

CLIFFORD E. BROWN (Wittenberg University, Springfield; USAF, Armstrong Laboratory, Wright-Patterson AFB, OH), KENNETH R. BOFF (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH), and SARAH J. SWIERENGA (Logicon Technical Services, Inc., Dayton, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 398-403. refs (Contract F33615-89-C-0532)

The field of social psychology, due to its sensitivity to the effects of interpersonal and situational factors on individual and group behavior, may provide some useful insights as advanced technology and automated systems change the roles and functions of crew members. Especially relevant for cockpit resource management (CRM) are the subfields of social cognition/attribution and group dynamics. Each of these areas are described and related to CRM and the growing importance of these areas in light of advances in technology and automation are discussed. R.E.P.

**A92-44959****A NEW GENERATION OF CREW RESOURCE MANAGEMENT TRAINING**

NEIL A. JOHNSON, DAVID H. SHROYER, and JAMES B. GREWE (Hernandez Engineering, Inc., Denver, CO) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 404-409. refs

The nature of the evolution and the present capability of crew resource management programs are discussed. This paper focuses on the training strategy that was adopted in the late seventies as a reaction to incidents and accidents caused by human factors and to determine how the training strategy has changed as a result of lessons learned. It is indicated that most contemporary programs continue to follow the training strategy of 1979, while demonstrating some positive evolution from academic-oriented training to activity-oriented training. R.E.P.

**A92-44960****KLM FEEDBACK AND APPRAISAL SYSTEM FOR COCKPIT CREW MEMBERS**

JOLANDE PRAKTIEK (KLM Royal Dutch Airlines, Schiphol, Netherlands) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 410-415.

Within KLM extensive research has taken place to design a performance appraisal system for nontechnical skills for cockpit crew members. Recently KLM has redefined job descriptions for the position of captain, first and second officer and flight engineer in order to integrate technical and nontechnical performance aspects into homogeneous and coherent job profiles. After redefining these job profiles, it was decided to construct a performance appraisal system that covers nontechnical job aspect. In this paper a detailed description will be given of the process of designing this appraisal system that has been labeled as FAS: Feedback and Appraisal System for Cockpit Crew Members. Author

**A92-44961****APPLICATION OF INSTRUCTIONAL SYSTEMS DEVELOPMENT (ISD) PRINCIPLES TO THE ADVANCED QUALIFICATION PROGRAM (AQP)**

CHARLES A. STURGES (Ball Aerospace Systems Group, San Diego, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 416-421. refs

An overview of the AQP that is designed to integrate a number of training features and factors to enhance crew member performance when compared to traditional programs is presented. The principal factor is true proficiency-based qualification and training that is systematically developed, maintained and validated. The result of the employment of the ISD process and proficiency

based objectives will make aircrew training more responsive to changes in aircraft and instructional technology advances and implementation by the airlines more flexible, effective and possibly less costly without affecting safety. R.E.P.

**A92-44962**  
**PERSONALITY DIFFERENCES AMONG SUPERVISORY SELECTION PROGRAM CANDIDATES**

DANA BROACH (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 422-425. refs

This study examines the supposition that persons who strive for achievement, with the accompanying cost in irritability and impatience characterizing the Type A behavioral syndrome seen among controllers, would more likely succeed in completing multiple hurdles in a supervisory selection process. Logistic regression is employed to test this hypothesis. The analyses demonstrated that achievement striving and impatience/irritability did not provide useful information about characteristics predicting completion of multiple hurdles in the selection process. R.E.P.

**A92-44963**  
**ATCS FIELD TRAINING PERFORMANCE AND SUCCESS IN A SUPERVISORY SELECTION PROGRAM**

CAROL A. MANNING (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 426-431. refs

A discussion of the types of air traffic control facilities is presented and the various training programs provided by each facility type are described. The question of whether the available measures of technical performance that were found previously to be predicted by selection test scores are in turn predictive of success in the supervisory identification and development program is examined. It is shown that for air traffic controllers in general, the mean instructor rating assigned during on-the-job technical training is predictive of whether the controller passes the peer/supervisory assessment and continues in the supervisory selection and development process. R.E.P.

**A92-44964**  
**CANDIDATE PERFORMANCE IN A SUPERVISORY SELECTION PROGRAM AND SUBSEQUENT SELECTION DECISIONS**

JENNIFER G. MYERS (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 432-436. refs

It is noted that the FAA previously implemented the Air Traffic Supervisory Identification and Development Program (SIDP) to change the emphasis on technical performance in promotability decisions to include other skills, such as communication and decision-making, that reflect supervisory potential. This report examines whether measures of technical performance distinguish between successful versus unsuccessful candidates at different phases of the SIDP while also examining specific measures of SIDP performance. The results of the analysis of the referral variable identified important differences between the referred and not referred groups on the peer-supervisory assessment performance and dimensions ratings. R.E.P.

**A92-44965**  
**PERFORMANCE IN THE ATC SCREEN PROGRAM AND SUPERVISORY SELECTION PROGRAM OUTCOME**

PAMELA S. DELLA ROCCO (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 437-442.

A study is presented to examine the relationship between performance in the FAA Academy screening programs and the supervisory selection program ratings of the supervisory identification and development program (SIDP) applicants. The purpose of this study was to investigate the hypothesis that ATC

Specialist applicants to the SIDP program who were successful in the first stage of selection, had shown better performance in the Academy programs. Results of the analyses demonstrated that there were small but statistically significant correlations between all of the Academy measures and the peer/supervisory assessment technical rating, except for the controller phase test, for the en route option. R.E.P.

**A92-44966**  
**COGNITIVE INDICATORS OF ATCS TECHNICAL ABILITY AND PERFORMANCE IN A SUPERVISORY SELECTION PROGRAM**

DAVID J. SCHROEDER (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 443-447. refs

A study was developed to determine the relationship between entry level information of an applicant's cognitive capabilities (aptitudes) to function as an ATC Specialist (ATCS), as measured by the OPM selection battery, and subsequent selection as a potential supervisor through the SIDP. Specifically, the interest is in determining if scores on the initial selection tests predict technical performance ratings received by the SIDP applicants. Given the current measures of aptitudes for the ATCS profession there was little support shown for any relationship between these aptitudes and either overall ratings during the skill based interview or selection as a supervisor. R.E.P.

**A92-44970**  
**EXPLORING CONCEPTUAL STRUCTURES IN AIR TRAFFIC CONTROL (ATC)**

KELLY HARWOOD, RENATE ROSKE-HOFSTRAND, and ELIZABETH MURPHY (CTA, Inc., Rockville, MD) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 466-473. refs  
 (Contract DTRS-57-87-C-00107; DTFA03-89-C-00023)

Air traffic control (ATC) is a complex domain. To be meaningful and useful, research and applications must embrace this complexity. This study used Pathfinder network analysis to gain insight into air traffic controllers' representations of the relationships between ATC concepts. Two groups of controllers differing in years of experience and a control group of financial analysts provided ratings of the relatedness of pairs of selected ATC concepts. Various substructures within the derived networks revealed features of ATC domain knowledge as well as subtle differences between the two groups of controllers. These findings have tentative implications for ATC training, aiding, and incident/accident data-base organization. Author

**A92-44971**  
**APPLYING COGNITIVE INSTRUCTIONAL SYSTEMS DEVELOPMENT TO MULTINATIONAL AIRWAYS FACILITIES TRAINING**

ROBERT W. HOTES (Wilcox Electric, Inc., Kansas City, MO) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 474-479. refs

This paper discusses applications of Instructional Systems Development (CISD) in developing training for electronics technicians maintaining ground to air navigational aids systems. Cognitive ISD is defined as an approach to instructional systems development that incorporates selected principles of both behavioralism and cognitive psychology. Cognitive ISD may be distinguished from other applications of Instructional Systems Development through consideration of selected factors, including mental representation, critical reflection, automated behaviors, learner control, and an orientation toward learner-centered experimental knowledge acquisition resulting in competence. Author

**A92-44972**  
**COGNITIVE TASK ANALYSIS OF AIR TRAFFIC CONTROL**

## 53 BEHAVIORAL SCIENCES

RICHARD E. REDDING, JOHN R. CANNON, and BRUCE LIERMAN (Human Technology, Inc., McLean, VA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 480-485. Research supported by U.S. Office of Personnel Management. refs

A study is conducted to ascertain expert mental models and decision-making strategies, and to identify important differences in controller skills, knowledge, and mental models as a function of expertise. By comparing experts, novices, and intermediates, the cognitive analysis provides a better understanding of skill progression than would traditional, behavioral methods of task analysis. This cognitive analysis allows the acquisition of this rich expertise so that it can be systematically transmitted to apprentice controllers. R.E.P.

### A92-44973

#### THE HUMAN ELEMENT IN AIR TRAFFIC CONTROL (ATC)

EDMUND SPRING (MiTech, Inc., Washington, DC) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 486-490.

This report focuses on the decision of where to draw the line on the human-computer interface that will likely become critical to the continued safe and efficient management of the air traffic control system. Automation of the ATC system is gradually shifting this work from one of intense personal involvement and individual performance to one of monitoring the performance of machines. The solution to this human-machine interface problem will necessitate close cooperation between the technologists and the psychologists, but it is noted that the potential payoffs in system performance, capacity, and safety gains should be extensive. R.E.P.

### A92-44974

#### INFORMATION TRANSFER LIMITATIONS IN ATC

RICHARD J. ADAMS (Advanced Aviation Concepts, Inc., Jupiter, FL) and PETER V. HWOSCHINSKY (FAA, Washington, DC) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 491-496. refs

This paper analyzes the historical role of air traffic controller information transfer, the limitations which lead to operational errors, slips, incidents and accidents, and the need for specialized training to combat and overcome these limits. Human attributes which contribute to information transfer deficiencies are discussed. The impact of distractions, forgetting, failure to monitor, expectancy and complacency on the controller's job performance are illustrated by using operational error data and examples. Author

### A92-44978

#### THE HUMAN FACTORS OF TEAM-BUILDING IMPLICATIONS FOR AB INITIO TRAINING

GISELE WEISMAN (Hampton University, VA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 520-525. refs

A review is presented of a long-term CRM-intensive curriculum, that fully integrates CRM training into the technical ATC coursework, to produce graduates who are: (1) effective team-oriented communicators, and (2) able to transfer learned communication and team concepts and skills to the workplace. The prototype collegiate curriculum that is being developed under FAA contract is presented. This prototype program can be adapted to (1) shorter or longer prehire training curriculums, (2) collegiate or noncollegiate educational environments, and (3) to other aviation populations. R.E.P.

### A92-44979

#### SKILL FACTORS AFFECTING TEAM PERFORMANCE IN SIMULATED RADAR AIR TRAFFIC CONTROL

DANIEL A. HERSCHLER and RICHARD D. GILSON (Central Florida, University, Orlando, FL) IN: International Symposium on

Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 526-531. refs

A review is presented of certain NTSB data identifying several incidents that involved controller coordination problems. Problems with role ambiguity, situational awareness, supervision, and workload were frequently cited, and in more than one case, the experience level of a controller or pilot may have been partly to blame. These data indicate that communication and coordination in the NAS are inadequate, and that these problems may be intensified to an unacceptable degree when pilots and controllers are less than fully proficient. R.E.P.

### A92-44980

#### TAXONOMY OF ATC OPERATOR ERRORS BASED ON A MODEL OF HUMAN INFORMATION PROCESSING

WILLIAM E. MCCOY, III and KENNETH H. FUNK, II (Oregon State University, Corvallis) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 532-537. refs

Despite air transportation's outstanding safety record, increasing demand for air transportation services coupled with limits to facilities and air space is creating an increasing load on the ATC system. Air traffic controllers are subject to the same cognitive and perceptual limitations as any operator of any complex system and the consequences of errors they commit can be catastrophic. A study is presented to contribute to the understanding of the human error in the ATC domain and how to moderate its consequences. R.E.P.

A92-44984\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

#### VISUAL CUES TO GEOGRAPHICAL ORIENTATION DURING LOW-LEVEL FLIGHT

VERNOL BATTISTE (NASA, Ames Research Center, Moffett Field, CA) and SUZANNE DELZELL (San Jose State University, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 566-571. refs

A field study of an operational Emergency Medical Service (EMS) unit was conducted to investigate the relationships among geographical orientation, pilot decision making, and workload in EMS flights. The map data collected during this study were compared to protocols gathered in the laboratory, where pilots viewed a simulated flight over different types of unfamiliar terrain and verbally identified the features utilized to maintain geographical orientation. The EMS pilot's questionnaire data were compared with data from non-EMS helicopter pilots with comparable flight experience. R.E.P.

### A92-44987

#### PSYCHOLOGICAL STATE VS. PERIPHERAL COLOR PERCEPTION

EILEEN ANCMAN (USAF, Cockpit Integration Directorate, Wright-Patterson AFB, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 583-588. refs

Subject psychological state (normal, stressed, relaxed) affected the peripheral location of where the three primary colors could be correctly perceived utilizing a CRT as the display medium. For the normal baseline state a 1.3-deg circle of blue could not be seen further than 83.1 off of the fovea (along the x-axis). Red had to be closer than 76.3 deg and green nearer than 74.3 deg before the subjects reported seeing the colors. A significant degree of 'visual field narrowing' was noted for the relaxed state with a trend noted for the stressed state. Visual field narrowing is not equated with relaxation but only stress. These color-perception limitations induced by pilot psychological state must be kept in mind when designing CRT color formats for aircraft cockpits. Author

A92-44988

**TARGET ACQUISITION PERFORMANCE USING SPATIALLY CORRELATED AUDITORY INFORMATION OVER HEADPHONES**

MARK A. ERICSON (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH) and WILLIAM D. YEE (Ohio State University, Columbus) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 589-594. refs

An effort to reduce information overload of pilots has focused on the recently proven capability to provide directional information over headphones utilizing electronically synthesized auditory localization cues. A study is presented on the utility of this headset localization capability when applied to a practical visual target acquisition task that is emulated in the laboratory environment. The investigation attempts to isolate the target acquisition task from the other workload tasks, noise, and psychological stresses that a pilot experiences while flying, to provide a controlled testing environment. R.E.P.

A92-44989

**DYNAMIC CONTRAST SENSITIVITY**

A. M. PRESTRUDE and BRIAN OLESKO (Virginia Polytechnic Institute and State University, Blacksburg) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 595-600. refs

The development of a device and materials for the measurement of dynamic contrast sensitivity and an initial comparison of static and dynamic contrast sensitivity over a wider range of spatial frequencies are presented. The materials and procedure of this investigation provide contrast sensitivity data comparable to that of the VisTech Vision Contrast Sensitivity System. Peak sensitivity is the same, but occurs at a higher spatial frequency for the VisTech, i.e., 6 vs 4.25 cycles/deg. R.E.P.

A92-44990

**RELATIONSHIP BETWEEN SURFACE TEXTURE AND OBJECT DENSITY ON JUDGEMENTS OF VELOCITY, ALTITUDE, AND CHANGE OF ALTITUDE**

CRAIG ROSENBERG and WOODROW BARFIELD (Washington, University, Seattle) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 601-606. refs

The simulation of low-level flight has traditionally been difficult for computer image generation systems because of the amount of scene detail that must be rendered and the rate at which the visual scene must be transformed. Due to limitations in computing resources, computer-generated scenes must be significantly simplified in order to maintain real-time capabilities. In the course of this simplification it is important to retain the necessary perceptual cues to maintain situational awareness. The purpose of this exploratory study was to investigate the effect of varying two types of ground texture and three levels of object density on the observers ability to judge velocity, altitude, and change of altitude during low level flight. It was predicted that by increasing the density of objects and the realism of the computer-generated terrain performance would improve for the above three measures of situational awareness. The results indicated that the main effect for object density and terrain realism were not significant for estimates of velocity and altitude, however for a student population, estimates of the shift in altitude varied as a function of object density. Author

A92-44991

**A SURVEY OF NAVAL AVIATOR OPINIONS REGARDING UNAIDED VISION TRAINING TOPICS**

EDWARD TRAUTMAN (U.S. Navy, Naval Training Systems Center, Orlando, FL), WILLIAM LITTLE, and MICHAEL MITTLEMAN (U.S. Navy, Naval Aerospace Medical Institute, Pensacola, FL) IN:

International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 607-612.

A sampling among Navy and Marine Corps pilots regarding the importance of traditional unaided vision training is presented. Participants were given a series of topics, each including an explanation of a visual deficiency and a matrix for rating the frequency of the problem in a variety of operational scenarios. This analysis revealed findings that include evidence of fleet acceptance for each of the surveyed aviation physiology vision training topics. R.E.P.

A92-44992

**USE OF A HUMAN FACTORS CHECKLIST IN AIRCRAFT MISHAP INVESTIGATIONS**

ANTHONY P. CIAVARELLI (U.S. Naval Postgraduate School, Monterey, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 613-618. refs

An account is given of the development and potential applications of a human-factors checklist devised for the clarification of chains of causality relating to pilot/crew involvement in accidents and incidents. The checklist which has been devised for U.S. Navy/Marine use is meant to function both as a 'user-friendly' investigation tool, and as the basis for a safety program that addresses key preventive factors in aircrew-related mishaps. The classification-structure of the checklist encompasses sensory-perceptual, knowledge-skill, medical-physiological, communications-coordination, decision-judgment, and attitude-personality, as well as supervisory and design-systemic factors. O.C.

A92-45001

**BEHAVIORAL ANALYSIS OF MANAGEMENT ACTIONS IN AIRCRAFT ACCIDENTS**

ARTHUR KAHN (Westinghouse Electronic Systems Group, Annapolis, MD) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 674-678. refs

The sources of aircraft accidents in easily overlooked management actions, directives, and broad policies are presently illustrated in view of three aircraft accidents and one railway accident. Attention is given to psychological factors characterized as 'latent errors'; the analysis presented showed that the nonproximate factors accounting for the accidents were related to management policies via the reinforcing effects of the individuals or groups more proximately involved. It is shown that the behavior of managers at different levels must be analyzed to determine the extent of said reinforcement. O.C.

A92-45003

**THE MYTHS OF PILOT PERSONALITY STEREOTYPES**

ROBERT O. BESCO (Professional Performance/Improvement, Inc., Dallas, TX) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 685-693. refs

The present evaluation of existing pilot personality/aptitude selection criteria argues that no current method can adequately distinguish high-performance pilots from others. The bases of many such methods' assumptions are noted to be unsustainable stereotypes associated with popular stereotypes of military pilot behavior. There is accordingly a significant danger that aviation managers are being poorly advised and misled by behavioral scientists' biased, often methodologically unrigorous work. Extensive efforts toward the validation and cross-replication of aptitude evaluations are required. O.C.

A92-45004

**COMPARATIVE ANALYSIS OF MMPI PROFILES IN TWO GROUPS OF AB-INITIO FLYING TRAINEES**

GURMUKH SINGH (Institute of Aerospace Medicine, Bangalore,

India) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 694-699. refs

The Minnesota Multiphasic Personality Inventory (MMPI) psychological testing system has been used to ascertain the personality profiles of two groups of trainees under high stress conditions reflective of training in instrument flying, low level navigation, close formation, night flight, aerobatics, and long range flight. It is established that while normal subjects obtained MMPI profiles identical to those of a control group, subjects of an aberrant group exhibited a gross abnormality in their MMPI results relative to the control group. O.C.

**A92-45005****THE MYTH OF THE ADVENTURESOME AVIATOR**

RONALD A. WARREN, JOHN J. HUDY, and PETER GRATZINGER (Acumen International, San Rafael, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 700-705. refs

Experience obtained with hundreds of aviators from various airlines in cockpit resource management (CRM) courses suggests that many personality types are represented among young pilots. The use of reliable psychological aptitude measures also indicates that 'independent-minded' and 'adventurous' individuals may not dominate the profession. These attitudinal data have important implications for several areas of pilot training, by allowing a more careful tailoring of CRM and similar educational efforts to personality profiles. O.C.

**A92-45006****INAPPROPRIATE FUNCTIONING OF THE COCKPIT DOMINANCE HIERARCHY AS A FACTOR IN APPROACH/LANDING ACCIDENTS**

GEORGE WHITE and L. J. V. BAKER (Trinity College, Dublin, Republic of Ireland) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 706-711. refs

This paper introduces the hypothesis that a major factor influencing the behavior of subordinate crew members is the cockpit dominance hierarchy and that it adversely affects the behavior of the whole crew in certain critical situations. This extension of Milgram's classical work on authority and obedience is presented as a contribution to the development of cockpit resource management (CRM). While the influence of the dominance hierarchy permeates the basic concept of CRM, a review of the literature, while not exhaustive, shows no evidence of this subject being directly addressed. Author

**A92-45009****PROFESSIONAL PILOTS' EVALUATION OF THE EXTENT, CAUSES, AND MEANS OF REDUCTION OF ALCOHOL USE IN AVIATION**

SUSAN M. ROSS and LEONARD E. ROSS (Wisconsin, University, Madison) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 728-733. refs

Questionnaires were sent to a sample of 1000 pilots; of the 983 delivered, a return rate of 61.5 percent was achieved. The questionnaires posed questions as to the respondent's aviation experience and solicited characterizations of the extent to which alcohol abuse is a problem in aviation. The results of the survey indicate that while the respondents are aware of cases of alcohol abuse, they see these as isolated and due to factors involving the psychology of individuals. O.C.

**A92-45013****EFFECTS OF GYRO-FITNESS TRAINING ON AIRSICKNESS MANAGEMENT**

CARL J. MALLERY, ROBERT C. BERGER, WILLIAM T. WITTMAN, GEORGE R. MASTROIANNI, and ROBERT J. SCHOEN (U.S. Air Force Academy, Colorado Springs, CO) IN: International

Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 752-757. refs

An effort is made to experimentally assess whether that USAF Academy's eclectic approach to the treatment of trainee airsickness conditions will succeed in the acceleration of airsickness recovery rates. Attention is given to the effectiveness of the 'Equinox trainer', a man-sized, two-axis-of-motion gyroscope, which induces vestibular acceleration and visual tracking requirements similar to those encountered in flight. The data obtained are judged to be insufficient for the determination of a definite reduction of airsickness symptoms as a result of such 'gyrofitness training'. O.C.

**A92-45017****THE INTERACTIVE EFFECTS OF COCKPIT RESOURCE MANAGEMENT, DOMESTIC STRESS, AND INFORMATION PROCESSING IN COMMERCIAL AVIATION**

RONALD E. CLARK, RONALD A. NIELSEN, and RAWSON L. WOOD (Embry-Riddle Aeronautical University, Prescott; America West Airlines, Inc., Phoenix, AZ) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 776-781. refs

An effort is made to characterize the interactivity of domestic stress, information processing degradation, and pilots' cockpit-resource management (CRM) training, on the basis of responses to a survey. The analysis of survey results indicates that both domestic and aviation stress have increased for the majority of aircrew samples, and that the majority of airline pilots experienced a degradation of information-processing capability when under aviation or domestic stress. The vast majority of those pilots underwent an enhancement of information processing when subjected to Aircrew Team Dynamics training. O.C.

**A92-45018****THE FROZEN PILOT SYNDROME**

T. W. HEASLIP, N. HULL, R. K. MCLEOD, and M. VERMIJ (Accident Investigation & Research, Inc., Ottawa, Canada) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 782-787.

Accounts are given of cases in which experienced pilots become fixated in emergencies upon a narrow aircraft-control factor or activity to the exclusion of all others. In such cases, the pilot's cognitive processes have for all intents and purposes ceased, as they become obsessively concerned with an inappropriate action that does nothing but appear to relieve psychological stress. It is presently argued that the accident-investigation process may yield information useful in the identification of individuals that are susceptible to this syndrome. O.C.

**A92-45019****FLIGHT ANXIETY OF CIVILIAN STUDENT PILOTS**

PAUL D. LINDSETH and GLENDA N. LINDSETH (North Dakota, University, Grand Forks) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 788-792. refs

The results of a study which measured the predictors of flight anxiety in civilian student pilots are presented. Such preflight predictors of anxiety as insomnia, fatigue, apprehension, restlessness, etc., were correlated with high anxiety levels to a degree that allowed their use as predictors. High anxiety significantly correlated with such physiological outcomes as faintness, nausea, airsickness, and greyout/blackout. Fully 49 percent of pilots in this study had experienced insomnia within the 24 hours prior to their next flight. O.C.

**A92-45022**

**INCREMENTAL TRANSFER STUDY OF SCENE DETAIL AND VISUAL AUGMENTATION GUIDANCE IN LANDING TRAINING**  
HENRY L. TAYLOR, GAVAN LINTERN, JEFFERSON M. KOONCE,

ROBERT H. KAISER, and GREGORY A. MORRISON (Illinois, University, Savoy) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 805-810. refs

(Contract DTFA01-90-C-00045)

Beginning flight students were taught landings in a flight simulator with a visual landing display to examine the effects of scene detail, visual augmented guidance, and the number of landing training trials. Transfer as assessed in a criterion simulator configuration showed advantages for larger numbers of training trials, visual augmented guidance, and moderate scene detail. Subjects who had received landing training in the simulator, however, showed no advantage in transfer to the airplane compared to control subjects who received an equal amount of simulator time practicing an instrument pattern. While it is clear that training manipulations using a computer graphics visual display can impact the acquisition of landing skills as assessed by testing in the simulator, the conditions under which skills learned in the simulator transfer to the aircraft are not clear. Author

#### A92-45023

##### VISUAL AUGMENTATION AND SCENE DETAIL EFFECTS IN FLIGHT TRAINING

JEFFERSON M. KOONCE and GAVAN LINTERN (Illinois, University, Savoy) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 811-816. refs

(Contract MDA903-86-C-0169)

Flight students were taught landings in a flight simulator with a visual landing display to examine the effects of high- and low-detail scenes, adaptive and no visual augmentation (command and/or guidance), and fast, normal and slow roll response on the acquisition and transfer of landing skills. Transfer was assessed in the simulator with a high-detail pictorial scene, no visual augmentation, and a normal roll response. Training with visual augmentation was superior to training without it. Guidance augmentation enhanced transfer only when it was combined in training with the low-detail scene. Author

#### A92-45024

##### VISUAL PROPERTIES FOR THE TRANSFER OF LANDING SKILL

DEBORAH A. REISWEBER and GAVAN LINTERN (Illinois, University, Savoy) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 817-822. refs

(Contract MDA903-86-C-0169)

Flight naive subjects flew landing approaches in a simulator with a computer animated visual display under different settings of visual augmented feedback, scene content, training headwinds, and transfer headwinds. The use of augmented command feedback in training enhanced glideslope tracking performance in training and in transfer, but the nature of the enhancement differed in that stability was affected in training and bias was affected in transfer. Biasing effects were also observed in probe trials (inserted into the transfer session) in which various forms of visual information were distorted or removed. For texture gradient added to or deleted from the ground plane, the glideslope bias of subjects trained with constant command augmentation or with no command augmentation was affected. There was no such effect for subjects trained with adaptive command augmentation. These data suggest that the different command augmentation schedules tested in this experiment oriented subjects to different visual properties that can support glideslope control. Author

#### A92-45037

##### COMPUTER-BASED PROCEDURAL TRAINING

TOM CORDELL (United Airlines, Chicago, IL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr.

29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 904-909. refs

The potential latent in the use of inexpensive PCs to serve as the bases of 'part-task trainers' allowing systematic interaction between student and simulator device, with the appropriate feedback and automatic scoring of student performance, has not been fully exploited by the aviation industry. Attention is presently given to the training effectiveness of a procedures trainer manufactured from full-scale computer-drawn artwork with touchpoints for each switch, gage, and control. Three experiments were conducted with the device, using flight-naive subjects; the results obtained show that the imposition of a rigid order on procedural tasks aids learning. O.C.

#### A92-45038

##### TRANSFER OF TRAINING FROM A LOW COST HELICOPTER SIMULATOR

JACK DOHME (U.S. Army, Research Institute, Fort Rucker, AL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 910-915. refs

The UH-1TRS system has been developed to evaluate low-cost simulator-based training for U.S. Army 'Initial Entry Rotary Wing' flight students. The focus of the research presently reported was Transfer of Training (TOT) with these neophyte flight students. Training on the UH-1TRS was conducted in light of the criterion of three successive iterations of a maneuver which met the published standard in the Flight Training Guide. A TOT effectiveness ratio (TER) was calculated for each maneuver. Considerable TER variability is found across the four different TOT research studies conducted. O.C.

#### A92-45039

##### SAGES - A SYSTEM OPTIMISING EACH TRAINEE'S COURSE TOWARDS A FINAL LEVEL WHICH WILL BE THE PURPOSE OF THE TRAINING PERIOD

MICHEL PISTRE and DANIEL ESPART (Ecole Nationale de l'Aviation Civile, Toulouse, France) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 917-922.

The 'SAGES' system facilitates the individualization of simulation-based training, on the basis of software which generates a distinctive pedagogical course for each trainee on the basis of: (1) actual performance on training tasks, (2) the specific goal of the training course, and (3) the time and equipment available. The system differs from conventional, 'task scheduling' systems in that it not only optimizes the uses of resources, but also allows a given course of instruction to be accelerated within the constraints of the given simulator resources. The SAGES software is written in the language 'C', and runs on PCs. O.C.

#### A92-45043

##### RELATIONSHIP BETWEEN MENTAL MODELS AND SCANNING BEHAVIOR DURING INSTRUMENT APPROACHES

DONALD E. HAMELUCK (York University, Toronto, Canada) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 939-944. Research supported by Department of Supply and Services, York University, and IBM Canada. refs

A factor-analysis examination is conducted of the correspondence between the instrument-scanning performance of pilots during two different types of instrument approaches and their 'mental model knowledge' of these approaches. In virtue of the common-factors approach employed, the numerous statistical measures of the skilled scanning process could be discussed in terms of underlying sets of information gathered by the pilots during flight. It was then possible to characterize the pilots' understanding of the approach procedure at the appropriate level of description, and relate this to their information-gathering behavior. O.C.

A92-45045

**THE PREDICTION OF ENGAGEMENT OUTCOME DURING AIR COMBAT MANEUVERING**

WAYNE L. WAAG, JEFFREY L. LEEDS, and WILLIAM B. RASPOТNIK (USAF, Armstrong Laboratory, Williams AFB, AZ) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 952-957. refs

An effort is made to ascertain the statistical relationship of each candidate measure for air combat engagement outcomes, as well as to determine the relative importance of each measurement category for the prediction of engagement outcome. A composite measure of performance from all candidate measures which maximizes the prediction of engagement outcome is devised. The adversary model used was the Adaptive Maneuvering Logic. The most salient result from analysis of the candidate measures was the very powerful effect of 'opponent type'; all multivariate analyses accordingly had to be conducted separately for each type of opponent. O.C.

A92-45046

**TEACHING AN OLD DOG NEW TRICKS - CONCEPTS, SCHEMATA AND METACOGNITION IN PILOT TRAINING AND EDUCATION**

GEORGE W. STRAGISHER (Kent State University, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 958-963. refs

Experienced pilots attempting to master new aircraft must learn how to recognize cues that signal problems with either the acquisition of critical new information or interference in effective interaction among crewmembers. An 'assertiveness training program' may be required for effective interaction in the cockpit environment. Attention is given to the 'concept mapping' method for decomposing an individual's ideas into relational components, in order to identify anomalies which may be acting as barriers to learning. O.C.

A92-45049

**THE USE OF AN EXPERT CRITIC TO IMPROVE AVIATION TRAINING**

ANDREW S. GIBBONS and DWAYNE H. ROGERS (Wicat Systems, Orem, UT) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 974-980. refs

It is feedback which ultimately allows the student pilot to understand the full implications of cockpit indicators and take appropriate and timely actions. In order to assist in the imparting of flying skills, a type of computerized instructional resource, designated an 'expert critic' or 'evaluator', has been developed to generate and deliver an extensive feedback message concerning: (1) a specific student performance goal, (2) a free-play simulated environment of defined scope, (3) a record of student activities within the simulated environment, or (4) a complete feedback review of student performance following the requisite interactions. O.C.

A92-45050\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**WHAT MAKES A GOOD LOFT SCENARIO? ISSUES IN ADVANCING CURRENT KNOWLEDGE OF SCENARIO DESIGN**

STEVEN E. GREGORICH (Texas, University, Austin; NASA, Ames Research Center, Moffett Field, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 981-986. refs

An effort is made to ascertain which combinations of technical demands and crew coordination should be incorporated in training scenarios in order to maximize the effectiveness of training for crew members. Such high-fidelity simulation, which has come to be known as 'line-oriented flight training' or LOFT, involves the practice of both technical and crew coordination skills in a realistic setting, in conjunction with periodic reviews of performance via videotaped feedback. Attention is given to the integration of

appropriate information, the measurement of objective task demands, the character of information from LOFT students, and the leeway allowed LOFT instructors. O.C.

A92-45053 National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ON OPERATOR STRATEGIC BEHAVIOR**

P. A. HANCOCK (Minnesota, University, Minneapolis) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 999-1007. Research supported by NASA. refs

(Contract NAG1-1118)

Deeper and more detailed knowledge as to how human operators such as pilots respond, singly and in groups, to demands on their performance which arise from technical systems will support the manipulation of such systems' design in order to accommodate the foibles of human behavior. Efforts to understand how self-autonomy impacts strategic behavior and such related issues as error generation/recognition/correction are still in their infancy. The present treatment offers both general and aviation-specific definitions of strategic behavior as precursors of prospective investigations. O.C.

A92-45057\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**REPRESENTING COCKPIT CREW DECISION MAKING**

GARY A. KLEIN and MARVIN L. THORSDEN (Klein Associates, Inc., Fairborn, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1026-1031. refs

(Contract NASA ORDER A-72145-C)

A theoretical framework has been synthesized for the use of cognitive processes to understand team functions. Three different pilot-copilot-flight engineer cockpit crews were observed over the course of a set of mission conducted in a B 727 simulator at NASA-Ames. Only experienced commercial aviators were used in positions for which they were officially qualified; one of the flights involved a generator malfunction, and another was marked by a serious fuel leak. All flights were videotaped and shown to the crews immediately after each session. Transcripts prepared from these videotapes logged the person uttering each comment and the exact time of the comment. O.C.

A92-45058\* National Aeronautics and Space Administration, Washington, DC.

**WHY PILOTS ARE LEAST LIKELY TO GET GOOD DECISION MAKING PRECISELY WHEN THEY NEED IT MOST**

JOHN W. MAHER (Delta Airlines, Centerville; Harvard University, Cambridge, MA; NASA/University of Texas Aerospace Crew Research Center, Austin) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1032-1037. refs

Studies of commercial aircraft incidents and accidents indicate that, in flight conditions not covered by standard operating procedures, as well as when the environment is saturated with information or unmanaged stress, cognitive shortcuts dominate aircrews' decisionmaking processes. Multidisciplinary research on such situations with high-fidelity simulators becomes critically important, as do psychometric tools which examine vigilance, personality resiliency before stressful conditions, and decisional and interpersonal mind-sets. O.C.

A92-45059

**'PILOT ERROR' AS INFORMATION PROBLEM**

TOMASZ SMOLICZ (LOT Polish Airlines, Warsaw, Poland) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1038-1043. refs

All aviation activities should be so structured that pilots will be compelled to take actions only within that range of factors most

directly conducive to the maintenance of safety in matters of perception, stress, and workload. System design should stress the quality of pilot perception and the availability of suitable reaction time. Difficulties will inevitably arise, however, in the ability of the pilot to analytically identify the reasons for malfunctions. O.C.

**A92-45060****FLYING AN AIRCRAFT AS A PROBLEM SOLVING PROCESS - ABOUT THE INSTRUMENT-FAILURE-SIMULATOR (IFS) AS A TEST FOR PILOT APPLICANTS**

GERHARD FAHNENBRUCK (DLR, Hamburg, Federal Republic of Germany) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1044-1048. refs

On the basis of a theoretical model about how pilots fly an aircraft, an Instrument-Failure-Simulator (IFS) was developed. The simulator is equipped with instruments that systematically malfunction. The task for the subjects is to fly and follow a rather simple track several times while scanning the instruments for failures. The performance is rated on the basis of the distance between the actual flight path and the given track as well as the ability to detect instrument failures. The results indicate that the IFS can be used to predict professional success. Author

**A92-45061****TOWARDS THE VALIDATION OF THE FIVE HAZARDOUS THOUGHTS MEASURE**

M. LUBNER, M. PHIL, and J. MARKOWITZ (Columbia University, New York) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1049-1054. Research sponsored by FAA. refs

The 'five hazardous thoughts scale', a self-evaluation test that can be conducted with pencil and paper, proceeds from the discovery by Jensen and Benel (1977) that decision errors constituted the largest category of causes of aviation fatalities. The 'subscales' for which the test is named are: (1) antiauthority, (2) invulnerability, (3) macho, (4) impulsiveness, and (5) resignation. The test covers five scenarios with five evaluated items in each, furnishing a total of 25 items; each item is scored from 1 = not likely to 5 = highly likely. It is experimentally established that, with some additional refinement, the scale may be predictive of dangerous aviation occurrences. O.C.

**A92-45063****THE PILOT JUDGEMENT STYLES MODEL SUPER C - A NEW TOOL FOR TRAINING IN DECISION-MAKING**

EINAR J. WESTERLUND (Westerlund & Associates, Toronto, Canada) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1061-1067. refs

The present framework for pilot problem-solving-related analysis and training tasks is concerned with the individuals' ability to recognize problems, process information, recall previously encountered information, generate alternatives, and evaluate the risks associated with each alternative. Also involved is the motivational or 'attitudinal' dimension of decisionmaking, which entails recognition of hazardous attitudes that can affect decisionmaking and compels the fostering of those attitudes which will lead to selection and execution of safe courses of action. O.C.

**A92-45065****KNOWLEDGE TRANSFER AND ANTICIPATION IN AIRLINE PILOTING**

SYLVIE FIGAROL (Ecole Nationale de l'Aviation Civile, Toulouse, France) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1074-1079. refs

The methods of cognitive psychology are presently used to study the problem of knowledge transfer when pilots convert to a new aircraft, giving attention to the 'anticipatory' aspect of pilot cognitive activities. Anticipatory competence allows pilots to predict

the evolution of a flight and thereby dynamically generate suitable plans of action. A set of hypotheses is formulated for the relationship between anticipation and knowledge transfer, and training tools based on them are derived. O.C.

**A92-45066****INFORMATION PROCESSING IN AB INITIO PILOT TRAINING**

LYNN M. HUNT (Massey University, Palmerston North, New Zealand) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1080-1087. refs

While information-processing proficiency can affect an individual's learning and task-related performance, little effort has been made to teach this skill during pilot training, and there is accordingly a poor harnessing of cognitive and metacognitive skills associated with strategic information processing. Attention is presently given to a pilot program which evaluated the idiosyncrasies of each pilot-training candidate's information-processing styles; the cognitive profile thus obtained becomes the *groundwork for instruction aimed at the development of cognitive and metacognitive capabilities, on the basis of self-monitoring/self-evaluation.* O.C.

**A92-45067****THE EFFECTS OF UNIQUE ENCODING ON THE RECALL OF NUMERIC INFORMATION**

ELIZABETH PARKER-HANEY (San Jose State University, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1089-1094. refs

In order to determine the suitability of the digit-by-digit transmission of numeric data to pilots, the present experiment examined pilots' short term memory span by auditorily presenting air traffic control messages with one of two presentation formats: digit-by-digit or the unique 'chunked' transmission. Data analysis revealed that there were no significant differences in recall between the digit-by-digit and the chunking conditions. However, analysis of message type and length of retention interval revealed significant main effects and interactions. The importance of errors found in recall and the error types are also discussed. Author

**A92-45068****ROLE OF PILOT'S METAKNOWLEDGE OF THEIR OWN RELIABILITY AND CAPABILITIES**

CLAUDE VALOT (Centre d'Enseignement et de Recherches de Medecine Aeronautique, Bretigny-sur-Orge, France) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1095-1100. refs

'Metaknowledge', which is ever-present in piloting activities, constructs an individual 'logic' of actions on the basis of general cognitive tools, thereby associating technical procedures with a personal approach to the management of cognitive resources. An investigation is presently conducted of the kind of knowledge which pilots gather to adjust domain-dependent rules, individual range of adaptation, and efficiency. Attention is given to two forms of metaknowledge: the cataloging of known procedures and actions, and the representation of cognitive competencies. O.C.

**A92-45069\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**AN EVALUATION OF STRATEGIC BEHAVIORS IN A HIGH FIDELITY SIMULATED FLIGHT TASK - COMPARING PRIMARY PERFORMANCE TO A FIGURE OF MERIT**

MICHAEL R. BORTOLUSSI (Western Aerospace Laboratories, Inc., Moffett Field, CA) and MICHAEL A. VIDULICH (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1101-1106. refs  
(Contract NCC2-486)

The usual method of evaluating flight performance during a simulation is to collect as many primary performance measurements

as possible. Then analyze all the measurements to find one sensitive to the manipulations imposed on the pilot during the scenario. Although this method can be useful, it is usually unreliable from one study to another. A simulation was conducted to test an integrated figure of merit (FOM) constructed using a standardized procedure. Pilots flew two full-mission scenarios in an instrument trainer with three degrees of motion freedom. The primary performance measurements selected assessed the pilot's performance in accuracy, smoothness, and activity. The results suggest that the integrated FOMs performed comparably to the primary performance measurements in determining which flight imposed the higher demands on the pilot. The standardized construction process allow adjustments to the FOM, so it can be used in different applications. Author

**A92-45070\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**THE EFFECTS OF TASK DIFFICULTY AND RESOURCE REQUIREMENTS ON ATTENTION STRATEGIES**

TERESA KING (Western Aerospace Laboratories, Inc., Monte Sereno, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1107-1111. refs (Contract NCC2-486)

The patterns of attention strategies for task difficulty/resource tasks for which experimental results are presented and analyzed support the hypothesis that subjects may adopt an alternating (rather than concurrent one) when compelled to do so by either the size or the complexity of a visual display. According to the multiple resource model, if subjects had been performing the two tasks concurrently, the cost of this strategy would have been shown by a decrement in the spatial format, rather than the verbal format, due to competition for the same resource. Subjects may apply different strategies as a function of task difficulty and/or resource demand. O.C.

**A92-45071**

**THE STRATEGIC INTEGRATION OF PERCEPTION AND ACTION**

RALPH J. ROBERTS, JR., SCOTT WIEBKE, LAURA VALAER, BRANDON MATTHIAS, and MICHAEL ONDREJKO (Denver, University, CO) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1112-1117. refs

Although highly skilled action in dynamic visual environments is believed to require an ongoing orchestration between perception and action, there is little research that directly examines this relation. Preliminary findings are reported from a laboratory designed to examine the real-time coordination between eye movements and skilled action. Expert subjects performed a video-game task that involved selecting targets and judging intercept times in a dynamic and cluttered visual environment. The results showed a high degree of corespondence between looking and acting and suggested that performers obtain specific visual information within specific time intervals to calibrate future action. Author

**A92-45072\*** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**MULTI-ATTRIBUTE TASK BATTERY - APPLICATIONS IN PILOT WORKLOAD AND STRATEGIC BEHAVIOR RESEARCH**

RUTH J. ARNEGARD (Old Dominion University, Norfolk, VA) and J. R. COMSTOCK, JR. (NASA, Langley Research Center, Hampton, VA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1118-1123. Previously announced in STAR as N92-17130. refs

The Multi-Attribute Task (MAT) Battery provides a benchmark set of tasks for use in a wide range of lab studies of operator performance and workload. The battery incorporates tasks analogous to activities that aircraft crewmembers perform in flight, while providing a high degree of experimenter control, performance

data on each subtask, and freedom to nonpilot test subjects. Features not found in existing computer based tasks include an auditory communication task (to simulate Air Traffic Control communication), a resource management task permitting many avenues or strategies of maintaining target performance, a scheduling window which gives the operator information about future task demands, and the option of manual or automated control of tasks. Performance data are generated for each subtask. In addition, the task battery may be paused and onscreen workload rating scales presented to the subject. The MAT Battery requires a desktop computer with color graphics. The communication task requires a serial link to a second desktop computer with a voice synthesizer or digitizer card. Author

**A92-45073**

**STATE-OF-THE-ART PILOT PERFORMANCE AND WORKLOAD MEASUREMENT**

VALERIE GAWRON (Calspan Advanced Technology Center, Buffalo, NY) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1124-1129. refs

All extant methods for evaluation of pilot performance during system design and evaluation have been assessed. Methods for crewstation evaluation are presently categorized as measures of performance and workload. Workload measures have been further categorized as 'secondary tasks' and 'subjective measures'. Tabulations are given for all three. O.C.

**A92-45074**

**STRATEGIC BEHAVIOUR IN FLIGHT WORKLOAD MANAGEMENT**

MIREILLE RABY and CHRISTOPHER D. WICKENS (Illinois, University, Savoy) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1130-1135. Research supported by USAF. refs

An examination is conducted of the flexibility of human operators in dynamic and complex situations, in order to characterize how individuals schedule and prioritize tasks. Participating subjects were free to monitor their own workload, as well as evaluate the time required for performing a given set of tasks and modify those tasks at their own discretion. Thirty instrumented pilots flew simulated instrument approaches under different workload conditions; analysis of the results obtained indicates that as workload increased, pilots spent a greater portion of the available time on the higher-priority tasks, and their ability to perform those tasks remained optimal despite the increase in workload. The implications of these findings for flight training are discussed. O.C.

**A92-45075**

**THE BEDFORD SCALE - DOES IT MEASURE SPARE CAPACITY?**

MICHAEL A. VIDULICH (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1136-1141. refs

The foundational concept of the Bedford scale is that it is natural for individuals to judge the amount of space capacity that remains while they perform a task. An effort is presently made to ascertain whether subjects employing this scale could focus on the demands of one task to the exclusion of other time-shared tasks. It appears possible that a more intensive training of pilots may render them resistant to the contaminating influence of time-shared tasks; until this is experimentally demonstrated, the use of the Bedford scale to evaluate one task in a multitask cockpit environment cannot be recommended. O.C.

**A92-45076\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**INDIVIDUAL DIFFERENCES IN STRATEGIC FLIGHT MANAGEMENT AND SCHEDULING**

CHRISTOPHER D. WICKENS and MIREILLE RABY (Illinois, University, Savoy) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1142-1147. Research sponsored by USAF. refs  
(Contract NAG2-308)

A group of 30 instrument-rated pilots was made to fly simulator approaches to three airports under conditions of low, medium, and high workload conditions. An analysis is presently conducted of the difference in discrete task scheduling between the group of 10 highest and 10 lowest performing pilots in the sample; this categorization was based on the mean of various flight-profile measures. The two groups were found to differ from each other only in terms of the time when specific events were conducted, and of the optimality of scheduling for certain high-priority tasks. These results are assessed in view of the relative independence of task-management skills from aircraft-control skills. O.C.

#### A92-45077

##### PERSONALITY ASSESSMENT IN PROPOSED USAF PILOT SELECTION AND CLASSIFICATION SYSTEMS

THOMAS R. CARRETTA, LAURIE C. WALTERS, and FREDERICK M. SIEM (USAF, Armstrong Laboratory, Brooks AFB, TX) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1148-1153. refs

The purpose of the USAF Pilot Selection and Classification System is to reduce pilot-training attrition rate and furnish the Air Training Command (ATC) with early classification of pilot candidates. ATC has initiated research on a structured interview designed to improve candidate selection. It is fortunate that much of the personality assessment work presently evaluated involves performance-based measures, rather than self-report inventories, in virtue of the merely weak relationship that has been found between the two by Dolgin and Gibb (1988). O.C.

#### A92-45078

##### CRITERION TASK SET (CTS) - EVALUATION OF COGNITIVE TASK BATTERIES

MARK S. CRABTREE and SHARON A. DAVIS (Logicon Technical Services, Inc., Dayton, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1154-1159. refs  
(Contract F33615-89-C-0532)

CTS, a computerized battery of tasks developed by the USAF to conduct rapid, standardized evaluations of workload metrics and cognitive performance capabilities, has completed several development phases and continues to be used in cognitive studies. The task battery presented by the USN's UTC-PAB/AGARD STRES PC-compatible workload metric evaluator is similar to that of the CTS. The USAF is applying CTS experience to the evaluation of the AGARD STRES system. An effort is being made to obviate all peripheral hardware requirements that cannot be accommodated by a PC. O.C.

#### A92-45079

##### CULTURE-FAIRNESS OF TEST METHODS - PROBLEMS IN THE SELECTION OF AVIATION PERSONNEL

CHRISTOPH FASSBENDER (DLR, Hamburg, Federal Republic of Germany) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1160-1168. refs

The accurate assessment of cognitive abilities and personality characteristics of individuals in international groups with standardized tests is encumbered by several factors, chiefly including cultural ones. The culture-fairness of test methods that have been successfully used in national psychological assessment of aviation personnel is assessed. The influence of cultural differences among testees on a number of general aptitude and personality tests is investigated. Testees from 12 European countries took part in this study. Results indicate that cultural differences seem to affect test performance on a number of tests.

However, when English language skill is controlled as a concomitant variable in an analysis of covariance, culture or nationality differences disappear on all tests. Results are discussed and recommendations for the improvement of culture-fairness of test methods are formulated. Author

#### A92-45378

##### MEDIA SELECTION ANALYSIS - IMPLICATIONS FOR TRAINING DESIGN

H. B. SORENSEN (USAF, Armstrong Laboratory, Brooks AFB, TX) IN: International Pacific Air and Space Technology Conference and Aircraft Symposium, 29th, Gifu, Japan, Oct. 7-11, 1991, Proceedings. Warrendale, PA, Society of Automotive Engineers, Inc., 1991, p. 47-64. Research supported by DOD. refs  
(SAE PAPER 911971) Copyright

A comparative analysis of current media selection models was conducted to improve key Instructional System Development (ISD) steps that would significantly benefit from automation and decision support features. Media selection models in general use by military, contractor, and civilian instructional designers were compared and contrasted. Key features that impact media selection model automation were identified. A preliminary design of an automated media selection model incorporates the requirements of as many of the reviewed media selection models as possible was developed. Author

#### A92-45379

##### A FRAMEWORK FOR OPTIMIZING TOTAL TRAINING SYSTEMS - APPLICATION TO MAINTENANCE TRAINING AND TEAM TRAINING SYSTEMS

ROBERT F. BACHERT and TENNY A. LINDHOLM (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: International Pacific Air and Space Technology Conference and Aircraft Symposium, 29th, Gifu, Japan, Oct. 7-11, 1991, Proceedings. Warrendale, PA, Society of Automotive Engineers, Inc., 1991, p. 65-74. refs  
(SAE PAPER 911972) Copyright

The USAF has been applying systems approaches to the development of methods for the definition of training systems requirements and their implementation. The systems methodology further supports the integration of training efforts with other aspects of USAF operations and to establish frameworks within which operational efficiencies can be determined. O.C.

#### A92-45452

##### SOCIO-CULTURAL ISSUES DURING LONG DURATION SPACE MISSIONS

NICK KANAS (California, University; USVA, Medical Center, San Francisco) IN: International Pacific Air and Space Technology Conference and Aircraft Symposium, 29th, Gifu, Japan, Oct. 7-11, 1991, Proceedings. Warrendale, PA, Society of Automotive Engineers, Inc., 1991, p. 835-840. refs  
(SAE PAPER 912075) Copyright

Sociocultural issues that can affect the work of space crews during long missions are briefly discussed. The most important of these issues are language differences between crew members, cultural and racial biases, gender stereotyping, and differences in career motivation. Measures that can be taken to deal with these issues are considered. C.D.

#### A92-46277

##### EFFECT OF SPATIAL FREQUENCY CONTENT OF THE BACKGROUND ON VISUAL DETECTION OF A KNOWN TARGET

WILLIAM GENTLES, THAHN NGUYEN, WILLIAM HO, CURTIS CALDWELL, LISA EHRLICH, CHARLENE LEONHARDT, and RICK REED (Toronto, University, Canada) IN: Medical imaging VI - Image processing; Proceedings of the Meeting, Newport Beach, CA, Feb. 24-27, 1992. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1992, p. 341-351. Research supported by Sunnybrook Trust for Medical Research. refs  
Copyright

The background of a target is varied in terms of frequency to

experimentally study the effects of background on a visual detection task for humans. A known target is superimposed on a bandwidth-limited Gaussian noise background, and the observers are asked to state a confidence level regarding whether the target is present. The 'signal-known-exactly' ROC experiment is conducted with no changes to the low-contrast target disk, and observer performance is rated by calculating the area under the ROC curve. The results are shown to be inconsistent with the ideal observer model set forth, but a complexity-contrast model is proposed that predicts the experimental results. The results show that image-enhancement algorithms which cause increases in the power of background spatial frequencies of about 4 cycles/deg can degrade human observation. C.C.S.

A92-46278

**TASK PERFORMANCE ON CONSTRAINED RECONSTRUCTIONS - HUMAN OBSERVER PERFORMANCE COMPARED WITH SUB-OPTIMAL BAYESIAN PERFORMANCE**  
ROBERT F. WAGNER, KYLE J. MYERS (Food and Drug Administration, Center for Devices and Radiological Health, Rockville, MD), and KENNETH M. HANSON (Los Alamos National Laboratory, NM) IN: Medical imaging VI - Image processing; Proceedings of the Meeting, Newport Beach, CA, Feb. 24-27, 1992. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1992, p. 352-362. refs  
(Contract W-7405-ENG-36)  
Copyright

The performance of an extended family of algorithmic observers based on Bayesian statistical decision theory is investigated for viewing tomographic images. The parameter alpha is varied which changes the stopping point of the iterative reconstruction technique and controls the smoothness of the reconstruction. In the region of maximum likelihood estimation the validity of Gaussian approximation used by one of the machine algorithms is found to be suboptimal. For the smallest alpha values the best machine observers perform with the same level of success as human observers, and human and machine performances degrade significantly as the values of alpha increase. Task performance of algorithmic observers is shown to be a function of the prior probability parameter alpha, and the degree of sharpness/smoothing in the image is significant when the images are to be used for visual tasks. C.C.S.

A92-46296

**COLLECTIVE BEHAVIOR AND TEAM PERFORMANCE**  
JAMES E. DRISKELL (Florida Maxima Corp., Winter Park) and EDUARDO SALAS (U.S. Navy, Naval Training Systems Center, Orlando, FL) Human Factors (ISSN 0018-7208), vol. 34, no. 3, June 1992, p. 277-288. refs  
Copyright

A procedure is developed for differentiating collectively oriented versus egocentric team members. Experimental results confirm that collectively oriented team members were more likely to attend to the task inputs of other team members and to improve their performance during team interaction than were egocentric team members. Author

A92-46300

**A DYADIC PROTOCOL FOR TRAINING COMPLEX SKILLS**  
WAYNE L. SHEBILSKE (Texas A & M University, College Station), J. W. REGIAN (USAF, Intelligent Training Branch, Brooks AFB, TX), WINFRED ARTHUR, JR., and JEFFREY A. JORDAN (Texas A & M University, College Station) Human Factors (ISSN 0018-7208), vol. 34, no. 3, June 1992, p. 369-374. Research supported by USAF. refs  
Copyright

A dyadic training protocol is tested which is derived from cognitive and social theories of complex skill acquisition. A video-game-like research tool is used by subjects for 10 sessions of eight practice and two test games. Half of them practiced and tested alone; the others had identical tests but dyadic practice, in which they controlled part of each practice while being interlocked with a partner who controlled the rest. Subjects practiced both

parts and their connections by alternating roles and by modeling their partners. Trainer time and resources were half for the dyadic group, and performance was equivalent. This 100 percent increase in training efficiency is discussed. Author

A92-48548

**PERIPHERALLY LOCATED CRTS - COLOR PERCEPTION LIMITATIONS**

EILEEN ANCMAN (USAF, Wright Laboratory, Wright-Patterson AFB, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 960-965. refs

Colors on a peripherally located CRT (cathode ray tube) may be misperceived. Subjects wrongly identified the color of a peripherally located, 1.3 deg circle displayed on a CRT 5 percent of the time if it was blue, 63 percent of the time if red, and 62 percent of the time if green. Blue could not be seen further than 83.1 deg off of the fovea (along the x-axis). Red had to be closer than 76.3 deg and green nearer than 74.3 deg before the subjects reported seeing the colors. These average color field dimensions changed with differing subject psychological states due to the observed visual field narrowing (i.e., reduction of the subject's peripheral field of view) in both the relaxed and stressed states. A significant degree of visual field narrowing was noted for the relaxed states (8 percent), with a trend noted for the stressed state (2 percent). It is concluded that these color perception limitations must be kept in mind when designing CRT color formats for aircraft cockpits. I.E.

N92-28396# Human Engineering Labs., Aberdeen Proving Ground, MD.

**PROGRAM CLUSTER: AN IDENTIFICATION OF FIXATION CLUSTER CHARACTERISTICS**

RAMAKRISHNA S. PILLALAMARRI, B. D. BARNETTE, ROBERT KARSH, and DEBORAH P. BIRKMIRE Jan. 1992 30 p  
(AD-A247014; HEL-TN-1-92) Avail: CASI HC A03/MF A01

Innovative software techniques to advance methods of analysis in eye movement research have not kept pace with the development of hardware for collecting the samples of eye position. Eye fixation and duration have been the primary measures focused upon to glean knowledge of subjects' performance while engaged in cognitive visual tasks. Program cluster was developed as a means of investigating the dynamics of target examination characteristics that did not lend themselves to traditional eye movement analysis methods. The development of this tool proved to be a valuable means of assessing visual activity at a micro level as compared to the gross measures of distribution of visual attention in various areas of the visual field. This report describes the history surrounding the development of program cluster as an analysis tool, the source of input required for its execution, the mechanics of the execution as an interactive process, the program's products of visual displays and data file output, and potential application of such a tool for analysis of visual activity. GRA

N92-28408# Naval Postgraduate School, Monterey, CA.  
**A PROFILE OF SCIENTIST AND ENGINEER TRAINING CONDUCTED BY THE NAVAL AVIONICS CENTER M.S. Thesis**  
MICHAEL L. GREGORY Dec. 1991 425 p  
(AD-A245925) Avail: CASI HC A18/MF A04

This thesis provides an assessment of the training program from the perspective of civilian scientists and engineers working at the Naval Avionics Center (NAC). This assessment can be used in conjunction with other studies to provide NAC management with a basis on which to evaluate its return on investment from training. The author used a questionnaire to survey scientists and engineers in order to reveal training related trends across departments, job categories, paygrade levels, gender, ethnic origin, age, experience at NAC, and marital status. The author concluded that there is a good organizational climate for and support of the training program at NAC, that most of the job needs of scientists and engineers are being met by NAC's training program, and that there are some administrative changes needed to improve the

training program. In addition, the kinds of NAC training that are most useful to scientists and engineers are identified. The author presented several recommendations to improve the training program at NAC. GRA

**N92-28557#** Naval Aerospace Medical Research Lab., Pensacola, FL.

**DELAYS IN LASER GLARE ONSET DIFFERENTIALLY AFFECT TARGET-LOCATION PERFORMANCE IN A VISUAL SEARCH TASK Interim Report, 1 Oct. 1990 - 30 Sep. 1991**

M. D. REDDIX, J. A. DANDREA, and P. D. COLLYER Jun. 1991 23 p  
(AD-A246708; NAMRL-1367) Avail: CASI HC A03/MF A01

The present study examined the effects of low-intensity argon-laser glare on the visual search performance of aviators. Using a modified backward-masking paradigm, subjects were exposed to laser glare, either while seated in a cockpit simulation trainer with attached F-15 windscreens assembly. Brief exposure to laser glare, either 25 or 50 ms after a visual scene's onset, produced significant decrements in target-detection performance relative to a no-glare control whereas a 300-ms delay of laser glare onset had very little effect. The intensity of the light entering the eye (.38 micro-W/cm<sup>2</sup>(exp 2)) and producing these effects was far below the Maximum Permissible Exposure (MPE) limit for safe viewing of coherent light. In addition, these effects were modulated by a target's distance from the center of the beam path (also center of the visual display). Specifically, targets closest to the center of the beam path were responded to the most slowly and with the least accuracy. This study demonstrated that the presence of the laser glare is not sufficient, in and of itself, to diminish target-detection performance. The time at which laser glare is experienced is an important factor in determining the probability and extent of visually mediated performance decrements. GRA

**N92-28744\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**CREW STATION RESEARCH AND DEVELOPMENT FACILITY TRAINING FOR THE LIGHT HELICOPTER DEMONSTRATION/VALIDATION PROGRAM**

JOY HAMERMAN MATSUMOTO (Bio-Dynamics Research and Development Corp., Eugene, OR.), STEVEN ROGERS, MICHAEL MCCAULEY (Monterey Technologies, Inc., Carmel, CA.), and AL SALINAS (Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, MD.) Mar. 1992 10 p  
(Contract NAS2-12849; RTOP 505-61-51)  
(NASA-TM-103865; A-91153; NAS 1.15:103865; USAAVSCOM-TR-92-A-003) Avail: CASI HC A02/MF A01

The U.S. Army Crew Station Research and Development Branch (CSRDB) of the Aircraft Simulation Division (AVSCOM) was tasked by the Light Helicopter Program Manager (LH-PM) to provide training to Army personnel in advanced aircraft simulation technology. The purpose of this training was to prepare different groups of pilots to support and evaluate two contractor simulation efforts during the Demonstration/Validation (DEM/VAL) phase of the LH program. The personnel in the CSRDB developed mission oriented training programs to accomplish the objectives, conduct the programs, and provide guidance to army personnel and support personnel throughout the DEM/VAL phase. Author

**N92-28775#** Argonne National Lab., IL.

**A STRATEGY FOR MINIMIZING COMMON MODE HUMAN ERROR IN EXECUTING CRITICAL FUNCTIONS AND TASKS**

L. BELTRACCHI (Nuclear Regulatory Commission, Washington, DC.) and R. W. LINDSAY 1992 7 p Presented at the 8th Power Plant Dynamics, Control and Testing Symposium, Knoxville, TN, 27-29 May 1992  
(Contract W-31-109-ENG-38)  
(DE92-011839; ANL/CP-75335; CONF-920538-18) Avail: CASI HC A02/MF A01

Human error in execution of critical functions and tasks can be costly. The Three Mile Island and the Chernobyl accidents are examples of results from human error in the nuclear industry. There are similar errors that could no doubt be cited from other

industries. A strategy to minimize common mode human error in the execution of critical functions and tasks is discussed. The strategy consists of the use of human redundancy, and also diversity in human cognitive behavior: skill-, rule-, and knowledge-based behavior. The authors contend that the use of diversity in human cognitive behavior is possible, and it minimizes common mode error. DOE

**N92-28787#** Technische Univ., Berlin (Germany, F.R.). Fachbereich Informatik.

**IMPROVEMENT OF CONNECTIONIST LEARNING PROCESSES, WORKING ACCORDING TO THE GRADIENTS METHOD Ph.D. Thesis [VERBESSERUNG KONNEKTIONISTISCHER LERNVERFAHREN, DIE NACH DER GRADIENTENMETHODE ARBEITEN]**

RALF SALOMON 1991 142 p In GERMAN  
(ETN-92-91335) Avail: CASI HC A07/MF A02

The method developed automatically adapts the parameters without unusefully raising the computing costs. Known gradient processes are combined with the 'mutation' and 'selection' principles of the strategy of evolution. Prior to each iteration step, a set of learning and strategy parameters is produced by mutation from the present values. A dynamic adaptation is obtained to the constantly changing optical values of the learning parameters during the learning process. Detailed practical examinations show that this new process strongly reduces the number of necessary learning cycles with regard to other known improvements. ESA

**N92-28877#** Howard Univ., Washington, DC.

**NEUROPSYCHOLOGICAL COMPONENTS OF OBJECT IDENTIFICATION Annual Technical Report, 1 Dec. 1990 - 31 Dec. 1991**

STEPHEN M. KOSSLYN 10 Jan. 1992 33 p  
(Contract AF-AFOSR-0100-91)

(AD-A247049; AFOSR-92-0136TR) Avail: CASI HC A03/MF A01

Four kinds of investigations of the structure of high-level visual processing were conducted during the past year. First, we carried out case studies of individual brain-damaged patients, finding evidence that curved edges are processed separately from straight edges, that location information sometimes can be used to encode some characteristics of shape, and that a decrease in overall activation level can selectively impair performance on some tasks. Second, we administered a set of 27 tasks to a group of 17 brain-damaged patients; these tasks were designed to assess the efficacy of specific subsystems. We have preliminary evidence that most (89 percent) of the subsystems double-dissociate, suggesting that these subsystems are in fact distinct. Third, we constructed computer simulation models to explore properties of the high-level visual system, and found support for the distinction between subsystems that compute two distinct kinds of spatial relations. Finally, some of the tasks we had developed to study deficits in brain-damaged patients were used to study the visual-spatial abilities of air force pilots; we found that pilots are particularly good at mental rotation and encoding metric distance information. GRA

**N92-28880#** California State Univ., Chico. Coll. of Communication.

**INTEGRATING THE AFFECTIVE DOMAIN INTO THE INSTRUCTIONAL DESIGN PROCESS Interim Report, Jun. - Aug. 1991**

ROBERT G. MAIN Mar. 1992 27 p  
(Contract F49620-90-C-0076)

(AD-A249287; AL-TP-1992-0004) Avail: CASI HC A03/MF A01

This study develops a model of instructional design that incorporates the affective domain as an integral component. The model combines Keller's ARCS model of motivation for learning with the five phased military instructional design model. The proposed model provides a framework for organizing instructional principles, strategies and techniques concerning the affective domain and furnishes a theoretical base to aid in formulating research hypotheses and collecting empirical data. Attention to the affective domain is particularly important for technology based

instruction that removes teacher/student interaction from the lesson delivery. This model should be helpful because it provides for the systematic consideration of the affective domain in every aspect of the instructional design process. The study concludes with recommendations for additional research needed to operationalize the model for use by instructional designers. GRA

**N92-28940#** Naval Health Research Center, San Diego, CA.  
**LAPSES IN ALERTNESS: BRAIN-EVOKED RESPONSES TO TASK-IRRELEVANT AUDITORY PROBES** Final Report, Jun. 1989 - Sep. 1990

SCOTT MAKEIG, F. S. ELLIOTT, MARK INLOW, and DAVID KOBUS Jan. 1992 31 p  
 (AD-A247669; NHRC-90-39) Avail: CASI HC A03/MF A01

Thirteen subjects participated in an auditory simulation of a passive sonar target detection environment. Targets were 300 ms noise bursts presented at near threshold levels in a noise background at a mean rate of 10 per minute. Task irrelevant probe tones were also presented at inter-stimulus intervals of 2-4 seconds. Each subject participated in two 28 minute test sessions, pressing a button whenever they detected a noise target. Prominent minute-scale fluctuations in performance (computed as changes in local error rate using a 32-s moving window) occurred in many of the sessions. Evoked responses to the irrelevant probe tones in thirteen runs with highest number of performance lapses were sorted by current local error rate and smoothed using a moving-average. The amplitude of the grand mean N2 response to the irrelevant probe tones increased monotonically with error rate. Averaged evoked responses to relatively frequent, task-irrelevant probe tones appear to allow an accurate estimate of level of alertness if adequate number of trials are available.

GRA

**N92-28957#** McGill Univ., Montreal (Quebec). Computer Vision and Robotics Lab.

**CURVATURE ESTIMATION IN ORIENTATION SELECTION**  
 Final Report, 1 Feb. 1989 - 31 Jan. 1992

STEVEN W. ZUCKER and MAX S. CYNADER 31 Jan. 1992 12 p  
 (Contract AF-AFOSR-0260-89)

(AD-A247862; AFOSR-92-0211TR) Avail: CASI HC A03/MF A01  
 To summarize, progress has been made on a family of related problems, including: A model of endstopped visual cortical neurons was extended to include complex components; An extensive simulation of the model was completed with regard to orientation, positional, spatial frequency, curvature, chevron, and end-line sensitivity; Orientation discontinuities were extended into the motion domain, and psychological and computational experiments were performed to confirm the hypothesis of multiple directions being represented at a point of discontinuity; A theory was developed to capture the non-linearities necessary for early measurement of orientation and curvature; A totally different theory has begun to take shape for functionally characterizing cytochrome oxidase blobs; and The mathematical foundations were laid for a theory of shape.

GRA

**N92-29119#** Oregon State Univ., Newport. Marine Science Center.

**IN SEARCH OF A UNIFIED THEORY OF BIOLOGICAL ORGANIZATION: WHAT DOES THE MOTOR SYSTEM OF A SEA SLUG TELL US ABOUT HUMAN MOTOR INTEGRATION?**  
 Report, 15 Jan. 1989 - 14 Jan. 1992

GEORGE J. MPITSOS and SEPO SOINILA 7 Apr. 1992 71 p  
 (Contract AF-AFOSR-0262-89)

(AD-A250223; AFOSR-92-0299TR) Avail: CASI HC A04/MF A01  
 We summarize the behavioral, electrophysiological, and immunohistochemical findings in the sea slug, Pleurobranchaea, and compare these findings to those obtained in other invertebrate animals, in higher animals, and in humans. The findings show that there is massive distribution and sharing of information occurring, respectively, through diverging and converging network connections. We examine the findings of reductionist approaches and find them inadequate to answer the problems arising from

such widely distributed, multifunctional, and highly converging networks whose activity may be variable. Such findings indicate that cooperative actions among groups of neurons may arise dynamically and nonlinearly in shifting contexts or consensuses of response in which individual neurons may have different functions, even during times when the behaviors are similar. Control of these systems is emergent, fuzzy, and error-prone rather than being reflexive or following explicit causes and effects that can be read from the switchboard circuit of the connections between neurons. A unified theoretical perspective is needed that accounts for both the emergent and switch-board systems. Two problems apply in both cases. First, animals may have evolved highly specialized behaviors whose underlying neural networks may not necessarily reflect generally applicable principles. Second, owing to their complexity, it may not be possible to characterize biological networks in sufficient detail to permit an understanding of the system through simulation of the system itself. GRA

**N92-29142#** University of Southern Illinois, Springfield. School of Medicine.

**LEARNING, TEACHING, AND TESTING FOR COMPLEX CONCEPTUAL UNDERSTANDING** Technical Report, 1 Dec. 1987 - 30 Nov. 1990

PAUL J. FELTOVICH, RAND J. SPIRO, and RICHARD L. COULSON 4 Oct. 1991 56 p  
 (Contract N00014-88-K-0077)

(AD-A248728; TR-6) Avail: CASI HC A04/MF A01

Drawing upon our research, which has revealed problems among medical students in their understanding of complex material, we propose that new visions of instruction and assessment are required if education is to promote deep and usable understanding of complex, difficult subject matter. In the main, we argue that instruction and testing should be congruent with the cognitive goals for students that are desired--that if what is desired is that students obtain accurate understanding, instruction and testing should focus on this; that if what is desired is that students be able to apply knowledge, instruction and testing should focus on knowledge application; that if what is desired is that students acquire a structure of knowledge that they will not easily forget, education should concentrate on building and assessing robust knowledge structures. We propose some desirable characteristics of learning, teaching and testing for achieving this combination of goals. Tied to this, we suggest that educational goals for understanding can be aided by knowing how understanding is likely to break down, and we present numerous examples of ways that students misunderstand. GRA

**N92-29144#** Utah Univ., Salt Lake City. Dept. of Psychology.  
**STUDIES OF PERCEPTUAL MEMORY** Final Technical Report, 1 Feb. 1989 - 31 Jan. 1992

WILLIAM A. JOHNSTON, KEVIN J. HAWLEY, and JAMES M. FARNHAM 31 Jan. 1992 44 p  
 (Contract AF-AFOSR-0275-89)

(AD-A250200; AFOSR-92-0308TR) Avail: CASI HC A03/MF A01

Perceptual memory refers to experience-induced changes in perceptual processing of particular objects or scenes. Part 1 of this report summarizes the results of 8 studies of the role of perceptual memory in recognition memory. The hypothesis was confirmed that perceptual memory-contributes to the feeling of familiarity that observers sometimes experience even when they lack explicit memory for previously encountered objects. Part 2 summarizes the results of 14 studies of a by-product of perceptual memory called novel popout. The theory was confirmed that novel popout arises from the automatic disinhibition of processing of objects that fail to match top-down effects of perceptual memory. GRA

**N92-29146#** Ohio State Univ., Columbus.  
**DEMODULATION PROCESSES IN AUDITORY PERCEPTION**  
 Annual Report, 1 Dec. 1989 - 30 Nov. 1990

LAWRENCE L. FETH 1 Mar. 1992 6 p  
 (Contract AF-AFOSR-0227-89)

(AD-A250203; AFOSR-92-0300TR) Avail: CASI HC A02/MF A01

The development of a multi-channel version of the EWAIF model has begun. The revised model is the IWAIF (Intensity Weighted Average of Instantaneous Frequency) model. The intensity is proportional to the square of the amplitude (or envelope) and in an earlier paper the PI had shown that envelope squared weighting worked at least as well as simple envelope weighting. Anantharaman's work, which he used as his masters thesis, led to a much more efficient calculation scheme. The model helps understand the intuitive notion that a signal's IWAIF value is its spectral center of gravity. Thus, EWAIF calculations may indeed have application to spectral shape discriminations. GRA

**N92-29174\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**ACQUISITION AND IMPROVEMENT OF HUMAN MOTOR SKILLS: LEARNING THROUGH OBSERVATION AND PRACTICE**

WAYNE IBA (RECOM Technologies, Inc., Moffett Field, CA.) Oct. 1991 121 p  
(NASA-TM-107878; RIA-91-29; NAS 1.15:107878) Avail: CASI HC A06/MF A02

Skilled movement is an integral part of the human existence. A better understanding of motor skills and their development is a prerequisite to the construction of truly flexible intelligent agents. We present MAEANDER, a computational model of human motor behavior, that uniformly addresses both the acquisition of skills through observation and the improvement of skills through practice. MAEANDER consists of a sensory-effector interface, a memory of movements, and a set of performance and learning mechanisms that let it recognize and generate motor skills. The system initially acquires such skills by observing movements performed by another agent and constructing a concept hierarchy. Given a stored motor skill in memory, MAEANDER will cause an effector to behave appropriately. All learning involves changing the hierarchical memory of skill concepts to more closely correspond to either observed experience or to desired behaviors. We evaluated MAEANDER empirically with respect to how well it acquires and improves both artificial movement types and handwritten script letters from the alphabet. We also evaluate MAEANDER as a psychological model by comparing its behavior to robust phenomena in humans and by considering the richness of the predictions it makes. Author

**N92-29186#** Minnesota Univ., Minneapolis. Dept. of Psychology.

**PSYCHOPHYSICAL ANALYSES OF PERCEPTUAL REPRESENTATIONS Annual Report, 15 Apr. 1990 - 14 May 1991**

IRVING BIEDERMAN 3 Dec. 1991 8 p  
(Contract AF-AFOSR-0105-92)  
(AD-A246945; AFOSR-92-0105TR) Avail: CASI HC A02/MF A01

A number of collaborative projects have been launched during the first year and a half of the grant. Consistent with the original proposal, the common theme to all these projects is the linkages between early sensory (psychophysical) processes and perceptual representations that provide access to cognition. The individual project are summarized in the body of the report. In addition to the research projects, two informal weekly seminars were held throughout the first year among center personnel and those with closely related interests. One was concerned with the development of a front end for the kind of object recognition model described by RBC. The other was a general examination of recent research in neural net type models. GRA

**N92-29334#** Pittsburgh Univ., PA. Dept. of Behavioral Neuroscience.

**A SYSTEMS THEORETIC INVESTIGATION OF NEURONAL NETWORK PROPERTIES OF THE HIPPOCAMPAL FORMATION Final Report, 1 Dec. 1988 - 30 Nov. 1991**

THEODORE W. BERGER 30 Nov. 1991 15 p  
(Contract AF-AFOSR-0197-89)  
(AD-A250246; AFOSR-92-0363TR) Avail: CASI HC A03/MF A01

The following Progress Report describes the results of the

majority of our AFOSR-supported research for Year 3 of the project entitled A Systems Theoretic Investigation of Neuronal Network Properties of the Hippocampal Formation. The Progress Report is divided into six sections: a brief statement of the research objectives, an overview of general experimental and analytical procedures; research characterizing nonlinear response properties of the in vivo dentate gyrus; the extension of this research to the in vitro hippocampal slice; computer simulations of nonlinear response properties of the dentate based on the experimental work; and a listing of publications during the past year of support. GRA

**N92-29398#** Pennsylvania Univ., Philadelphia.  
**BIOLOGICALLY-BASED NEURAL NETWORK MODEL OF COLOR CONSTANCY AND COLOR CONTRAST**

SUSAN M. COURTNEY, GERSHON BUCHSBAUM, and LEIF H. FINKEL 1992 6 p  
(Contract N00014-90-J-1864)  
(AD-A248128) Avail: CASI HC A02/MF A01

The light which reaches the eye, or any other sensor, is the product of the reflectance and the illuminant. Therefore, in order to determine the surface reflectance of an object independent of the illuminant, a system must use the spatiochromatic context of the image. We have developed a neural network based on the anatomy and physiology of the visual projection from retina to V4. The network combines color-opponent and contrast information to achieve a good degree of color constancy. This network was tested on simulated images corresponding to the stimuli used in well established psychophysical experiments. Responses qualitatively match human responses to a variety of center-surround and Mondrian test stimuli. Color constancy is the ability to maintain an approximately constant color perception despite changes in the incident illumination of the object. Color contrast, also referred to as chromatic induction or simultaneous contrast, is the change in the (perceived) color of a surface due to the spectral composition of neighboring surface. Color perception in natural scenes depends upon both of these phenomena. Together, these two effects demonstrate that color perception does not directly depend upon the wavelength of the light reflected from a surface. GRA

**N92-29420#** Columbia Univ., New York, NY. Dept. of Psychology.

**VISUAL PERCEPTION OF ELEVATION Annual Report, 1 Jan. - 31 Dec. 1991**

LEONARD MATIN 20 Jan. 1992 8 p  
(Contract AF-AFOSR-0146-91)  
(AD-A248338; REPT-001; AFOSR-92-0206TR) Avail: CASI HC A02/MF A01

The experiments demonstrate the importance for human observers of the retinal orientation and location of individual straight lines in determining (1) the physical elevation visually perceived as being at eye level (VPEL), and (2) the orientation within a frontal plane visually perceived as being vertical (VPV). The particular depth plane is unimportant for each discrimination as shown by experiments in which stimuli at the same retinal location from differently pitched and differently rolled planes of different depth influence each discrimination identically. The laws of spatial summation for lines controlling VPEL have been determined and are very different than for other visual discriminations: Influences for a parallel line set summate across a negatively accelerated exponential with a 15.1 degree space constant; lines from nonparallel sets make use of a mechanism that takes a weighted average of their individual influences. The time course for light and dark adaptation of VPEL for a 2-line stimulus is similar to that for a normally illuminated and fully structured pitched visual environment. The VPEL discrimination is near-spatiotopic for eye position and head orientation. The analysis of results at 1.5G has not yet been completed, but it appears that a bias with only minimal influence on the slope of the VPEL-vs-pitch function results from change of G. GRA

**N92-29503#** Southwest Texas State Univ., San Marcos.  
**THE EFFECTS OF STUDENT-INSTRUCTOR INTERACTION  
 AND PAIRED/INDIVIDUAL STUDY ON ACHIEVEMENT IN  
 COMPUTER-BASED TRAINING** Interim Technical Paper, Jun. -  
 Aug. 1991

STANLEY D. STEPHENSON Mar. 1992 20 p  
 (Contract F49620-90-C-0076)  
 (AD-A248518; AL-TR-1992-0003) Avail: CASI HC A03/MF A01

Research shows that interaction between the students and instructor can improve performance in computer-based training (CBT). Small group study can also improve CBT performance. However, there is no data available on the interaction between these two variables. Therefore, a 2 x 2 factorial design experiment was conducted. Two hypotheses were tested: (1) paired learning would have a positive effect on performance; and (2) interactions between student and instructor would have a positive effect. The experimental data support the first hypothesis. They provide only moderate support for the second. Perhaps a CBT partner can provide the feedback and support usually given by the instructor in a traditional setting. More research is needed on the social aspects of learning and the role of the instructor in CBT. GRA

**N92-29560#** Pennsylvania Univ., Philadelphia. Dept. of  
 Bioengineering.

**OBJECT DISCRIMINATION BASED ON  
 DEPTH-FROM-OCCLUSION**

LEIF H. FINKEL and PAUL SAJDA 1991 23 p  
 (Contract N00014-90-J-1864)  
 (AD-A248104) Avail: CASI HC A03/MF A01

We present a model of how objects can be visually discriminated based on the extraction of depth from occlusion. Object discrimination requires consideration of both the binding problem and the problem of segmentation. We propose that the visual system binds contours and surfaces by identifying 'proto-objects', compact regions bounded by close contours. Proto-objects can then be linked into larger structures. The model is simulated by a system of interconnected neural networks. The networks have biologically-motivated architectures and utilize a distributed representation of depth. We present simulations that demonstrate three robust psychophysical properties of the system. In order to discriminate objects in the visual world, the nervous system must solve two fundamental problems: binding and segmentation. The binding problem addresses how the attributes of an object's shape, color, motion, and depth are linked to create an individual object. Segmentation deals with the converse problem of how separate objects are distinguished. GRA

**N92-29591#** Rochester Univ., NY. Center for Visual Science.  
**PERIPHERAL LIMITATIONS ON SPATIAL VISION** Final  
 Report, 1 Aug. 1988 - 31 Jan. 1992

DAVID R. WILLIAMS 24 Mar. 1992 12 p  
 (Contract AF-AFOSR-0292-88)  
 (AD-A250579; AFOSR-92-0267TR) Avail: CASI HC A03/MF A01

This project employs psychophysical techniques to examine the limitations on spatial vision imposed by the first stages in the visual pathway. The appearance of very high frequency interference fringes is distorted, or aliased, by the cone mosaic. Such moire patterns allow us to assess the topography of the cone mosaic in the living eye, clarifying the relationship between cone spacing and resolution. Resolution was also measured under conditions in which only the M or L cones could detect the interference fringe. Visual acuity was little different than it was when both cone types detected the grating showing that resolution is immune to photoreceptor loss under these circumstances. We recently also established that a phenomenon known for 150 years has been misunderstood, and that it is chromatic aliasing caused by spatial sampling by M and L cones. A device has been constructed to provide objective measurements of the off-axis optical quality of the eye, and measurements show that optical quality declines surprisingly little across the visual field. In addition, we have taken advantage of an early nonlinearity in the visual system to measure the spatial responses of the earliest stages in retinal processing. GRA

**N92-29592#** Wisconsin Univ., Madison. Center on Mental  
 Retardation and Human Development.  
**ADDITIVITY AND AUDITORY PATTERN ANALYSIS** Final  
 Report, 1 May 1987 - 31 Mar. 1991

R. LUTFI 26 Mar. 1992 5 p  
 (Contract AF-AFOSR-0240-87)  
 (AD-A250580; AFOSR-92-0303TR) Avail: CASI HC A01/MF A01

Human discrimination of complex acoustic signals typically cannot be predicted from the simple sum of the discriminabilities associated with individual components of the signal. Understanding such failures of additivity is central to our understanding of complex sound analysis. The goal of this project is to elucidate the rules and mechanisms whereby individual stimulus components combine to influence the detection and discrimination of complex sounds. The project is designed to answer specific questions regarding listeners' abilities to integrate information within and across acoustic dimensions, to extract information contained in the pattern of the acoustic signal, and to perform under conditions of stimulus uncertainty. The data are also used to determine how listeners weight the information provided by different components of the signal, and how best to package the acoustic information so as to be most effectively processed by the listener. GRA

**N92-29620#** Universal Energy Systems, Inc., San Antonio, TX.  
**ON THE EFFECT OF RANGE RESTRICTION ON  
 CORRELATION COEFFICIENT ESTIMATION** Final Report, 1  
 Jan. - 31 Dec. 1991

DOUGLAS E. JACKSON and MALCOLM J. REE Apr. 1992  
 41 p  
 (Contract F49620-88-C-0053)

(AD-A248956; AL-CR-1992-001) Avail: CASI HC A03/MF A01  
 Suppose it is desired to estimate the correlation coefficient between random variables X and Y in some population P and the only data available are from some population Q where Q is a proper subset of P. X and Y are defined on P, while X and Y will denote X and Y restricted to Q. A simulation program was written to study the effect of this restricted sampling on the estimation of correlation coefficients. The Air Force is studying the implementation of new selection devices that optimize the selection and classification of individuals. Whenever a new measurement instrument is suggested, it must be evaluated by estimating its correlation with performance criteria and with tests and selection devices that are currently part of the selection process. The difficulty is that the new test can only be administered to Air Force personnel. That is, people who have already been selected. Air Force personnel constitute the population Q and the applicants constitute the population P. It is necessary to use a sample from Q' to estimate correlations between tests that are to be used in P. This is called the range restriction problem. The purpose of this paper is to present the results of a study which addresses a number of issues related to the range restriction problem. The performance of the F-statistic, confidence intervals, and 'hidden variables' are considered. GRA

**N92-29871#** National Aerospace Lab., Amsterdam (Netherlands).  
 Afdel. Vliegtuigen.

**FIGHTER PILOT TRAINING: THE CONTRIBUTION OF  
 SIMULATION [TRAINING VAN GEVECHTSVLIEGERS: DE ROL  
 VAN SIMULATIE]**

J. T. M. VANDOORN, G. J. ALDERS, E. W. PIJPERS, and H. J.  
 L. VOGELAAR 10 Feb. 1989 33 p In DUTCH Presented at  
 the ISSC Seminar on Simulation for Training, 's-Gravenhage,  
 Netherlands, 18 Oct. 1989  
 (NLR-TP-89311-U; ETN-92-91527). Avail: CASI HC A03/MF A01

The contribution of simulation and simulators to the training of pilots of fighter aircrafts is discussed. The present training curriculum, including the use of simulation and simulators, is described. The possibilities to improve training by the increased use of simulation are discussed. The question whether simulation can replace live training, especially operational training is addressed. It can be concluded that simulation is a force multiplier with respect to training but that the effect of increased simulation

on the required live training effect is not a simple matter to assess. Any such deduction should be thoroughly evaluated to guarantee operational safety and effectiveness. ESA

**N92-29930#** Princeton Univ., NJ.  
**PHYSIOLOGICAL ANALYSES OF THE AFFERENTS CONTROLLING BRAIN NEUROCHEMICAL SYSTEMS Annual Report, 1 Jun. 1990 - 31 May 1991**  
 BARRY L. JACOBS 24 Feb. 1992 3 p  
 (Contract AF-AFOSR-0294-90)  
 (AD-A248334; REPT-255-6491-1; AFOSR-92-0189TR) Avail:  
 CASI HC A01/MF A01

These experiments are directed at the neurochemical systems and neuroanatomical pathways that control the activity of brain serotonergic (dorsal raphe nucleus) and noradrenergic (locus coeruleus) neurons. It seeks to answer these questions by studying single unit activity in combination with microiontophoresis in the awake cat during exposure to physiologically relevant conditions. Four series of studies are proposed. The first three will examine the neurochemical afferents that control the following types of activity of serotonergic and noradrenergic neurons: (1) tonic, as well as state-dependent activity; (2) phasic activity evoked by various sensory stimuli; and (3) activation in response to environmental and physiological challenges (stressors). The fourth series of studies will take results from the first three and seek to establish the nuclear site of origin of these effects by employing electrical stimulation in combination with single unit recording and microiontophoresis. This research program will provide a critical link for understanding the control of these two important neurochemical systems, and will thus help to elucidate, more broadly, their role in processes such as state-dependent changes in physiology and behavior, and arousal and attention. GRA

**N92-30127\*#** Federal Aviation Administration, Washington, DC.  
**REVISION OF CERTIFICATION STANDARDS FOR AVIATION MAINTENANCE PERSONNEL**  
 LESLIE K. VIPOND /in NASA. Langley Research Center, The 1991 International Conference on Aging Aircraft and Structural Airworthiness p 315-319 Jul. 1992  
 Avail: CASI HC A01/MF A04

Part 65, Subparts D and E, of the Federal Aviation Regulations (FAR) identify the certification requirements for aviation mechanics and aviation repairmen. The training, experience, privileges, ratings, recordkeeping, and currency requirements for aviation maintenance personnel are also addressed by those parts of the FAR. The recent emergence of the aging fleet problem and the introduction of new technologies, aircraft, engines, and aeronautical products has caused certain portions of these rules to become obsolete. Further, international political arrangements, such as bilateral airworthiness and maintenance agreements, International Civil Aviation Organization (ICAO) standards, certain international agreements for maintenance personnel training, and mechanic certificate reciprocity, have all impacted on the current regulatory policy. Author

## 54

## MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

**A92-44905\*** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**INFORMATION MANAGEMENT FOR COMMERCIAL AVIATION - A RESEARCH PERSPECTIVE**  
 WENDELL R. RICKS, KATHY H. ABBOTT (NASA, Langley Research Center, Hampton, VA), JON E. JONSSON (Douglas Aircraft Co., Long Beach, CA), GEORGE BOUCEK (Boeing

Commercial Airplane Group, Seattle, WA), and WILLIAM H. ROGERS (Bolt Beranek and Newman, Inc., Cambridge, MA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 60-65. refs

The problem of flight deck information management (IM), defined as processing, controlling, and directing information, for commercial flight decks, and a research effort underway to address this problem, are discussed. The premises provided are utilized to lay the groundwork required for such research by providing a framework to describe IM problems and an avenue to follow when investigating solution concepts. The research issues presented serve to identify specific questions necessary to achieve a better understanding of the IM problem, and to provide assessments of the relative merit of various solution concepts. R.E.P.

**A92-44906\*** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**INFORMATION MANAGEMENT - ASSESSING THE DEMAND FOR INFORMATION**  
 WILLIAM H. ROGERS (Bolt Beranek and Newman, Inc., Cambridge, MA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 66-71. refs  
 (Contract NAS1-18788)

Information demand is defined in terms of both information content (what information) and form (when, how, and where it is needed). Providing the information richness required for flight crews to be informed without overwhelming their information processing capabilities will require a great deal of automated intelligence. It is seen that the essence of this intelligence is comprehending and capturing the demand for information. R.E.P.

**A92-44908**  
**FLIGHT DECK INFORMATION MANAGEMENT - A CHALLENGE TO COMMERCIAL TRANSPORT AVIATION**  
 ROLF J. BRAUNE, ELFIE F. HOFER, and K. M. DRESEL (Boeing Commercial Airplane Group, Seattle, WA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 78-84. refs

Some operational flight deck information management examples are presented and aviation industry and research needs in this area are defined. Flight deck information overload has been a concern for a number of years as has the integration of information from various sources and media. The goal should be to adopt a human-centered information system design approach (Rouse, 1990), through which the operator's information processing and usage requirements are completely taken into account. R.E.P.

**A92-44910**  
**AUTOMATIC DISPLAY MANAGEMENT USING DYNAMIC PLANS AND EVENTS**  
 NORMAN D. GEDDES (Applied Systems Intelligence, Inc., Gainesville, GA) and JOHN M. HAMMER (Search Technology, Inc., Norcross, GA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 90-95. refs

A flexible and powerful approach to automatic management of computer-based displays and controls has been developed as a part of the intelligent Pilot Vehicle Interface (PVI) for the USAF/Lockheed Pilot's Associate. Because the active information requirements are maintained dynamically as the system is operated, the automatic selection of display formats and control functions can be sensitive to the exact tasks and situations of the pilot. The generality of the display management process suggests that it can be easily applied in a wide variety of situations in which management of large volumes of time-sensitive information is an issue for effective system operation. Author

**A92-44913**  
**INTERFACE STYLES FOR ADAPTIVE AUTOMATION**

JAMES A. BALLAS, CONSTANCE L. HEITMEYER, and MANUEL A. PEREZ (U.S. Navy, Human Computer Interaction Laboratory, Washington, DC) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 108-113. refs

It is noted that some of the adverse effects of automation in cockpit design may be reduced if adaptive rather than static automation is employed. Adaptive automation is implemented dynamically in response to altering task demands. The design of a direct manipulation interface (Jacob, 1989) that should offset some of automation's drawbacks is discussed. R.E.P.

**A92-44914****THE EFFECT OF ADAPTIVE FUNCTION ALLOCATION ON THE COCKPIT DESIGN PARADIGM**

TERRY J. EMERSON and JOHN M. REISING (USAF, Wright-Patterson AFB, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 114-119. refs

This paper discusses how the impact of adaptive, artificially intelligent computers on the crew station design process will leave the overall paradigm intact, but will substantially affect subsections such as information needs, levels of automation, and evaluation/validation. Several programs are underway investigating the utilization of artificially intelligent computers to create an electronic crewmember (EC). Traditional aspects such as mission and function analysis, workload prediction, and task allocation will probably be affected by the availability of adaptive decision aiding, intelligent mission management and other EC functions. R.E.P.

**A92-44918\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**AN EVALUATION OF FLIGHT PATH MANAGEMENT AUTOMATION IN TRANSPORT CATEGORY AIRCRAFT**

D. CHANDRA and S. R. BUSSOLARI (MIT, Lexington, MA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 139-144. refs (Contract NAG2-12)

A desk-top simulation of a Boeing 757/767 Electronic Flight Instrumentation System (EFIS) and Control Display Unit (CDU) was used in an experiment to compare three modes of communication for the clearance amendment process: standard voice procedures, a textual delivery method, and a graphical delivery method. Eight qualified Boeing 757/767 pilots served as subjects. Each flew nine landing scenarios with three amendments given in each scenario. Both acceptable and unacceptable clearance amendments were presented in order to assess situational awareness. Times for comprehension and execution of the amendment were recorded along with workload ratings, responses to unacceptable amendments, and subjective impressions. The graphical mode was found to be superior in terms of the time measures and subjective ratings. No difference was found between the modes in the ability to detect unacceptable clearances. Author

**A92-44924\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**ELECTRONIC CHECKLISTS - EVALUATION OF TWO LEVELS OF AUTOMATION**

EVERETT PALMER (NASA, Ames Research Center, Moffett Field, CA) and ASAF DEGANI (San Jose State University Foundation, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 178-183. refs (Contract NCC2-327)

Two versions of an electronic checklist have been implemented in the Advanced Concepts Flight Simulator (ACFS) at NASA Research Center. The two designs differ in the degree of pilot involvement in conducting the checklists. One version (manual-sensed), requires the crew to manually acknowledge the

completion of each checklist item. The other version (automatic-sensed), automatically indicates completed items without requiring pilot acknowledgement. These two designs and a paper checklist (as a control condition) were evaluated in line oriented simulation. Twelve aircrews from one major air-carrier flew a routine, four leg, short-haul trip. This paper presents and discusses the portion of the experiment that was concerned with measuring the effect of the degree of automation on the crews' performance. It discusses and presents evidence for a potential down-side of implementing an electronic checklist that is designed to provide fully redundant monitoring of human procedure execution and monitoring. Author

**A92-44925** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**PHILOSOPHY, POLICIES, AND PROCEDURES - THE THREE P'S OF FLIGHT-DECK OPERATIONS**

ASAF DEGANI (San Jose State University Foundation, CA) and EARL L. WIENER (Miami University, Coral Gables, FL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 184-191. Research supported by NASA, America West Airlines, Inc., and Delta Air Lines, Inc. refs (Contract NCC2-327; NCA2-441)

Standard operating procedures are drafted and provided to flightcrews to dictate the manner in which tasks are carried out. Failure to conform to Standard Operating Procedures (SOP) is frequently listed as the cause of violations, incidents, and accidents. However, procedures are often designed piecemeal, rather than being based on a sound philosophy of operations and policies that follow from such a philosophy. A framework of philosophy, policies, and procedures is proposed. Author

**A92-44927****SYNTHETIC VISION IN THE BOEING HIGH SPEED CIVIL TRANSPORT**

DAVID REGAL (Boeing Commercial Airplane Group, Seattle, WA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 198-203.

A general flight deck design approach for the HSCT is described and focuses on the early definition and development of a synthetic vision system. A top-down, requirements approach is followed, beginning with a complete set of the aircraft's missions, and as complete a list as possible, of the nonnormal situations to be handled by the crew. The synthetic vision system consists of displays that provide an out-the-window type view that can be used by the crew as a substitute for limited or totally absent forward windows. R.E.P.

**A92-44928****CODING TECHNIQUES FOR RAPID COMMUNICATION DISPLAYS**

SARAH J. SWIERENGA (Logicon Technical Services, Inc., Dayton, OH), KENNETH R. BOFF (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH), and REBECCA S. DONOVAN (Logicon Technical Services, Inc., Dayton, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 204-209. refs (Contract F33615-89-C-0532)

A critical issue for the successful application of rapid communication (RAPCOM) display technology lies in whether or not the information presented can be portrayed so that successive frames can be independently discriminated by the system user. This study compared performance on a monitoring task for four single coding strategies as well as four redundant code combinations at four presentation rates. Results indicated significant differences in accuracy and reaction time for task performance using single and redundant codes at various frame durations. These findings represent a step toward defining efficient coding formats for future applications of RAPCOM technology in operational settings. Author

A92-44968

**CUSTOMIZING THE ATC COMPUTER-HUMAN INTERFACE VIA THE USE OF CONTROLLER PREFERENCE SETS**

DAVID R. LENOROVITZ, SUSAN C. OLASON, PAUL A. KROIS, and WAYNE K. TOBEY (CTA, Inc., Englewood, CO) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 454-459. refs

Some of the considerations and constraints that must be factored into the FAA's Advanced Automation System (AAS) computer-human interface (CHI) design, to produce a system that can satisfy the diverse range of operational requirements of its very diverse user population, are discussed. The need to accommodate this broad range of requirements dictates a CHI approach that affords individual controllers, conducting a variety of different types or classes of ATC tasks, the flexibility to tailor the appearance and functional operation of their sector suites in a manner optimally suited to the task being performed. The AAS will provide this flexibility via a tailored parameter-setting process named 'controller preference sets', defined as a collection of tailorable attributes that can be applied to any of the one to four common consoles within a sector suite. R.E.P.

A92-44983\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**TIME ESTIMATION IN FLIGHT**

CYNTHIA A. AWE and WALTER W. JOHNSON (NASA, Ames Research Center, Moffett Field, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 560-565. refs

Experiments were performed to determine whether edge rate and flow rate impact the perception of time during an active control task and to further examine the relationship between edge rate or flow rate and time perception. One experiment also examined the extent to which time perception is driven by: (1) the temporal structure of the world, i.e., edge rate/flow rate changes, and (2) the amount of activity involved in accomplishing a task. The second factor was varied by examining time estimations made while subjects passively viewed the simulated flight and while also actively engaged in controlling lateral craft disturbances. R.E.P.

A92-44986\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**ATTENTIONAL ISSUES IN SUPERIMPOSED FLIGHT SYMBOLOGY**

DAVID C. FOYLE (NASA, Ames Research Center, Moffett Field, CA), BEVERLY D. SANFORD (San Jose State University, CA), and ROBERT S. MCCANN (Sterling Federal Systems, Inc.; NASA, Ames Research Center, Moffett Field, CA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1. Columbus, OH, Ohio State University, 1991, p. 577-582. refs

The mechanisms of the failure to simultaneously process HUD superimposed symbology and the out-the-window view may lie in the many cognitive and perceptual cues that inform the pilot that the HUD, although collimated at infinity, is an instrument on the aircraft. Thus, in relation to the world scene, the HUD forms a perceptually segregated object that has a different frame of reference. Research is being explored to determine the mechanisms in this problem, and to develop advanced designs that maximize the cognitive and perceptual compatibility of the superimposed symbology by integrating the important information into the world scene. R.E.P.

A92-45030

**PRAGMATIC SIMULATION, BASICS AND TECHNIQUES**

JANUSZ M. MORAWSKI (Academy of Physical Education, Gdansk, Poland) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 857-862. Research supported by LOT Polish Airlines. refs

Various considerations lead to the insight that locomotion

rhythms (LRs) are important in the realm of human interaction with dynamic objects. The 'pragmatic' simulation technique presented is illustrated by the case of aircraft longitudinal motion; as compared with the classical fourth-order models, the pragmatic approach yields a 20-30 percent reduction in the computational capacity entailed for these problems. The human-oriented model employed is substantially different from a physics-based one. O.C.

A92-45031

**THE USE OF SIMULATION IN HUMAN FACTORS TEST AND EVALUATION OF THE LH HELICOPTER**

DINO PICCIONE and STEVE HALE (Essex Corp., Fort Rucker, AL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 863-867.

Because the LH helicopter's pilot-vehicle interface system is far more complex than that of any vehicle thus far in U.S. Army inventory, the only adequate path to cockpit-design simulation is through the use of man-in-the-loop, full-mission simulations. The human factors portion of LH cockpit design evaluation employed the Subjective Workload Assessment Technique, a scaling procedure furnishing a psychological model of mental workload based on an additive, multidimensional representation of three dimensions: time-load, mental effort load, and psychological stress load. O.C.

A92-45032

**MOTION CUEING FOR MARGINAL FLIGHT - IS IT INFORMATION OR ISN'T IT?**

EDWARD A. STARK IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 873-879. refs

Pilot self-motion generates information; each of a variety of sensory systems plays a part in perception, interpretation, and utilization of motion-related information, as well as in the anticipation of future events involving self-motion. Systematic changes in the processing of flight-control information occur throughout the learning and skill development processes, entailing that simulator and training devices incorporate a more profound understanding of both sensory and learning processes than currently exist. O.C.

A92-45033

**AN OVERVIEW OF HUMAN FACTORS R&D IN FLIGHTDECK AUTOMATION - THE NATIONAL PLAN FOR AVIATION HUMAN FACTORS**

RONALD J. LOFARO (FAA, Washington, DC) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 880-886. refs

The FAA, NASA, and the DOD have defined a 10-year research initiative on aviation-related automation designated the National Plan for Aviation Human Factors. While the plan also treats ATC, airway-facility maintenance, and aviation medicine applications of automation, attention is presently given to flight-deck applications. Automated flight-deck environments encompass control and display designs, safety monitoring systems, the measurement of human performance, and pilot selection and training systems. Illustrative research programs in the standardization of flight-deck displays and guidelines for data-entry devices are discussed. O.C.

A92-45035\* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**DIVERTER - PERSPECTIVES ON THE INTEGRATION AND DISPLAY OF FLIGHT CRITICAL INFORMATION USING AN EXPERT SYSTEM AND MENU-DRIVEN DISPLAYS**

FREDERICK M. RUDOLPH (Lockheed Aeronautical Systems Co., Marietta, GA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 893-898. (Contract NAS1-18029)

An expert system prototype, called Diverter, was developed which evaluates, integrates, and displays flight plan recommendations to the pilot during the planning of an inflight diversion. The system integrates information from many sources to provide a comprehensive description of the flight planning alternatives available to the pilot. Diverter evaluates all applicable constraints to arrive at a flight plan to make efficient use of manpower, fuel, and time. The use of an expert system automates much of the integration and evaluation of variables impacting the flight. The use of hierarchical menu-driven displays and direct manipulation interface techniques may reduce workload. Author

**A92-45036**  
**RESEARCH IN COOPERATIVE PROBLEM-SOLVING SYSTEMS FOR AVIATION**

C. E. MCCOY (Nebraska, University, Omaha), PHILIP J. SMITH, and CHUCK LAYTON (Ohio State University, Columbus) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 899-903. refs

A three-stage process for the design of cooperative, en route flight-planning systems is presented which involves human-performance modeling in existing environments, followed by the construction of cognitive artifacts and the study of subjects working in collaboration with these artifacts. Attention is given to the prototyping environment thus far developed within this process-framework; this functional system has proved to be a valuable aid in the stimulation of novel concepts and their appraisal, as well as an efficient basis for the collection of empirical data on which evaluations can be based. O.C.

**A92-45040**  
**INTERACTIVE VIDEO DISK AS AN INSTRUCTIONAL TOOL IN CRM PROGRAMS**

BENJAMIN R. MCDONALD and DENNIS J. SULLIVAN (Hernandez Engineering, Inc., International Training Div., Denver, CO) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 923-928. refs

The present discussion of SAC's Crew Resource Management (CRM) program gives attention to the use of the Interactive Video Disk (IVD) device as an effective instructional tool. The use of IVD allows the videotaped scenarios to be specific not only to a given aircraft, but also to the mission in question. Because IVD is a dynamic medium, the CRM student interacts with the program through responses to questions and video sequences. IVD programs also allow training interruptions when necessary, with subsequent resumption from the point at which the student left off. O.C.

**A92-45047**  
**KNOWLEDGE TRANSFER AND SUPPORT SYSTEMS IN FIGHTER AIRCRAFT**

JEAN Y. GRAU and CLAUDE VALOT (Centre d'Enseignement et de Recherches de Medecine Aeronautique, Bretigny-sur-Orge, France) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 964-969. refs

Pilot conversion from one aircraft to another with different technology is a process in which knowledge-transfer is as critical a factor as knowledge-acquisition. While transfer may for the pilot in question be positive in terms of 'cognitive cost', it could also be negative for safety and/or efficiency. This apparent conflict in purposes entails a cautious attitude toward the stipulation of inviolable rules concerning transferred knowledge; every context for transplantation must be ergonomically analyzed, in order to improve and more clearly define the learning process. O.C.

**A92-45051**  
**COCKPIT DESIGN CONSIDERATION FOR HIGHLY AGILE AIRCRAFT**

RICHARD BOROWSKI (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) and JOHN REISING (USAF, Cockpit

Integration Directorate, Wright-Patterson AFB, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 987-992. refs

A MIL-STD HUD symbology is proposed which attempts to empower pilots of prospective ultramaneuverable aircraft with the fullest accessibility to such expanded flight envelopes. Attention is given to this HUD's innovative pitch/flight path angle scale, ghost horizon, and climb/dive marker. More advanced cockpit-display formats, such as 'pathway-in-the-sky', are under development for the longer term and may be applicable to NASA's High Speed Civil Transport. An evaluation is made of the various, distinctive functional advantages of the proposed symbols. O.C.

**A92-45056\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**COMPATIBILITY AND CONSISTENCY IN AIRCREW DECISION AIDING**

ANTHONY D. ANDRE and CHRISTOPHER D. WICKENS (Illinois, University, Savoy) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1020-1025. refs

(Contract NCC2-632)

A group of 32 subjects performed a flight-control task while responding to between one and four analog indicators that were formatted as either command or status-decision aid displays. The results obtained indicate the advantage of the status format when subjects are required to verbally support the state of the indicator(s), in part, because the command format 'bypasses' the representation of the indicator's state from which the command was derived. No advantage is noted for either format in the case where the subjects are required to manually correct the state indicated. The importance of consistency in system-design efforts may exceed that of compatibility. O.C.

**A92-45062**  
**INVESTIGATION AND EVALUATION OF A COMPUTER PROGRAM TO MINIMIZE VFR FLIGHT PLANNING ERRORS**

PETER J. MCALINDON (Embry-Riddle Aeronautical University, Daytona Beach, FL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2. Columbus, OH, Ohio State University, 1991, p. 1055-1060. refs

The purpose of this study was to investigate the effect of computer aided flight planning on flight planning errors. Focus was on two variables: pilot cross country flight experience and prior computer experience. It was initially expected that the computer aided flight plans would have fewer flight planning errors than those calculated using conventional methods. The results obtained by analyzing the two variables supported the hypothesis that flight planning errors are greatly reduced when computer aided flight planning techniques are used. Author

**A92-45250**  
**AN ARGUMENT FOR HUMAN EXPLORATION OF THE MOON AND MARS**

PAUL D. SPUDIS (Lunar and Planetary Institute, Houston, TX) American Scientist (ISSN 0003-0996), vol. 80, no. 3, May-June 1992, p. 269, 271-277. refs

Copyright

The merits of human space missions and the role of people in the scientific exploration of space are examined with particular reference to the Space Exploration Initiative. It is noted that certain tasks, such as custom installation of complex and delicate scientific instruments and various repair and maintenance operations, can be best accomplished by human operators and that reliance on robots only would limit the mission capabilities. Consideration is also given to the importance of field work by scientists in space exploration, the concept of telepresence, and the need for closer collaboration between robots and people. V.L.

**A92-45301\*** National Aeronautics and Space Administration, Washington, DC.

**AEROSPACE CREW STATION DESIGN**

GERALD P. CARR, ED. (Texas, University, Austin) and MELVIN D. MONTEMERLO, ED. (NASA, Washington, DC) Amsterdam and New York, Elsevier Science Publishers, 1984, 353 p. No individual items are abstracted in this volume. (ISBN 0-444-87569-7) Copyright

Consideration is given to spacecraft cockpits and work stations, commercial aircraft cockpits and crew stations, high performance aircraft cockpits and crew stations, and space stations and habitat crew stations. Particular attention is given to an historical review of NASA manned spacecraft crew stations, ESA spacelab crew stations, the evolution of commercial aircraft flight station design, Boeing 757/767 flight deck, a historical review of Concorde flight deck design, trends in the cockpit design of new European fighters, and state-of-the-art applications for Space Station crew interface design. O.G.

**A92-45453**

**ARCHITECTURAL STUDIES RELATING TO THE NATURE OF HUMAN BODY MOTION IN MICROGRAVITY**

REGIS S. FAUQUET (Design Models, Inc., Los Angeles, CA) and JUN OKUSHI IN: International Pacific Air and Space Technology Conference and Aircraft Symposium, 29th, Gifu, Japan, Oct. 7-11, 1991, Proceedings. Warrendale, PA, Society of Automotive Engineers, Inc., 1991, p. 841-861. Previously announced in STAR as N92-27011. refs

(SAE PAPER 912076) Copyright

In microgravity the human body experiences dramatic postural physiological and perceptual changes. These transformations make a human being in weightlessness a different person with different needs. Mobility becomes a central issue of human life in orbit where the absence of gravity constitutes a handicap. The architectural layout of the hardware in a space habitat must not only be engineered properly, but also be tailored to the mobility needs of the human body in microgravity. Thus, the interface between human movements and the environment must be observed to understand the morphology of body motion and to assess what types of environmental conditions have the greatest potential to support adequately human mobility in weightlessness. From these observations a tentative elementary taxonomy of movements was formulated to serve as a design reference tool. The current definition of body envelope was expanded to take on consideration the kinetic characteristics of human motion that revealed geometries with intriguing implications for the design of future space habitats. Author

**A92-45814**

**CONTACT LENS WEAR WITH THE USAF PROTECTIVE INTEGRATED HOOD/MASK CHEMICAL DEFENSE ENSEMBLE**

RICHARD J. DENNIS, ROBERT E. MILLER, II, RIC D. PETERSON, and WILLIAM G. JACKSON, JR. (USAF, Armstrong Laboratory, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 565-571. refs Copyright

The Protective Integrated Hood/Mask (PIHM) chemical defense aircrew ensemble blows air from the mask's plenum across the visor at a rate of approximately 15 L/min in order to prevent fogging of the visor and to cool the aircrew member's face. This study was designed to determine the effect of the PIHM airflow on soft contact lens (SCL) dehydration, contact lens comfort, and corneal integrity. There were 26 subjects who participated in this study: 15 SCL wearers, six rigid gas-permeable (RGP) wearers, and five nonspectacle wearing controls. Contrast acuity with the three Regan charts, subjective comfort, and relative humidity (RH) and temperature readings under the PIHM mask were monitored every 0.5 h during 6-h laboratory rides. Slit-lamp examinations and SCL water content measurements with a hand-held Abbe refractometer were made before and after the rides. High RH under the mask may have accounted for the moderate SCL dehydration (8.3 percent), no decrease in contrast acuity for any group, and lack of corneal stress. Although all groups experienced

some inferior, epithelial, punctate keratopathy, RGP wearers had the most significant effects. SCLs performed relatively well in the PIHM mask environment. Testing with other parameter designs is necessary before recommending RGPs with the PIHM system. Author

**A92-45824\*** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

**COMPARISON OF CURRENT SHUTTLE AND PRE-CHALLENGER FLIGHT SUIT REACH CAPABILITY DURING LAUNCH ACCELERATIONS**

JAMES P. BAGIAN (NASA, Johnson Space Center, Houston, TX) and LAUREN E. SCHAFER (NASA, Johnson Space Center, Houston, TX; Lockheed Engineering and Sciences Co., Southgate, MI) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 624-628. refs Copyright

The Challenger accident prompted the creation of a crew escape system which replaced the former Launch Entry Helmet (LEH) ensemble with the current Launch Entry Suit (LES). However, questions were raised regarding the impact of this change on crew reach capability. This study addressed the question of reach capability and its effects on realistic ground-based training for Space Shuttle missions. Eleven subjects performed reach sweeps in both the LEH and LES suits during 1 and 3 Gx acceleration trials in the Brooks AFB centrifuge. These reach sweeps were recorded on videotape and subsequently analyzed using a 3D motion analysis system. The ANOVA procedure of the Statistical Analysis System program was used to evaluate differences in forward and overhead reach. The results showed that the LES provided less reach capability than its predecessor, the LEH. This study also demonstrated that, since there was no substantial difference between 1 and 3 Gx reach sweeps in the LES, realistic Shuttle launch training may be accomplished in ground based simulators. Author

**A92-45825**

**A NEW GENERATION OF U.S. ARMY FLIGHT HELMETS**

RICHARD M. CARTER (U.S. Army, School of Aviation Medicine, Fort Rucker, AL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 7, July 1992, p. 629-633. refs Copyright

Head injuries are the most common cause of fatal injury in helicopter crashes. For over 80 years, the U.S. Army has used crash investigation studies to redesign flight helmets. This paper describes the evolution of the newly fielded U.S. Army helmet, the Sound Protection Helmet No. 4B (SPH-4B), and compares its protective features to its predecessors, especially the SPH-4. A major contribution to the helmet design process was made by the Aviation Life Support Equipment Retrieval Program (ALSERP), a functional program at the U.S. Army Aeromedical Research Laboratory. ALSERP has analyzed more than 500 helmets involved in crash events since 1972. Based on these studies of critical safety factors, the Army has developed and deployed the SPH-4B, a new helmet with improved energy absorption, retention, and stability. Author

**A92-45948**

**AN EXTENSION OF HUMAN OPTIMAL CONTROL MODEL**

SHU-MING LUO (Institute of Space Medico-Engineering, Beijing, People's Republic of China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 1, 1992, p. 31-36. In Chinese. refs

The mathematical model of human optimal control (Kleinman, 1981) is extended using the modern control theory. The applicability of the extended model is tested using three types each of specially designed dynamics and control tasks. Comparisons of results obtained in manual control compensatory tracking experiments with the results obtained on manual-control man-machine systems simulated by the extended human optimal control model showed excellent agreement. I.S.

**A92-46105**

**BIG GRAPHICS AND LITTLE SCREENS - DESIGNING GRAPHICAL DISPLAYS FOR MAINTENANCE TASKS**

PAUL R. FREY, WILLIAM B. ROUSE (Search Technology, Inc., Atlanta, GA), and ROSEMARY D. GARRIS (U.S. Navy, Naval Training Systems Center, Orlando, FL) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. 22, no. 1, Jan.-Feb. 1992, p. 10-20. refs  
(Contract N00014-89-C-0047)

Copyright

The design of computer-based graphical displays for maintenance tasks is addressed. Traditional maintenance information includes large graphical drawings that are difficult to portray on the small screens of computer-based maintenance information systems. This research investigates the design of graphical displays using display abstraction and aggregation as design parameters. A display's aggregation level reflects the field of view of a display, such as component, assembly, or system level diagrams. A display's abstraction level reflects the representation contained in a diagram, such as a component's form, function, or purpose in an assembly. The results from two experiments with experienced maintenance personnel are presented. Results of this investigation show promise for the application of these concepts to the development of computer-based maintenance information systems. Author

**A92-46276**

**MEDICAL IMAGING VI - IMAGE PROCESSING; PROCEEDINGS OF THE MEETING, NEWPORT BEACH, CA, FEB. 24-27, 1992**

MURRAY H. LOEW, ED. (George Washington University, Washington, DC) Meeting sponsored by SPIE, Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Vol. 1652), 1992, 699 p. For individual items see A92-46277 to A92-46279.

(SPIE-1652; ISBN 0-8194-0804-2) Copyright

The present conference on medical imaging and image processing encompasses segmentation, magnetic resonance imaging (MRI), coding and reconstruction, reconstruction, multimodalities and fusion, shape matching and identification, modality-specific applications, as well as human observers, task performance, and workstations. Also addressed are advances in the applications of imaging modalities, preprocessing and enhancement, feature extraction, pattern-recognition applications, knowledge-based methods, and the use of nonlinear filtering. Specific issues addressed include the effect of spatial frequency content of the background on visual detection of a known target, human vs suboptimal Bayesian task performance on constrained reconstructions, and the statistical differentiation between malignant and benign prostate lesions from ultrasound images. C.C.S.

**A92-46279\*** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

**STATISTICAL DIFFERENTIATION BETWEEN MALIGNANT AND BENIGN PROSTATE LESIONS FROM ULTRASOUND IMAGES**

S. B. PREMKUMAR, A. G. HOUSTON (Houston, University, TX), DAVID E. PITTS (NASA, Johnson Space Center, Houston, TX), and R. J. BABAIAN (Texas, University, Houston) IN: Medical imaging VI - Image processing; Proceedings of the Meeting, Newport Beach, CA, Feb. 24-27, 1992. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1992, p. 652-659. Research supported by University of Texas and University of Houston. refs

(Contract NCC9-16)

Copyright

**A92-46294**

**MASKING IN THREE-DIMENSIONAL AUDITORY DISPLAYS**

THEODORE J. DOLL (Georgia Institute of Technology, Atlanta), THOMAS E. HANNA, and JOSEPH S. RUSSOTTI (U.S. Navy, Naval Submarine Medical Research Laboratory, Groton, CT)

Human Factors (ISSN 0018-7208), vol. 34, no. 3, June 1992, p. 255-265. Research supported by U.S. Navy. refs  
Copyright

The extent to which simultaneous inputs in a three-dimensional (3D) auditory display mask one another was studied in a simulated sonar task. The minimum signal-to-noise ratio (SNR) required to detect an amplitude-modulated 500-Hz tone in a background of broadband noise was measured using a loudspeaker array in a free field. Three aspects of the 3D array were varied: angular separation of the sources, degree of correlation of the background noise, and listener head movement. Masking was substantially reduced when the sources were uncorrelated. The SNR needed for detection decreased with source separation, and the rate of decrease was significantly greater with uncorrelated sources than with partially or fully correlated sources. Head movement had no effect on the SNR required for detection. Implications for the design and application of 3D auditory displays are discussed. Author

**A92-46295**

**MINIMUM AUDIBLE MOVEMENT ANGLE AS A FUNCTION OF THE AZIMUTH AND ELEVATION OF THE SOURCE**

THOMAS Z. STRYBEL (California State University, Long Beach), CAROL L. MANLIGAS, and DAVID R. PERROTT (California State University, Los Angeles) Human Factors (ISSN 0018-7208), vol. 34, no. 3, June 1992, p. 267-275. refs

(Contract NSF BNS-90-25118; NIH-3505-RR-0801-1452)

Copyright

Auditory directional cues to enhance situational awareness in cockpits with head-coupled displays are examined in terms of the pilot's ability to detect the direction of moving sounds at different locations in space. Auditory motion acuity was measured by the minimum audible movement angle (MAMA) which is the minimum angle of travel required for detection of the direction of sound movement. Five experienced listeners were instructed to indicate the direction of travel of a sound source (broadband noise at 50 dBA) that moved at a velocity of 20 deg/s. Nine azimuth positions were tested at 0 deg elevation. Five elevations were then tested at 0 deg azimuth. Finally, two azimuth positions were tested at an elevation of 80 deg. The position of the source did not significantly affect the MAMA for azimuth locations between +40 and -40 deg and elevations below 80 deg. Within this area the MAMA ranged between 1 and 2 deg. Outside this area the MAMA increased to 3 to 10 deg. Author

**A92-46298**

**APPARENT SIZE AND DISTANCE IN AN IMAGING DISPLAY**

JAMES W. MEEHAN (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris, France) and THOMAS J. TRIGGS (Monash University, Melbourne, Australia) Human Factors (ISSN 0018-7208), vol. 34, no. 3, June 1992, p. 303-311. refs

Copyright

The size-distance invariance hypothesis suggests that the perceived size and the perceived distance of objects in a field viewed naturally are closely related. However, this relationship breaks down when scenes are viewed through high-power optical systems. When natural scenes are viewed through an imaging display of unity magnification, there is a reduction in their apparent size. This raises the question of whether the relationship breaks down when scenes are viewed through a low-power imaging display. A single-lens reflex camera was used as an imaging display that enabled subjects to vary the size of imaged real-world scenes. Judgments of size were found to vary with depth information in scenes and between monocular and binocular viewing, consistent with a previous finding, but judgments of distance did not vary significantly across either of these conditions. The results suggest that judgments of size and judgments of distance with imaging displays are not influenced uniformly by environmental and task variables. Author

**A92-46299**

**JUDGMENTS OF CHANGE AND PROPORTION IN GRAPHICAL PERCEPTION**

J. G. HOLLANDS and IAN SPENCE (Toronto, University, Canada)

Human Factors (ISSN 0018-7208), vol. 34, no. 3, June 1992, p. 313-334. refs

(Contract NSERC-A-8351)

Copyright

Subjects judged change and proportion when viewing graphs in two experiments. Change was judged more quickly and accurately with line and bar graphs than with pie charts or tiered bar graphs, and this difference was larger when the rate of change was smaller. Without a graduated scale, proportion was judged more quickly and accurately with pie charts and divided bar graphs than with line or bar graphs. Perception is direct when it requires simpler or fewer mental operations; it is proposed that perception of change is direct with line and bar graphs, whereas perception of proportion is direct with pie charts and divided bar graphs. The results are also consistent with the proximity compatibility principle. Suggestions for improving the design of graphical displays are given. Author

**A92-46763** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**MAN-IN-THE-LOOP STUDY OF FILTERING IN AIRBORNE HEAD TRACKING TASKS**

S. LIFSHITZ and S. J. MERHAV (Technion - Israel Institute of Technology, Haifa) Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol. 15, no. 4, July-Aug. 1992, p. 1043-1045. Research supported by NASA. refs

(Contract NAGW-1128; AF-AFOSR-88-0298)

Copyright

A human-factors study is conducted of problems due to vibrations during the use of a helmet-mounted display (HMD) in tracking tasks whose major factors are target motion and head vibration. A method is proposed for improving aiming accuracy in such tracking tasks on the basis of (1) head-motion measurement and (2) the shifting of the reticle in the HMD in ways that inhibit much of the involuntary apparent motion of the reticle, relative to the target, and the nonvoluntary motion of the teleoperated device. The HMD inherently furnishes the visual feedback required by this scheme. O.C.

**A92-46795**

**RANGE, ENERGY, HEAT OF MOTION IN THE MODIFIED NBC, ANTI-G, TANK SUIT**

JOSEPH A. MASTROPAOLO (Trisphere Institute of Sports Medicine, Huntington Beach, CA), A. N. DE GASTON, CRAIG H. DURCK (McDonnell Douglas Corp., Long Beach, CA), and ALLEN R. VAN SANTEN (Trisphere Institute of Sports Medicine, Huntington Beach, CA) Journal of Aircraft (ISSN 0021-8669), vol. 29, no. 4, July-Aug. 1992, p. 652-656. refs

Copyright

The modified nuclear, biologic pathogen, chemical (NBC), anti-g, anthropomorphic tank suit (ATS 2), was designed and modified. The ATS 2 provided a protective liner of water around, but not in contact with, the subject to the neck. For three subjects in the ATS 2, range of motion was lost in 30 of 32 tests by an average of 39 percent dry and 40 percent wet, p less than 0.001. For work rates from 49 to 151 W, all blood pressures were significantly elevated, p less than 0.05, but no other significant differences were found. The factors dry and wet, for heart rate were 1.2, 1.3; for systolic blood pressure 1.2, 1.4; for diastolic blood pressure 1.1, 1.3; for estimated mean blood pressure 1.1, 1.3; for ventilation 1.7, 2.0 and for energy of motion 1.40, 1.53. The factor 1.53 was an underestimation because of a suppressed maximal oxygen consumption. Special joints, pressure breathing and water cooling seemed desirable for future suits. Author

**A92-47682**

**COCA-COLA SPACE CAN UNDERGOES SUCCESSFUL TEST BY COSMONAUTS ONBOARD SOVIET SPACE STATION MIR**

AIAA Student Journal (ISSN 0001-1460), vol. 29, no. 4, Winter 1992, p. 14, 15.

Copyright

The Coca-Cola space can has been successfully tested onboard the space station Mir in August 1992 by the Coca-Cola Company

in cooperation with the Energia Soviet space agency. The test demonstrated the can's ability to provide carbonated soft drinks for consumption by cosmonauts in the microgravity environment.

O.G.

**A92-48174\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**WASTE STREAMS IN A CREWED SPACE HABITAT. II**

MORTON A. GOLUB and THEODORE WYDEVEN (NASA, Ames Research Center, Moffett Field, CA) Waste Management & Research (ISSN 0734-242X), vol. 10, 1992, p. 269-280. refs

Copyright

An update is presented of a compilation of generation rates and chemical compositions of potential waste streams in a typical crewed space habitat which was reported in the NASA Technical Memorandum. New topics under consideration include data obtained from Soviet literature on life support issues and data on various minor human body wastes not presented previously (saliva, Flatus, hair, finger- and toenails, dried skin and skin secretions, tears and semen). Attention is also given to the latest information on the environmental control and life support system design parameters for SSF. O.G.

**A92-48395\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**UTILIZATION OF POTATOES FOR LIFE SUPPORT SYSTEMS IN SPACE. I - CULTIVAR-PHOTOPERIOD INTERACTIONS**

RAYMOND M. WHEELER and THEODORE W. TIBBITTS (Wisconsin, University, Madison) American Potato Journal (ISSN 0003-0589), vol. 63, 1986, p. 315-323. Research supported by University of Wisconsin. refs

(Contract NCC2-136; NCC2-301)

Copyright

The productive potential of four potato varieties considered as a food source for space stations and/or lunar colonies was assessed for plants grown for 15 weeks in walk-in rooms at 20 C under 12-, 16-, or 20-hr exposures to 400-micromol/sq m per sec photosynthetic photon flux. It was found that Norland potatoes yielded the greatest tuber fresh weight, producing 2.3, 2.4, and 2.9 kg/plant under 12-, 16, and 20-hr, respectively. The respective yields for the other three varieties were: Superior, 1.9, 1.5, and 1.8 kg/plant; Norchip, 1.8, 1.4, and 2.0 kg/plant; and Kennebec, 2.3, 0.2, and 0.8 kg/plant. I.S.

**A92-48396\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**UTILIZATION OF POTATOES FOR LIFE SUPPORT SYSTEMS. II - THE EFFECTS OF TEMPERATURE UNDER 24-H AND 12-H PHOTOPERIODS**

RAYMOND M. WHEELER, KENNETH L. STEFFEN, THEODORE W. TIBBITTS, and JIWAN P. PALTA (Wisconsin, University, Madison) American Potato Journal (ISSN 0003-0589), vol. 63, 1986, p. 639-647. Research supported by University of Wisconsin. refs

(Contract NCC2-136; NCC2-301)

Copyright

The effects of temperature and the photoperiod length on the growth and tuberization of Norland potatoes were investigated for two photoperiods, 12-h and 24-hr at 400 micromol/sq m per sec PPF, and at temperatures of 12, 16, 20, 24, and 28 C. It was found that stem length increased with increasing temperature under both photoperiods. The highest tuber yield was obtained at 16 C under the 24-hr photoperiod and at 20 C under the 12-hr photoperiod (i.e., increasing the photoperiod from 12 to 24 hrs effectively decreases the optimal temperature for tuber formation). Little or no tuber formation occurred at 28 C under either photoperiod. I.S.

**A92-48397\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**UTILIZATION OF POTATOES FOR LIFE SUPPORT SYSTEMS IN SPACE. III - PRODUCTIVITY AT SUCCESSIVE HARVEST DATES UNDER 12-H AND 24-H PHOTOPERIODS**

RAYMOND M. WHEELER and THEODORE W. TIBBITTS (Wisconsin, University, Madison) American Potato Journal (ISSN 0003-0589), vol. 64, 1987, p. 311-320. Research supported by University of Wisconsin. refs  
(Contract NCC2-136; NCC2-301)  
Copyright

Efficient crop production for controlled ecological life support systems requires near-optimal growing conditions with harvests taken when production per unit area per unit time is maximum. This maximum for potato was determined using data on Norland plants which were grown in walk-in growth rooms under 12-h and 24-h photoperiods at 16 C. Results show that high tuber production can be obtained from potatoes grown under a continuous light regime. The dry weights (dwt) of tuber and of the entire plants were found to increase under both photoperiods until the final harvest date (148 days), reaching 5732 g tuber dwt and 704 g total dwt under 12-h, and 791 g tuber dwt and 972 g total dwt under 24-h. O.G.

**A92-48398\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**UTILIZATION OF POTATOES FOR LIFE SUPPORT SYSTEMS IN SPACE. IV - EFFECT OF CO2 ENRICHMENT**

RAYMOND M. WHEELER (Bionetics Corp., Cocoa Beach, FL) and THEODORE W. TIBBITTS (Wisconsin, University, Madison) American Potato Journal (ISSN 0003-0589), vol. 66, 1989, p. 25-34. Research supported by University of Wisconsin. refs  
(Contract NCC2-301)  
Copyright

To assess the response of potato to elevated carbon dioxide levels in life support farms for space colonies, Norland and Russet Burbank were grown in solid stands in separate controlled environment rooms at two CO2 levels, 365 micromol/mol and 1000 micromol/mol. It is found that potatoes show only marginal growth gains from elevated CO2: tuber dry weight increased by 2 percent for Norland, and 12 percent for Russet Burbank. CO2 assimilation rates of Norland leaves increased by about 24 percent, but assimilation rates of Russet Burbank leaves decreased by about 12 percent. It is concluded that the best productivity obtained in the study (21.9 g tuber dry weight/sq m/day from Norland at 1000 micromol/mol of CO2) indicates that the dietary energy needs of one human in space could be supplied from 34 sq m of potatoes. O.G.

**A92-48453**

**AVIONICS PLANNING FOR FUTURE AERONAUTICAL SYSTEMS - PILOT-VEHICLE INTERFACE (PVI)**

THOMAS E. WILKINS (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 1. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 265-268. refs

The author presents the efforts of the DCS, Development Planning at Aeronautical Systems Division (ASD/XR) in the area of future system cockpit planning. Over the last three years a central group of emerging aeronautical weapon systems has been identified, and planning efforts have begun to understand the likely mission needs and requirements these systems will demand. Much of this planning is conducted horizontally, across the future systems. This facilitates the discovery of commonality between the various future systems, especially in avionics. A ripe technical area for upfront definition is pilot-vehicle interface (PVI). PVI is addressed in the overall context of weapon system avionics, and a system cockpit vision is presented. I.E.

**A92-48526**

**AN INTEGRATED METHODOLOGY FOR KNOWLEDGE AND DESIGN ACQUISITION**

BRIAN S. ZAFF (Logicon Technical Services, Inc., Dayton, OH) and MICHAEL D. MCNEESE (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH,

May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 779-785. refs  
Copyright

The authors document the creation, development, application, and evaluation of an advanced knowledge and design acquisition methodology. The methodology acts to acquire and represent user requirements along three separate yet integrated perspectives: 1) structural/functional, 2) experiential/conceptual, and 3) intuitive/perceptual. The authors discuss three specific tools designed to capture these perceptives: IDEF-O (integrated computer-aided manufacturing definition) modeling, concept mapping, and design storyboarding. I.E.

**A92-48528**

**SOCIAL PSYCHOLOGICAL METAPHORS FOR HUMAN-COMPUTER SYSTEM DESIGN**

CLIFFORD E. BROWN (Wittenberg University, Springfield; USAF, Armstrong Laboratory, Wright-Patterson AFB, OH), SARAH J. SWIERENGA (Logicon Technical Services, Inc., Dayton, OH), and A. R. WELLENS (Miami, University, Coral Gables, FL) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 793-799. refs  
Copyright

It is noted that interpersonal relationships progress through specific phases which are affected in predictable ways by variables which are potentially controllable. Social-psychological research in these areas raises important issues to consider when designing human-computer systems. Attention to early human-computer encounters must enhance opportunities for repeated exposures under favorable circumstances. Displays and workstations should be more than functional; they should be attractive, comfortable, and inviting. System software must be relatively easy to learn and use. Building a deeper human-computer relationship requires clear communication which provides accurate, appropriate, and timely feedback. It is concluded that maintaining the human-computer relationship and optimizing system performance will be achieved only through careful consideration of issues related to authority, trust, function allocation, and autonomy. I.E.

**A92-48533**

**EARLY MPTS ANALYSIS - METHODS IN THIS 'MADNESS'**

FRANK C. GENTNER and EDWARD BOYLE (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 832-841. refs  
Copyright

The approved DoD Instruction (DoDI) 5000.2, Defense Acquisition Management Policy and Procedures, and draft AFR 57-1, Operational Needs, Requirements, and Concepts, require Manpower, Personnel, Training, and Safety (MPTS) or Human Systems Integration (HSI) analysis early in the acquisition process. These new requirements push MPTS analysis earlier than ever before into the pre-concept and concept phases. Air Force (AF) and DoD acquisition leaders have been stressing the importance of higher quality system requirements identification and refinement prior to entering the demonstration/validation phase, since it is less expensive to make conceptual changes than engineering changes during the later acquisition phases. The authors examine one method by which AF personnel and contractors can conduct early MPTS/HSI analysis with today's available MPTS tools and databases. I.E.

**A92-48535**

**METHODOLOGY FOR MOTION BASE SIMULATION OF CLOSED LOOP SUPERMANEUVERS ON A CENTRIFUGE SIMULATOR**

D. W. REPPERGER, K. MCCLOSKEY, J. FRAZIER, R. ESKEN (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH), and M. ROARK (Raytheon Service Co., Burlington, MA) IN: NAECON

91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 849-855. refs

A methodology for designing a closed-loop motion simulation is discussed. This procedure is applicable to a centrifuge simulator as well as other types of devices which can produce both motion and visual fields. The key issues of coordinating the motion field with the visual simulation are discussed. Both systems are driven by the stick commands of the pilot, thus making it closed loop. The motion fields simulated are based on supermaneuverable flight trajectories where research is needed to investigate how these supermaneuvers influence the ability of a pilot to perform a mission. It has been shown in performance studies that an agile aircraft has a definite combat edge over a nonagile aircraft. Also, using agility, a tactical maneuver can be performed expending less overall aircraft energy. I.E.

#### A92-48537

##### THE USE OF A TACTILE DEVICE TO MEASURE AN ILLUSION

T. L. CHELETTE and K. MCCLOSKEY (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 865-868. refs

A device known as the Tactile Perceived Attitude Transducer (TPAT) has been fabricated which makes use of the subject's hand and forearm to describe perceived attitude. The first experiment involving the use of the TPAT was an attempt to quantify the G-excess effect. This effect is the basis for a pilot illusion that can cause overbanking of an aircraft. The G-excess illusion is an exaggerated sensation of body tilt caused by a greater than 1 Gz acceleration on the otolith organs of the vestibular system. The experimental design includes several tests of the TPAT as a cross modal measurement technique. The use of the TPAT in this experiment has resulted in an expanded and progressive experimental design which is considerably larger and more complex than a typical experiment on the DES (Dynamic Environment Simulator). However, the design provides a unique opportunity to carefully examine the cross modal matching of two metrics involved in a complex blending of the visual and vestibular systems. I.E.

#### A92-48538

##### THE CASE FOR RECURRENT TRAINING ON HUMAN CENTRIFUGES

R. E. VAN PATTEN (Environmental Tectonics Corp., Southampton, PA) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 869-872. refs  
Copyright

Anecdotal evidence and some evidence from both animal and human experimentation indicate that there is a steady decline in G tolerance when exposures to sustained acceleration are lacking or infrequent. Likewise, there is evidence that frequent exposure enhances G tolerance. The author examines some arguments for recurrent centrifuge training of aircrew personnel for the maintenance and enhancement of sustained acceleration tolerance. I.E.

#### A92-48541

##### 3-D TV WITHOUT GLASSES

RICHARD E. HOLMES (Electronic Image Systems, Inc., Xenia, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 914-920. refs  
Copyright

The author describes a hologram-like 3-D high-resolution color CRT (cathode ray tube)-based stereoscopic television-like video display technique that is presently under development. The patented technique used is unique in that it is autostereoscopic,

i.e., no special glasses, goggles, panels, helmets or two-channel optical systems are required by the viewer to see depth. Any image that can be put into a television-like format can be displayed. This allows real-time computer-generated shaded surfaces and real-time scanning sensor data to be viewed with depth in a format familiar to the viewer. I.E.

#### A92-48544

##### SPECIFYING PERFORMANCE FOR A NEW GENERATION OF VISIONICS SIMULATORS

EDWARD M. SIMS and KENNETH B. DONOVAN (GE Aerospace, Simulation and Control Systems Dept., Daytona Beach, FL) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 933-939.  
Copyright

It is noted that the specifics of visual systems, and related visionics systems, is one of the most difficult aspects of flight trainer procurement. The common goal for the services and industry is to establish specification terms which ensure the most cost-effective training systems. There has been a shift in specifications from terms of graphics primitives, such as polygons and lights, to terms of training cues, such as terrain fidelity. The authors describe the impact of this new specification method for three key areas of visionics system performance: terrain fidelity, feature fidelity, and system resolution. I.E.

#### A92-48545

##### LOW-COST APPROACHES TO VIRTUAL FLIGHT SIMULATION

PHILIP A. PLATT, DAVID A. DAHN, and PHIL AMBURN (USAF, Institute of Technology, Wright-Patterson AFB, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 940-946. Research supported by USAF and NOAA. refs  
Copyright

An attempt was made to determine whether a flight simulator could be hosted on inexpensive computer image generators (CIG) and interfaced to a virtual environment system. Effective training systems provide a wide visual field-of-view through the use of CRT (cathode ray tube) arrays or dome simulator projectors. These display systems require graphics processing support from expensive CIGs with multiple graphics channels. A promising technology that could help reduce the costs of these flight simulators is head-mounted display (HMD) systems. Simple virtual world interfaces using HMD technology require only one graphics channel, providing the potential to use low-cost CIGs. The approach was to build a virtual world interface to an existing flight simulator application using an HMD. To investigate two classes of computing platforms suitable for use as the CIG, the flight simulator was hosted on a Silicon Graphics Iris 4D/85GT and an 80386/80387 enhanced with a high-performance graphics engine. Neither the SGI 4D/85GT system nor the PC system achieved the desired frame rate; however, the performance of the SGI 4D/320VGX did show that a more powerful workstation could. I.E.

#### A92-48546

##### EMBEDDING TRAINING IN A SYSTEM

WILLIAM F. JORGENSEN (Dynamics Research Corp., Andover, MA) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 947-953.  
Copyright

A review was conducted of US Air Force, Army, and Navy studies which attempted to establish procedures and guidelines for the development of embedded training (ET). The review showed that the studies to date have not provided an analysis process which can examine early design data, and state with any precision what ET is required and what its content should be. Based on this review and some internal company research, characteristics required of a process to determine and specify ET were developed.

A conceptual procedure for conducting the analysis of ET requirements is presented. This concept incorporates procedures from recent Army and Navy published studies. The conclusion is that, by combining the procedures from these endeavors, a process can be demonstrated which will define ET requirements early enough to include in system design. I.E.

A92-48547

#### A REMOTE VISUAL INTERFACE TOOL FOR SIMULATION CONTROL AND DISPLAY

WILLIAM J. DEROUCHÉY and THOMAS C. HARTRUM (USAF, Institute of Technology, Wright-Patterson AFB, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1991, p. 954-959. refs

The authors discuss the design and development of the Visual Interactive Simulation Interface Tool (VISIT). VISIT was designed to provide the graphical representation and user interface for a simulation that is running on another processor utilizing internet communications. Since the simulation processor may be any system capable of implementing the proper network protocol, specialized processors with no graphics display devices can benefit from this architecture. The system provides support for various input devices to control the simulation display and environment. Simulation objects are displayed using either a 3-D wireframe representation or a Gouraud shaded representation. Viewer interaction with the simulation is provided by a collection of commands that allow the viewer to initialize, start, stop, abort, and restart the simulation. The viewer also has the ability to establish checkpoints. Upon reaching a checkpoint the viewer can step through the output display and/or manipulate the objects within the simulation. I.E.

A92-49073#

#### PURIFICATION AND STORAGE OF WASTE GASES ON SPACE STATION FREEDOM

BRIAN D. VICKERS and STEVEN J. ADAM (McDonnell Douglas Space Systems Co., Huntington Beach, CA) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 9 p. refs (AIAA PAPER 92-3607) Copyright

Fluid systems are being designed to handle waste gases generated from experiments performed on Space Station Freedom. These laboratory waste gases are collected and stored for later use as supplemental reboost propellant for a resistojet propulsion system. Contained within waste gases will be contaminants including organic and inorganic acids and bases, solvents, halogens, and material particulates. Concentrations and mixtures of gases and contaminants will constantly change over the 30-year operation of the Station. Material selection for system components must consider corrosion and stress corrosion cracking. This paper describes the difficulties associated with characterizing material behavior for fluid system designs in such an unpredictable waste gas environment. Material selection and design of high pressure (1100 psi) storage tanks are considered. Composite pressure vessels, with nickel alloy liners that operate in a residual compressive stress state up to maximum operating pressure, are discussed as a method of eliminating stress corrosion cracking concerns. Also presented are data on a prototype gas purifier, which can minimize waste gas contaminant levels prior to storage. Author

N92-28286# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.

#### A STUDY OF PILOT ATTITUDES REGARDING THE IMPACT ON MISSION EFFECTIVENESS OF USING NEW COCKPIT AUTOMATION TECHNOLOGIES TO REPLACE THE NAVIGATOR/WEAPON SYSTEM OFFICER/ELECTRONIC WARFARE OFFICER M.S. Thesis

WILLIAM K. STARR and DONALD A. WELCH Sep. 1991 258 p

(AD-A246683; AFIT/GLM/LSR/91S-62) Avail: CASI HC A12/MF A03

This study analyzed the self-reported survey responses of 404 Air Force pilots concerning their perceptions of using advanced cockpit technologies to replace the Navigator, Weapon System Officer, and Electronic Warfare Officer (Nav/WSO/EWO) and the impact of advanced cockpit technologies on combat mission effectiveness. The first objective of this study was to compare, by aircraft type, the mission effectiveness factors that are always critical and almost always critical to the success of a combat mission. The second objective was to examine, from the pilot's point of view, the Nav/WSO/EWO's contribution (NAVCRIT) to enhancing the combat mission effectiveness factors. The third objective was to examine the Nav/WSO/EWO's contribution (REQ) to overall combat mission success. A stepwise regression model for predicting NAVCRIT and REQ utilizing surveyed pilot demographics was also explored. Research conclusions were mixed, since aircraft type impacted on almost all results. Mission effectiveness factors that were always critical were, however, similar across all aircraft types. Examination of NAVCRIT and REQ revealed distinct differences, by aircraft type, of the pilot's perception of Nav/WSO/EWO contribution to combat mission effectiveness. GRA

N92-28346# Defence Research Establishment, Ottawa (Ontario).

#### MODELLING OF HEAT AND MOISTURE LOSS THROUGH NBC ENSEMBLES

BRAD CAIN and RANDALL OSCZEWSKI Nov. 1991 30 p (AD-A245939) Avail: CASI HC A03/MF A01

This report summarizes work done to model the heat and moisture transport through various nuclear, bacteriological, chemical (NBC) clothing ensembles. The analysis involves simplifying the three dimensional physical problem of clothing on a person to that of a one dimensional problem of flow through parallel layers of clothing and air. Body temperatures are calculated based on prescribed work rates, ambient conditions and clothing properties. Sweat response and respiration rates are estimated based on empirical data to provide appropriate boundary conditions at the skin. Core and skin temperatures are calculated during the analysis and reported as functions of time for four different clothing ensembles. Evaporative heat loss was found to be the dominant heat loss mechanism. Estimates of the rate of sweat evaporation through the clothing ensembles is made. The predicted temperature responses, although not exact, are comparable to results from physiological experiments but somewhat lower. Work tolerance times were predicted to be longer than that found experimentally. GRA

N92-28518# Naval Postgraduate School, Monterey, CA.

#### CORRELATIONAL ANALYSIS OF SURVEY AND MODEL-GENERATED WORKLOAD VALUES M.S. Thesis

JAMES J. GALVIN, JR. Sep. 1991 98 p (AD-A247153) Avail: CASI HC A05/MF A02

This study examines the accuracy of an Army helicopter pilot workload measuring model called the Task Loading Model. The model is a submodel of the Army-NASA Aircrew/Aircraft Integration Program's Man-Machine Integration Design and Analysis System. The model's workload level output was correlated with the subjective workload measurements of several groups of pilots evaluating a variety of flight tasks. Seventy-one Army aviators completed surveys requiring scaled ratings and paired comparisons of workload related to common flight tasks conducted during typical missions. Their responses were examined for internal consistency and pooling by means of nonparametric tests. Aviator-supplied data was found to be robust and reliable. Pooled response data was correlated with model-generated data to determine the accuracy of the model. Results of this study show that the Task Loading Model is presently inadequate, but displays promising trends and should be further refined. GRA

**N92-28521\*#** National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

**ANTHROPOMORPHIC TELEOPERATION: CONTROLLING REMOTE MANIPULATORS WITH THE DATAGLOVE Final Report**

J. P. HALE, II Jun. 1992 31 p

(Contract PROJ. 89-06)

(NASA-TM-103588; NAS 1.15:103588) Avail: CASI HC A03/MF A01

A two phase effort was conducted to assess the capabilities and limitations of the DataGlove, a lightweight glove input device that can output signals in real-time based on hand shape, orientation, and movement. The first phase was a period for system integration, checkout, and familiarization in a virtual environment. The second phase was a formal experiment using the DataGlove as input device to control the protoflight manipulator arm (PFMA) - a large telerobotic arm with an 8-ft reach. The first phase was used to explore and understand how the DataGlove functions in a virtual environment, build a virtual PFMA, and consider and select a reasonable teleoperation control methodology. Twelve volunteers (six males and six females) participated in a 2 x 3 (x 2) full-factorial formal experiment using the DataGlove to control the PFMA in a simple retraction, slewing, and insertion task. Two within-subjects variables, time delay (0, 1, and 2 seconds) and PFMA wrist flexibility (rigid/flexible), were manipulated. Gender served as a blocking variable. A main effect of time delay was found for slewing and total task times. Correlations among questionnaire responses, and between questionnaire responses and session mean scores and gender were computed. The experimental data were also compared with data collected in another study that used a six degree-of-freedom handcontroller to control the PFMA in the same task. It was concluded that the DataGlove is a legitimate teleoperations input device that provides a natural, intuitive user interface. From an operational point of view, it compares favorably with other 'standard' telerobotic input devices and should be considered in future trades in teleoperation systems' designs. Author

**N92-28670\*#** Bionetics Corp., Cocoa Beach, FL.  
**COUPLING PLANT GROWTH AND WASTE RECYCLING SYSTEMS IN A CONTROLLED LIFE SUPPORT SYSTEM (CELSS)**

JAY L. GARLAND 25 Mar. 1992 57 p

(Contract NAS10-11624)

(NASA-TM-107544; NAS 1.15:107544) Avail: CASI HC A04/MF A01

The development of bioregenerative systems as part of the Controlled Ecological Life Support System (CELSS) program depends, in large part, on the ability to recycle inorganic nutrients, contained in waste material, into plant growth systems. One significant waste (resource) stream is inedible plant material. This research compared wheat growth in hydroponic solutions based on inorganic salts (modified Hoagland's) with solutions based on the soluble fraction of inedible wheat biomass (leachate). Recycled nutrients in leachate solutions provided the majority of mineral nutrients for plant growth, although additions of inorganic nutrients to leachate solutions were necessary. Results indicate that plant growth and waste recycling systems can be effectively coupled within CELSS based on equivalent wheat yield in leachate and Hoagland solutions, and the rapid mineralization of waste organic material in the hydroponic systems. Selective enrichment for microbial communities able to mineralize organic material within the leachate was necessary to prevent accumulation of dissolved organic matter in leachate-based solutions. Extensive analysis of microbial abundance, growth, and activity in the hydroponic systems indicated that addition of soluble organic material from plants does not cause excessive microbial growth or 'biofouling', and helped define the microbially-mediated flux of carbon in hydroponic solutions. Author

**N92-28671\*#** Iowa State Univ. of Science and Technology, Ames. Dept. of Chemical Engineering.

**SPACE LIFE SUPPORT ENGINEERING PROGRAM Annual Progress Report, 1 Jul. 1991 - 30 Jun. 1992**

RICHARD C. SEAGRAVE 30 Jun. 1992 36 p

(Contract NAG2-722)

(NASA-CR-190448; NAS 1.26:190448) Avail: CASI HC A03/MF A01

A comprehensive study to develop software to simulate the dynamic operation of water reclamation systems in long-term closed-loop life support systems is being carried out as part of an overall program for the design of systems for a moon station or a Mars voyage. This project is being done in parallel with a similar effort in the Department of Chemistry to develop durable accurate low-cost sensors for monitoring of trace chemical and biological species in recycled water supplies. Aspen-Plus software is being used on a group of high-performance work stations to develop the steady state descriptions for a number of existing technologies. Following completion, a dynamic simulation package will be developed for determining the response of such systems to changes in the metabolic needs of the crew and to upsets in system hardware performance. Author

**N92-28681\*#** Texas Univ., Arlington.

**A STUDY OF THE CONTROL PROBLEM OF THE SHOOT SIDE ENVIRONMENT DELIVERY SYSTEM OF A CLOSED CROP GROWTH RESEARCH CHAMBER**

C. C. BLACKWELL and A. L. BLACKWELL Jun. 1992 113 p

(Contract NCA2-484)

(NASA-CR-177597; A-92138; NAS 1.26:177597) Avail: CASI HC A06/MF A02

The details of our initial study of the control problem of the crop shoot environment of a hypothetical closed crop growth research chamber (CGRC) are presented in this report. The configuration of the CGRC is hypothetical because neither a physical subject nor a design existed at the time the study began, a circumstance which is typical of large scale systems control studies. The basis of the control study is a mathematical model which was judged to adequately mimic the relevant dynamics of the system components considered necessary to provide acceptable realism in the representation. Control of pressure, temperature, and flow rate of the crop shoot environment, along with its oxygen, carbon dioxide, and water concentration is addressed. To account for mass exchange, the group of plants is represented in the model by a source of oxygen, a source of water vapor, and a sink for carbon dioxide. In terms of the thermal energy exchange, the group of plants is represented by a surface with an appropriate temperature. Most of the primitive equations about an experimental operating condition and a state variable representation which was extracted from the linearized equations are presented. Next, we present the results of a real Jordan decomposition and the repositioning of an undesirable eigenvalue via full state feedback. The state variable representation of the modeling system is of the nineteenth order and reflects the eleven control variables and eight system disturbances. Five real eigenvalues are very near zero, with one at zero, three having small magnitude positive values, and one having a small magnitude negative value. A Singular Value Decomposition analysis indicates that these non-zero eigenvalues are not results of numerical error. Author

**N92-28831#** National Aerospace Lab., Tokyo (Japan). Control System Development Team.

**THE SECOND FLIGHT SIMULATOR TEST OF THE HEAD-UP DISPLAY FOR NAL QSTOL EXPERIMENTAL AIRCRAFT (ASKA)**

KEIJI TANAKA, KENJI YAZAWA, and KAZUYA MASUI Feb.

1991 27 p In JAPANESE

(ISSN 0452-2982)

(NAL-TM-633; JTN-92-80351) Avail: CASI HC A03/MF A01

A Head Up Display (HUD) designed by the NAL and manufactured for the NAL Quiet Short Take Off and Landing (QSTOL) experimental aircraft, ASKA, was evaluated for the second

time using the STOL flight simulator. The objectives of these simulator tests were: (1) to confirm the display format which was modified after flight test results of the Beechcraft Queen-Air (a NAL research aircraft); (2) to evaluate the radar guidance functions which telelink information displayed in the HUD; and (3) to study the QSTOL's Instrument Flight Rules (IFR) approach capability using the HUD's radar guidance ability. Results of about 300 simulated approach and landing flights which were evaluated by five test pilots showed: (1) display format modifications improved readability and smoothness of the display's motion; (2) the radar guidance algorithm which obtains aircraft position using a tracking radar that is complemented by inertial information was determined to be satisfactory for use in actual flight; and (3) by using the HUD, and especially its indicated runway image, pilots were able to make precise approaches to the runway under Instrument Meteorological Conditions. In addition, other beneficial suggestions for display format final adjustments were obtained prior to HUD's use in the QSTOL flight test series. Author (NASDA)

**N92-28897\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**EXPERIMENTAL MEASUREMENT OF THE ORBITAL PATHS OF PARTICLES SEDIMENTING WITHIN A ROTATING VISCOUS FLUID AS INFLUENCED BY GRAVITY**

DAVID A. WOLF and RAY P. SCHWARZ (Krug Life Sciences, Inc., Houston, TX.) Jun. 1992 19 p  
(Contract RTOP 694-01-23-05)  
(NASA-TP-3200; S-668; NAS 1.60:3200) Avail: CASI HC A03/MF A01

Measurements were taken of the path of a simulated typical tissue segment or 'particle' within a rotating fluid as a function of gravitational strength, fluid rotation rate, particle sedimentation rate, and particle initial position. Parameters were examined within the useful range for tissue culture in the NASA rotating wall culture vessels. The particle moves along a nearly circular path through the fluid (as observed from the rotating reference frame of the fluid) at the same speed as its linear terminal sedimentation speed for the external gravitational field. This gravitationally induced motion causes an increasing deviation of the particle from its original position within the fluid for a decreased rotational rate, for a more rapidly sedimenting particle, and for an increased gravitational strength. Under low gravity conditions (less than 0.1 G), the particle's motion through the fluid and its deviation from its original position become negligible. Under unit gravity conditions, large distortions (greater than 0.25 inch) occur even for particles of slow sedimentation rate (less than 1.0 cm/sec). The particle's motion is nearly independent of the particle's initial position. Comparison with mathematically predicted particle paths show that a significant error in the mathematically predicted path occurs for large particle deviations. This results from a geometric approximation and numerically accumulating error in the mathematical technique. Author

**N92-28944#** Army Aeromedical Research Lab., Fort Rucker, AL.

**METHODS OF VISUAL SCANNING WITH NIGHT VISION GOGGLES Final Report**

JOHN C. KOTULAK Feb. 1992 20 p  
(Contract DA PROJ. 3M1-62787-A-879)  
(AD-A247470; USAARL-92-10) Avail: CASI HC A03/MF A01

This report describes recommended methods for scanning the flight path and cockpit instruments for pilots wearing night vision goggles (NVGs) while flying Army helicopters. The impetus for this report was a task force sponsored by the Office of the Deputy Chief of Staff of the Army for Plans and Operations, which determined that the development of scanning methods was the Army's top training priority for night helicopter operations. The recommended methods of scanning were derived from published scientific works, interviews with scientists, and interviews with aviators from field tactical units, training units, and from the research and development community. The proposed scanning methods recommend free search as opposed to formalized scan patterns. In addition, they place equal weight on crew coordination and

individual technique. The proposed methods stress actions taken before flight, such as premission planning and NVG preflight adjustments. Furthermore, the proposed methods are intended to build an awareness of: NVG performance limits, and how to maximize performance; common problems encountered while scanning with NVGs, and the conditions which elicit them; and the scientific basis for scanning. Separate scanning methods were developed for individuals and for crews. In addition, the relevant scientific literature was reviewed. GRA

**N92-29121#** Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

**SUPER AUDITORY LOCALIZATION FOR IMPROVED HUMAN-MACHINE INTERFACES Final Report, 1 Jun. 1990 - 28 Feb. 1992**

NATHANIEL DURLACH 28 Apr. 1992 5 p  
(Contract AF-AFOSR-0312-90)  
(AD-A250288; AFOSR-92-0392TR) Avail: CASI HC A01/MF A01  
Work by Dr. Durlach and his collaborators is summarized here.

The creation of a serious journal for continuing publication of peer-reviewed papers seemed essential for the development of the field (both technically and academically.) Thus, the funds in the grant were used to support the creation of a journal rather than a book. The journal is 'Presence: teleoperators and virtual environments,' published by MIT Press. The work performed to start the journal has occurred in two phases. The first consisted of establishing the journal as an organization entity. The second, which has only been completed within the past month, consisted of generating the first issue. GRA

**N92-29129\*** National Aeronautics and Space Administration. Pasadena Office, CA.

**METHOD AND APPARATUS FOR PREDICTING THE DIRECTION OF MOVEMENT IN MACHINE VISION Patent**

TERI B. LAWTON, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 28 Apr. 1992 16 p Filed 30 Sep. 1988  
(NASA-CASE-NPO-17552-1-CU; US-PATENT-5,109,425; US-PATENT-APPL-SN-251500; US-PATENT-CLASS-382-1; US-PATENT-CLASS-358-105; US-PATENT-CLASS-364-424.01; US-PATENT-CLASS-382-22; US-PATENT-CLASS-901-1; INT-PATENT-CLASS-G06K-9/00) Avail: US Patent and Trademark Office

A computer-simulated cortical network is presented. The network is capable of computing the visibility of shifts in the direction of movement. Additionally, the network can compute the following: (1) the magnitude of the position difference between the test and background patterns; (2) localized contrast differences at different spatial scales analyzed by computing temporal gradients of the difference and sum of the outputs of paired even- and odd-symmetric bandpass filters convolved with the input pattern; and (3) the direction of a test pattern moved relative to a textured background. The direction of movement of an object in the field of view of a robotic vision system is detected in accordance with nonlinear Gabor function algorithms. The movement of objects relative to their background is used to infer the 3-dimensional structure and motion of object surfaces.

Official Gazette of the U.S. Patent and Trademark Office

**N92-29137\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**WHOLE BODY CLEANING AGENT CONTAINING N-ACYLTAURATE Patent**

STEVEN E. LENTSCH, inventor (to NASA) 26 May 1992 5 p Filed 29 May 1990 Supersedes N91-16566 (29 - 8, p 1195)  
(NASA-CASE-MSC-21589-1; US-PATENT-5,116,543; US-PATENT-APPL-SN-529427; US-PATENT-CLASS-252-545; US-PATENT-CLASS-252-547; US-PATENT-CLASS-252-DIG.5; US-PATENT-CLASS-252-DIG.14; US-PATENT-CLASS-252-DIG.13; US-PATENT-CLASS-424-70; US-PATENT-CLASS-4-661) Avail: US Patent and Trademark Office

The subject invention relates to a human cleansing agent particularly suitable for use in long duration spaceflight and to a

method of bathing with the agent. The agent of the subject invention is in the form of a paste having a pH of 5.0 to 7.9 which comprises an acyltaurate, a skin conditioner, a hair conditioner, and a preservative. More specifically, it includes sodium N-coconut acid-N-methyl taurate, in combination with soybean lecithin, polyquaternium 16, and formalin. This particular combination satisfies the following objectives: (1) that it be usable with a minimum amount of water per shower (approximately 1 gallon); (2) that it be easily separated from the water for purposes of water reclamation; (3) that it be pH compatible with skin and hair; (4) that it rinse well in deionized water; (5) that it be mild to skin and eyes; (6) that it effectively clean both skin and hair; (7) that it be suitable for use in zero gravity; and (8) that it provide ease of combing of wet and dry hair. The method of the invention includes the steps of wetting the skin and hair with a small quantity of water, lathering the skin with the paste, rinsing the lather from the skin and hair with a small quantity of water to produce a rinse water containing the cleansing agent, defoaming the rinse water, and supplying the defoamed rinse water to a water reclamation unit for recycling the water. The novelty of the invention appears to lie in the particular formulation of the cleansing agent and its method of use which provide optimal results under the given constraints and objectives.

Official Gazette of the U.S. Patent and Trademark Office

**N92-29227#** Harvard Coll. Observatory, Cambridge, MA.  
**THE ENERGETICS AND MECHANICS OF LOAD CARRYING**  
**Final Report, 1 Feb. 1988 - 31 Jan. 1989**

NORMAN C. HEGLUND 16 Jan. 1992 5 p

(Contract DAAL03-88-K-0032)

(AD-A248441) Avail: CASI HC A01/MF A01

African women commonly carry prodigious loads (70 percent or more of their body weight) supported by their heads for long distances. This method of load carriage is very economical; in a comparison of the metabolic cost of carrying large head-supported loads (by African women) to large back-supported loads (by American army recruits), it was found that the army recruits had to increase their metabolism twice as much as the women for the same load at the same walking speed. The mechanism by which these women carry loads so economically is unknown. The purpose of this study was to develop a quantitative understanding of how these women are able to carry head-supported loads so cheaply.

GRA

**N92-29348#** Army Aeromedical Research Lab., Fort Rucker, AL.

**VISUAL ACUITY WITH SECOND AND THIRD GENERATION NIGHT VISION GOGGLES OBTAINED FROM A NEW METHOD OF NIGHT SKY SIMULATION ACROSS A WIDE RANGE OF TARGET CONTRAST Final Report**

JOHN C. KOTULAK and CLARENCE E. RASH Jan. 1992 42 p

(Contract DA PROJ. 3M1-62787-A-79-B)

(AD-A248284; USAARL-92-9) Avail: CASI HC A03/MF A01

The purpose of this investigation was to study the primary factors which influence visual acuity (VA) with night vision goggles (NVGs). These factors are: night sky condition, target contrast, and NVG generation. Improved methods were used to simulate the night sky and to control for differences in target contrast which result from dissimilarities in spectral sensitivity between NVG generations. The new simulation method used combinations of spectrally flat (neutral density) and wavelength selective (blue glass) filters to reproduce the spectral distribution of the night sky across the entire NVG response range. Between-generation differences in target contrast were eliminated by weighting the incident radiant flux by the sensitivity of the detector. It was found that the difference in VA between the two generations widens under two conditions: (1) when target contrast is constant and night sky irradiance decreases; and (2) when night sky irradiance is constant and target contrast decreases. Furthermore, it was found that for a given NVG generation, VA falls off more rapidly for a low contrast target than for one of high contrast when night sky irradiance decreases.

GRA

**N92-29413\*#** Sterling (Walter V.), Inc., Palo Alto, CA.

**ARMY-NASA AIRCREW/AIRCRAFT INTEGRATION PROGRAM: PHASE 4 A(3) MAN-MACHINE INTEGRATION DESIGN AND ANALYSIS SYSTEM (MIDAS) SOFTWARE DETAILED DESIGN DOCUMENT**

CAROLYN BANDA, DAVID BUSHNELL, SCOTT CHEN, ALEX CHIU, BETSY CONSTANTINE, JERRY MURRAY, CHRISTIAN NEUKOM, MICHAEL PREVOST, RENUKA SHANKAR, and LOWELL STAVELAND Dec. 1991 514 p

(Contract NAS2-13210)

(NASA-CR-177593; A-92049; NAS 1.26:177593) Avail: CASI HC A22/MF A04

The Man-Machine Integration Design and Analysis System (MIDAS) is an integrated suite of software components that constitutes a prototype workstation to aid designers in applying human factors principles to the design of complex human-machine systems. MIDAS is intended to be used at the very early stages of conceptual design to provide an environment wherein designers can use computational representations of the crew station and operator, instead of hardware simulators and man-in-the-loop studies, to discover problems and ask 'what if' questions regarding the projected mission, equipment, and environment. This document is the Software Product Specification for MIDAS. Introductory descriptions of the processing requirements, hardware/software environment, structure, I/O, and control are given in the main body of the document for the overall MIDAS system, with detailed discussion of the individual modules included in Annexes A-J.

Author

**N92-29538#** Analysis and Technology, Inc., New London, CT.  
**EVALUATION OF NIGHT VISION GOGGLES (NVG) FOR MARITIME SEARCH AND RESCUE Interim Report No. 3, Mar. 1989 - Feb. 1991**

R. Q. ROBE, J. V. PLOURDE, and G. L. HOVER Jun. 1991 106 p

(Contract DTCG39-89-C-80671)

(AD-A247182; CGR/DC-19/91; USCG-D-03-92) Avail: CASI HC A06/MF A02

Three experiments were conducted during 1989 and two more have been conducted during 1990 by the U.S. Coast Guard Research and Development (R&D) Center to evaluate night vision goggles (NVGs) for their effectiveness in detecting small targets at night. Three types of NVGs were evaluated: the AN/AVS-6 Aviators Night Vision Imaging System (ANVIS) NVG was tested onboard Coast Guard HH-3 and CH-3 helicopters, and the AN/PVS-5C and AN/PVS-7A NVGs were tested onboard 41-foot Coast Guard utility boats (UTBs). During the Fall 1990 experiment, 4- and 6-person unlit life rafts, with and without retro-reflective tape and 18- and 21-foot white boats were employed as targets during realistically-simulated search missions and are discussed herein. A large quantity of well moonlit data were collected during the fall 1990 experiment and this third interim report discusses target types where new information was obtained. A total of 1,612 target detection opportunities were generated for the above-mentioned target types during the five experiments. These data were analyzed to determine which of 25 search parameters of interest exerted a statistically-significant influence on target detection probability. Lateral range curves and sweep width estimates are developed for each search unit/target type combination. Human factors data are presented and discussed. Recommendations for conducting NVG searches for small targets and for additional data collection and analysis are provided.

GRA

**N92-29949#** Texas Technological Univ., Lubbock. Dept. of Industrial Engineering.

**DEVELOPMENT OF MODELS FOR PREDICTION OF OPTIMAL LIFTING MOTION Final Report**

M. M. AYOUB 30 Sep. 1991 106 p Prepared for Centers for Disease Control, Atlanta, GA

(Contract NIOSH-R01-OH-02434)

(PB92-164656) Avail: CASI HC A06/MF A02

The angular movement of five human joints was simulated based on the invariant characteristics of manual lifting that are

multidirectional and multiarticular and executed by large muscle groups generating within maximum torques. The study dealt with only one set of performance limitations of manual lifting, those produced by the understanding of human physical capacities and task requirements. It was assumed that the body will perform the lifting motion pattern in such a fashion so as to minimize a cost function. Therefore, the focus of the research was to identify the paths of motion of each of five selected joints (elbow, shoulder, hip, knee, and ankle) within the feasible space which will minimize the cost function. Three different optimization searching algorithms were introduced to minimize the objective function representing the total work done in lifting. These algorithms were: heuristic dynamic programming, filtering by total enumeration, and the general reduced gradient algorithm. A comparison was made between the prediction of the five selected joints to the actual paths to illustrate the validity of the model. Author

**N92-30125\*#** Federal Aviation Administration, Washington, DC. Office of Aviation Medicine.

#### **HUMAN FACTORS IN AIRCRAFT MAINTENANCE AND INSPECTION**

WILLIAM T. SHEPHERD *In* NASA. Langley Research Center, The 1991 International Conference on Aging Aircraft and Structural Airworthiness p 301-304 Jul. 1992  
Avail: CASI HC A01/MF A04

The events which have led to the intensive study of aircraft structural problems have contributed in no less measure to the study of human factors which influence aircraft maintenance and inspection. Initial research emphasis on aging aircraft maintenance and inspection has since broadened to include all aircraft types. Technicians must be equally adept at repairing old and new aircraft. Their skills must include the ability to repair sheet metal and composite materials; control cable and fly-by-wire systems; round dials and glass cockpits. Their work performance is heavily influenced by others such as designers, technical writers, job card authors, schedulers, and trainers. This paper describes the activities concerning aircraft and maintenance human factors. Author

**N92-30126\*#** Galaxy Scientific Corp., Atlanta, GA.

#### **USING INTELLIGENT SIMULATION TO ENHANCE HUMAN PERFORMANCE IN AIRCRAFT MAINTENANCE**

WILLIAM B. JOHNSON and JEFFREY E. NORTON *In* NASA. Langley Research Center, The 1991 International Conference on Aging Aircraft and Structural Airworthiness p 305-313 Jul. 1992 (Contract DTFA03-89-C-00043)  
Avail: CASI HC A02/MF A04

Human factors research and development investigates the capabilities and limitations of the human within a system. Of the many variables affecting human performance in the aviation maintenance system, training is among the most important. The advent of advanced technology hardware and software has created intelligent training simulations. This paper describes one advanced technology training system under development for the Federal Aviation Administration. Author

## 55

### SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

**A92-46443**

#### **WHAT MAKES A PLANET HABITABLE, AND HOW TO SEARCH FOR HABITABLE PLANETS IN OTHER SOLAR SYSTEMS**

MICHAEL D. PAPAGIANNIS (Boston University, MA) British Interplanetary Society, Journal (ISSN 0007-094X), vol. 45, no. 6, June 1992, p. 227-230. refs

Copyright

This review examines the characteristics of habitable planets

where biologically advanced life could exist and lists some observational search techniques for such planets. Attention is given to the presence of liquid water and the importance of organic molecules, and consideration is given to temperature and the development of ozone layers in habitable planets. The availability of O<sub>2</sub> and/or O<sub>3</sub> in the atmospheres of these planets is shown to be a critical precondition for habitability. Where there are life forms on planets it is shown that oxygen is likely to accumulate in the atmosphere; this suggests that large IR arrays can be used to search for planets with free oxygen and ozone in their atmospheres. These planets are acknowledged to be more common than those with technologically advanced civilizations suggesting that the search for life in space could be expanded in this direction. C.C.S.

**A92-46445**

#### **CHEMICAL STUDIES ON THE EXISTENCE OF EXTRATERRESTRIAL LIFE**

CYRIL PONNAMPERUMA, YASUHIRO HONDA, and RAFAEL NAVARRO-GONZALEZ (Maryland, University, College Park) British Interplanetary Society, Journal (ISSN 0007-094X), vol. 45, no. 6, June 1992, p. 241-249. refs

Copyright

A composite scenario is developed based on synthetic experiments and analytical studies to describe the origin of life. The theories proposed by Oparin (1967) and Haldane (1967) are used to structure the knowledge synthesized from observations of the atmosphere, geology, and chemistry on earth. Particular treatment is given to the sources of energy on the primitive earth and the roles of monomers, oligomers, amino acids/nucleotides, and trace metal ions in the chemical evolution. Also reviewed are chirality, meteorite composition, interstellar matter and comets, and the composition of lunar samples. A scenario is described with five stages for the development of life in the universe detailing: (1) the synthesis of organic molecules during planet formation; (2) the accumulation of monomers and polymers in the lithosphere-atmosphere-hydrosphere system; (3) cometary delivery of organic matter; and (4) the evolution of 'protobionts' into primordial cells. C.C.S.

**A92-46446**

#### **CHEMISTRY OF THE INTERSTELLAR MEDIUM - AN EVOLUTIONARY DEAD END?**

M. D. NUSINOV, V. V. BURDIUZHAKA (Rossiiskaya Akademiia Nauk, Fizicheskii Institut, Moscow, Russia), and S. I. GLEIZER (Interbios, Moscow, Russia) British Interplanetary Society, Journal (ISSN 0007-094X), vol. 45, no. 6, June 1992, p. 251-255. Translation. refs

Copyright

Data are presented which show that biological evolution as it is presently understood is not tenable within the interstellar medium. Particular attention is given to the initial physicochemical precellular stages of evolution and to the composition of interstellar gas-dust clouds. General descriptions are given of dust-grain composition and interstellar molecules. Biological evolution is shown to require the simultaneous presence of liquid water, solid surfaces, and some definite carbon compounds. The function of mineral particles such as clay and clay minerals in evolutionary progress is assessed, and experimental evidence is listed that points to problems in the origin of chirality. Maximum bond energy occurs in molecules with 10-20 atoms, and a further increase is possible but with lower specific bond energies and low probabilities of formation. Therefore the increase in molecular complexity appears to come to a 'dead end' in the interstellar medium. C.C.S.

**A92-46447**

#### **TITAN AND EXOBIOLOGICAL ASPECTS OF THE CASSINI-HUYGENS MISSION**

F. RAULIN, C. FRERE, P. PAILLOUS, E. DE VANSSAY, L. DO, and M. KHLIFI (Paris XII, Universite, Creteil, France) British Interplanetary Society, Journal (ISSN 0007-094X), vol. 45, no. 6, June 1992, p. 257-271. refs

Copyright

The joint NASA-ESA Cassini-Huygens mission is discussed in terms of the study of extraterrestrial organic processes with the orbiter and the probe on or near Titan. The satellite of Saturn is described generally with specific references to the chemical composition of the stratospheric and atmospheric organic compounds. The compounds that are already known to exist near Titan are confirmed with results from simulations and models of N<sub>2</sub>-CH<sub>4</sub> evolution and other processes. The organic chemistry of Titan's surface is expected to have an ocean and strong surface-atmosphere coupling, and the principal likely components of the ocean are set forth. The Cassini-Huygens mission is expected to provide data that describe the atmosphere, aerosols, and hypothesized oceans. These data are important for learning more about prebiotic chemistry generally and for gas-phase organic chemistry at low temperatures. C.C.S.

collector is planned for use with the Cosmic Dust Collection Facility, and an active system is described for attachment to the Space Station Freedom payload. Exobiological study of cosmic dust could provide insights on organic chemistry in the grains and on the relative abundances of biogenic elements in interstellar, cometary, and meteoric samples. C.C.S.

**A92-48100\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**ON PERFORMING EXOBIOLOGY EXPERIMENTS ON AN EARTH-ORBITAL PLATFORM WITH THE GAS-GRAIN SIMULATION FACILITY**

JUDITH L. HUNTINGTON and GUY FOGLEMAN (NASA, Ames Research Center; SETI Institute; Moffett Field, CA) *Origins of Life and Evolution of the Biosphere* (ISSN 0169-6149), vol. 19, no. 3-5, 1989, p. 493, 494. refs  
Copyright

Laboratory simulations of gas-dust interactions performed on Space Station Freedom in the Gas-Grain Simulation Facility (GGSF) are considered for studying the nature of bodies in the solar system. The GGSF includes a 4-10 liter chamber for experiments with the capability for environmental control, measurement, levitation, and energy. The simulations can provide low gas pressure and dust density in a microgravitational environment. C.C.S.

**A92-48179**

**ORGANIC COMPOUNDS IN THE FOREST VALE, H4 ORDINARY CHONDRITE**

RENATO ZENOBI, JEAN-MICHEL PHILIPPOZ, RICHARD N. ZARE (Stanford University, CA), MICHAEL R. WING, JEFFREY L. BADA (Scripps Institution of Oceanography, La Jolla, CA), and KURT MARTI (California, University, La Jolla) *Geochimica et Cosmochimica Acta* (ISSN 0016-7037), vol. 56, no. 7, July 1992, p. 2899-2905. Research supported by IBM Corp. and U.S. Navy. refs  
(Contract NSF EAR-89-15829)

Copyright

The H4 ordinary chondrite Forest Vale was analyzed for polycyclic aromatic hydrocarbons (PAHs), using two-step laser mass spectrometry (L2MS) and, for amino acids, using a standard chromatographic method. Indigenous PAHs were identified in the matrices of freshly cleaved interior faces but could not be detected in pulverized silicates and chondrules. No depth dependence of the PAHs was found in a chipped interior piece. Amino acids, taken from the entire sample, consisted of protein amino acids that were nonracemic, indicating that they are terrestrial contaminants. The presence of indigenous PAHs and absence of indigenous amino acids provides support for the contention that different processes and environments contributed to the synthesis of the organic matter in the solar system. Author

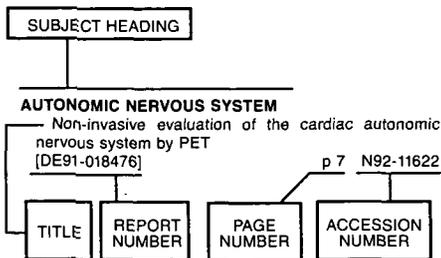
**A92-48225\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**COLLECTION OF COSMIC DUST IN EARTH ORBIT FOR EXOBIOLOGICAL ANALYSIS**

GUY FOGLEMAN, JUDITH L. HUNTINGTON (SETI Institute; NASA, Ames Research Center, Moffett Field, CA), and GLENN C. CARLE (NASA, Ames Research Center, Moffett Field, CA) *Origins of Life and Evolution of the Biosphere* (ISSN 0169-6149), vol. 19, no. 3-5, 1989, p. 465, 466. refs  
Copyright

Two proposed NASA exobiology flight experiments are described in terms of the approaches to cosmic dust collection and the issues addressed by the analysis of the samples. A passive

### Typical Subject Index Listing



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

## A

**ABIOTENESIS**  
Chemical studies on the existence of extraterrestrial life p 372 A92-46445

**ACCELERATION PROTECTION**  
Self-protective anti-Gz straining maneuvers (AGSM) physiology p 336 A92-48536

**ACCELERATION STRESSES (PHYSIOLOGY)**  
Determination of a pressure breathing schedule for improving +Gz tolerance p 334 A92-45815  
Cervical injuries during high G maneuvers - A review of Naval Safety Center data, 1980-1990 p 334 A92-45820

**ACCELERATION TOLERANCE**  
Determination of a pressure breathing schedule for improving +Gz tolerance p 334 A92-45815  
The case for recurrent training on human centrifuges p 367 A92-48538  
G-tolerance and spatial disorientation: Can simulation help us? p 337 N92-28534

**ACCIDENT PREVENTION**  
A workshop on understanding and preventing aircrew error p 339 A92-44902

**ACCIDENTS**  
A strategy for minimizing common mode human error in executing critical functions and tasks [DE92-011839] p 355 N92-28775

**ACHIEVEMENT**  
The effects of student-instructor interaction and paired/individual study on achievement in computer-based training [AD-A248518] p 358 N92-29503

**ACOUSTICS**  
Additivity and auditory pattern analysis [AD-A250580] p 358 N92-29592

**ACTIVITY CYCLES (BIOLOGY)**  
Utilization of potatoes for life support systems in space. I - Cultivar-photoperiod interactions p 365 A92-48395

Utilization of potatoes for life support systems. II - The effects of temperature under 24-h and 12-h photoperiods p 365 A92-48396  
Carbon dioxide effects on potato growth under different photoperiods and irradiance p 328 A92-48399

**ADAPTIVE FILTERS**  
Man-in-the-loop study of filtering in airborne head tracking tasks p 365 A92-46763

**ADRENAL METABOLISM**  
Effect of vibration on the metabolism of gamma-aminobutyric acid in the brain for different functional states of the adrenal cortex p 327 A92-46601

**AERONAUTICAL ENGINEERING**  
Revision of certification standards for aviation maintenance personnel p 359 N92-30127

**AEROSPACE MEDICINE**  
**COGSCREEN** - Personal computer-based tests of cognitive function for occupational medical certification p 332 A92-45010  
An overview of human factors R&D in flightdeck automation - The National Plan for Aviation Human Factors p 361 A92-45033  
Laser surgery procedures in the operational KC-135E aviation environment p 335 A92-45823  
G-tolerance and spatial disorientation: Can simulation help us? p 337 N92-28534  
Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 N92-29341  
Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) 8 [AD-A248283] p 339 N92-29347

**AGE FACTOR**  
Some factors associated with pilot age in general aviation crashes p 333 A92-45016

**AGREEMENTS**  
Revision of certification standards for aviation maintenance personnel p 359 N92-30127

**AIR NAVIGATION**  
Applying cognitive Instructional Systems Development to multinational airways facilities training p 345 A92-44971

**AIR TRAFFIC CONTROL**  
International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vols. 1 & 2 p 339 A92-44901  
When high is big and low is small, decisions aren't that hard at all - Analog encoding of altitude in C.D.T.I. revisited p 340 A92-44916  
Customizing the ATC computer-human interface via the use of controller preference sets p 361 A92-44968  
Exploring conceptual structures in air traffic control (ATC) p 345 A92-44970  
Cognitive task analysis of air traffic control p 345 A92-44972  
The human element in air traffic control (ATC) p 346 A92-44973  
Information transfer limitations in ATC p 346 A92-44974  
The human factors of team-building implications for ab initio training p 346 A92-44978  
Skill factors affecting team performance in simulated radar air traffic control p 346 A92-44979  
Taxonomy of ATC operator errors based on a model of human information processing p 346 A92-44980  
An overview of human factors R&D in flightdeck automation - The National Plan for Aviation Human Factors p 361 A92-45033  
The effects of unique encoding on the recall of numeric information p 351 A92-45067

**AIR TRAFFIC CONTROLLERS (PERSONNEL)**  
Collaboration in pilot-controller communication p 341 A92-44938  
Personality differences among supervisory selection program candidates p 345 A92-44962  
ATCS field training performance and success in a supervisory selection program p 345 A92-44963  
Candidate performance in a supervisory selection program and subsequent selection decisions p 345 A92-44964

Performance in the ATC screen program and supervisory selection program outcome p 345 A92-44965  
Cognitive indicators of ATCS technical ability and performance in a supervisory selection program p 345 A92-44966  
Customizing the ATC computer-human interface via the use of controller preference sets p 361 A92-44968  
Exploring conceptual structures in air traffic control (ATC) p 345 A92-44970  
Cognitive task analysis of air traffic control p 345 A92-44972  
The human element in air traffic control (ATC) p 346 A92-44973  
Information transfer limitations in ATC p 346 A92-44974  
Taxonomy of ATC operator errors based on a model of human information processing p 346 A92-44980

**AIR TRANSPORTATION**  
Vigilance of aircrews during long-haul flights p 333 A92-45021

**AIRCRAFT ACCIDENT INVESTIGATION**  
Aircrew coordination for Army helicopters - Improved procedures for accident investigation p 342 A92-44945  
Microcoding of communications in accident investigation - Crew coordination in United 811 and United 232 p 343 A92-44950  
Use of a human factors checklist in aircraft mishap investigations p 347 A92-44992  
Behavioral analysis of management actions in aircraft accidents p 347 A92-45001  
Inappropriate functioning of the cockpit dominance hierarchy as a factor in approach/landing accidents p 348 A92-45006  
Some factors associated with pilot age in general aviation crashes p 333 A92-45016  
*The frozen pilot syndrome* p 348 A92-45018  
The utilization of the aviation safety reporting system - A case study in pilot fatigue p 333 A92-45020  
Vigilance of aircrews during long-haul flights p 333 A92-45021  
An overview of human factors R&D in flightdeck automation - The National Plan for Aviation Human Factors p 361 A92-45033  
Teaching an old dog new tricks - Concepts, schemata and metacognition in pilot training and education p 350 A92-45046  
Knowledge transfer and support systems in fighter aircraft p 362 A92-45047  
'Pilot error' as information problem p 350 A92-45059  
Towards the validation of the five hazardous thoughts measure p 351 A92-45061

**AIRCRAFT ACCIDENTS**  
Aircrew coordination for Army helicopters - Research overview p 341 A92-44939

**AIRCRAFT COMMUNICATION**  
Coding techniques for rapid communication displays p 360 A92-44928

**AIRCRAFT CONSTRUCTION MATERIALS**  
Human factors in aircraft maintenance and inspection p 372 N92-30125

**AIRCRAFT CONTROL**  
The effect of adaptive function allocation on the cockpit design paradigm p 360 A92-44914

**AIRCRAFT DESIGN**  
Cockpit design consideration for highly agile aircraft p 362 A92-45051

**AIRCRAFT DETECTION**  
Target acquisition performance using spatially correlated auditory information over headphones p 347 A92-44988

**AIRCRAFT INSTRUMENTS**  
Specifying performance for a new generation of visioning simulators p 367 A92-48544

**AIRCRAFT LANDING**  
Inappropriate functioning of the cockpit dominance hierarchy as a factor in approach/landing accidents p 348 A92-45006  
Incremental transfer study of scene detail and visual augmentation guidance in landing training p 348 A92-45022

SUBJECT

- Visual augmentation and scene detail effects in flight training p 349 A92-45023  
 Visual properties for the transfer of landing skill p 349 A92-45024  
 Why pilots are least likely to get good decision making precisely when they need it most p 350 A92-45058
- AIRCRAFT MAINTENANCE**  
 A framework for optimizing total training systems - Application to maintenance training and team training systems [SAE PAPER 911972] p 353 A92-45379  
 Human factors in aircraft maintenance and inspection p 372 N92-30125  
 Using intelligent simulation to enhance human performance in aircraft maintenance p 372 N92-30126  
 Revision of certification standards for aviation maintenance personnel p 359 N92-30127
- AIRCRAFT MANEUVERS**  
 The prediction of engagement outcome during air combat maneuvering p 350 A92-45045  
 Cockpit design consideration for highly agile aircraft p 362 A92-45051  
 Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535
- AIRCRAFT PILOTS**  
 The emergency checklist, testing various layouts --- for A-310 aircraft pilots p 340 A92-44921  
 Pilot attitudes to cockpit automation p 340 A92-44926  
 Collaboration in pilot-controller communication p 341 A92-44938  
 Team building following a pilot labour dispute - Extending the CRM envelope p 344 A92-44955  
 Exogenous and endogenous determinants of cockpit management attitudes p 344 A92-44956  
 A survey of naval aviator opinions regarding unaided vision training topics p 347 A92-44991  
 Use of a human factors checklist in aircraft mishap investigations p 347 A92-44992  
 Flight anxiety of civilian student pilots p 348 A92-45019  
 Pragmatic simulation, basics and techniques p 361 A92-45030  
 Diverter - Perspectives on the integration and display of flight critical information using an expert system and menu-driven displays p 361 A92-45035  
 Relationship between mental models and scanning behavior during instrument approaches p 349 A92-45043  
 The use of an expert critic to improve aviation training p 350 A92-45049  
 The Pilot Judgement Styles Model super C - A new tool for training in decision-making p 351 A92-45063  
 Knowledge transfer and anticipation in airline piloting p 351 A92-45065  
 Information processing in ab initio pilot training p 351 A92-45066  
 The effects of unique encoding on the recall of numeric information p 351 A92-45067  
 Role of pilot's metaknowledge of their own reliability and capabilities p 351 A92-45068  
 Strategic behaviour in flight workload management p 352 A92-45074  
 Personality assessment in proposed USAF pilot selection and classification systems p 353 A92-45077  
 Changes of serum cortisol, insulin, glucagon, thyroxines and cyclic nucleotides pre- and post-flight in pilots p 335 A92-45946  
 An integrated methodology for knowledge and design acquisition --- development and evaluation of software tools for capturing pilot comprehension of tactical fighter mission p 366 A92-48526  
 The use of a tactile device to measure an illusion p 367 A92-48537  
 A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer [AD-A246683] p 368 N92-28286  
 Correlational analysis of survey and model-generated workload values [AD-A247153] p 368 N92-28518  
 Delays in laser glare onset differentially affect target-location performance in a visual search task [AD-A246708] p 355 N92-28557  
 Study of the loss of consciousness inflight by fighter aircraft pilots [ONERA-RTS-11/3446-EY] p 338 N92-28844  
 Neuropsychological components of object identification [AD-A247049] p 355 N92-28877  
 Methods of visual scanning with night vision goggles [AD-A247470] p 370 N92-28944
- AIRCRAFT RELIABILITY**  
 Teaching an old dog new tricks - Concepts, schemata and metacognition in pilot training and education p 350 A92-45046
- AIRCRAFT STRUCTURES**  
 Human factors in aircraft maintenance and inspection p 372 N92-30125
- AIRLINE OPERATIONS**  
 Lessons from cross-fleet/cross-airline observations - Evaluating the impact of CRM/LOFT training p 342 A92-44946  
 Behavioral interactions across various aircraft types - Results of systematic observations of line operations and simulations p 343 A92-44947  
 Exogenous and endogenous determinants of cockpit management attitudes p 344 A92-44956  
 KLM feedback and appraisal system for cockpit crew members p 344 A92-44960
- ALCOHOLS**  
 Alcoholism - An equal opportunity disease p 332 A92-45007  
 Professional pilots' evaluation of the extent, causes, and means of reduction of alcohol use in aviation p 348 A92-45009
- ALERTNESS**  
 Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes [AD-A247669] p 356 N92-28940
- ALTITUDE SICKNESS**  
 Effects of high terrestrial altitude on military performance [AD-A246695] p 336 N92-28288
- ALTITUDE SIMULATION**  
 Menstrual history in altitude chamber trainees p 335 A92-45822
- AMINO ACIDS**  
 Effect of vibration on the metabolism of gamma-aminobutyric acid in the brain for different functional states of the adrenal cortex p 327 A92-46601  
 Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179
- ANALOG SIMULATION**  
 On performing exobiology experiments on an earth-orbital platform with the Gas-Grain Simulation Facility p 373 A92-48100
- ANALYSIS (MATHEMATICS)**  
 Microbial aldolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735
- ANGLE OF ATTACK**  
 Cockpit design consideration for highly agile aircraft p 362 A92-45051
- ANTHROPOMETRY**  
 The anthropometric survey for JASDF men and women - 1988. I - Methods and statistics of body dimensions p 336 A92-47500
- ANTIgravity**  
 Range, energy, heat of motion in the modified NBC, anti-g, tank suit p 365 A92-46795
- ANTIAGING ADDITIVES**  
 Behavioral analysis of management actions in aircraft accidents p 347 A92-45001
- ANXIETY**  
 Flight anxiety of civilian student pilots p 348 A92-45019
- APPROACH AND LANDING TESTS (STS)**  
 The second flight simulator test of the head-up display for NAL QSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 N92-28831
- APPROACH CONTROL**  
 Visual properties for the transfer of landing skill p 349 A92-45024
- ARGON LASERS**  
 Delays in laser glare onset differentially affect target-location performance in a visual search task [AD-A246708] p 355 N92-28557
- ARMED FORCES (UNITED STATES)**  
 A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer [AD-A246683] p 368 N92-28286
- AROMATIC COMPOUNDS**  
 Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179
- ARRAYS**  
 Masking in three-dimensional auditory displays p 364 A92-46294
- ARTIFICIAL INTELLIGENCE**  
 Human performance in complex task environments - A basis for the application of adaptive automation p 340 A92-44911  
 Effects of shifts in the level of automation on operator performance p 340 A92-44912
- Acquisition and improvement of human motor skills: Learning through observation and practice [NASA-TM-107878] p 357 N92-29174
- ASCORBIC ACID**  
 Investigation of laser-induced retinal damage [AD-A250173] p 338 N92-28920
- ASTRONAUTS**  
 Thermoregulation during spaceflight [NASA-TM-103913] p 337 N92-28420
- ATTENTION**  
 Integrating the affective domain into the instructional design process [AD-A249287] p 355 N92-28880
- AUDITORY FACTS**  
 Inner ear barotrauma - A case for exploratory tympanotomy p 335 A92-45821  
 Effects of ionizing radiation on auditory and visual thresholds [AD-A248199] p 329 N92-29410
- AUDITORY FATIGUE**  
 Heart rate variability and auditory workload during noise stress - Speaker sex and bandpass effects on speech intelligibility p 333 A92-45011
- AUDITORY PERCEPTION**  
 Masking in three-dimensional auditory displays p 364 A92-46294  
 Minimum audible movement angle as a function of the azimuth and elevation of the source p 364 A92-46295  
 Demodulation processes in auditory perception [AD-A250203] p 356 N92-29146
- AUDITORY SIGNALS**  
 Target acquisition performance using spatially correlated auditory information over headphones p 347 A92-44988  
 Minimum audible movement angle as a function of the azimuth and elevation of the source p 364 A92-46295  
 Additivity and auditory pattern analysis [AD-A250580] p 358 N92-29592
- AUGMENTATION**  
 Incremental transfer study of scene detail and visual augmentation guidance in landing training p 348 A92-45022  
 Visual augmentation and scene detail effects in flight training p 349 A92-45023
- AUTOMATION**  
 Effects of shifts in the level of automation on operator performance p 340 A92-44912  
 Pilot attitudes to cockpit automation p 340 A92-44926
- AVIATION PSYCHOLOGY**  
 International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vols. 1 & 2 p 339 A92-44901  
 Stress management for the third revolution aviator p 339 A92-44903  
 Pilot attitudes to cockpit automation p 340 A92-44926  
 The Flight Management System - 'Rumors and facts' p 341 A92-44933  
 Communication variations related to leader personality p 341 A92-44934  
 Coordination strategies of crew management p 341 A92-44935  
 Aircrew coordination for Army helicopters - An exploration of the attitude-behavior-performance relationship p 342 A92-44940  
 The impact of initial and recurrent cockpit resource management training on attitudes p 343 A92-44949  
 Advanced CRM training for instructors and evaluators p 343 A92-44951  
 Pilot reaction to ultra-long-haul flying p 344 A92-44954  
 Exogenous and endogenous determinants of cockpit management attitudes p 344 A92-44956  
 Taxonomy of crew resource management - Information processing domain p 344 A92-44957  
 Cockpit resource management - A social psychological perspective p 344 A92-44958  
 A new generation of crew resource management training p 344 A92-44959  
 The human element in air traffic control (ATC) p 346 A92-44973  
 Psychological state vs. peripheral color perception p 346 A92-44987  
 Psychoactive drugs - Effects on cockpit performance p 332 A92-45008  
 EEG correlates of critical decision making in computer simulated combat p 333 A92-45014  
 The Bedford scale - Does it measure spare capacity? p 352 A92-45075  
 Culture-fairness of test methods - Problems in the selection of aviation personnel p 353 A92-45079
- AVIONICS**  
 An evaluation of flight path management automation in transport category aircraft p 360 A92-44918

- Electronic checklists - Evaluation of two levels of automation --- on flight crew performance p 360 A92-44924
- Avionics planning for future aeronautical systems - Pilot-vehicle interface (PVI) p 366 A92-48453
- A profile of scientist and engineer training conducted by the Naval Avionics Center [AD-A245925] p 354 N92-28408
- AZIMUTH**
- Minimum audible movement angle as a function of the azimuth and elevation of the source p 364 A92-46295
- B**
- BABOONS**
- Effects of ionizing radiation on auditory and visual thresholds [AD-A248199] p 329 N92-29410
- BACK INJURIES**
- Cervical injuries during high G maneuvers - A review of Naval Safety Center data, 1980-1990 p 334 A92-45820
- BACKGROUND NOISE**
- Effect of spatial frequency content of the background on visual detection of a known target p 353 A92-46277
- BACTERIA**
- Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737
- BACTERIOLOGY**
- Microbial aldonolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735
- BAROTRAUMA**
- Inner ear barotrauma - A case for exploratory tympanotomy p 335 A92-45821
- BATHING**
- Whole body cleaning agent containing N-acyltaurate [NASA-CASE-MS-C-21589-1] p 370 N92-29137
- BAYES THEOREM**
- Task performance on constrained reconstructions - Human observer performance compared with sub-optimal Bayesian performance p 354 A92-46278
- BEARING (DIRECTION)**
- Visual cues to geographical orientation during low-level flight p 346 A92-44984
- BEHAVIOR**
- Strategies for the study of flightcrew behavior p 343 A92-44948
- Study of SCN neurochemistry using in vivo microdialysis in the conscious brain: Correlation with overt circadian rhythms [AD-A247172] p 338 N92-28886
- Physiological analyses of the afferents controlling brain neurochemical systems [AD-A248334] p 359 N92-29930
- BEVERAGES**
- Coca-Cola space can undergoes successful test by cosmonauts onboard Soviet space station Mir p 365 A92-47682
- BIBLIOGRAPHIES**
- Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 N92-29341
- BINOULAR VISION**
- Non-linear analysis of visual cortical neurons [AD-A250233] p 338 N92-29179
- BIOCHEMISTRY**
- Study of SCN neurochemistry using in vivo microdialysis in the conscious brain: Correlation with overt circadian rhythms [AD-A247172] p 338 N92-28886
- Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737
- BIOCONVERSION**
- Flux-capacity relationships of Acinetobacter calcoaceticus enzymes during xylose oxidation p 331 N92-29739
- State estimation and control of the IBE-fermentation with product recovery p 331 N92-29756
- Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 N92-29759
- BIODYNAMICS**
- Observation of dynamic changes of rat soleus during tail suspension p 327 A92-45949
- BIOLOGICAL EFFECTS**
- Problems in mechanistic theoretical models for cell transformation by ionizing radiation [DE92-010265] p 336 N92-28278
- BIOLOGICAL EVOLUTION**
- What makes a planet habitable, and how to search for habitable planets in other solar systems p 372 A92-46443
- Evidence that eukaryotes and eocyte prokaryotes are immediate relatives p 328 A92-47309
- BIOLOGICAL MODELS (MATHEMATICS)**
- The membrane-electrolyte system - Model of the interaction of gravity with biological systems at the cellular level p 328 A92-48624
- The use of state estimators (observers) for on-line estimation of non-measurable process variables p 331 N92-29755
- BIOLUMINESCENCE**
- Bioluminescence in the western Alboran Sea in April 1991 [AD-A250016] p 329 N92-29089
- BIOMASS**
- Coupling plant growth and waste recycling systems in a controlled life support system (CELSS) [NASA-TM-107544] p 369 N92-28670
- On the estimation of bioenergetic parameters p 330 N92-29738
- BIOMETRICS**
- Comparison of current Shuttle and pre-Challenger flight suit reach capability during launch accelerations p 363 A92-45824
- BIOPROCESSING**
- State estimation and error diagnosis for biotechnological processes [ETN-92-91744] p 331 N92-29754
- The use of state estimators (observers) for on-line estimation of non-measurable process variables p 331 N92-29755
- State estimation and control of the IBE-fermentation with product recovery p 331 N92-29756
- A low sensitivity observer for complex biotechnological processes p 331 N92-29757
- Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 N92-29758
- BIOREACTORS**
- Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity [NASA-TP-3200] p 370 N92-28897
- The bioreactor overflow device: An undesired selective separator in continuous cultures? p 330 N92-29736
- BIOTECHNOLOGY**
- Analysis and experimental testing of a bottleneck model for the description of microbial dynamics p 331 N92-29740
- A low sensitivity observer for complex biotechnological processes p 331 N92-29757
- Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 N92-29758
- Sequential application of data reconciliation for sensitive detection of systematic errors p 332 N92-29760
- BLAST LOADS**
- Analysis of the mechanism and protection of upper limb windblast flailing injury p 335 A92-45947
- BLEEDING**
- Laser surgery procedures in the operational KC-135E aviation environment p 335 A92-45823
- BLOOD FLOW**
- Professional pilots' evaluation of the extent, causes, and means of reduction of alcohol use in aviation p 348 A92-45009
- Study of the loss of consciousness inflight by fighter aircraft pilots [ONERA-RTS-11/3446-EY] p 338 N92-28844
- BOATS**
- Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 N92-29538
- BODY SIZE (BIOLOGY)**
- The anthropometric survey for JASDF men and women - 1988. I - Methods and statistics of body dimensions p 336 A92-47500
- BODY TEMPERATURE**
- Modelling of heat and moisture loss through NBC ensembles [AD-A245939] p 368 N92-28346
- Thermoregulation during spaceflight [NASA-TM-103913] p 337 N92-28420
- BRAIN**
- Effect of vibration on the metabolism of gamma-aminobutyric acid in the brain for different functional states of the adrenal cortex p 327 A92-46601
- Effect of weak, extremely low-frequency magnetic fields on the time organization of exchange between thiol groups and lipid peroxidation products p 327 A92-46602
- The Coordinated Noninvasive Studies (CNS) project, phase 1 [AD-A247159] p 337 N92-28397
- Neuropsychological components of object identification [AD-A247049] p 355 N92-28877
- Study of SCN neurochemistry using in vivo microdialysis in the conscious brain: Correlation with overt circadian rhythms [AD-A247172] p 338 N92-28886
- Physiological analyses of the afferents controlling brain neurochemical systems [AD-A248334] p 359 N92-29930
- BRAIN DAMAGE**
- Neuropsychological components of object identification [AD-A247049] p 355 N92-28877
- C**
- CARBON DIOXIDE**
- Utilization of potatoes for life support systems in space. IV - Effect of CO<sub>2</sub> enrichment p 366 A92-48398
- Carbon dioxide effects on potato growth under different photoperiods and irradiance p 328 A92-48399
- Modelling and experimental validation of carbon dioxide evolution in alkalophilic cultures p 330 N92-29734
- CARBONACEOUS CHONDRITES**
- Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179
- CARCINOGENS**
- Problems in mechanistic theoretical models for cell transformation by ionizing radiation [DE92-010265] p 336 N92-28278
- Somatic gene mutation in the human in relation to radiation risk [DE92-009459] p 337 N92-28685
- CASSINI MISSION**
- Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447
- CATHODE RAY TUBES**
- Peripherally located CRTs - Color perception limitations p 354 A92-48548
- CELL MEMBRANES (BIOLOGY)**
- The membrane-electrolyte system - Model of the interaction of gravity with biological systems at the cellular level p 328 A92-48624
- CELLS (BIOLOGY)**
- Theoretical and experimental investigations on the fast rotating clinostat p 329 A92-48631
- Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity [NASA-TP-3200] p 370 N92-28897
- On the estimation of bioenergetic parameters p 330 N92-29738
- CENTER OF GRAVITY**
- Demodulation processes in auditory perception [AD-A250203] p 356 N92-29146
- CENTRAL NERVOUS SYSTEM**
- Psychoactive drugs - Effects on cockpit performance p 332 A92-45008
- CENTRIFUGING STRESS**
- The case for recurrent training on human centrifuges p 367 A92-48538
- CEREBRAL CORTEX**
- Non-linear analysis of visual cortical neurons [AD-A250233] p 338 N92-29179
- CERTIFICATION**
- Revision of certification standards for aviation maintenance personnel p 359 N92-30127
- CHANGE DETECTION**
- Judgments of change and proportion in graphical perception p 364 A92-46299
- CHAOS**
- In search of a unified theory of biological organization: What does the motor system of a sea slug tell us about human motor integration? [AD-A250223] p 356 N92-29119
- CHARGE COUPLED DEVICES**
- Portable dynamic fundus instrument [NASA-CASE-MS-C-21675-1] p 337 N92-28755
- CHEMICAL COMPOSITION**
- Chemical studies on the existence of extraterrestrial life p 372 A92-46445
- CHEMICAL DEFENSE**
- Range, energy, heat of motion in the modified NBC, anti-g, tank suit p 365 A92-46795
- CHEMICAL EVOLUTION**
- Chemical studies on the existence of extraterrestrial life p 372 A92-46445
- Chemistry of the interstellar medium - An evolutionary dead end? p 372 A92-46446
- CHEMICAL REACTIONS**
- Modelling and experimental validation of carbon dioxide evolution in alkalophilic cultures p 330 N92-29734
- CHEMICAL WARFARE**
- Contact lens wear with the USAF protective integrated hood/mask chemical defense ensemble p 363 A92-45814

## CHROMOSOMES

Primer on molecular genetics  
[DE92-010680] p 329 N92-28382

## CIRCADIAN RHYTHMS

Study of SCN neurochemistry using *in vivo* microdialysis in the conscious brain: Correlation with overt circadian rhythms  
[AD-A247172] p 338 N92-28886

## CIRCUITS

Non-linear analysis of visual cortical neurons  
[AD-A250233] p 338 N92-29179

## CIVIL AVIATION

Information management for commercial aviation - A research perspective p 359 A92-44905  
Flight deck information management - A challenge to commercial transport aviation p 359 A92-44908  
Synthetic vision in the Boeing high speed civil transport p 360 A92-44927

## CLASSIFICATIONS

On the effect of range restriction on correlation coefficient estimation  
[AD-A248956] p 358 N92-29620  
Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737

## CLEANERS

Whole body cleaning agent containing N-acyltaurate [NASA-CASE-MSC-21589-1] p 370 N92-29137

## CLINICAL MEDICINE

Medical imaging VI - Image processing; Proceedings of the Meeting, Newport Beach, CA, Feb. 24-27, 1992 [SPIE-1652] p 364 A92-46276

## CLOSED ECOLOGICAL SYSTEMS

Coupling plant growth and waste recycling systems in a controlled life support system (CELSS)  
[NASA-TM-107544] p 369 N92-28670  
Space life support engineering program  
[NASA-CR-190448] p 369 N92-28671  
A study of the control problem of the shoot side environment delivery system of a closed crop growth research chamber  
[NASA-CR-177597] p 369 N92-28681

## CLOTHING

Modelling of heat and moisture loss through NBC ensembles  
[AD-A245939] p 368 N92-28346

## COCKPIT SIMULATORS

Representing cockpit crew decision making p 350 A92-45057  
Delays in laser glare onset differentially affect target-location performance in a visual search task  
[AD-A246708] p 355 N92-28557  
Army-NASA aircrew/aircraft integration program: Phase 4 A(3) Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413

## COCKPITS

CRM scenario development - The next generation p 339 A92-44904  
The role of behavioral decision theory for cockpit information management p 340 A92-44907  
Automatic display management using dynamic plans and events p 359 A92-44910  
Effects of shifts in the level of automation on operator performance p 340 A92-44912  
Interface styles for adaptive automation --- in military aircraft cockpits p 359 A92-44913  
The effect of adaptive function allocation on the cockpit design paradigm p 360 A92-44914  
When high is big and low is small, decisions aren't that hard at all - Analog encoding of altitude in C.D.T.I. revisited p 340 A92-44916  
Training and cockpit design to promote expert performance p 340 A92-44917  
Pilot attitudes to cockpit automation p 340 A92-44926  
The myth of the adventuresome aviator p 348 A92-45005  
Inappropriate functioning of the cockpit dominance hierarchy as a factor in approach/landing accidents p 348 A92-45006  
Psychoactive drugs - Effects on cockpit performance p 332 A92-45008  
The interactive effects of cockpit resource management, domestic stress, and information processing in commercial aviation p 348 A92-45017  
Cockpit design consideration for highly agile aircraft p 362 A92-45051  
Aerospace crew station design  
[ISBN 0-444-87569-7] p 363 A92-45301  
Avionics planning for future aeronautical systems - Pilot-vehicle interface (PVI) p 366 A92-48453

A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer p 368 N92-28286  
[AD-A246683]  
Methods of visual scanning with night vision goggles  
[AD-A247470] p 370 N92-28944

## CODING

Neuropsychological components of object identification  
[AD-A247049] p 355 N92-28877

## COGNITION

Information management - Assessing the demand for information p 359 A92-44906  
Cognitive indicators of ATCS technical ability and performance in a supervisory selection program p 345 A92-44966  
Exploring conceptual structures in air traffic control (ATC) p 345 A92-44970  
Cognitive task analysis of air traffic control p 345 A92-44972  
Neuropsychological components of object identification  
[AD-A247049] p 355 N92-28877  
Integrating the affective domain into the instructional design process  
[AD-A249287] p 355 N92-28880  
Learning, teaching, and testing for complex conceptual understanding  
[AD-A248728] p 356 N92-29142

## COGNITIVE PSYCHOLOGY

Applying cognitive Instructional Systems Development to multinational airways facilities training p 345 A92-44971  
COGSCREEN - Personal computer-based tests of cognitive function for occupational medical certification p 332 A92-45010  
Topographic EEG correlates of perceptual defensiveness p 333 A92-45015  
Knowledge transfer and anticipation in airline piloting p 351 A92-45065  
Information processing in ab initio pilot training p 351 A92-45066  
Criterion Task Set (CTS) - Evaluation of cognitive task batteries p 353 A92-45078  
Studies of perceptual memory  
[AD-A250200] p 356 N92-29144  
Psychophysical analyses of perceptual representations  
[AD-A246945] p 357 N92-29186

## COLLECTION

Collection of cosmic dust in earth orbit for exobiological analysis p 373 A92-48225

## COLOR

Biologically-based neural network model of color constancy and color contrast  
[AD-A248128] p 357 N92-29398  
Object discrimination based on depth-from-occlusion  
[AD-A248104] p 358 N92-29560  
3-D TV without glasses p 367 A92-48541

## COLOR TELEVISION

Psychological state vs. peripheral color perception p 346 A92-44987

## COLOR VISION

Peripherally located CRTs - Color perception limitations p 354 A92-48548  
Biologically-based neural network model of color constancy and color contrast  
[AD-A248128] p 357 N92-29398  
Peripheral limitations on spatial vision  
[AD-A250579] p 358 N92-29591

## COMBAT

EEG correlates of critical decision making in computer simulated combat p 333 A92-45014  
The prediction of engagement outcome during air combat maneuvering p 350 A92-45045  
Role of pilot's metaknowledge of their own reliability and capabilities p 351 A92-45068  
A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer  
[AD-A246683] p 368 N92-28286

## COMFORT

Contact lens wear with the USAF protective integrated hood/mask chemical defense ensemble p 363 A92-45814

## COMMAND AND CONTROL

Compatibility and consistency in aircrew decision aiding p 362 A92-45056

## COMMERCIAL AIRCRAFT

Information management for commercial aviation - A research perspective p 359 A92-44905

## COMMUNICATING

Communication variations related to leader personality p 341 A92-44934

Coordination strategies of crew management p 341 A92-44935  
Information transfer and shared mental models for decision making p 341 A92-44937  
Collaboration in pilot-controller communication p 341 A92-44938  
Aircrew coordination for Army helicopters - Research overview p 341 A92-44939

## COMPUTER AIDED DESIGN

Army-NASA aircrew/aircraft integration program: Phase 4 A(3) Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413

## COMPUTER ANIMATION

A remote visual interface tool for simulation control and display p 368 A92-48547

## COMPUTER ASSISTED INSTRUCTION

Media selection analysis - Implications for training design  
[SAE PAPER 911971] p 353 A92-45378  
Integrating the affective domain into the instructional design process  
[AD-A249287] p 355 N92-28880  
The effects of student-instructor interaction and paired/individual study on achievement in computer-based training  
[AD-A248518] p 358 N92-29503

## COMPUTER GRAPHICS

Interface styles for adaptive automation --- in military aircraft cockpits p 359 A92-44913  
Multi-Attribute Task Battery - Applications in pilot workload and strategic behavior research p 352 A92-45072  
Big graphics and little screens - Designing graphical displays for maintenance tasks p 364 A92-46105  
Low-cost approaches to virtual flight simulation p 367 A92-48545

## COMPUTER NETWORKS

A systems theoretic investigation of neuronal network properties of the hippocampal formation  
[AD-A250246] p 357 N92-29334

## COMPUTER PROGRAMS

Investigation and evaluation of a computer program to minimize VFR flight planning errors p 362 A92-45062  
Language Research Center's Computerized Test System (LRC-CTS) - Video-formatted tasks for comparative primate research p 328 A92-48096  
Acquisition and improvement of human motor skills: Learning through observation and practice  
[NASA-TM-107878] p 357 N92-29174

## COMPUTER TECHNIQUES

Computer-based procedural training p 349 A92-45037  
The effects of student-instructor interaction and paired/individual study on achievement in computer-based training  
[AD-A248518] p 358 N92-29503

## COMPUTER VISION

Synthetic vision in the Boeing high speed civil transport p 360 A92-44927  
Method and apparatus for predicting the direction of movement in machine vision  
[NASA-CASE-NPO-17552-1-CU] p 370 N92-29129

## COMPUTERIZED SIMULATION

An evaluation of flight path management automation in transport category aircraft p 360 A92-44918  
EEG correlates of critical decision making in computer simulated combat p 333 A92-45014  
Variables affecting simulator sickness - Report of a semi-automatic scoring system p 333 A92-45029  
Flying an aircraft as a problem solving process - About the Instrument-Failure-Simulator (IFS) as a test for pilot applicants p 351 A92-45060  
Specifying performance for a new generation of visionics simulators p 367 A92-48544  
Theoretical and experimental investigations on the fast rotating cinostat p 329 A92-48631  
Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 N92-28744  
Method and apparatus for predicting the direction of movement in machine vision  
[NASA-CASE-NPO-17552-1-CU] p 370 N92-29129  
A systems theoretic investigation of neuronal network properties of the hippocampal formation  
[AD-A250246] p 357 N92-29334

## CONFERENCES

International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vols. 1 & 2 p 339 A92-44901  
Aerospace crew station design  
[ISBN 0-444-87569-7] p 363 A92-45301  
Medical imaging VI - Image processing; Proceedings of the Meeting, Newport Beach, CA, Feb. 24-27, 1992 [SPIE-1652] p 364 A92-46276

- Gordon research conference on Barrier Function of Mammalian Skin [AD-A248556] p 339 N92-29577
- CONSTRAINTS**  
Peripheral limitations on spatial vision [AD-A250579] p 358 N92-29591
- CONTACT LENSES**  
Contact lens wear with the USAF protective integrated hood/mask chemical defense ensemble p 363 A92-45814
- CONTROL SIMULATION**  
Skill factors affecting team performance in simulated radar air traffic control p 346 A92-44979
- CONTROL SYSTEMS DESIGN**  
Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 N92-28521  
A study of the control problem of the shoot side environment delivery system of a closed crop growth research chamber [NASA-CR-177597] p 369 N92-28681  
State estimation and control of the IBE-fermentation with product recovery p 331 N92-29756
- CONTROL THEORY**  
An extension of human optimal control model p 363 A92-45948
- CONTROLLERS**  
State estimation and error diagnosis for biotechnological processes [ETN-92-91744] p 331 N92-29754
- COOLING**  
Modelling of heat and moisture loss through NBC ensembles [AD-A245939] p 368 N92-28346
- CORIOLIS EFFECT**  
Histaminergic response to Coriolis stimulation - Implication for transdermal scopolamine therapy of motion sickness p 334 A92-45816
- CORNEA**  
Contact lens wear with the USAF protective integrated hood/mask chemical defense ensemble p 363 A92-45814
- CORRELATION COEFFICIENTS**  
On the effect of range restriction on correlation coefficient estimation [AD-A248956] p 358 N92-29620
- COSMIC DUST**  
Collection of cosmic dust in earth orbit for exobiological analysis p 373 A92-48225
- COSMIC RAYS**  
The effects of microgravity on the character of progeny of *Drosophila melanogaster* p 328 A92-48630
- COST REDUCTION**  
Computer-based procedural training p 349 A92-45037
- COUNTING**  
Chimpanzee counting and rhesus monkey ordinality judgments p 328 A92-48097
- CREW PROCEDURES (INFLIGHT)**  
The emergency checklist, testing various layouts --- for A-310 aircraft pilots p 340 A92-44921  
Electronic checklists - Evaluation of two levels of automation --- on flight crew performance p 360 A92-44924  
Philosophy, policies, and procedures - The three P's of flight-deck operations p 360 A92-44925  
Coordination strategies of crew management p 341 A92-44935  
Pilot reaction to ultra-long-haul flying p 344 A92-44954  
Correlational analysis of survey and model-generated workload values [AD-A247153] p 368 N92-28518
- CREW PROCEDURES (PREFLIGHT)**  
Behavioral analysis of management actions in aircraft accidents p 347 A92-45001
- CREW WORKSTATIONS**  
State-of-the-art pilot performance and workload measurement p 352 A92-45073  
Aerospace crew station design [ISBN 0-444-87569-7] p 363 A92-45301
- CROP GROWTH**  
Utilization of potatoes for life support systems in space. I - Cultivar-photoperiod interactions p 365 A92-48395  
Utilization of potatoes for life support systems. II - The effects of temperature under 24-h and 12-h photoperiods p 365 A92-48396  
Utilization of potatoes for life support systems in space. III - Productivity at successive harvest dates under 12-h and 24-h photoperiods p 365 A92-48397  
Utilization of potatoes for life support systems in space. IV - Effect of CO<sub>2</sub> enrichment p 366 A92-48398  
Carbon dioxide effects on potato growth under different photoperiods and irradiance p 328 A92-48399
- A study of the control problem of the shoot side environment delivery system of a closed crop growth research chamber [NASA-CR-177597] p 369 N92-28681
- CULTURE (SOCIAL SCIENCES)**  
Socio-cultural issues during long duration space missions [SAE PAPER 912075] p 353 A92-45452
- CULTURE TECHNIQUES**  
Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity p 370 N92-28897  
Modelling and experimental validation of carbon dioxide evolution in alkalophilic cultures p 330 N92-29734  
Microbial aldonolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735  
The bioreactor overflow device: An undesired selective separator in continuous cultures? p 330 N92-29736  
Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737
- CURVATURE**  
Curvature estimation in orientation selection [AD-A247862] p 356 N92-28957
- CYCLIC HYDROCARBONS**  
Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179
- CYTOCHROMES**  
Curvature estimation in orientation selection [AD-A247862] p 356 N92-28957
- CYTOLGY**  
Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817

## D

**DAMAGE ASSESSMENT**

Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system [AD-A247167] p 336 N92-28242

**DATA BASES**

Research in cooperative problem-solving systems for aviation p 362 A92-45036

**DATA PROCESSING**

Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737

**DATA SIMULATION**

A remote visual interface tool for simulation control and display p 368 A92-48547

**DECISION MAKING**

When high is big and low is small, decisions aren't that hard at all - Analog encoding of altitude in C.D.T.I. revisited p 340 A92-44916  
Expert decision-making strategies p 341 A92-44936  
Information transfer and shared mental models for decision making p 341 A92-44937  
Training implications of a team decision model p 342 A92-44941  
EEG correlates of critical decision making in computer simulated combat p 333 A92-45014  
The utilization of the aviation safety reporting system - A case study in pilot fatigue p 333 A92-45020  
Diverter - Perspectives on the integration and display of flight critical information using an expert system and menu-driven displays p 361 A92-45035  
Compatibility and consistency in aircrew decision aiding p 362 A92-45056  
Representing cockpit crew decision making p 350 A92-45057  
Why pilots are least likely to get good decision making precisely when they need it most p 350 A92-45058  
The Pilot Judgement Styles Model super C - A new tool for training in decision-making p 351 A92-45063  
Information processing in ab initio pilot training p 351 A92-45066

**DECISION THEORY**

The role of behavioral decision theory for cockpit information management p 340 A92-44907

**DECOMPRESSION SICKNESS**

Menstrual history in altitude chamber trainees p 335 A92-45822

**DEFENSE PROGRAM**

Early MPTS analysis - Methods in this 'madness' --- manpower, personnel, training, and safety early in DoD acquisition process p 366 A92-48533

**DEHYDRATION**

Cold and hypoxia p 335 A92-45950

**DEMULATION**

Demodulation processes in auditory perception [AD-A250203] p 356 N92-29146

**DEMOGRAPHY**

Exercise and three psychosocial variables: A longitudinal study [AD-A250649] p 339 N92-30216

**DEOXYRIBONUCLEIC ACID**

Problems in mechanistic theoretical models for cell transformation by ionizing radiation [DE92-010265] p 336 N92-28278

Primer on molecular genetics [DE92-010680] p 329 N92-28382

**DEPTH**

Object discrimination based on depth-from-occlusion [AD-A248104] p 358 N92-29560

**DESIGN ANALYSIS**

A new generation of U.S. Army flight helmets p 363 A92-45825

Integrating the affective domain into the instructional design process [AD-A249287] p 355 N92-28880

**DETECTION**

Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes [AD-A247669] p 356 N92-28940

Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 N92-29538

**DIAGNOSIS**

Portable dynamic fundus instrument [NASA-CASE-MSC-21675-1] p 337 N92-28755

State estimation and error diagnosis for biotechnological processes [ETN-92-91744] p 331 N92-29754

Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 N92-29759

**DICARBOXYLIC ACIDS**

Structural characterization of cross-linked hemoglobins developed as potential transfusion substitutes [AD-A246777] p 337 N92-28515

**DISCRIMINATION**

Additivity and auditory pattern analysis [AD-A250580] p 358 N92-29592

**DISEASES**

Alcoholism - An equal opportunity disease p 332 A92-45007

Professional pilots' evaluation of the extent, causes, and means of reduction of alcohol use in aviation p 348 A92-45009

**DISORIENTATION**

G-tolerance and spatial disorientation: Can simulation help us? p 337 N92-28534

**DISPLAY DEVICES**

Interface styles for adaptive automation --- in military aircraft cockpits p 359 A92-44913

When high is big and low is small, decisions aren't that hard at all - Analog encoding of altitude in C.D.T.I. revisited p 340 A92-44916

Synthetic vision in the Boeing high speed civil transport p 360 A92-44927  
Coding techniques for rapid communication displays p 360 A92-44928

Customizing the ATC computer-human interface via the use of controller preference sets p 361 A92-44968  
Psychological state vs. peripheral color perception p 346 A92-44987

Incremental transfer study of scene detail and visual augmentation guidance in landing training p 348 A92-45022

Visual augmentation and scene detail effects in flight training p 349 A92-45023  
Visual properties for the transfer of landing skill p 349 A92-45024

Big graphics and little screens - Designing graphical displays for maintenance tasks p 364 A92-46105  
Masking in three-dimensional auditory displays p 364 A92-46294

Apparent size and distance in an imaging display p 364 A92-46298  
3-D TV without glasses p 367 A92-48541

Peripherally located CRTs - Color perception limitations p 354 A92-48548

**DOSIMETERS**

Somatic gene mutation in the human in relation to radiation risk [DE92-009459] p 337 N92-28685

**DROSOPHILA**

The effects of microgravity on the character of progeny of *Drosophila melanogaster* p 328 A92-48630

**DRUGS**

Psychoactive drugs - Effects on cockpit performance p 332 A92-45008

**DYADICS**

A dyadic protocol for training complex skills p 354 A92-46300

## E

## EARDRUMS

Inner ear barotrauma - A case for exploratory tympanotomy p 335 A92-45821

## EARTH ORBITAL ENVIRONMENTS

On performing exobiology experiments on an earth-orbital platform with the Gas-Grain Simulation Facility p 373 A92-48100  
Collection of cosmic dust in earth orbit for exobiological analysis p 373 A92-48225

## EDEMA

Effects of high terrestrial altitude on military performance [AD-A246695] p 336 N92-28288

## EDUCATION

The human factors of team-building implications for ab initio training p 354 A92-44978  
Teaching an old dog new tricks - Concepts, schemata and metacognition in pilot training and education p 350 A92-45046  
A dyadic protocol for training complex skills p 354 A92-46300

A profile of scientist and engineer training conducted by the Naval Avionics Center p 354 N92-28408

Learning, teaching, and testing for complex conceptual understanding [AD-A248728] p 356 N92-29142

Exercise and three psychosocial variables: A longitudinal study [AD-A250649] p 339 N92-30216

## EFFECTORS

Acquisition and improvement of human motor skills: Learning through observation and practice [NASA-TM-107878] p 357 N92-29174

## EFFECTS

The effects of student-instructor interaction and paired/individual study on achievement in computer-based training [AD-A248518] p 358 N92-29503

## EJECTION INJURIES

Analysis of the mechanism and protection of upper limb windblast flailing injury p 335 A92-45947

## EJECTION SEATS

Analysis of the mechanism and protection of upper limb windblast flailing injury p 335 A92-45947

## ELECTROENCEPHALOGRAPHY

EEG correlates of critical decision making in computer simulated combat p 333 A92-45014  
Topographic EEG correlates of perceptual defensiveness p 333 A92-45015  
Multiple dipole modeling and localization from spatio-temporal MEG data --- Magnetoencephalogram p 327 A92-45983

## ELECTROLYTE METABOLISM

The membrane-electrolyte system - Model of the interaction of gravity with biological systems at the cellular level p 328 A92-48624

## ELECTROMAGNETIC COMPATIBILITY

Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) 8 [AD-A248283] p 339 N92-29347

## ELECTROMAGNETIC INTERFERENCE

Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) 8 [AD-A248283] p 339 N92-29347

## ELECTROPHYSIOLOGY

The Coordinated Noninvasive Studies (CNS) project, phase 1 [AD-A247159] p 337 N92-28397

## ELEVATION

Minimum audible movement angle as a function of the azimuth and elevation of the source p 364 A92-46295  
Visual perception of elevation [AD-A248338] p 357 N92-29420

## EMBEDDED COMPUTER SYSTEMS

Embedding training in a system p 367 A92-48546

## EMERGENCIES

The emergency checklist, testing various layouts --- for A-310 aircraft pilots p 340 A92-44921

## EMPLOYEE RELATIONS

Team building following a pilot labour dispute - Extending the CRM envelope p 344 A92-44955

## ENVIRONMENT POLLUTION

Purification and storage of waste gases on Space Station Freedom [AIAA PAPER 92-3607] p 368 A92-49073

## ENVIRONMENTAL TESTS

Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system [AD-A247167] p 336 N92-28242

## ENZYME ACTIVITY

Methodology on monitoring and modelling of microbial metabolism [ETN-92-91745] p 330 N92-29732

Flux-capacity relationships of Acinetobacter calcoaceticus enzymes during xylose oxidation p 331 N92-29739

## ERROR ANALYSIS

Investigation and evaluation of a computer program to minimize VFR flight planning errors p 362 A92-45062  
The effects of unique encoding on the recall of numeric information p 351 A92-45067  
A strategy for minimizing common mode human error in executing critical functions and tasks [DE92-011839] p 355 N92-28775

## ERRORS

Taxonomy of ATC operator errors based on a model of human information processing p 346 A92-44980  
Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes [AD-A247669] p 356 N92-28940  
Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737

## ERYTHROCYTES

Structural characterization of cross-linked hemoglobins developed as potential transfusion substitutes [AD-A246777] p 337 N92-28515

## ESTIMATING

Curvature estimation in orientation selection [AD-A247862] p 356 N92-28957

## EUKARYOTES

Evidence that eukaryotes and eocyte prokaryotes are immediate relatives p 328 A92-47309

## EVAPORATION RATE

Modelling of heat and moisture loss through NBC ensembles [AD-A245939] p 368 N92-28346

## EXO BIOLOGY

What makes a planet habitable, and how to search for habitable planets in other solar systems p 372 A92-46443

Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447

On performing exobiology experiments on an earth-orbital platform with the Gas-Grain Simulation Facility p 373 A92-48100

Collection of cosmic dust in earth orbit for exobiological analysis p 373 A92-48225

## EXPERIMENT DESIGN

The use of a tactile device to measure an illusion p 367 A92-48537

## EXPERT SYSTEMS

The effect of adaptive function allocation on the cockpit design paradigm p 360 A92-44914  
Training and cockpit design to promote expert performance p 340 A92-44917  
Applying cognitive Instructional Systems Development to multinational airways facilities training p 345 A92-44971

Diverter - Perspectives on the integration and display of flight critical information using an expert system and menu-driven displays p 361 A92-45035

An integrated methodology for knowledge and design acquisition --- development and evaluation of software tools for capturing pilot comprehension of tactical fighter mission p 366 A92-48526

Acquisition and improvement of human motor skills: Learning through observation and practice [NASA-TM-107878] p 357 N92-29174

## EXPOSURE

The chronic effects of JP-8 jet fuel exposure on the lungs [AD-A250308] p 338 N92-29123

## EXTRASOLAR PLANETS

What makes a planet habitable, and how to search for habitable planets in other solar systems p 372 A92-46443

## EXTRATERRESTRIAL LIFE

Chemical studies on the existence of extraterrestrial life p 372 A92-46445

## EXTRAVEHICULAR ACTIVITY

Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 N92-29341

## EYE (ANATOMY)

Portable dynamic fundus instrument [NASA-CASE-MS-C-21675-1] p 337 N92-28755

Non-linear analysis of visual cortical neurons [AD-A250233] p 338 N92-29179

Biologically-based neural network model of color constancy and color contrast [AD-A248128] p 357 N92-29398

Visual perception of elevation [AD-A248338] p 357 N92-29420

Peripheral limitations on spatial vision [AD-A250579] p 358 N92-29591

## EYE MOVEMENTS

The strategic integration of perception and action p 352 A92-45071

Program Cluster: An identification of fixation cluster characteristics [AD-A247014] p 354 N92-28396

## EYEPICES

Yellow lens effects upon visual acquisition performance p 334 A92-45813

## F

## FARM CROPS

A study of the control problem of the shoot side environment delivery system of a closed crop growth research chamber [NASA-CR-177597] p 369 N92-28681

## FEEDBACK CONTROL

Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535

## FEMALES

The energetics and mechanics of load carrying [AD-A248441] p 371 N92-29227

## FERMENTATION

State estimation and control of the IBE-fermentation with product recovery p 331 N92-29756

## FIGHTER AIRCRAFT

Knowledge transfer and support systems in fighter aircraft p 362 A92-45047

An integrated methodology for knowledge and design acquisition --- development and evaluation of software tools for capturing pilot comprehension of tactical fighter mission p 366 A92-48526

Embedding training in a system p 367 A92-48546

Fighter pilot training: The contribution of simulation [NLR-TP-89311-U] p 358 N92-29871

## FIGURE OF MERIT

An evaluation of strategic behaviors in a high fidelity simulated flight task - Comparing primary performance to a figure of merit p 351 A92-45069

## FLIGHT ALTITUDE

When high is big and low is small, decisions aren't that hard at all - Analog encoding of altitude in C.D.T.I. revisited p 340 A92-44916

## FLIGHT CLOTHING

Contact lens wear with the USAF protective integrated hood/mask chemical defense ensemble p 363 A92-45814

Comparison of current Shuttle and pre-Challenger flight suit reach capability during launch accelerations p 363 A92-45824

A new generation of U.S. Army flight helmets p 363 A92-45825

## FLIGHT CONTROL

An evaluation of flight path management automation in transport category aircraft p 360 A92-44918

Pilot attitudes to cockpit automation p 340 A92-44926

The effects of speech controls on performance in advanced helicopters in a double stimulation paradigm p 341 A92-44930

Compatibility and consistency in aircrew decision aiding p 362 A92-45056

## FLIGHT CREWS

A workshop on understanding and preventing aircrew error p 339 A92-44902

Information management - Assessing the demand for information p 359 A92-44906

Communication variations related to leader personality p 341 A92-44934

Coordination strategies of crew management p 341 A92-44935

Information transfer and shared mental models for decision making p 341 A92-44937

Aircrew coordination for Army helicopters - Research overview p 341 A92-44939

Aircrew coordination for Army helicopters - An exploration of the attitude-behavior-performance relationship p 342 A92-44940

Instructional strategy for aircrew coordination training p 342 A92-44942

The assessment of coordination demand for helicopter flight requirements p 342 A92-44943

Development of aircrew coordination exercises to facilitate training transfer p 342 A92-44944

Aircrew coordination for Army helicopters - Improved procedures for accident investigation p 342 A92-44945

Lessons from cross-fleet/cross-airline observations - Evaluating the impact of CRM/LOFT training p 342 A92-44946

Behavioral interactions across various aircraft types - Results of systematic observations of line operations and simulations p 343 A92-44947

Strategies for the study of flightcrew behavior p 343 A92-44948

- Microcoding of communications in accident investigation - Crew coordination in United 811 and United 232 p 343 A92-44950
- U.S. Navy aircrew coordination training - A progress report p 343 A92-44953
- Team building following a pilot labour dispute - Extending the CRM envelope p 344 A92-44955
- Exogenous and endogenous determinants of cockpit management attitudes p 344 A92-44956
- Taxonomy of crew resource management - Information processing domain p 344 A92-44957
- A new generation of crew resource management training p 344 A92-44959
- KLM feedback and appraisal system for cockpit crew members p 344 A92-44960
- Application of instructional systems development (ISD) principles to the Advanced Qualification Program (AQP) p 344 A92-44961
- Inappropriate functioning of the cockpit dominance hierarchy as a factor in approach/landing accidents p 348 A92-45006
- Vigilance of aircrews during long-haul flights p 333 A92-45021
- Research in cooperative problem-solving systems for aviation p 362 A92-45036
- Interactive video disk as an instructional tool in CRM programs p 362 A92-45040
- Knowledge transfer and support systems in fighter aircraft p 362 A92-45047
- What makes a good LOFT scenario? Issues in advancing current knowledge of scenario design --- Line Oriented Flight Training p 350 A92-45050
- Compatibility and consistency in aircrew decision aiding p 362 A92-45056
- Representing cockpit crew decision making p 350 A92-45057
- Multi-Attribute Task Battery - Applications in pilot workload and strategic behavior research p 352 A92-45072
- The Bedford scale - Does it measure spare capacity? p 352 A92-45075
- The case for recurrent training on human centrifuges p 367 A92-48538
- G-tolerance and spatial disorientation: Can simulation help us? p 337 N92-28534
- Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 N92-28744
- FLIGHT FATIGUE**
- The utilization of the aviation safety reporting system - A case study in pilot fatigue p 333 A92-45020
- Vigilance of aircrews during long-haul flights p 333 A92-45021
- FLIGHT FITNESS**
- Effects of gyro-fitness training on airsickness management p 348 A92-45013
- Key problems of medical examinations by aviation physicians p 336 A92-49229
- FLIGHT HAZARDS**
- Towards the validation of the five hazardous thoughts measure p 351 A92-45061
- FLIGHT MANAGEMENT SYSTEMS**
- The Flight Management System - 'Rumors and facts' p 341 A92-44933
- Individual differences in strategic flight management and scheduling p 352 A92-45076
- FLIGHT PATHS**
- An evaluation of flight path management automation in transport category aircraft p 360 A92-44918
- Divertor - Perspectives on the integration and display of flight critical information using an expert system and menu-driven displays p 361 A92-45035
- FLIGHT PLANS**
- Divertor - Perspectives on the integration and display of flight critical information using an expert system and menu-driven displays p 361 A92-45035
- Research in cooperative problem-solving systems for aviation p 362 A92-45036
- Investigation and evaluation of a computer program to minimize VFR flight planning errors p 362 A92-45062
- The Pilot Judgement Styles Model super C - A new tool for training in decision-making p 351 A92-45063
- Role of pilot's metaknowledge of their own reliability and capabilities p 351 A92-45068
- An evaluation of strategic behaviors in a high fidelity simulated flight task - Comparing primary performance to a figure of merit p 351 A92-45069
- Individual differences in strategic flight management and scheduling p 352 A92-45076
- FLIGHT SAFETY**
- A workshop on understanding and preventing aircrew error p 339 A92-44902
- Electronic checklists - Evaluation of two levels of automation --- on flight crew performance p 360 A92-44924
- Philosophy, policies, and procedures - The three P's of flight-deck operations p 360 A92-44925
- Pilot reaction to ultra-long-haul flying p 344 A92-44954
- Use of a human factors checklist in aircraft mishap investigations p 347 A92-44992
- The myth of the adventuresome aviator p 348 A92-45005
- Some factors associated with pilot age in general aviation crashes p 333 A92-45016
- The utilization of the aviation safety reporting system - A case study in pilot fatigue p 333 A92-45020
- The use of an expert critic to improve aviation training p 350 A92-45049
- Role of pilot's metaknowledge of their own reliability and capabilities p 351 A92-45068
- FLIGHT SIMULATION**
- Behavioral interactions across various aircraft types - Results of systematic observations of line operations and simulations p 343 A92-44947
- Time estimation in flight p 361 A92-44983
- Relationship between surface texture and object density on judgements of velocity, altitude, and change of altitude p 347 A92-44990
- Pragmatic simulation, basics and techniques p 361 A92-45030
- The use of simulation in human factors test and evaluation of the LH helicopter p 361 A92-45031
- An evaluation of strategic behaviors in a high fidelity simulated flight task - Comparing primary performance to a figure of merit p 351 A92-45069
- Low-cost approaches to virtual flight simulation p 367 A92-48545
- Correlational analysis of survey and model-generated workload values [AD-A247153] p 368 N92-28518
- G-tolerance and spatial disorientation: Can simulation help us? p 337 N92-28534
- FLIGHT SIMULATORS**
- Electronic checklists - Evaluation of two levels of automation --- on flight crew performance p 360 A92-44924
- Motion cuing for marginal flight - Is it information or isn't it? p 361 A92-45032
- Transfer of training from a low cost helicopter simulator p 349 A92-45038
- The prediction of engagement outcome during air combat maneuvering p 350 A92-45045
- Individual differences in strategic flight management and scheduling p 352 A92-45076
- Use of a motion sickness history questionnaire for prediction of simulator sickness p 334 A92-45818
- Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 N92-28744
- The second flight simulator test of the head-up display for NAL QSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 N92-28831
- Fighter pilot training: The contribution of simulation [NLR-TP-89311-U] p 358 N92-29871
- FLIGHT STRESS**
- Stress management for the third revolution aviator p 339 A92-44903
- CRM scenario development - The next generation p 339 A92-44904
- Effects of gyro-fitness training on airsickness management p 348 A92-45013
- FLIGHT STRESS (BIOLOGY)**
- The interactive effects of cockpit resource management, domestic stress, and information processing in commercial aviation p 348 A92-45017
- Changes of serum cortisol, insulin, glucagon, thyroxines and cyclic nucleotides pre- and post-flight in pilots p 335 A92-45946
- FLIGHT TESTS**
- Laser surgery procedures in the operational KC-135E aviation environment p 335 A92-45823
- FLIGHT TIME**
- Pilot reaction to ultra-long-haul flying p 344 A92-44954
- Time estimation in flight p 361 A92-44983
- FLIGHT TRAINING**
- Lessons from cross-fleet/cross-airline observations - Evaluating the impact of CRM/LOFT training p 342 A92-44946
- Strategies for the study of flightcrew behavior p 343 A92-44948
- The impact of initial and recurrent cockpit resource management training on attitudes p 343 A92-44949
- Advanced CRM training for instructors and evaluators p 343 A92-44951
- Crew member and instructor evaluations of line oriented flight training p 343 A92-44952
- U.S. Navy aircrew coordination training - A progress report p 343 A92-44953
- Taxonomy of crew resource management - Information processing domain p 344 A92-44957
- A new generation of crew resource management training p 344 A92-44959
- Application of instructional systems development (ISD) principles to the Advanced Qualification Program (AQP) p 344 A92-44961
- A survey of naval aviator opinions regarding unaided vision training topics p 347 A92-44991
- Comparative analysis of MMPI profiles in two groups of ab-initio flying trainees p 347 A92-45004
- The myth of the adventuresome aviator p 348 A92-45005
- Inappropriate functioning of the cockpit dominance hierarchy as a factor in approach/landing accidents p 348 A92-45006
- Effects of gyro-fitness training on airsickness management p 348 A92-45013
- Visual augmentation and scene detail effects in flight training p 349 A92-45023
- Variables affecting simulator sickness - Report of a semi-automatic scoring system p 333 A92-45029
- Motion cuing for marginal flight - Is it information or isn't it? p 361 A92-45032
- Computer-based procedural training p 349 A92-45037
- Interactive video disk as an instructional tool in CRM programs p 362 A92-45040
- The prediction of engagement outcome during air combat maneuvering p 350 A92-45045
- The use of an expert critic to improve aviation training p 350 A92-45049
- What makes a good LOFT scenario? Issues in advancing current knowledge of scenario design --- Line Oriented Flight Training p 350 A92-45050
- FLUID MANAGEMENT**
- Purification and storage of waste gases on Space Station Freedom [AIAA PAPER 92-3607] p 368 A92-49073
- FLUOROSCOPY**
- Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system [AD-A247167] p 336 N92-28242
- FLUX (RATE)**
- Flux-capacity relationships of Acinetobacter calcoaceticus enzymes during xylose oxidation p 331 N92-29739
- FLYING PERSONNEL**
- Culture-fairness of test methods - Problems in the selection of aviation personnel p 353 A92-45079

## G

## GAS GUNS

- Effects of extremely high G acceleration forces on NASA's control and space exposed tomato seeds [AD-A247488] p 329 N92-28247

## GAS PRESSURE

- In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397

## GASEOUS ROCKET PROPELLANTS

- Purification and storage of waste gases on Space Station Freedom [AIAA PAPER 92-3607] p 368 A92-49073

## GENERAL AVIATION AIRCRAFT

- Some factors associated with pilot age in general aviation crashes p 333 A92-45016

## GENES

- Evidence that eukaryotes and eocyte prokaryotes are immediate relatives p 328 A92-47309
- Primer on molecular genetics [DE92-010680] p 329 N92-28382
- Somatic gene mutation in the human in relation to radiation risk [DE92-009459] p 337 N92-28685

## GENETIC CODE

- Primer on molecular genetics [DE92-010680] p 329 N92-28382

## GENETICS

- Problems in mechanistic theoretical models for cell transformation by ionizing radiation [DE92-010265] p 336 N92-28278
- Primer on molecular genetics [DE92-010680] p 329 N92-28382
- Somatic gene mutation in the human in relation to radiation risk [DE92-009459] p 337 N92-28685

## GERMINATION

- Effects of extremely high G acceleration forces on NASA's control and space exposed tomato seeds [AD-A247488] p 329 N92-28247

## GLARE

Delays in laser glare onset differentially affect target-location performance in a visual search task [AD-A246708] p 355 N92-28557

## GLOVES

Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 N92-28521

## GOGGLES

Methods of visual scanning with night vision goggles [AD-A247470] p 370 N92-28944  
Visual acuity with second and third generation night vision goggles obtained from a new method of night sky simulation across a wide range of target contrast [AD-A248284] p 371 N92-29348  
Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 N92-29538

## GRADIENTS

Improvement of connectionist learning processes, working according to the gradients method [ETN-92-91335] p 355 N92-28787

## GRANTS

Super auditory localization for improved human-machine interfaces [AD-A250288] p 370 N92-29121

## GRAPHS (CHARTS)

Judgments of change and proportion in graphical perception p 364 A92-46299

## GRAVITATIONAL EFFECTS

The membrane-electrolyte system - Model of the interaction of gravity with biological systems at the cellular level p 328 A92-48624  
In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397

## GROUP DYNAMICS

Communication variations related to leader personality p 341 A92-44934  
Coordination strategies of crew management p 341 A92-44935  
Expert decision-making strategies p 341 A92-44936  
Information transfer and shared mental models for decision making p 341 A92-44937  
Aircrew coordination for Army helicopters - Research overview p 341 A92-44939  
Aircrew coordination for Army helicopters - An exploration of the attitude-behavior-performance relationship p 342 A92-44940  
Training implications of a team decision model p 342 A92-44941  
Instructional strategy for aircrew coordination training p 342 A92-44942  
The assessment of coordination demand for helicopter flight requirements p 342 A92-44943  
Development of aircrew coordination exercises to facilitate training transfer p 342 A92-44944  
Aircrew coordination for Army helicopters - Improved procedures for accident investigation p 342 A92-44945

Behavioral interactions across various aircraft types - Results of systematic observations of line operations and simulations p 343 A92-44947  
Strategies for the study of flightcrew behavior p 343 A92-44948

The impact of initial and recurrent cockpit resource management training on attitudes p 343 A92-44949  
Microcoding of communications in accident investigation - Crew coordination in United 811 and United 232 p 343 A92-44950

U.S. Navy aircrew coordination training - A progress report p 343 A92-44953

Team building following a pilot labour dispute - Extending the CRM envelope p 344 A92-44955  
Cockpit resource management - A social psychological perspective p 344 A92-44958

KLM feedback and appraisal system for cockpit crew members p 344 A92-44960

The human factors of team-building implications for ab initio training p 346 A92-44978

Skill factors affecting team performance in simulated radar air traffic control p 346 A92-44979

Socio-cultural issues during long duration space missions [SAE PAPER 912075] p 353 A92-45452

## H

## HABITABILITY

What makes a planet habitable, and how to search for habitable planets in other solar systems p 372 A92-46443

## HAMSTERS

Study of SCN neurochemistry using in vivo microdialysis in the conscious brain: Correlation with overt circadian rhythms [AD-A247172] p 338 N92-28886

## HAZARDS

The chronic effects of JP-8 jet fuel exposure on the lungs [AD-A250308] p 338 N92-29123

## HEAD MOVEMENT

Man-in-the-loop study of filtering in airborne head tracking tasks p 365 A92-46763  
The use of a tactile device to measure an illusion p 367 A92-48537

## HEAD-UP DISPLAYS

Attentional issues in superimposed flight symbology p 361 A92-44986  
Knowledge transfer and support systems in fighter aircraft p 362 A92-45047  
The second flight simulator test of the head-up display for NAL QSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 N92-28831

## HEALTH

Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 N92-29341  
Exercise and three psychosocial variables: A longitudinal study [AD-A250649] p 339 N92-30216

## HEART RATE

Heart rate variability and auditory workload during noise stress - Speaker sex and bandpass effects on speech intelligibility p 333 A92-45011  
Heart rate variability as an index for pilot workload p 333 A92-45012

## HEAT ACCLIMATIZATION

Sustained attention and serial responding in heat - Mental effort in the control of performance p 334 A92-45819

## HEAT TRANSFER

Modelling of heat and moisture loss through NBC ensembles [AD-A245939] p 368 N92-28346

## HELICOPTER CONTROL

The effects of speech controls on performance in advanced helicopters in a double stimulation paradigm p 341 A92-44930  
Time estimation in flight p 361 A92-44983

## HELICOPTERS

Visual cues to geographical orientation during low-level flight p 346 A92-44984  
Correlational analysis of survey and model-generated workload values [AD-A247153] p 368 N92-28518  
Methods of visual scanning with night vision goggles [AD-A247470] p 370 N92-28944  
Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 N92-29538

## HELMET MOUNTED DISPLAYS

Man-in-the-loop study of filtering in airborne head tracking tasks p 365 A92-46763  
Low-cost approaches to virtual flight simulation p 367 A92-48545

## HELMETS

Cervical injuries during high G maneuvers - A review of Naval Safety Center data, 1980-1990 p 334 A92-45820  
A new generation of U.S. Army flight helmets p 363 A92-45825

## HEMODYNAMIC RESPONSES

Self-protective anti-Gz straining maneuvers (AGSM) physiology p 336 A92-48536

## HEMOGLOBIN

Structural characterization of cross-linked hemoglobins developed as potential transfusion substitutes [AD-A246777] p 337 N92-28515

## HIGH ACCELERATION

Effects of extremely high G acceleration forces on NASA's control and space exposed tomato seeds [AD-A247488] p 329 N92-28247

## HIGH ALTITUDE ENVIRONMENTS

Effects of high terrestrial altitude on military performance [AD-A246695] p 336 N92-28288

## HIGH RESOLUTION

Bioluminescence in the western Alboran Sea in April 1991 [AD-A250016] p 329 N92-29089

## HIGH TEMPERATURE ENVIRONMENTS

Sustained attention and serial responding in heat - Mental effort in the control of performance p 334 A92-45819

## HIGH TEMPERATURE TESTS

Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system [AD-A247167] p 336 N92-28242

## HIPPOCAMPUS

A systems theoretic investigation of neuronal network properties of the hippocampal formation [AD-A250246] p 357 N92-29334

## HISTAMINES

Histaminergic response to Coriolis stimulation - Implication for transdermal scopolamine therapy of motion sickness p 334 A92-45816

## HORMONES

Changes of serum cortisol, insulin, glucagon, thyroxines and cyclic nucleotides pre- and post-flight in pilots p 335 A92-45946

## HUMAN BEHAVIOR

The role of behavioral decision theory for cockpit information management p 340 A92-44907  
Behavioral analysis of management actions in aircraft accidents p 347 A92-45001  
The myths of pilot personality stereotypes p 347 A92-45003  
The myth of the adventuresome aviator p 348 A92-45005  
Inappropriate functioning of the cockpit dominance hierarchy as a factor in approach/landing accidents p 348 A92-45006  
Alcoholism - An equal opportunity disease p 332 A92-45007  
The frozen pilot syndrome p 348 A92-45018  
Research in cooperative problem-solving systems for aviation p 362 A92-45036  
Relationship between mental models and scanning behavior during instrument approaches p 349 A92-45043  
On operator strategic behavior p 350 A92-45053  
The effects of task difficulty and resource requirements on attention strategies p 352 A92-45070  
Strategic behaviour in flight workload management p 352 A92-45074  
Collective behavior and team performance p 354 A92-46296

## HUMAN BEINGS

Visual perception of elevation [AD-A248338] p 357 N92-29420  
Peripheral limitations on spatial vision [AD-A250579] p 358 N92-29591

## HUMAN CENTRIFUGES

Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535  
The case for recurrent training on human centrifuges p 367 A92-48538  
G-tolerance and spatial disorientation: Can simulation help us? p 337 N92-28534

## HUMAN FACTORS ENGINEERING

International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vols. 1 & 2 p 339 A92-44901  
The emergency checklist, testing various layouts --- for A-310 aircraft pilots p 340 A92-44921  
Customizing the ATC computer-human interface via the use of controller preference sets p 361 A92-44968  
Attentional issues in superimposed flight symbology p 361 A92-44986  
Psychological state vs. peripheral color perception p 346 A92-44987  
The use of simulation in human factors test and evaluation of the LH helicopter p 361 A92-45031  
An overview of human factors R&D in flightdeck automation - The National Plan for Aviation Human Factors p 361 A92-45033  
On operator strategic behavior p 350 A92-45053  
'Pilot error' as information problem p 350 A92-45059  
Architectural studies relating to the nature of human body motion in microgravity [SAE PAPER 912076] p 363 A92-45453  
A new generation of U.S. Army flight helmets p 363 A92-45825  
Big graphics and little screens - Designing graphical displays for maintenance tasks p 364 A92-46105  
A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer [AD-A246683] p 368 N92-28286  
Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 N92-28521  
A strategy for minimizing common mode human error in executing critical functions and tasks [DE92-011839] p 355 N92-28775

- Super auditory localization for improved human-machine interfaces  
[AD-A250288] p 370 N92-29121
- Visual acuity with second and third generation night vision goggles obtained from a new method of night sky simulation across a wide range of target contrast  
[AD-A248284] p 371 N92-29348
- Army-NASA aircrew/aircraft integration program: Phase 4 A(3) Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document  
[NASA-CR-177593] p 371 N92-29413
- Human factors in aircraft maintenance and inspection p 372 N92-30125
- Using intelligent simulation to enhance human performance in aircraft maintenance p 372 N92-30126
- HUMAN PERFORMANCE**
- Performance in the ATC screen program and supervisory selection program outcome p 345 A92-44965
- Sustained attention and serial responding in heat - Mental effort in the control of performance p 334 A92-45819
- Task performance on constrained reconstructions - Human observer performance compared with sub-optimal Bayesian performance p 354 A92-46278
- Collective behavior and team performance p 354 A92-46296
- Effects of high terrestrial altitude on military performance  
[AD-A246695] p 336 N92-28288
- Program Cluster: An identification of fixation cluster characteristics  
[AD-A247014] p 354 N92-28396
- The Coordinated Noninvasive Studies (CNS) project, phase 1  
[AD-A247159] p 337 N92-28397
- Correlational analysis of survey and model-generated workload values  
[AD-A247153] p 368 N92-28518
- A strategy for minimizing common mode human error in executing critical functions and tasks  
[DE92-011839] p 355 N92-28775
- Integrating the affective domain into the instructional design process  
[AD-A249287] p 355 N92-28880
- Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes  
[AD-A247669] p 356 N92-28940
- Acquisition and improvement of human motor skills: Learning through observation and practice  
[NASA-TM-107878] p 357 N92-29174
- The energetics and mechanics of load carrying  
[AD-A248441] p 371 N92-29227
- Development of models for prediction of optimal lifting motion  
[PB92-164656] p 371 N92-29949
- Using intelligent simulation to enhance human performance in aircraft maintenance p 372 N92-30126
- HUMAN REACTIONS**
- Pilot attitudes to cockpit automation p 340 A92-44926
- Pilot reaction to ultra-long-haul flying p 344 A92-44954
- A survey of naval aviator opinions regarding unaided vision training topics p 347 A92-44991
- HYDROLYSIS**
- Microbial aldolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735
- HYDROPONICS**
- Coupling plant growth and waste recycling systems in a controlled life support system (CELSS)  
[NASA-TM-107544] p 369 N92-28670
- HYPERTENSION**
- Self-protective anti-Gz straining maneuvers (AGSM) physiology p 336 A92-48536
- HYPERTHERMIA**
- Thermoregulation during spaceflight  
[NASA-TM-103913] p 337 N92-28420
- HYPOBARIC ATMOSPHERES**
- Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817
- Menstrual history in altitude chamber trainees p 335 A92-45822
- HYPODYNAMIA**
- Observation of dynamic changes of rat soleus during tail suspension p 327 A92-45949
- HYPOKINESIA**
- Observation of dynamic changes of rat soleus during tail suspension p 327 A92-45949
- HYPOXIA**
- Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817
- Cold and hypoxia p 335 A92-45950
- Effects of high terrestrial altitude on military performance  
[AD-A246695] p 336 N92-28288
- ILLUMINATION**
- Utilization of potatoes for life support systems in space. I - Cultivar-photoperiod interactions p 365 A92-48395
- Utilization of potatoes for life support systems. II - The effects of temperature under 24-h and 12-h photoperiods p 365 A92-48396
- Carbon dioxide effects on potato growth under different photoperiods and irradiance p 328 A92-48399
- IMAGE ANALYSIS**
- Task performance on constrained reconstructions - Human observer performance compared with sub-optimal Bayesian performance p 354 A92-46278
- Statistical differentiation between malignant and benign prostate lesions from ultrasound images p 364 A92-46279
- IMAGE CONTRAST**
- Dynamic contrast sensitivity p 347 A92-44989
- IMAGE PROCESSING**
- Synthetic vision in the Boeing high speed civil transport p 360 A92-44927
- Medical imaging VI - Image processing; Proceedings of the Meeting, Newport Beach, CA, Feb. 24-27, 1992 [SPIE-1652] p 364 A92-46276
- Method and apparatus for predicting the direction of movement in machine vision  
[NASA-CASE-NPO-17552-1-CU] p 370 N92-29129
- IMAGES**
- Apparent size and distance in an imaging display p 364 A92-46298
- IMAGING TECHNIQUES**
- Task performance on constrained reconstructions - Human observer performance compared with sub-optimal Bayesian performance p 354 A92-46278
- Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system  
[AD-A247167] p 336 N92-28242
- The Coordinated Noninvasive Studies (CNS) project, phase 1  
[AD-A247159] p 337 N92-28397
- Visual acuity with second and third generation night vision goggles obtained from a new method of night sky simulation across a wide range of target contrast  
[AD-A248284] p 371 N92-29348
- IMMOBILIZATION**
- Effect of the blocking of beta receptors on the state of the lysosomal apparatus in neutrophilic leukocytes in the peripheral blood of rabbits subjected to immobilization stress p 328 A92-46603
- IMPROVEMENT**
- Improvement of connectionist learning processes, working according to the gradients method  
[ETN-92-91335] p 355 N92-28787
- INFORMATION MANAGEMENT**
- International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vols. 1 & 2 p 339 A92-44901
- Information management for commercial aviation - A research perspective p 359 A92-44905
- Information management - Assessing the demand for information p 359 A92-44906
- The role of behavioral decision theory for cockpit information management p 340 A92-44907
- Flight deck information management - A challenge to commercial transport aviation p 359 A92-44908
- Automatic display management using dynamic plans and events p 359 A92-44910
- Human performance in complex task environments - A basis for the application of adaptive automation p 340 A92-44911
- Representing cockpit crew decision making p 350 A92-45057
- INFORMATION PROCESSING (BIOLOGY)**
- Information management - Assessing the demand for information p 359 A92-44906
- Taxonomy of crew resource management - Information processing domain p 344 A92-44957
- Information transfer limitations in ATC p 346 A92-44974
- Taxonomy of ATC operator errors based on a model of human information processing p 346 A92-44980
- Attentional issues in superimposed flight symbology p 361 A92-44986
- The interactive effects of cockpit resource management, domestic stress, and information processing in commercial aviation p 348 A92-45017
- 'Pilot error' as information problem p 350 A92-45059
- Information processing in ab initio pilot training p 351 A92-45066
- The effects of task difficulty and resource requirements on attention strategies p 352 A92-45070
- The strategic integration of perception and action p 352 A92-45071
- Studies of perceptual memory  
[AD-A250200] p 356 N92-29144
- INFORMATION TRANSFER**
- Coding techniques for rapid communication displays p 360 A92-44928
- Information transfer and shared mental models for decision making p 341 A92-44937
- Information transfer limitations in ATC p 346 A92-44974
- The effects of unique encoding on the recall of numeric information p 351 A92-45067
- INJURIES**
- The chronic effects of JP-8 jet fuel exposure on the lungs  
[AD-A250308] p 338 N92-29123
- INSPECTION**
- Human factors in aircraft maintenance and inspection p 372 N92-30125
- INSTRUCTION SETS (COMPUTERS)**
- Interactive video disk as an instructional tool in CRM programs p 362 A92-45040
- INSTRUCTORS**
- Advanced CRM training for instructors and evaluators p 343 A92-44951
- Crew member and instructor evaluations of line oriented flight training p 343 A92-44952
- The effects of student-instructor interaction and paired/individual study on achievement in computer-based training  
[AD-A248518] p 358 N92-29503
- INSTRUMENT ERRORS**
- Flying an aircraft as a problem solving process - About the Instrument-Failure-Simulator (IFS) as a test for pilot applicants p 351 A92-45060
- INSULIN**
- Changes of serum cortisol, insulin, glucagon, thyroxines and cyclic nucleotides pre- and post-flight in pilots p 335 A92-45946
- INTERPROCESSOR COMMUNICATION**
- A remote visual interface tool for simulation control and display p 368 A92-48547
- INTERSTELLAR CHEMISTRY**
- Chemistry of the interstellar medium - An evolutionary dead end? p 372 A92-46446
- INTERSTELLAR MATTER**
- Chemistry of the interstellar medium - An evolutionary dead end? p 372 A92-46446
- INVENTIONS**
- Whole body cleaning agent containing N-acetyltaurate  
[NASA-CASE-MSC-21589-1] p 370 N92-29137
- INVERTEBRATES**
- In search of a unified theory of biological organization: What does the motor system of a sea slug tell us about human motor integration?  
[AD-A250223] p 356 N92-29119
- IONIZING RADIATION**
- Problems in mechanistic theoretical models for cell transformation by ionizing radiation  
[DE92-010265] p 336 N92-28278
- Somatic gene mutation in the human in relation to radiation risk  
[DE92-009459] p 337 N92-28685
- Effects of ionizing radiation on auditory and visual thresholds  
[AD-A248199] p 329 N92-29410
- ITERATION**
- Improvement of connectionist learning processes, working according to the gradients method  
[ETN-92-91335] p 355 N92-28787
- J**
- JP-8 JET FUEL**
- The chronic effects of JP-8 jet fuel exposure on the lungs  
[AD-A250308] p 338 N92-29123
- K**
- KINETIC EQUATIONS**
- Microbial aldolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735
- KNOWLEDGE REPRESENTATION**
- Knowledge transfer and support systems in fighter aircraft p 362 A92-45047
- What makes a good LOFT scenario? Issues in advancing current knowledge of scenario design --- Line Oriented Flight Training p 350 A92-45050
- Knowledge transfer and anticipation in airframe piloting p 351 A92-45065

Role of pilot's metaknowledge of their own reliability and capabilities p 351 A92-45068

## L

## LANDING SIMULATION

Incremental transfer study of scene detail and visual augmentation guidance in landing training p 348 A92-45022

Visual augmentation and scene detail effects in flight training p 349 A92-45023

Visual properties for the transfer of landing skill p 349 A92-45024

## LANGUAGES

Language Research Center's Computerized Test System (LRC-CTS) - Video-formatted tasks for comparative primate research p 328 A92-48096

## LASER APPLICATIONS

Laser surgery procedures in the operational KC-135E aviation environment p 335 A92-45823

## LASER DAMAGE

Investigation of laser-induced retinal damage [AD-A250173] p 338 N92-28920

## LEADERSHIP

Instructional strategy for aircrew coordination training p 342 A92-44942

The assessment of coordination demand for helicopter flight requirements p 342 A92-44943

Development of aircrew coordination exercises to facilitate training transfer p 342 A92-44944

## LEARNING

A dyadic protocol for training complex skills p 354 A92-46300

Language Research Center's Computerized Test System (LRC-CTS) - Video-formatted tasks for comparative primate research p 328 A92-48096

Chimpanzee counting and rhesus monkey ordinality judgments p 328 A92-48097

Improvement of connectionist learning processes, working according to the gradients method [ETN-92-91335] p 355 N92-28787

Integrating the affective domain into the instructional design process [AD-A249287] p 355 N92-28880

In search of a unified theory of biological organization: What does the motor system of a sea slug tell us about human motor integration? [AD-A250223] p 356 N92-29119

Learning, teaching, and testing for complex conceptual understanding [AD-A248728] p 356 N92-29142

## LEARNING THEORY

Acquisition and improvement of human motor skills: Learning through observation and practice [NASA-TM-107878] p 357 N92-29174

## LENSES

Yellow lens effects upon visual acquisition performance p 334 A92-45813

Portable dynamic fundus instrument [NASA-CASE-MS-21675-1] p 337 N92-28755

## LESIONS

Statistical differentiation between malignant and benign prostate lesions from ultrasound images p 364 A92-46279

Study of SCN neurochemistry using in vivo microdialysis in the conscious brain: Correlation with overt circadian rhythms [AD-A247172] p 338 N92-28886

## LEUKOCYTES

Effect of the blocking of beta receptors on the state of the lysosomal apparatus in neutrophilic leukocytes in the peripheral blood of rabbits subjected to immobilization stress p 328 A92-46603

## LIFE RAFTS

Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 N92-29538

## LIFE SUPPORT SYSTEMS

Utilization of potatoes for life support systems in space. I - Cultivar-photoperiod interactions p 365 A92-48395

Utilization of potatoes for life support systems. II - The effects of temperature under 24-h and 12-h photoperiods p 365 A92-48396

Utilization of potatoes for life support systems in space. III - Productivity at successive harvest dates under 12-h and 24-h photoperiods p 365 A92-48397

Utilization of potatoes for life support systems in space. IV - Effect of CO<sub>2</sub> enrichment p 366 A92-48398

Coupling plant growth and waste recycling systems in a controlled life support system (CELSS) [NASA-TM-107544] p 369 N92-28670

## LIFT

Development of models for prediction of optimal lifting motion [PB92-164656] p 371 N92-29949

## LIGHT HELICOPTERS

The use of simulation in human factors test and evaluation of the LH helicopter p 361 A92-45031

Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 N92-28744

## LIGHTNING

Why pilots are least likely to get good decision making precisely when they need it most p 350 A92-45058

## LIMBS (ANATOMY)

Analysis of the mechanism and protection of upper limb windblast flailing injury p 335 A92-45947

## LINEAR SYSTEMS

Linear relations in microbial reaction systems: A general overview of their origin, form, and use p 330 N92-29733

## LIPIDS

Effect of weak, extremely low-frequency magnetic fields on the time organization of exchange between thiol groups and lipid peroxidation products p 327 A92-46602

## LISTS

The emergency checklist, testing various layouts --- for A-310 aircraft pilots p 340 A92-44921

## LOAD CARRYING CAPACITY

The energetics and mechanics of load carrying [AD-A248441] p 371 N92-29222

## LOAD DISTRIBUTION (FORCES)

The energetics and mechanics of load carrying [AD-A248441] p 371 N92-29222

## LOADS (FORCES)

The energetics and mechanics of load carrying [AD-A248441] p 371 N92-29222

## LOCOMOTION

Architectural studies relating to the nature of human body motion in microgravity [SAE PAPER 912076] p 363 A92-45453

## LONG DURATION EXPOSURE FACILITY

Effects of extremely high G acceleration forces on NASA's control and space exposed tomato seeds [AD-A247488] p 329 N92-28247

## LONG DURATION SPACE FLIGHT

Socio-cultural issues during long duration space missions [SAE PAPER 912075] p 353 A92-45452

## LOUDSPEAKERS

Masking in three-dimensional auditory displays p 364 A92-46294

## LOW ALTITUDE

Time estimation in flight p 361 A92-44983

Visual cues to geographical orientation during low-level flight p 346 A92-44984

## LOW COST

Transfer of training from a low cost helicopter simulator p 349 A92-45038

Low-cost approaches to virtual flight simulation p 367 A92-48545

## LOW FREQUENCIES

Effect of weak, extremely low-frequency magnetic fields on the time organization of exchange between thiol groups and lipid peroxidation products p 327 A92-46602

## LOW TEMPERATURE ENVIRONMENTS

Cold and hypoxia p 335 A92-45950

## LUNAR EXPLORATION

An argument for human exploration of the moon and Mars p 362 A92-45250

## LYSOSOMES

Effect of the blocking of beta receptors on the state of the lysosomal apparatus in neutrophilic leukocytes in the peripheral blood of rabbits subjected to immobilization stress p 328 A92-46603

## M

## MACHINE LEARNING

Computer-based procedural training p 349 A92-45037

Acquisition and improvement of human motor skills: Learning through observation and practice [NASA-TM-107878] p 357 N92-29174

## MAGNETIC DIPOLES

Multiple dipole modeling and localization from spatio-temporal MEG data --- Magnetoencephalogram p 327 A92-45983

## MAGNETIC EFFECTS

Effect of weak, extremely low-frequency magnetic fields on the time organization of exchange between thiol groups and lipid peroxidation products p 327 A92-46602

## MAGNETIC FIELDS

Effect of weak, extremely low-frequency magnetic fields on the time organization of exchange between thiol groups and lipid peroxidation products p 327 A92-46602

## MAGNETIC MEASUREMENT

Multiple dipole modeling and localization from spatio-temporal MEG data --- Magnetoencephalogram p 327 A92-45983

## MAGNETOMETERS

Multiple dipole modeling and localization from spatio-temporal MEG data --- Magnetoencephalogram p 327 A92-45983

## MAINTENANCE TRAINING

Using intelligent simulation to enhance human performance in aircraft maintenance p 372 N92-30126

Revision of certification standards for aviation maintenance personnel p 359 N92-30127

## MAMMALS

Gordon research conference on Barrier Function of Mammalian Skin [AD-A248556] p 339 N92-29577

## MAN MACHINE SYSTEMS

Automatic display management using dynamic plans and events p 359 A92-44910

Interface styles for adaptive automation --- in military aircraft cockpits p 359 A92-44913

The effect of adaptive function allocation on the cockpit design paradigm p 360 A92-44914

Philosophy, policies, and procedures - The three P's of flight-deck operations p 360 A92-44925

Coding techniques for rapid communication displays p 360 A92-44928

The Flight Management System - 'Rumors and facts' p 341 A92-44933

Customizing the ATC computer-human interface via the use of controller preference sets p 361 A92-44968

The human element in air traffic control (ATC) p 346 A92-44973

The use of simulation in human factors test and evaluation of the LH helicopter p 361 A92-45031

Research in cooperative problem-solving systems for aviation p 362 A92-45036

Relationship between mental models and scanning behavior during instrument approaches p 349 A92-45043

Teaching an old dog new tricks - Concepts, schemata and metacognition in pilot training and education p 350 A92-45046

Cockpit design consideration for highly agile aircraft p 362 A92-45051

An extension of human optimal control model p 363 A92-45948

Man-in-the-loop study of filtering in airborne head tracking tasks p 365 A92-46763

Avionics planning for future aeronautical systems - Pilot-vehicle interface (PVI) p 366 A92-48453

An integrated methodology for knowledge and design acquisition --- development and evaluation of software tools for capturing pilot comprehension of tactical fighter mission p 366 A92-48526

Social psychological metaphors for human-computer system design p 366 A92-48528

Early MPTS analysis - Methods in this 'madness' --- manpower, personnel, training, and safety early in DoD acquisition process p 366 A92-48533

Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535

Super auditory localization for improved human-machine interfaces [AD-A250288] p 370 N92-29121

Army-NASA aircrew/aircraft integration program: Phase 4 A(3) Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413

## MAN-COMPUTER INTERFACE

Automatic display management using dynamic plans and events p 359 A92-44910

Interface styles for adaptive automation --- in military aircraft cockpits p 359 A92-44913

Customizing the ATC computer-human interface via the use of controller preference sets p 361 A92-44968

Big graphics and little screens - Designing graphical displays for maintenance tasks p 364 A92-46105

Social psychological metaphors for human-computer system design p 366 A92-48528

A remote visual interface tool for simulation control and display p 368 A92-48547

Super auditory localization for improved human-machine interfaces p 370 N92-29121

## MANIPULATORS

Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 N92-28521

## MANNED MARS MISSIONS

An argument for human exploration of the moon and Mars p 362 A92-45250

## MANNED SPACE FLIGHT

Space life support engineering program [NASA-CR-190448] p 369 N92-28671

**MANPOWER**

Early MPTS analysis - Methods in this 'madness' --- manpower, personnel, training, and safety early in DoD acquisition process p 366 A92-48533

**MANUAL CONTROL**

Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535

**MASKING**

Masking in three-dimensional auditory displays p 364 A92-46294

**MATERIAL BALANCE**

The bioreactor overflow device: An undesired selective separator in continuous cultures? p 330 A92-29736

**MATHEMATICAL MODELS**

An extension of human optimal control model p 363 A92-45948

Demodulation processes in auditory perception [AD-A250203] p 356 A92-29146

Methodology on monitoring and modelling of microbial metabolism [ETN-92-91745] p 330 A92-29732

Linear relations in microbial reaction systems: A general overview of their origin, form, and use p 330 A92-29733

Modelling and experimental validation of carbon dioxide evolution in alkalophilic cultures p 330 A92-29734

The bioreactor overflow device: An undesired selective separator in continuous cultures? p 330 A92-29736

On the estimation of bioenergetic parameters p 330 A92-29738

Analysis and experimental testing of a bottleneck model for the description of microbial dynamics p 331 A92-29740

Development of models for prediction of optimal lifting motion [PB92-164656] p 371 A92-29949

**MATRICES (MATHEMATICS)**

Linear relations in microbial reaction systems: A general overview of their origin, form, and use p 330 A92-29733

**MEASURING INSTRUMENTS**

Space life support engineering program [NASA-CR-190448] p 369 A92-28671

Sequential application of data reconciliation for sensitive detection of systematic errors p 332 A92-29760

**MECHANICAL SHOCK**

Effects of extremely high G acceleration forces on NASA's control and space exposed tomato seeds [AD-A247488] p 329 A92-28247

**MEDICAL EQUIPMENT**

Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) 8 [AD-A248283] p 339 A92-29347

**MEDICAL SERVICES**

Visual cues to geographical orientation during low-level flight p 346 A92-44984

Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) 8 [AD-A248283] p 339 A92-29347

**MEDITERRANEAN SEA**

Bioluminescence in the western Alboran Sea in April 1991 [AD-A250016] p 329 A92-29089

**MELANIN**

Investigation of laser-induced retinal damage [AD-A250173] p 338 A92-28920

**MEMORY**

Studies of perceptual memory [AD-A250200] p 356 A92-29144

A systems theoretic investigation of neuronal network properties of the hippocampal formation [AD-A250246] p 357 A92-29334

**MENSTRUATION**

Menstrual history in altitude chamber trainees p 335 A92-45822

**MENTAL PERFORMANCE**

Relationship between mental models and scanning behavior during instrument approaches p 349 A92-45043

Knowledge transfer and anticipation in airline piloting p 351 A92-45065

The effects of task difficulty and resource requirements on attention strategies p 352 A92-45070

Criterion Task Set (CTS) - Evaluation of cognitive task batteries p 353 A92-45078

Culture-fairness of test methods - Problems in the selection of aviation personnel p 353 A92-45079

Chimpanzee counting and rhesus monkey ordinality judgments p 328 A92-48097

Effects of high terrestrial altitude on military performance [AD-A246695] p 336 A92-28288

**METABOLISM**

The energetics and mechanics of load carrying [AD-A248441] p 371 A92-29227

Methodology on monitoring and modelling of microbial metabolism [ETN-92-91745] p 330 A92-29732

On the estimation of bioenergetic parameters p 330 A92-29738

**METEORITIC COMPOSITION**

Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179

**METHODOLOGY**

Methodology on monitoring and modelling of microbial metabolism [ETN-92-91745] p 330 A92-29732

**MICROBIOLOGY**

Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 A92-29341

Linear relations in microbial reaction systems: A general overview of their origin, form, and use p 330 A92-29733

**MICROCOMPUTERS**

Investigation and evaluation of a computer program to minimize VFR flight planning errors p 362 A92-45062

**MILITARY AIRCRAFT**

Interface styles for adaptive automation --- in military aircraft cockpits p 359 A92-44913

**MILITARY HELICOPTERS**

Army-NASA aircrew/aircraft integration program: Phase 4 A(3)I Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 A92-29413

**MILITARY OPERATIONS**

Early MPTS analysis - Methods in this 'madness' --- manpower, personnel, training, and safety early in DoD acquisition process p 366 A92-48533

Methods of visual scanning with night vision goggles [AD-A247470] p 370 A92-28944

**MILITARY TECHNOLOGY**

3-D TV without glasses p 367 A92-48541

**MINERALS**

Coupling plant growth and waste recycling systems in a controlled life support system (CELLSS) [NASA-TM-107544] p 369 A92-28670

**MIR SPACE STATION**

Coca-Cola space can undergoes successful test by cosmonauts onboard Soviet space station Mir p 365 A92-47682

**MONKEYS**

Non-linear analysis of visual cortical neurons [AD-A250233] p 338 A92-29179

**MORPHOLOGY**

Architectural studies relating to the nature of human body motion in microgravity [SAE PAPER 912076] p 363 A92-45453

**MOTION PERCEPTION**

Dynamic contrast sensitivity p 347 A92-44989

Relationship between surface texture and object density on judgements of velocity, altitude, and change of altitude p 347 A92-44990

The strategic integration of perception and action p 352 A92-45071

Minimum audible movement angle as a function of the azimuth and elevation of the source p 364 A92-46295

**MOTION SICKNESS**

Flight anxiety of civilian student pilots p 348 A92-45019

Variables affecting simulator sickness - Report of a semi-automatic scoring system p 333 A92-45029

Histaminergic response to Coriolis stimulation - Implication for transdermal scopolamine therapy of motion sickness p 334 A92-45816

Use of a motion sickness history questionnaire for prediction of simulator sickness p 334 A92-45818

**MOTION SICKNESS DRUGS**

Effects of gyro-fitness training on airsickness management [AD-A247862] p 356 A92-28957

Histaminergic response to Coriolis stimulation - Implication for transdermal scopolamine therapy of motion sickness p 334 A92-45816

**MOTION SIMULATION**

Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535

Curvature estimation in orientation selection [AD-A247862] p 356 A92-28957

**MOTION SIMULATORS**

Motion cuing for marginal flight - Is it information or isn't it? p 361 A92-45032

**MOTIVATION**

Integrating the affective domain into the instructional design process [AD-A249287] p 355 A92-28880

**MUSCLES**

Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817

Development of models for prediction of optimal lifting motion [PB92-164656] p 371 A92-29949

**MUTATIONS**

Problems in mechanistic theoretical models for cell transformation by ionizing radiation [DE92-010265] p 336 A92-28276

Primer on molecular genetics [DE92-010680] p 329 A92-28382

Somatic gene mutation in the human in relation to radiation risk [DE92-009459] p 337 A92-28685

**N****NAVIGATION AIDS**

Applying cognitive Instructional Systems Development to multinational airways facilities training p 345 A92-44971

**NECK (ANATOMY)**

Cervical injuries during high G maneuvers - A review of Naval Safety Center data, 1980-1990 p 334 A92-45820

**NETWORK ANALYSIS**

Exploring conceptual structures in air traffic control (ATC) p 345 A92-44970

**NEURAL NETS**

Improvement of connectionist learning processes, working according to the gradients method [ETN-92-91335] p 355 A92-28787

Method and apparatus for predicting the direction of movement in machine vision [NASA-CASE-NPO-17552-1-CU] p 370 A92-29129

A systems theoretic investigation of neuronal network properties of the hippocampal formation [AD-A250246] p 357 A92-29334

Biologically-based neural network model of color constancy and color contrast [AD-A248128] p 357 A92-29398

Object discrimination based on depth-from-occlusion [AD-A248104] p 358 A92-29560

**NEUROLOGY**

Study of SCN neurochemistry using in vivo microdialysis in the conscious brain: Correlation with overt circadian rhythms [AD-A247172] p 338 A92-28886

**NEURONS**

In search of a unified theory of biological organization: What does the motor system of a sea slug tell us about human motor integration? [AD-A250223] p 356 A92-29119

Non-linear analysis of visual cortical neurons [AD-A250233] p 338 A92-29179

Physiological analyses of the afferents controlling brain neurochemical systems [AD-A248334] p 359 A92-29930

**NEUROPHYSIOLOGY**

The Coordinated Noninvasive Studies (CNS) project, phase 1 [AD-A247159] p 337 A92-28397

Neuropsychological components of object identification [AD-A247049] p 355 A92-28877

A systems theoretic investigation of neuronal network properties of the hippocampal formation [AD-A250246] p 357 A92-29334

**NEUROTRANSMITTERS**

In search of a unified theory of biological organization: What does the motor system of a sea slug tell us about human motor integration? [AD-A250223] p 356 A92-29119

**NIGHT VISION**

Methods of visual scanning with night vision goggles [AD-A247470] p 370 A92-28944

Visual acuity with second and third generation night vision goggles obtained from a new method of night sky simulation across a wide range of target contrast [AD-A248284] p 371 A92-29348

Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 A92-29538

**NOISE INJURIES**

Heart rate variability and auditory workload during noise stress - Speaker sex and bandpass effects on speech intelligibility p 333 A92-45011

**NOISE SPECTRA**

Demodulation processes in auditory perception [AD-A250203] p 356 A92-29146

**NOREPINEPHRINE**

Physiological analyses of the afferents controlling brain neurochemical systems [AD-A248334] p 359 A92-29930

**NUCLEAR REACTORS**

A strategy for minimizing common mode human error in executing critical functions and tasks  
[DE92-011839] p 355 N92-28775

**NUCLEOSIDES**

Changes of serum cortisol, insulin, glucagon, thyroxines and cyclic nucleotides pre- and post-flight in pilots  
p 335 A92-45946

**NUMERICAL DATA BASES**

The effects of unique encoding on the recall of numeric information  
p 351 A92-45067

**O**

**OBSERVABILITY (SYSTEMS)**

A low sensitivity observer for complex biotechnological processes  
p 331 N92-29757

Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery  
p 332 N92-29758

**OCCLUSION**

Object discrimination based on depth-from-occlusion  
[AD-A248104] p 358 N92-29560

**OCEANOGRAPHIC PARAMETERS**

Bioluminescence in the western Alboran Sea in April 1991  
[AD-A250016] p 329 N92-29089

**OCEANS**

Bioluminescence in the western Alboran Sea in April 1991  
[AD-A250016] p 329 N92-29089

**OCULOGRAVIC ILLUSIONS**

The use of a tactile device to measure an illusion  
p 367 A92-48537

**ON-LINE SYSTEMS**

The use of state estimators (observers) for on-line estimation of non-measurable process variables  
p 331 N92-29755

Sequential application of data reconciliation for sensitive detection of systematic errors  
p 332 N92-29760

**ONBOARD EQUIPMENT**

Evaluation of Night Vision Goggles (NVG) for maritime search and rescue  
[AD-A247182] p 371 N92-29538

**OPERATOR PERFORMANCE**

Electronic checklists - Evaluation of two levels of automation --- on flight crew performance  
p 360 A92-44924

Collaboration in pilot-controller communication  
p 341 A92-44938

Aircrew coordination for Army helicopters - An exploration of the attitude-behavior-performance relationship  
p 342 A92-44940

Lessons from cross-fleet/cross-airline observations - Evaluating the impact of CRM/LOFT training  
p 342 A92-44946

Skill factors affecting team performance in simulated radar air traffic control  
p 346 A92-44979

Taxonomy of ATC operator errors based on a model of human information processing  
p 346 A92-44980

On operator strategic behavior  
p 350 A92-45053

The effects of task difficulty and resource requirements on attention strategies  
p 352 A92-45070

Multi-Attribute Task Battery - Applications in pilot workload and strategic behavior research  
p 352 A92-45072

Strategic behaviour in flight workload management  
p 352 A92-45074

Criterion Task Set (CTS) - Evaluation of cognitive task batteries  
p 353 A92-45078

**OPTICAL PROPERTIES**

Bioluminescence in the western Alboran Sea in April 1991  
[AD-A250016] p 329 N92-29089

**OPTICAL TRACKING**

Man-in-the-loop study of filtering in airborne head tracking tasks  
p 365 A92-46763

**OPTIMAL CONTROL**

An extension of human optimal control model  
p 363 A92-45948

**ORGANIC CHEMISTRY**

Titan and exobiological aspects of the Cassini-Huygens mission  
p 372 A92-46447

**ORGANISMS**

Theoretical and experimental investigations on the fast rotating clinostat  
p 329 A92-48631

**OSMOMETERS**

In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity  
[NASA-TM-103853] p 329 N92-29397

**OXIDASE**

Curvature estimation in orientation selection  
[AD-A247862] p 356 N92-28957

**OXIDATION**

Investigation of laser-induced retinal damage  
[AD-A250173] p 338 N92-28920

Flux-capacity relationships of Acinetobacter calcoaceticus enzymes during xylose oxidation  
p 331 N92-29739

**OXYGEN**

What makes a planet habitable, and how to search for habitable planets in other solar systems  
p 372 A92-46443

**OXYHEMOGLOBIN**

Structural characterization of cross-linked hemoglobins developed as potential transfusion substitutes  
[AD-A246777] p 337 N92-28515

**P**

**PARAMECIA**

Theoretical and experimental investigations on the fast rotating clinostat  
p 329 A92-48631

**PASTES**

Whole body cleaning agent containing N-acyltaurate  
[NASA-CASE-MS-21589-1] p 370 N92-29137

**PATHOGENESIS**

Problems in mechanistic theoretical models for cell transformation by ionizing radiation  
[DE92-010265] p 336 N92-28278

Somatic gene mutation in the human in relation to radiation risk  
[DE92-009459] p 337 N92-28685

**PATTERN RECOGNITION**

Method and apparatus for predicting the direction of movement in machine vision  
[NASA-CASE-NPO-17552-1-CU] p 370 N92-29129

Psychophysical analyses of perceptual representations  
[AD-A246945] p 357 N92-29186

**PATTERN REGISTRATION**

Neuropsychological components of object identification  
[AD-A247049] p 355 N92-28877

**PERCEPTION**

Studies of perceptual memory  
[AD-A250200] p 356 N92-29144

**PERCEPTUAL ERRORS**

Peripherally located CRTs - Color perception limitations  
p 354 A92-48548

**PERFORMANCE**

Specifying performance for a new generation of visionics simulators  
p 367 A92-48544

**PERFORMANCE PREDICTION**

The prediction of engagement outcome during air combat maneuvering  
p 350 A92-45045

On operator strategic behavior  
p 350 A92-45053

Low-cost approaches to virtual flight simulation  
p 367 A92-48545

**PERFORMANCE TESTS**

The Coordinated Noninvasive Studies (CNS) project, phase 1  
[AD-A247159] p 337 N92-28397

Delays in laser glare onset differentially affect target-location performance in a visual search task  
[AD-A246708] p 355 N92-28557

Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes  
[AD-A247669] p 356 N92-28940

Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) 8  
[AD-A248283] p 339 N92-29347

Visual acuity with second and third generation night vision goggles obtained from a new method of night sky simulation across a wide range of target contrast  
[AD-A248284] p 371 N92-29348

**PERIODICALS**

Super auditory localization for improved human-machine interfaces  
[AD-A250288] p 370 N92-29121

**PERIPHERAL CIRCULATION**

Effect of the blocking of beta receptors on the state of the lysosomal apparatus in neutrophilic leukocytes in the peripheral blood of rabbits subjected to immobilization stress  
p 328 A92-46603

**PERIPHERAL VISION**

Psychological state vs. peripheral color perception  
p 346 A92-44987

Peripherally located CRTs - Color perception limitations  
p 354 A92-48548

**PERSONAL COMPUTERS**

COGSCREEN - Personal computer-based tests of cognitive function for occupational medical certification  
p 332 A92-45010

**PERSONALITY**

Communication variations related to leader personality  
p 341 A92-44934

Personality differences among supervisory selection program candidates  
p 345 A92-44962

**PERSONALITY TESTS**

The myths of pilot personality stereotypes  
p 347 A92-45003

Comparative analysis of MMPI profiles in two groups of ab-initio flying trainees  
p 347 A92-45004

Why pilots are least likely to get good decision making precisely when they need it most  
p 350 A92-45058

Personality assessment in proposed USAF pilot selection and classification systems  
p 353 A92-45077

Culture-fairness of test methods - Problems in the selection of aviation personnel  
p 353 A92-45079

**PERSONNEL**

Exercise and three psychosocial variables: A longitudinal study  
[AD-A250649] p 339 N92-30216

**PERSONNEL DEVELOPMENT**

Candidate performance in a supervisory selection program and subsequent selection decisions  
p 345 A92-44964

The human element in air traffic control (ATC)  
p 346 A92-44973

Early MPTS analysis - Methods in this 'madness' --- manpower, personnel, training, and safety early in DoD acquisition process  
p 366 A92-48533

Revision of certification standards for aviation maintenance personnel  
p 359 N92-30127

**PERSONNEL MANAGEMENT**

Coordination strategies of crew management  
p 341 A92-44935

A new generation of crew resource management training  
p 344 A92-44959

ATCS field training performance and success in a supervisory selection program  
p 345 A92-44963

Candidate performance in a supervisory selection program and subsequent selection decisions  
p 345 A92-44964

**PERSONNEL SELECTION**

Personality differences among supervisory selection program candidates  
p 345 A92-44962

ATCS field training performance and success in a supervisory selection program  
p 345 A92-44963

Candidate performance in a supervisory selection program and subsequent selection decisions  
p 345 A92-44964

Performance in the ATC screen program and supervisory selection program outcome  
p 345 A92-44965

Cognitive indicators of ATCS technical ability and performance in a supervisory selection program  
p 345 A92-44966

Culture-fairness of test methods - Problems in the selection of aviation personnel  
p 353 A92-45079

**PHOTOCHEMICAL REACTIONS**

Investigation of laser-induced retinal damage  
[AD-A250173] p 338 N92-28920

**PHOTORECEPTORS**

Peripheral limitations on spatial vision  
[AD-A250579] p 358 N92-29591

**PHOTOSYNTHESIS**

Utilization of potatoes for life support systems in space. III - Productivity at successive harvest dates under 12-h and 24-h photoperiods  
p 365 A92-48397

**PHYSICAL EXAMINATIONS**

Key problems of medical examinations by aviation physicians  
p 336 A92-49229

**PHYSICAL EXERCISE**

Thermoregulation during spaceflight  
[NASA-TM-103913] p 337 N92-28420

Exercise and three psychosocial variables: A longitudinal study  
[AD-A250649] p 339 N92-30216

**PHYSICAL FITNESS**

Key problems of medical examinations by aviation physicians  
p 336 A92-49229

**PHYSICIANS**

Key problems of medical examinations by aviation physicians  
p 336 A92-49229

**PHYSIOLOGICAL EFFECTS**

Effects of high terrestrial altitude on military performance  
[AD-A246695] p 336 N92-28288

Study of the loss of consciousness inflight by fighter aircraft pilots  
[ONERA-RTS-11/3446-EY] p 338 N92-28844

**PHYSIOLOGICAL RESPONSES**

Range, energy, heat of motion in the modified NBC, anti-g, tank suit  
p 365 A92-46795

**PHYSIOLOGY**

Modelling of heat and moisture loss through NBC ensembles  
[AD-A245939] p 368 N92-28346

Physiological analyses of the afferents controlling brain neurochemical systems  
[AD-A248334] p 359 N92-29930

**PHYTOTRONS**

A study of the control problem of the shoot side environment delivery system of a closed crop growth research chamber  
[NASA-CR-177597] p 369 N92-28681

**PILOT ERROR**

A workshop on understanding and preventing aircrew error p 339 A92-44902  
Expert decision-making strategies p 341 A92-44936  
Aircrew coordination for Army helicopters - Research overview p 341 A92-44939  
Aircrew coordination for Army helicopters - Improved procedures for accident investigation p 342 A92-44945  
Taxonomy of crew resource management - Information processing domain p 344 A92-44957  
Use of a human factors checklist in aircraft mishap investigations p 347 A92-44992  
The myths of pilot personality stereotypes p 347 A92-45003  
The frozen pilot syndrome p 348 A92-45018  
Vigilance of aircrews during long-haul flights p 333 A92-45021  
Why pilots are least likely to get good decision making precisely when they need it most p 350 A92-45058  
'Pilot error' as information problem p 350 A92-45059  
Towards the validation of the five hazardous thoughts measure p 351 A92-45061

**PILOT PERFORMANCE**

Stress management for the third revolution aviator p 339 A92-44903  
CRM scenario development - The next generation p 339 A92-44904  
Flight deck information management - A challenge to commercial transport aviation p 359 A92-44908  
Human performance in complex task environments - A basis for the application of adaptive automation p 340 A92-44911  
Effects of shifts in the level of automation on operator performance p 340 A92-44912  
Training and cockpit design to promote expert performance p 340 A92-44917  
An evaluation of flight path management automation in transport category aircraft p 360 A92-44918  
Communication variations related to leader personality p 341 A92-44934  
Expert decision-making strategies p 341 A92-44936  
KLM feedback and appraisal system for cockpit crew members p 344 A92-44960  
Visual cues to geographical orientation during low-level flight p 346 A92-44984  
Target acquisition performance using spatially correlated auditory information over headphones p 347 A92-44988  
The myths of pilot personality stereotypes p 347 A92-45003  
Comparative analysis of MMPI profiles in two groups of ab-initio flying trainees p 347 A92-45004  
The myth of the adventurous aviator p 348 A92-45005  
Alcoholism - An equal opportunity disease p 332 A92-45007  
Psychoactive drugs - Effects on cockpit performance p 332 A92-45008  
Professional pilots' evaluation of the extent, causes, and means of reduction of alcohol use in aviation p 348 A92-45009  
Heart rate variability and auditory workload during noise stress - Speaker sex and bandpass effects on speech intelligibility p 333 A92-45011  
Heart rate variability as an index for pilot workload p 333 A92-45012  
EEG correlates of critical decision making in computer simulated combat p 333 A92-45014  
Some factors associated with pilot age in general aviation crashes p 333 A92-45016  
The interactive effects of cockpit resource management, domestic stress, and information processing in commercial aviation p 348 A92-45017  
The utilization of the aviation safety reporting system - A case study in pilot fatigue p 333 A92-45020  
The use of simulation in human factors test and evaluation of the LH helicopter p 361 A92-45031  
An evaluation of strategic behaviors in a high fidelity simulated flight task - Comparing primary performance to a figure of merit p 351 A92-45069  
State-of-the-art pilot performance and workload measurement p 352 A92-45073  
Individual differences in strategic flight management and scheduling p 352 A92-45076  
Avionics planning for future aeronautical systems - Pilot-vehicle interface (PVI) p 366 A92-48453  
Key problems of medical examinations by aviation physicians p 336 A92-49229

A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer  
[AD-A246683] p 368 N92-28286

Study of the loss of consciousness inflight by fighter aircraft pilots  
[ONERA-RTS-11/3446-EY] p 338 N92-28844  
Neuropsychological components of object identification  
[AD-A247049] p 355 N92-28877

**PILOT SELECTION**

The myths of pilot personality stereotypes p 347 A92-45003  
Flying an aircraft as a problem solving process - About the Instrument-Failure-Simulator (IFS) as a test for pilot applicants p 351 A92-45060  
Personality assessment in proposed USAF pilot selection and classification systems p 353 A92-45077  
On the effect of range restriction on correlation coefficient estimation  
[AD-A248956] p 358 N92-29620

**PILOT TRAINING**

CRM scenario development - The next generation p 339 A92-44904  
Training and cockpit design to promote expert performance p 340 A92-44917  
Philosophy, policies, and procedures - The three P's of flight-deck operations p 360 A92-44925  
Training implications of a team decision model p 342 A92-44941  
Instructional strategy for aircrew coordination training p 342 A92-44942  
The assessment of coordination demand for helicopter flight requirements p 342 A92-44943  
Lessons from cross-fleet/cross-airline observations - Evaluating the impact of CRM/LOFT training p 342 A92-44946  
Crew member and instructor evaluations of line oriented flight training p 343 A92-44952  
Application of instructional systems development (ISD) principles to the Advanced Qualification Program (AQP) p 344 A92-44961  
A survey of naval aviator opinions regarding unaided vision training topics p 347 A92-44991  
Comparative analysis of MMPI profiles in two groups of ab-initio flying trainees p 347 A92-45004  
Effects of gyro-fitness training on airsickness management p 348 A92-45013  
Topographic EEG correlates of perceptual defensiveness p 333 A92-45015  
The interactive effects of cockpit resource management, domestic stress, and information processing in commercial aviation p 348 A92-45017  
The frozen pilot syndrome p 348 A92-45018  
Flight anxiety of civilian student pilots p 348 A92-45019  
Incremental transfer study of scene detail and visual augmentation guidance in landing training p 348 A92-45022  
Visual properties for the transfer of landing skill p 349 A92-45024  
Pragmatic simulation, basics and techniques p 361 A92-45030  
Motion cuing for marginal flight - Is it information or isn't it? p 361 A92-45032  
Computer-based procedural training p 349 A92-45037  
Transfer of training from a low cost helicopter simulator p 349 A92-45038  
Teaching an old dog new tricks - Concepts, schemata and metacognition in pilot training and education p 350 A92-45046  
Towards the validation of the five hazardous thoughts measure p 351 A92-45061  
The Pilot Judgement Styles Model super C - A new tool for training in decision-making p 351 A92-45063  
Information processing in ab initio pilot training p 351 A92-45066  
Personality assessment in proposed USAF pilot selection and classification systems p 353 A92-45077  
Embedding training in a system p 367 A92-48546  
Methods of visual scanning with night vision goggles  
[AD-A247470] p 370 N92-28944  
Fighter pilot training: The contribution of simulation  
[NLR-TP-89311-U] p 358 N92-29871

**PILOTS (PERSONNEL)**

On the effect of range restriction on correlation coefficient estimation  
[AD-A248956] p 358 N92-29620

**POLICIES**  
Revision of certification standards for aviation maintenance personnel p 359 N92-30127

**POSTURE**

Architectural studies relating to the nature of human body motion in microgravity  
[SAE PAPER 912076] p 363 A92-45453

**POTATOES**

Utilization of potatoes for life support systems in space.  
I - Cultivar-photoperiod interactions p 365 A92-48395  
Utilization of potatoes for life support systems. II - The effects of temperature under 24-h and 12-h photoperiods p 365 A92-48396  
Utilization of potatoes for life support systems in space.  
III - Productivity at successive harvest dates under 12-h and 24-h photoperiods p 365 A92-48397  
Utilization of potatoes for life support systems in space.  
IV - Effect of CO2 enrichment p 366 A92-48398  
Carbon dioxide effects on potato growth under different photoperiods and irradiance p 328 A92-48399

**PREDICTION ANALYSIS TECHNIQUES**

Development of models for prediction of optimal lifting motion  
[PB92-164656] p 371 N92-29949

**PREDICTIONS**

Method and apparatus for predicting the direction of movement in machine vision  
[NASA-CASE-NPO-17552-1-CU] p 370 N92-29129

**PRESSURE BREATHING**

Determination of a pressure breathing schedule for improving +Gz tolerance p 334 A92-45815

**PRESSURE MEASUREMENT**

In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity  
[NASA-TM-103853] p 329 N92-29397

**PRESSURE SUITS**

Determination of a pressure breathing schedule for improving +Gz tolerance p 334 A92-45815

**PRIMITIVE EARTH ATMOSPHERE**

Chemical studies on the existence of extraterrestrial life p 372 A92-46445

**PROBLEM SOLVING**

Research in cooperative problem-solving systems for aviation p 362 A92-45036  
Flying an aircraft as a problem solving process - About the Instrument-Failure-Simulator (IFS) as a test for pilot applicants p 351 A92-45060  
The Pilot Judgement Styles Model super C - A new tool for training in decision-making p 351 A92-45063

**PROCESS CONTROL (INDUSTRY)**

State estimation and error diagnosis for biotechnological processes  
[ETN-92-91744] p 331 N92-29754  
State estimation and control of the IBE-fermentation with product recovery p 331 N92-29756  
Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 N92-29758

**PROKARYOTES**

Evidence that eukaryotes and eocyte prokaryotes are immediate relatives p 328 A92-47309

**PROPORTION**

Judgments of change and proportion in graphical perception p 364 A92-46299

**PROSTATE GLAND**

Statistical differentiation between malignant and benign prostate lesions from ultrasound images p 364 A92-46279

**PROTECTIVE CLOTHING**

Range, energy, heat of motion in the modified NBC, anti-g, tank suit p 365 A92-46795  
Modelling of heat and moisture loss through NBC ensembles  
[AD-A245939] p 368 N92-28346

**PROTEINS**

Observation of dynamic changes of rat soleus during tail suspension p 327 A92-45949

**PROTOCOL (COMPUTERS)**

A dyadic protocol for training complex skills p 354 A92-46300

**PSYCHOLOGICAL FACTORS**

A workshop on understanding and preventing aircrew error p 339 A92-44902  
Aircrew coordination for Army helicopters - An exploration of the attitude-behavior-performance relationship p 342 A92-44940  
Training implications of a team decision model p 342 A92-44941  
The impact of initial and recurrent cockpit resource management training on attitudes p 343 A92-44949  
Team building following a pilot labour dispute - Extending the CRM envelope p 344 A92-44955  
Exogenous and endogenous determinants of cockpit management attitudes p 344 A92-44956  
Cockpit resource management - A social psychological perspective p 344 A92-44958  
A new generation of crew resource management training p 344 A92-44959

KLM feedback and appraisal system for cockpit crew members p 344 A92-44960  
Behavioral analysis of management actions in aircraft accidents p 347 A92-45001  
Towards the validation of the five hazardous thoughts measure p 351 A92-45061  
Social psychological metaphors for human-computer system design p 366 A92-48528  
Exercise and three psychosocial variables: A longitudinal study [AD-A250649] p 339 N92-30216

**PSYCHOLOGICAL TESTS**  
COGSCREEN - Personal computer-based tests of cognitive function for occupational medical certification p 332 A92-45010  
Culture-fairness of test methods - Problems in the selection of aviation personnel p 353 A92-45079

**PSYCHOLOGY**  
Exercise and three psychosocial variables: A longitudinal study [AD-A250649] p 339 N92-30216

**PSYCHOMETRICS**  
Personality differences among supervisory selection program candidates p 345 A92-44962

**PSYCHOMOTOR PERFORMANCE**  
A dyadic protocol for training complex skills p 354 A92-46300  
Effects of high terrestrial altitude on military performance [AD-A246695] p 336 N92-28268

**PSYCHOPHYSIOLOGY**  
Psychophysical analyses of perceptual representations [AD-A246945] p 357 N92-29186

**PULMONARY FUNCTIONS**  
The chronic effects of JP-8 jet fuel exposure on the lungs [AD-A250308] p 338 N92-29123

**PULSE COMMUNICATION**  
The effects of unique encoding on the recall of numeric information p 351 A92-45067

**Q**

**QUALITY**  
Peripheral limitations on spatial vision [AD-A250579] p 358 N92-29591

**R**

**RADAR NAVIGATION**  
Skill factors affecting team performance in simulated radar air traffic control p 346 A92-44979

**RADIATION EFFECTS**  
Problems in mechanistic theoretical models for cell transformation by ionizing radiation [DE92-010265] p 336 N92-28278  
Somatic gene mutation in the human in relation to radiation risk [DE92-009459] p 337 N92-28685  
Effects of ionizing radiation on auditory and visual thresholds [AD-A248199] p 329 N92-29410

**RADIATION PROTECTION**  
Range, energy, heat of motion in the modified NBC, anti-g, tank suit p 365 A92-46795

**RADIOGRAPHY**  
Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system [AD-A247167] p 336 N92-28242

**RANDOM ERRORS**  
State estimation and error diagnosis for biotechnological processes [ETN-92-91744] p 331 N92-29754  
The use of state estimators (observers) for on-line estimation of non-measurable process variables p 331 N92-29755  
Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 N92-29759  
Sequential application of data reconciliation for sensitive detection of systematic errors p 332 N92-29760

**RANDOM VARIABLES**  
On the effect of range restriction on correlation coefficient estimation [AD-A248956] p 358 N92-29620

**REACTION TIME**  
Effects of ionizing radiation on auditory and visual thresholds [AD-A248199] p 329 N92-29410

**REACTOR SAFETY**  
A strategy for minimizing common mode human error in executing critical functions and tasks [DE92-011839] p 355 N92-28775

**REAL TIME OPERATION**

Pragmatic simulation, basics and techniques p 361 A92-45030

SAGES - A system optimising each trainee's course towards a final level which will be the purpose of the training period p 349 A92-45039  
The strategic integration of perception and action p 352 A92-45071

Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 N92-28521

**RECEPTORS (PHYSIOLOGY)**  
Effect of the blocking of beta receptors on the state of the lysosomal apparatus in neutrophilic leukocytes in the peripheral blood of rabbits subjected to immobilization stress p 328 A92-46603

**RECONSTRUCTION**  
Task performance on constrained reconstructions - Human observer performance compared with sub-optimal Bayesian performance p 354 A92-46278

**RECYCLING**  
Coupling plant growth and waste recycling systems in a controlled life support system (CELSS) [NASA-TM-107544] p 369 N92-28670

**REDUCED GRAVITY**  
Architectural studies relating to the nature of human body motion in microgravity [SAE PAPER 912076] p 363 A92-45453  
On performing exobiology experiments on an earth-orbital platform with the Gas-Grain Simulation Facility p 373 A92-48100  
The membrane-electrolyte system - Model of the interaction of gravity with biological systems at the cellular level p 328 A92-48624  
The effects of microgravity on the character of progeny of *Drosophila melanogaster* p 328 A92-48630  
Theoretical and experimental investigations on the fast rotating clinostat p 329 A92-48631  
Thermoregulation during spaceflight [NASA-TM-103913] p 337 N92-28420  
Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity [NASA-TP-3200] p 370 N92-28897

**REDUNDANCY ENCODING**  
Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 N92-29759

**REGRESSION ANALYSIS**  
A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer [AD-A246683] p 368 N92-28286

**REGULATIONS**  
Revision of certification standards for aviation maintenance personnel p 359 N92-30127

**RELIABILITY ANALYSIS**  
Role of pilot's metaknowledge of their own reliability and capabilities p 351 A92-45068

**REMOTE CONTROL**  
Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 N92-28521

**RENAL FUNCTION**  
The chronic effects of JP-8 jet fuel exposure on the lungs [AD-A250308] p 338 N92-29123

**RESCUE OPERATIONS**  
Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 N92-29538

**RESEARCH AIRCRAFT**  
The second flight simulator test of the head-up display for NAL QSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 N92-28831

**RESOLUTION**  
Peripheral limitations on spatial vision [AD-A250579] p 358 N92-29591

**RESOURCES MANAGEMENT**  
CRM scenario development - The next generation p 339 A92-44904  
The assessment of coordination demand for helicopter flight requirements p 342 A92-44943  
Lessons from cross-fleet/cross-airline observations - Evaluating the impact of CRM/LOFT training p 342 A92-44946  
The impact of initial and recurrent cockpit resource management training on attitudes p 343 A92-44949  
Team building following a pilot labour dispute - Extending the CRM envelope p 344 A92-44955  
Taxonomy of crew resource management - Information processing domain p 344 A92-44957  
Cockpit resource management - A social psychological perspective p 344 A92-44958  
A new generation of crew resource management training p 344 A92-44959

The effects of task difficulty and resource requirements on attention strategies p 352 A92-45070

**RESPONSES**  
Peripheral limitations on spatial vision [AD-A250579] p 358 N92-29591

**RETINA**  
Portable dynamic fundus instrument [NASA-CASE-MS-C-21675-1] p 337 N92-28755  
Investigation of laser-induced retinal damage [AD-A250173] p 338 N92-28920

**RETINAL IMAGES**  
The effect of accommodation on retinal image size p 335 A92-46297

**RISK**  
Comparative analysis of MMPI profiles in two groups of ab-initio flying trainees p 347 A92-45004

**ROBOT CONTROL**  
Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 N92-28521  
Acquisition and improvement of human motor skills: Learning through observation and practice [NASA-TM-107878] p 357 N92-29174

**ROBOTICS**  
An argument for human exploration of the moon and Mars p 362 A92-45250  
Method and apparatus for predicting the direction of movement in machine vision [NASA-CASE-NPO-17552-1-CU] p 370 N92-29129

**ROTATING FLUIDS**  
Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity [NASA-TP-3200] p 370 N92-28897

**S**

**SAFETY**  
Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 N92-29341

**SAFETY DEVICES**  
Analysis of the mechanism and protection of upper limb windblast flailing injury p 335 A92-45947

**SAFETY FACTORS**  
COGSCREEN - Personal computer-based tests of cognitive function for occupational medical certification p 332 A92-45010  
Early MPTS analysis - Methods in this 'madness' --- manpower, personnel, training, and safety early in DoD acquisition process p 366 A92-48533

**SAMPLING**  
Peripheral limitations on spatial vision [AD-A250579] p 358 N92-29591  
On the effect of range restriction on correlation coefficient estimation [AD-A248956] p 358 N92-29620

**SATELLITE ATMOSPHERES**  
Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447

**SCANNING**  
Multiple dipole modeling and localization from spatio-temporal MEG data --- Magnetoencephalogram p 327 A92-45983  
Methods of visual scanning with night vision goggles [AD-A247470] p 370 N92-28944

**SCIENTISTS**  
A profile of scientist and engineer training conducted by the Naval Avionics Center [AD-A245925] p 354 N92-28408

**SEDIMENTS**  
Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity [NASA-TP-3200] p 370 N92-28897

**SEEDS**  
Effects of extremely high G acceleration forces on NASA's control and space exposed tomato seeds - [AD-A247488] p 329 N92-28247

**SENSITIVITY**  
A low sensitivity observer for complex biotechnological processes p 331 N92-29757

**SENSORIMOTOR PERFORMANCE**  
Acquisition and improvement of human motor skills: Learning through observation and practice [NASA-TM-107878] p 357 N92-29174  
Effects of ionizing radiation on auditory and visual thresholds [AD-A248199] p 329 N92-29410

**SENSORY PERCEPTION**  
Psychophysical analyses of perceptual representations [AD-A246945] p 357 N92-29186

- SEROTONIN**  
Study of SCN neurochemistry using in vivo microdialysis in the conscious brain: Correlation with overt circadian rhythms [AD-A247172] p 338 N92-28886  
Physiological analyses of the afferents controlling brain neurochemical systems [AD-A248334] p 359 N92-29930
- SERUMS**  
Changes of serum cortisol, insulin, glucagon, thyroxines and cyclic nucleotides pre- and post-flight in pilots p 335 A92-45946
- SHAPES**  
Neuropsychological components of object identification [AD-A247049] p 355 N92-28877  
Curvature estimation in orientation selection [AD-A247862] p 356 N92-28957  
Object discrimination based on depth-from-occlusion [AD-A248104] p 358 N92-29560
- SHORT TAKEOFF AIRCRAFT**  
The second flight simulator test of the head-up display for NAL QSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 N92-28831
- SHOULDERS**  
Development of models for prediction of optimal lifting motion [PB92-164656] p 371 N92-29949
- SIGNAL DETECTION**  
Additivity and auditory pattern analysis [AD-A250580] p 358 N92-29592
- SIGNS AND SYMPTOMS**  
Use of a motion sickness history questionnaire for prediction of simulator sickness p 334 A92-45818  
Inner ear barotrauma - A case for exploratory tympanotomy p 335 A92-45821
- SIMULATION**  
The second flight simulator test of the head-up display for NAL QSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 N92-28831  
Visual acuity with second and third generation night vision goggles obtained from a new method of night sky simulation across a wide range of target contrast [AD-A248284] p 371 N92-29348
- SIZE DETERMINATION**  
The effect of accommodation on retinal image size p 335 A92-46297  
Apparent size and distance in an imaging display p 364 A92-46298
- SKIN (ANATOMY)**  
Gordon research conference on Barrier Function of Mammalian Skin [AD-A248556] p 339 N92-29577
- SKIN TEMPERATURE (BIOLOGY)**  
Thermoregulation during spaceflight [NASA-TM-103913] p 337 N92-28420
- SLEEP**  
Pilot reaction to ultra-long-haul flying p 344 A92-44954  
Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes [AD-A247669] p 356 N92-28940
- SOCIAL FACTORS**  
Cockpit resource management - A social psychological perspective p 344 A92-44958  
Exercise and three psychosocial variables: A longitudinal study [AD-A250649] p 339 N92-30216
- SOCIAL PSYCHIATRY**  
Social psychological metaphors for human-computer system design p 366 A92-48528
- SOFTWARE ENGINEERING**  
Program Cluster: An identification of fixation cluster characteristics [AD-A247014] p 354 N92-28396
- SOFTWARE TOOLS**  
An integrated methodology for knowledge and design acquisition --- development and evaluation of software tools for capturing pilot comprehension of tactical fighter mission p 366 A92-48526  
A remote visual interface tool for simulation control and display p 368 A92-48547
- SONAR**  
Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes [AD-A247669] p 356 N92-28940
- SPACE EXPLORATION**  
An argument for human exploration of the moon and Mars p 362 A92-45250
- SPACE FLIGHT**  
The effects of microgravity on the character of progeny of *Drosophila melanogaster* p 328 A92-48630  
Theoretical and experimental investigations on the fast rotating clinostat p 329 A92-48631  
Thermoregulation during spaceflight [NASA-TM-103913] p 337 N92-28420  
Whole body cleaning agent containing N-acyltaurate [NASA-CASE-MSC-21589-1] p 370 N92-29137
- SPACE FLIGHT FEEDING**  
Coca-Cola space can undergoes successful test by cosmonauts onboard Soviet space station Mir p 365 A92-47682
- SPACE HABITATS**  
Waste streams in a crewed space habitat. II p 365 A92-48174
- SPACE MISSIONS**  
Space life support engineering program [NASA-CR-190448] p 369 N92-28671
- SPACE PERCEPTION**  
Relationship between surface texture and object density on judgements of velocity, altitude, and change of altitude p 347 A92-44990  
Apparent size and distance in an imaging display p 364 A92-46298  
Neuropsychological components of object identification [AD-A247049] p 355 N92-28877  
Visual perception of elevation [AD-A248338] p 357 N92-29420
- SPACE PSYCHOLOGY**  
Socio-cultural issues during long duration space missions [SAE PAPER 912075] p 353 A92-45452
- SPACE SHUTTLES**  
Comparison of current Shuttle and pre-Challenger flight suit reach capability during launch accelerations p 363 A92-45824
- SPACE STATION FREEDOM**  
Waste streams in a crewed space habitat. II p 365 A92-48174  
Purification and storage of waste gases on Space Station Freedom [AIAA PAPER 92-3607] p 368 A92-49073
- SPACE SUITS**  
Comparison of current Shuttle and pre-Challenger flight suit reach capability during launch accelerations p 363 A92-45824
- SPACEBORNE EXPERIMENTS**  
On performing exobiology experiments on an earth-orbital platform with the Gas-Grain Simulation Facility p 373 A92-48100  
The effects of microgravity on the character of progeny of *Drosophila melanogaster* p 328 A92-48630
- SPACECRAFT DESIGN**  
Architectural studies relating to the nature of human body motion in microgravity [SAE PAPER 912076] p 363 A92-45453
- SPACECRAFT ENVIRONMENTS**  
Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 N92-29341
- SPACECRAFT MAINTENANCE**  
An argument for human exploration of the moon and Mars p 362 A92-45250
- SPATIAL DISTRIBUTION**  
Relationship between surface texture and object density on judgements of velocity, altitude, and change of altitude p 347 A92-44990  
Curvature estimation in orientation selection [AD-A247862] p 356 N92-28957
- SPECTRAL REFLECTANCE**  
Biologically-based neural network model of color constancy and color contrast [AD-A248128] p 357 N92-29398
- SPECTRUM ANALYSIS**  
Demodulation processes in auditory perception [AD-A250203] p 356 N92-29146
- SPEECH DEFECTS**  
Heart rate variability and auditory workload during noise stress - Speaker sex and bandpass effects on speech intelligibility p 333 A92-45011
- SPINE**  
In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397
- SQUID (DETECTORS)**  
Multiple dipole modeling and localization from spatio-temporal MEG data --- Magnetoencephalogram p 327 A92-45983
- STANDARDS**  
Revision of certification standards for aviation maintenance personnel p 359 N92-30127
- STATE ESTIMATION**  
State estimation and error diagnosis for biotechnological processes [ETN-92-91744] p 331 N92-29754  
The use of state estimators (observers) for on-line estimation of non-measurable process variables p 331 N92-29755  
State estimation and control of the BE-fermentation with product recovery p 331 N92-29756
- A low sensitivity observer for complex biotechnological processes p 331 N92-29757  
Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 N92-29758  
Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 N92-29759  
Sequential application of data reconciliation for sensitive detection of systematic errors p 332 N92-29760
- STATISTICAL ANALYSIS**  
Statistical differentiation between malignant and benign prostate lesions from ultrasound images p 364 A92-46279  
Sequential application of data reconciliation for sensitive detection of systematic errors p 332 N92-29760
- STEADY STATE**  
Modelling and experimental validation of carbon dioxide evolution in alkaliophilic cultures p 330 N92-29734
- STEREOTELEVISION**  
3-D TV without glasses p 367 A92-48541
- STRESS (PHYSIOLOGY)**  
Effect of the blocking of beta receptors on the state of the lysosomal apparatus in neutrophilic leukocytes in the peripheral blood of rabbits subjected to immobilization stress p 328 A92-46603
- STRUCTURAL ANALYSIS**  
Structural characterization of cross-linked hemoglobins developed as potential transfusion substitutes [AD-A246777] p 337 N92-28515
- SUBSTITUTES**  
Structural characterization of cross-linked hemoglobins developed as potential transfusion substitutes [AD-A246777] p 337 N92-28515
- SUGARS**  
Microbial aldonolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735
- SUITS**  
Range, energy, heat of motion in the modified NBC, anti-g, tank suit p 365 A92-46795
- SUPERSONIC TRANSPORTS**  
Synthetic vision in the Boeing high speed civil transport p 360 A92-44927
- SURFACE PROPERTIES**  
Biologically-based neural network model of color constancy and color contrast [AD-A248128] p 357 N92-29398
- SURGERY**  
Laser surgery procedures in the operational KC-135E aviation environment p 335 A92-45823
- SURVEYS**  
A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer [AD-A246683] p 368 N92-28286  
A profile of scientist and engineer training conducted by the Naval Avionics Center [AD-A245925] p 354 N92-28408  
Correlational analysis of survey and model-generated workload values [AD-A247153] p 368 N92-28518
- SUSPENDING (HANGING)**  
Observation of dynamic changes of rat soleus during tail suspension p 327 A92-45949
- SWELLING**  
In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397
- SYSTEMS ANALYSIS**  
Methodology on monitoring and modelling of microbial metabolism [ETN-92-91745] p 330 N92-29732  
Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737  
Analysis and experimental testing of a bottleneck model for the description of microbial dynamics p 331 N92-29740
- SYSTEMS ENGINEERING**  
Synthetic vision in the Boeing high speed civil transport p 360 A92-44927  
Social psychological metaphors for human-computer system design p 366 A92-48528
- SYSTEMS SIMULATION**  
A study of the control problem of the shoot side environment delivery system of a closed crop growth research chamber [NASA-CR-177597] p 369 N92-28681  
Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 N92-28744

## T

## T-38 AIRCRAFT

Yellow lens effects upon visual acquisition performance p 334 A92-45813

## TARGET ACQUISITION

Target acquisition performance using spatially correlated auditory information over headphones p 347 A92-44988

Yellow lens effects upon visual acquisition performance p 334 A92-45813

An integrated methodology for knowledge and design acquisition --- development and evaluation of software tools for capturing pilot comprehension of tactical fighter mission p 366 A92-48526

Delays in laser glare onset differentially affect target-location performance in a visual search task [AD-A246708] p 355 N92-28557

## TARGET MASKING

Delays in laser glare onset differentially affect target-location performance in a visual search task [AD-A246708] p 355 N92-28557

## TARGET RECOGNITION

Effect of spatial frequency content of the background on visual detection of a known target p 353 A92-46277

Task performance on constrained reconstructions - Human observer performance compared with sub-optimal Bayesian performance p 354 A92-46278

Program Cluster: An identification of fixation cluster characteristics [AD-A247014] p 354 A92-28396

Delays in laser glare onset differentially affect target-location performance in a visual search task [AD-A246708] p 355 N92-28557

Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 N92-29538

## TARGETS

Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 N92-29538

## TASK COMPLEXITY

Human performance in complex task environments - A basis for the application of adaptive automation p 340 A92-44911

Cognitive task analysis of air traffic control p 345 A92-44972

Topographic EEG correlates of perceptual defensiveness p 333 A92-45015

The effects of task difficulty and resource requirements on attention strategies p 352 A92-45070

Multi-Attribute Task Battery - Applications in pilot workload and strategic behavior research p 352 A92-45072

State-of-the-art pilot performance and workload measurement p 352 A92-45073

Strategic behaviour in flight workload management p 352 A92-45074

The Bedford scale - Does it measure spare capacity? p 352 A92-45075

Individual differences in strategic flight management and scheduling p 352 A92-45076

Criterion Task Set (CTS) - Evaluation of cognitive task batteries p 353 A92-45078

## TEAMS

Collective behavior and team performance p 354 A92-46296

## TECHNOLOGIES

Human factors in aircraft maintenance and inspection p 372 N92-30125

## TECHNOLOGY ASSESSMENT

Using intelligent simulation to enhance human performance in aircraft maintenance p 372 N92-30126

## TELEOPERATORS

Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 N92-28521

Super auditory localization for improved human-machine interfaces [AD-A250288] p 370 N92-29121

## TELEROBOTICS

Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 N92-28521

## TEST FACILITIES

Language Research Center's Computerized Test System (LRC-CTS) - Video-formatted tasks for comparative primate research p 328 A92-48096

On performing exobiology experiments on an earth-orbital platform with the Gas-Grain Simulation Facility p 373 A92-48100

## TEXTURES

Relationship between surface texture and object density on judgements of velocity, altitude, and change of altitude p 347 A92-44990

## THERMOREGULATION

Cold and hypoxia p 335 A92-45950

Thermoregulation during spaceflight [NASA-TM-103913] p 337 N92-28420

## THIOLS

Effect of weak, extremely low-frequency magnetic fields on the time organization of exchange between thiol groups and lipid peroxidation products p 327 A92-46602

## THRUST VECTOR CONTROL

Cockpit design consideration for highly agile aircraft p 362 A92-45051

## THYROXINE

Changes of serum cortisol, insulin, glucagon, thyroxines and cyclic nucleotides pre- and post-flight in pilots p 335 A92-45946

## TISSUES (BIOLOGY)

Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity [NASA-TP-3200] p 370 N92-28897

## TITAN

Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447

## TOMATOES

Effects of extremely high G acceleration forces on NASA's control and space exposed tomato seeds [AD-A247488] p 329 N92-28247

## TOTAL QUALITY MANAGEMENT

A framework for optimizing total training systems - Application to maintenance training and team training systems [SAE PAPER 911972] p 353 A92-45379

## TOXICOLOGY

Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 N92-29341

## TRAINING ANALYSIS

Application of instructional systems development (ISD) principles to the Advanced Qualification Program (AQP) p 344 A92-44961

Exploring conceptual structures in air traffic control (ATC) p 345 A92-44970

Applying cognitive Instructional Systems Development to multinational airways facilities training p 345 A92-44971

Cognitive task analysis of air traffic control p 345 A92-44972

The human factors of team-building implications for ab initio training p 346 A92-44978

Media selection analysis - Implications for training design [SAE PAPER 911971] p 353 A92-45378

A framework for optimizing total training systems - Application to maintenance training and team training systems [SAE PAPER 911972] p 353 A92-45379

Chimpanzee counting and rhesus monkey ordinality judgments p 328 A92-48097

Embedding training in a system p 367 A92-48546

Learning, teaching, and testing for complex conceptual understanding [AD-A248728] p 356 N92-29142

Fighter pilot training: The contribution of simulation [NLR-TP-89311-U] p 358 N92-29871

## TRAINING EVALUATION

CRM scenario development - The next generation p 339 A92-44904

Training and cockpit design to promote expert performance p 340 A92-44917

Training implications of a team decision model p 342 A92-44941

Instructional strategy for aircrew coordination training p 342 A92-44942

The assessment of coordination demand for helicopter flight requirements p 342 A92-44943

Development of aircrew coordination exercises to facilitate training transfer p 342 A92-44944

Lessons from cross-fleet/cross-airline observations - Evaluating the impact of CRM/LOFT training p 342 A92-44946

The impact of initial and recurrent cockpit resource management training on attitudes p 343 A92-44949

Advanced CRM training for instructors and evaluators p 343 A92-44951

Crew member and instructor evaluations of line oriented flight training p 343 A92-44952

U.S. Navy aircrew coordination training - A progress report p 343 A92-44953

ATCS field training performance and success in a supervisory selection program p 345 A92-44963

The human factors of team-building implications for ab initio training p 346 A92-44978

SAGES - A system optimising each trainee's course towards a final level which will be the purpose of the training period p 349 A92-45039

The use of an expert critic to improve aviation training p 350 A92-45049

What makes a good LOFT scenario? Issues in advancing current knowledge of scenario design --- Line Oriented Flight Training p 350 A92-45050

Multi-Attribute Task Battery - Applications in pilot workload and strategic behavior research p 352 A92-45072

Media selection analysis - Implications for training design [SAE PAPER 911971] p 353 A92-45378

A framework for optimizing total training systems - Application to maintenance training and team training systems [SAE PAPER 911972] p 353 A92-45379

## TRAINING SIMULATORS

SAGES - A system optimising each trainee's course towards a final level which will be the purpose of the training period p 349 A92-45039

Interactive video disk as an instructional tool in CRM programs p 362 A92-45040

Specifying performance for a new generation of visiocons simulators p 367 A92-48544

Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 N92-28744

Fighter pilot training: The contribution of simulation [NLR-TP-89311-U] p 358 N92-29871

Using intelligent simulation to enhance human performance in aircraft maintenance p 372 N92-30126

## TRANSDUCERS

The use of a tactile device to measure an illusion p 367 A92-48537

## TRANSFER OF TRAINING

Development of aircrew coordination exercises to facilitate training transfer p 342 A92-44944

Transfer of training from a low cost helicopter simulator p 349 A92-45038

Knowledge transfer and support systems in fighter aircraft p 362 A92-45047

G-tolerance and spatial disorientation: Can simulation help us? p 337 N92-28534

## TRANSFUSION

Structural characterization of cross-linked hemoglobins developed as potential-transfusion substitutes [AD-A246777] p 337 N92-28515

## TRANSPORT AIRCRAFT

Flight deck information management - A challenge to commercial transport aviation p 359 A92-44908

An evaluation of flight path management automation in transport category aircraft p 360 A92-44918

## TUNING

Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 N92-29758

## TWITCHING

Observation of dynamic changes of rat soleus during tail suspension p 327 A92-45949

## U

## UH-1 HELICOPTER

Transfer of training from a low cost helicopter simulator p 349 A92-45038

## UH-60A HELICOPTER

Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) 8 [AD-A248283] p 339 N92-29347

## ULTRASONICS

Statistical differentiation between malignant and benign prostate lesions from ultrasound images p 364 A92-46279

## UNCONSCIOUSNESS

Study of the loss of consciousness inflight by fighter aircraft pilots [ONERA-RTS-11/3446-EY] p 338 N92-28844

## USER REQUIREMENTS

An integrated methodology for knowledge and design acquisition --- development and evaluation of tactical fighter mission p 366 A92-48526

## V

## VALSALVA EXERCISE

Self-protective anti-Gz straining maneuvers (AGSM) physiology p 336 A92-48536

## VASODILATION

Thermoregulation during spaceflight [NASA-TM-103913] p 337 N92-28420

**VEGETATION GROWTH**

Coupling plant growth and waste recycling systems in a controlled life support system (CELSS)  
[NASA-TM-107544] p 369 N92-28670

**VESTIBULES**

The use of a tactile device to measure an illusion  
p 367 A92-48537

**VIBRATION EFFECTS**

Effect of vibration on the metabolism of gamma-aminobutyric acid in the brain for different functional states of the adrenal cortex  
p 327 A92-46601

Man-in-the-loop study of filtering in airborne head tracking tasks  
p 365 A92-46763

**VIBRATION TESTS**

Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system  
[AD-A247167] p 336 N92-28242

**VIDEO DISKS**

Interactive video disk as an instructional tool in CRM programs  
p 362 A92-45040

**VIRTUAL REALITY**

Low-cost approaches to virtual flight simulation  
p 367 A92-48545

**VISCOUS FLUIDS**

Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity  
[NASA-TP-3200] p 370 N92-28897

**VISION**

Attentional issues in superimposed flight symbology  
p 361 A92-44986

**VISUAL ACCOMMODATION**

A survey of naval aviator opinions regarding unaided vision training topics  
p 347 A92-44991

The effect of accommodation on retinal image size  
p 335 A92-46297

**VISUAL ACUITY**

Dynamic contrast sensitivity  
p 347 A92-44989

Visual acuity with second and third generation night vision goggles obtained from a new method of night sky simulation across a wide range of target contrast  
[AD-A248284] p 371 N92-29348

**VISUAL AIDS**

Specifying performance for a new generation of visionics simulators  
p 367 A92-48544

A remote visual interface tool for simulation control and display  
p 368 A92-48547

**VISUAL DISCRIMINATION**

Object discrimination based on depth-from-occlusion  
[AD-A248104] p 358 N92-29560

**VISUAL FIELDS**

Program Cluster: An identification of fixation cluster characteristics  
[AD-A247014] p 354 N92-28396

**VISUAL FLIGHT RULES**

Investigation and evaluation of a computer program to minimize VFR flight planning errors  
p 362 A92-45062

**VISUAL PERCEPTION**

Dynamic contrast sensitivity  
p 347 A92-44989

A survey of naval aviator opinions regarding unaided vision training topics  
p 347 A92-44991

Incremental transfer study of scene detail and visual augmentation guidance in landing training  
p 348 A92-45022

Visual augmentation and scene detail effects in flight training  
p 349 A92-45023

The strategic integration of perception and action  
p 352 A92-45071

Effect of spatial frequency content of the background on visual detection of a known target  
p 353 A92-46277

The effect of accommodation on retinal image size  
p 335 A92-46297

Judgments of change and proportion in graphical perception  
p 364 A92-46299

Peripherally located CRTs - Color perception limitations  
p 354 A92-48548

Program Cluster: An identification of fixation cluster characteristics  
[AD-A247014] p 354 N92-28396

Delays in laser glare onset differentially affect target-location performance in a visual search task  
[AD-A246708] p 355 N92-28557

Neuropsychological components of object identification  
[AD-A247049] p 355 N92-28877

Object discrimination based on depth-from-occlusion  
[AD-A248104] p 358 N92-29560

**VISUAL SIGNALS**

Visual cues to geographical orientation during low-level flight  
p 346 A92-44984

**VISUAL STIMULI**

Effects of ionizing radiation on auditory and visual thresholds  
[AD-A248199] p 329 N92-29410

**VISUAL TASKS**

Dynamic contrast sensitivity  
p 347 A92-44989

Relationship between surface texture and object density on judgements of velocity, altitude, and change of altitude  
p 347 A92-44990

Visual properties for the transfer of landing skill  
p 349 A92-45024

Motion cuing for marginal flight - Is it information or isn't it?  
p 361 A92-45032

Yellow lens effects upon visual acquisition performance  
p 334 A92-45813

Program Cluster: An identification of fixation cluster characteristics  
[AD-A247014] p 354 N92-28396

**VOICE COMMUNICATION**

Microcoding of communications in accident investigation - Crew coordination in United 811 and United 232  
p 343 A92-44950

**VOICE CONTROL**

The effects of speech controls on performance in advanced helicopters in a double stimulation paradigm  
p 341 A92-44930

**W****WASTE DISPOSAL**

Purification and storage of waste gases on Space Station Freedom  
[AIAA PAPER 92-3607] p 368 A92-49073

**WASTE TREATMENT**

Waste streams in a crewed space habitat. II  
p 365 A92-48174

**WATER**

What makes a planet habitable, and how to search for habitable planets in other solar systems  
p 372 A92-46443

Space life support engineering program  
[NASA-CR-190448] p 369 N92-28671

**WATER BALANCE**

Cold and hypoxia  
p 335 A92-45950

**WATER RECLAMATION**

Space life support engineering program  
[NASA-CR-190448] p 369 N92-28671

Whole body cleaning agent containing N-acyltaurate  
[NASA-CASE-MS-C-21589-1] p 370 N92-29137

**WEIGHTLESSNESS**

Whole body cleaning agent containing N-acyltaurate  
[NASA-CASE-MS-C-21589-1] p 370 N92-29137

**WETTING**

Whole body cleaning agent containing N-acyltaurate  
[NASA-CASE-MS-C-21589-1] p 370 N92-29137

**WHITE NOISE**

Non-linear analysis of visual cortical neurons  
[AD-A250233] p 338 N92-29179

**WORKLOADS (PSYCHOPHYSIOLOGY)**

Aircrew coordination for Army helicopters - Research overview  
p 341 A92-44939

Heart rate variability and auditory workload during noise stress - Speaker sex and bandpass effects on speech intelligibility  
p 333 A92-45011

Heart rate variability as an index for pilot workload  
p 333 A92-45012

Diverter - Perspectives on the integration and display of flight critical information using an expert system and menu-driven displays  
p 361 A92-45035

An evaluation of strategic behaviors in a high fidelity simulated flight task - Comparing primary performance to a figure of merit  
p 351 A92-45069

Multi-Attribute Task Battery - Applications in pilot workload and strategic behavior research  
p 352 A92-45072

State-of-the-art pilot performance and workload measurement  
p 352 A92-45073

Strategic behaviour in flight workload management  
p 352 A92-45074

The Bedford scale - Does it measure spare capacity?  
p 352 A92-45075

Individual differences in strategic flight management and scheduling  
p 352 A92-45076

Correlational analysis of survey and model-generated workload values  
[AD-A247153] p 368 N92-28518

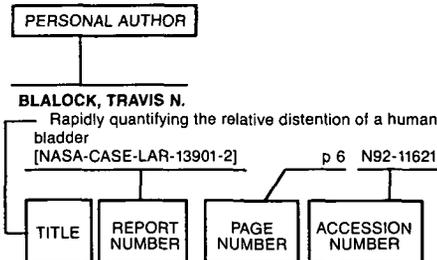
**X****X RAY APPARATUS**

Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system  
[AD-A247167] p 336 N92-28242

**XYLOSE**

Flux-capacity relationships of Acinetobacter calcoaceticus enzymes during xylose oxidation  
p 331 N92-29739

## Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document listed (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title. Under any one author's name the accession numbers are arranged in sequence.

## A

- ABBOTT, KATHY H.**  
Information management for commercial aviation - A research perspective p 359 A92-44905
- ADAM, STEVEN J.**  
Purification and storage of waste gases on Space Station Freedom [AIAA PAPER 92-3607] p 368 A92-49073
- ADAMS, RICHARD J.**  
Information transfer limitations in ATC p 346 A92-44974
- ALDERS, G. J.**  
Fighter pilot training: The contribution of simulation [NLR-TP-89311-U] p 358 N92-29871
- ALKOV, ROBERT A.**  
U.S. Navy aircrew coordination training - A progress report p 343 A92-44953
- ALSTON, NEIL**  
Team building following a pilot labour dispute - Extending the CRM envelope p 344 A92-44955
- AMBURN, PHIL**  
Low-cost approaches to virtual flight simulation p 367 A92-48545
- ANCMAN, EILEEN**  
Psychological state vs. peripheral color perception p 346 A92-44987
- Peripherally located CRTs - Color perception limitations p 354 A92-48548
- ANDRE, ANTHONY D.**  
Compatibility and consistency in aircrew decision aiding p 362 A92-45056
- ARNEGARD, RUTH J.**  
Multi-Attribute Task Battery - Applications in pilot workload and strategic behavior research p 352 A92-45072
- ARTHUR, WINFRED, JR.**  
A dyadic protocol for training complex skills p 354 A92-46300
- ASHTON, DEANA H.**  
Inner ear barotrauma - A case for exploratory tympanotomy p 335 A92-45821
- AWE, CYNTHIA A.**  
Time estimation in flight p 361 A92-44983

## B

- AYED, M.**  
Theoretical and experimental investigations on the fast rotating clinostat p 329 A92-48631
- AYOUB, M. M.**  
Development of models for prediction of optimal lifting motion [PB92-164656] p 371 N92-29949
- BABAIAN, R. J.**  
Statistical differentiation between malignant and benign prostate lesions from ultrasound images p 364 A92-46279
- BACHERT, ROBERT F.**  
A framework for optimizing total training systems - Application to maintenance training and team training systems [SAE PAPER 911972] p 353 A92-45379
- BACKS, RICHARD W.**  
Heart rate variability and auditory workload during noise stress - Speaker sex and bandpass effects on speech intelligibility p 333 A92-45011
- BADA, JEFFREY L.**  
Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179
- BAGIAN, JAMES P.**  
Comparison of current Shuttle and pre-Challenger flight suit reach capability during launch accelerations p 363 A92-45824
- BAHRI, TOUFIK**  
Effects of shifts in the level of automation on operator performance p 340 A92-44912
- BAKER, DAVID D., JR.**  
Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system [AD-A247167] p 336 N92-28242
- BAKER, DAVID P.**  
Development of aircrew coordination exercises to facilitate training transfer p 342 A92-44944
- BAKER, L. J. V.**  
Inappropriate functioning of the cockpit dominance hierarchy as a factor in approach/landing accidents p 348 A92-45006
- BAKSTEEN, J.**  
The bioreactor overflow device: An undesired selective separator in continuous cultures? p 330 N92-29736
- BALLARD, R.**  
In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397
- BALLAS, JAMES A.**  
Interface styles for adaptive automation p 359 A92-44913
- BANDA, CAROLYN**  
Army-NASA aircrew/aircraft integration program: Phase 4 A(3)I Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413
- BANDERET, LOUIS E.**  
Effects of high terrestrial altitude on military performance [AD-A246695] p 336 N92-28288
- BARFIELD, WOODROW**  
Relationship between surface texture and object density on judgements of velocity, altitude, and change of altitude p 347 A92-44990
- BARNETTE, B. D.**  
Program Cluster: An identification of fixation cluster characteristics [AD-A247014] p 354 N92-28396
- BASON, R.**  
Cervical injuries during high G maneuvers - A review of Naval Safety Center data, 1980-1990 p 334 A92-45820
- BATTISTE, VERNOL**  
Visual cues to geographical orientation during low-level flight p 346 A92-44984

- BAUMAN, MITCH**  
Development of aircrew coordination exercises to facilitate training transfer p 342 A92-44944
- BELTRACCHI, L.**  
A strategy for minimizing common mode human error in executing critical functions and tasks [DE92-011839] p 355 N92-28775
- BELYAVIN, A.**  
Pilot attitudes to cockpit automation p 340 A92-44926
- BERBAUM, KEVIN S.**  
Use of a motion sickness history questionnaire for prediction of simulator sickness p 334 A92-45818
- BERGER, ROBERT C.**  
Effects of gyro-fitness training on airsickness management p 348 A92-45013
- BERGER, THEODORE W.**  
A systems theoretic investigation of neuronal network properties of the hippocampal formation [AD-A250246] p 357 N92-29334
- BERINGER, DENNIS B.**  
When high is big and low is small, decisions aren't that hard at all - Analog encoding of altitude in C.D.T.I. revisited p 340 A92-44916
- BESCO, ROBERT O.**  
The myths of pilot personality stereotypes p 347 A92-45003
- BIEDERMAN, IRVING**  
Psychophysical analyses of perceptual representations [AD-A246945] p 357 N92-29186
- BIRKIRE, DEBORAH P.**  
Program Cluster: An identification of fixation cluster characteristics [AD-A247014] p 354 N92-28396
- BLACKWELL, A. L.**  
A study of the control problem of the shoot side environment delivery system of a closed crop growth research chamber [NASA-CR-177597] p 369 N92-28681
- BLACKWELL, C. C.**  
A study of the control problem of the shoot side environment delivery system of a closed crop growth research chamber [NASA-CR-177597] p 369 N92-28681
- BLOCK, MICHAEL G.**  
Yellow lens effects upon visual acquisition performance p 334 A92-45813
- BOFF, KENNETH R.**  
Coding techniques for rapid communication displays p 360 A92-44928
- Cockpit resource management - A social psychological perspective p 344 A92-44958
- BOLSTAD, CHERYL A.**  
EEG correlates of critical decision making in computer simulated combat p 333 A92-45014
- BOROWSKI, RICHARD**  
Cockpit design consideration for highly agile aircraft p 362 A92-45051
- BORTOLUSSI, MICHAEL R.**  
The effects of speech controls on performance in advanced helicopters in a double stimulation paradigm p 341 A92-44930
- An evaluation of strategic behaviors in a high fidelity simulated flight task - Comparing primary performance to a figure of merit p 351 A92-45069
- BOUCEK, GEORGE**  
Information management for commercial aviation - A research perspective p 359 A92-44905
- BOWERS, CLINT A.**  
The assessment of coordination demand for helicopter flight requirements p 342 A92-44943
- BOYLE, EDWARD**  
Early MPTS analysis - Methods in this 'madness' p 366 A92-48533
- BRAUNE, ROLF J.**  
Flight deck information management - A challenge to commercial transport aviation p 359 A92-44908
- The utilization of the aviation safety reporting system - A case study in pilot fatigue p 333 A92-45020

AUTHOR

## BRIEGLEB, WOLFGANG

The membrane-electrolyte system - Model of the interaction of gravity with biological systems at the cellular level p 328 A92-48624

## BROACH, DANA

Personality differences among supervisory selection program candidates p 345 A92-44962

## BRONKHORST, TINA M.

Aircrew coordination for Army helicopters - An exploration of the attitude-behavior-performance relationship p 342 A92-44940

## BROWN, CLIFFORD E.

Cockpit resource management - A social psychological perspective p 344 A92-44958  
Social psychological metaphors for human-computer system design p 366 A92-48528

## BROWN, M. D.

In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397

## BRYANT, DON

Coordination strategies of crew management p 341 A92-44935

## BUCHSBAUM, GERSHON

Biologically-based neural network model of color constancy and color contrast [AD-A248128] p 357 N92-29398

## BUICK, F.

Determination of a pressure breathing schedule for improving +Gz tolerance p 334 A92-45815

## BURDIUZZA, V. V.

Chemistry of the interstellar medium - An evolutionary dead end? p 372 A92-46446

## BURSE, RICHARD L.

Effects of high terrestrial altitude on military performance [AD-A246695] p 336 N92-28288

## BUSHNELL, DAVID

Army-NASA aircrew/aircraft integration program: Phase 4 A(3) Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413

## BUSSOLARI, S. R.

An evaluation of flight path management automation in transport category aircraft p 360 A92-44918

## BUTLER, ROY E.

Lessons from cross-fleet/cross-airline observations - Evaluating the impact of CRM/LOFT training p 342 A92-44946

## C

## CABON, PH.

Vigilance of aircrews during long-haul flights p 333 A92-45021

## CAIN, BRAD

Modelling of heat and moisture loss through NBC ensembles [AD-A245939] p 368 N92-28346

## CALDWELL, CURTIS

Effect of spatial frequency content of the background on visual detection of a known target p 353 A92-46277

## CALEEL, RICHARD

Laser surgery procedures in the operational KC-135E aviation environment p 335 A92-45823

## CANNON, JOHN R.

Cognitive task analysis of air traffic control p 345 A92-44972

## CANO, YVONNE

Coordination strategies of crew management p 341 A92-44935

## CAPUTO, MICHAEL P.

Portable dynamic fundus instrument [NASA-CASE-MS-C-21675-1] p 337 N92-28755

## CARLE, GLENN C.

Collection of cosmic dust in earth orbit for exobiological analysis p 373 A92-48225

## CARR, GERALD P.

Aerospace crew station design [ISBN 0-444-87569-7] p 363 A92-45301

## CARRETTA, THOMAS R.

Personality assessment in proposed USAF pilot selection and classification systems p 353 A92-45077

## CARTER, RICHARD M.

A new generation of U.S. Army flight helmets p 363 A92-45825

## CHANDRA, D.

An evaluation of flight path management automation in transport category aircraft p 360 A92-44918

## CHAPPELL, SHERYL L.

Training and cockpit design to promote expert performance p 340 A92-44917

## CHATTERJEE, A.

Problems in mechanistic theoretical models for cell transformation by ionizing radiation [DE92-010265] p 336 N92-28278

## CHELETTE, T. L.

The use of a tactile device to measure an illusion p 367 A92-48537

## CHEN, SCOTT

Army-NASA aircrew/aircraft integration program: Phase 4 A(3) Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413

## CHIU, ALEX

Army-NASA aircrew/aircraft integration program: Phase 4 A(3) Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413

## CIAVARELLI, ANTHONY P.

Use of a human factors checklist in aircraft mishap investigations p 347 A92-44992

## CLARK, RONALD E.

The interactive effects of cockpit resource management, domestic stress, and information processing in commercial aviation p 348 A92-45017

## CLOTHIER, CATHY C.

Behavioral interactions across various aircraft types - Results of systematic observations of line operations and simulations p 343 A92-44947

## COBLENTZ, A.

Vigilance of aircrews during long-haul flights p 333 A92-45021

## COLLYER, P. D.

Delays in laser glare onset differentially affect target-location performance in a visual search task [AD-A246708] p 355 N92-28557

## COLVARD, MICHAEL

Laser surgery procedures in the operational KC-135E aviation environment p 335 A92-45823

## COMSTOCK, J. R., JR.

Multi-Attribute Task Battery - Applications in pilot workload and strategic behavior research p 352 A92-45072

## CONLEY, SHARON

Coordination strategies of crew management p 341 A92-44935

## CONSTANTINE, BETSY

Army-NASA aircrew/aircraft integration program: Phase 4 A(3) Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413

## CONWAY, TERRY L.

Exercise and three psychosocial variables: A longitudinal study [AD-A250649] p 339 N92-30216

## CORDELL, TOM

Computer-based procedural training p 349 A92-45037

## COSTLEY, JOHN

Pilot reaction to ultra-long-haul flying p 344 A92-44954

## COULSON, RICHARD L.

Learning, teaching, and testing for complex conceptual understanding [AD-A248728] p 356 N92-29142

## COURTNEY, SUSAN M.

Biologically-based neural network model of color constancy and color contrast [AD-A248128] p 357 N92-29398

## CRABTREE, MARK S.

Criterion Task Set (CTS) - Evaluation of cognitive task batteries p 353 A92-45078

## CYNADER, MAX S.

Curvature estimation in orientation selection [AD-A247862] p 356 N92-28957

## D

## DAHNS, DAVID A.

Low-cost approaches to virtual flight simulation p 367 A92-48545

## DANDREA, J. A.

Delays in laser glare onset differentially affect target-location performance in a visual search task [AD-A246708] p 355 N92-28557

## DANLEY, DAVID L.

Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system [AD-A247167] p 336 N92-28242

## DAVIS, SHARON A.

Criterion Task Set (CTS) - Evaluation of cognitive task batteries p 353 A92-45078

## DAY, ROSS H.

The effect of accommodation on retinal image size p 335 A92-46297

## DE GASTON, A. N.

Range, energy, heat of motion in the modified NBC, anti-g, tank suit p 365 A92-46795

## DE REE, HANS

The emergency checklist, testing various layouts p 340 A92-44921

## DE VANSSAY, E.

Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447

## DEATON, JOHN E.

Human performance in complex task environments - A basis for the application of adaptive automation p 340 A92-44911

## DEFRANCO, CARL

Effects of extremely high G acceleration forces on NASA's control and space exposed tomato seeds [AD-A247488] p 329 N92-28247

## DEGANI, ASAF

Electronic checklists - Evaluation of two levels of automation p 360 A92-44924  
Philosophy, policies, and procedures - The three P's of flight-deck operations p 360 A92-44925

## DELLA ROCCO, PAMELA S.

Performance in the ATC screen program and supervisory selection program outcome p 345 A92-44965

## DELZELL, SUZANNE

Visual cues to geographical orientation during low-level flight p 346 A92-44984

## DENNIS, RICHARD J.

Contact lens wear with the USAF protective integrated hood/mask chemical defense ensemble p 363 A92-45814

## DEROUCHY, WILLIAM J.

A remote visual interface tool for simulation control and display p 368 A92-48547

## DICKSON, KATHERINE J.

Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 N92-29341

## DIEHL, ALAN E.

A workshop on understanding and preventing aircrew error p 339 A92-44902

## DO, L.

Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447

## DOHME, JACK

Transfer of training from a low cost helicopter simulator p 349 A92-45038

## DOLL, THEODORE J.

Masking in three-dimensional auditory displays p 364 A92-46294

## DONOVAN, KENNETH B.

Specifying performance for a new generation of visionics simulators p 367 A92-48544

## DONOVAN, REBECCA S.

Coding techniques for rapid communication displays p 360 A92-44928

## DRESEL, K. M.

Flight deck information management - A challenge to commercial transport aviation p 359 A92-44908

## DRISKELL, JAMES E.

Collective behavior and team performance p 354 A92-46296

## DUNN, DENNIS J.

Aircrew coordination for Army helicopters - Improved procedures for accident investigation p 342 A92-44945

## DURCK, CRAIG H.

Range, energy, heat of motion in the modified NBC, anti-g, tank suit p 365 A92-46795

## DURLACH, NATHANIEL

Super auditory localization for improved human-machine interfaces [AD-A250288] p 370 N92-29121

## E

## EHRlich, LISA

Effect of spatial frequency content of the background on visual detection of a known target p 353 A92-46277

## ELLIOTT, F. S.

Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes [AD-A247669] p 356 N92-28940

## EMERSON, TERRY J.

The effect of adaptive function allocation on the cockpit design paradigm p 360 A92-44914

## ENDSLEY, MICA R.

EEG correlates of critical decision making in computer simulated combat p 333 A92-45014

## ERICSON, MARK A.

Target acquisition performance using spatially correlated auditory information over headphones p 347 A92-44988

- ESKEN, R.**  
Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535
- ESPART, DANIEL**  
SAGES - A system optimising each trainee's course towards a final level which will be the purpose of the training period p 349 A92-45039
- F**
- FAHNENBRUCK, GERHARD**  
Flying an aircraft as a problem solving process - About the Instrument-Failure-Simulator (IFS) as a test for pilot applicants p 351 A92-45060
- FARNHAM, JAMES M.**  
Studies of perceptual memory [AD-A250200] p 356 N92-29144
- FASSBENDER, CHRISTOPH**  
Culture-fairness of test methods - Problems in the selection of aviation personnel p 353 A92-45079
- FAUQUET, REGIS S.**  
Architectural studies relating to the nature of human body motion in microgravity [SAE PAPER 912076] p 363 A92-45453
- FELTOVICH, PAUL J.**  
Learning, teaching, and testing for complex conceptual understanding [AD-A248728] p 356 N92-29142
- FETH, LAWRENCE L.**  
Demodulation processes in auditory perception [AD-A250203] p 356 N92-29146
- FIGAROL, SYLVIE**  
Knowledge transfer and anticipation in airline piloting p 351 A92-45065
- FINKEL, LEIF H.**  
Biologically-based neural network model of color constancy and color contrast [AD-A248128] p 357 N92-29398  
Object discrimination based on depth-from-occlusion [AD-A248104] p 358 N92-29560
- FISCHER, UTE**  
Information transfer and shared mental models for decision making p 341 A92-44937
- FITZPATRICK, ANN H.**  
Carbon dioxide effects on potato growth under different photoperiods and irradiance p 328 A92-48399
- FOGLEMAN, GUY**  
On performing exobiology experiments on an earth-orbital platform with the Gas-Grain Simulation Facility p 373 A92-48100  
Collection of cosmic dust in earth orbit for exobiological analysis p 373 A92-48225
- FORTNEY, SUZANNE M.**  
Thermoregulation during spaceflight [NASA-TM-103913] p 337 N92-28420
- FOUILLOT, J. P.**  
Vigilance of aircrews during long-haul flights p 333 A92-45021
- FOWLKES, JENNIFER E.**  
Use of a motion sickness history questionnaire for prediction of simulator sickness p 334 A92-45818
- FOYLE, DAVID C.**  
Attentional issues in superimposed flight symbology p 361 A92-44986
- FRAZIER, J.**  
Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535
- FREEMAN, CHARLOTTE**  
Taxonomy of crew resource management - Information processing domain p 344 A92-44957
- FRERE, C.**  
Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447
- FREY, PAUL R.**  
Big graphics and little screens - Designing graphical displays for maintenance tasks p 364 A92-46105
- FUNK, KENNETH H., II**  
Taxonomy of ATC operator errors based on a model of human information processing p 346 A92-44980
- G**
- GAFFIE, DANIEL**  
Study of the loss of consciousness inflight by fighter aircraft pilots [ONERA-RTS-11/3446-EY] p 338 N92-28844
- GALVIN, JAMES J., JR.**  
Correlational analysis of survey and model-generated workload values [AD-A247153] p 368 N92-28518
- GARFIN, S. R.**  
In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397
- GARLAND, JAY L.**  
Coupling plant growth and waste recycling systems in a controlled life support system (CELSS) [NASA-TM-107544] p 369 N92-28670
- GARRIS, ROSEMARY D.**  
Big graphics and little screens - Designing graphical displays for maintenance tasks p 364 A92-46105
- GASKA, JAMES P.**  
Non-linear analysis of visual cortical neurons [AD-A250233] p 338 N92-29179
- GASSET, G.**  
Theoretical and experimental investigations on the fast rotating clinostat p 329 A92-48631
- GAWRON, VALERIE**  
State-of-the-art pilot performance and workload measurement p 352 A92-45073
- GEDDES, NORMAN D.**  
Automatic display management using dynamic plans and events p 359 A92-44910
- GENTLES, WILLIAM**  
Effect of spatial frequency content of the background on visual detection of a known target p 353 A92-46277
- GENTNER, FRANK C.**  
Early MPTS analysis - Methods in this 'madness' p 366 A92-48533
- GIBBONS, ANDREW S.**  
The use of an expert critic to improve aviation training p 350 A92-45049
- GIBSON, C. ROBERT**  
Portable dynamic fundus instrument [NASA-CASE-MSC-21675-1] p 337 N92-28755
- GILSON, RICHARD D.**  
Skill factors affecting team performance in simulated radar air traffic control p 346 A92-44979
- GLASS, DAVID J.**  
Study of SCN neurochemistry using in vivo microdialysis in the conscious brain: Correlation with overt circadian rhythms [AD-A247172] p 338 N92-28886
- GLEIZER, S. I.**  
Chemistry of the interstellar medium - An evolutionary dead end? p 372 A92-46446
- GLICKMAN, RANDOLPH D.**  
Investigation of laser-induced retinal damage [AD-A250173] p 338 N92-28920
- GLOVER, M. G.**  
In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397
- GLUCKMAN, JONATHAN P.**  
Human performance in complex task environments - A basis for the application of adaptive automation p 340 A92-44911
- GOLUB, MORTON A.**  
Waste streams in a crewed space habitat. II p 365 A92-48174
- GOTT, S.**  
In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397
- GOVERDE, P. F. W.**  
A low sensitivity observer for complex biotechnological processes p 331 N92-29757
- GRATZINGER, PETER**  
The myth of the adventuresome aviator p 348 A92-45005
- GRAU, JEAN Y.**  
Knowledge transfer and support systems in fighter aircraft p 362 A92-45047
- GREEN, R.**  
Pilot attitudes to cockpit automation p 340 A92-44926
- GREENLEAF, JOHN E.**  
Thermoregulation during spaceflight [NASA-TM-103913] p 337 N92-28420
- GREGORICH, STEVEN E.**  
What makes a good LOFT scenario? Issues in advancing current knowledge of scenario design p 350 A92-45050
- GREGORY, MICHAEL L.**  
A profile of scientist and engineer training conducted by the Naval Avionics Center [AD-A245925] p 354 N92-28408
- GREWE, JAMES B.**  
A new generation of crew resource management training p 344 A92-44959
- GROOT, W. J.**  
State estimation and control of the IBE-fermentation with product recovery p 331 N92-29756
- H**
- HALE, J. P., II**  
Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 N92-28521
- HALE, STEVE**  
The use of simulation in human factors test and evaluation of the LH helicopter p 361 A92-45031
- HAMELUCK, DONALD E.**  
Relationship between mental models and scanning behavior during instrument approaches p 349 A92-45043
- HAMMER, JOHN M.**  
Automatic display management using dynamic plans and events p 359 A92-44910
- HANCOCK, P. A.**  
On operator strategic behavior p 350 A92-45053
- HANNA, THOMAS E.**  
Masking in three-dimensional auditory displays p 364 A92-46294
- HANSON, KENNETH M.**  
Task performance on constrained reconstructions - Human observer performance compared with sub-optimal Bayesian performance p 354 A92-46278
- HARGENS, A. R.**  
In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397
- HARTRUM, THOMAS C.**  
A remote visual interface tool for simulation control and display p 368 A92-48547
- HARWOOD, KELLY**  
Exploring conceptual structures in air traffic control (ATC) p 345 A92-44970
- HAUN, JEFFREY D.**  
Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) 8 [AD-A248283] p 339 N92-29347
- HAWLEY, KEVIN J.**  
Studies of perceptual memory [AD-A250200] p 356 N92-29144
- HAYWARD, BRENT**  
Team building following a pilot labour dispute - Extending the CRM envelope p 344 A92-44955
- HE, LING-HAN**  
Histaminergic response to Coriolis stimulation - Implication for transdermal scopolamine therapy of motion sickness p 334 A92-45816
- HEASLIP, T. W.**  
The frozen pilot syndrome p 348 A92-45018
- HEGLUND, NORMAN C.**  
The energetics and mechanics of load carrying [AD-A248441] p 371 N92-29227
- HEIJNEN, J. J.**  
Linear relations in microbial reaction systems: A general overview of their origin, form, and use p 330 N92-29733  
Modelling and experimental validation of carbon dioxide evolution in alkalophilic cultures p 330 N92-29734  
Microbial aldonolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735  
The bioreactor overflow device: An undesired selective separator in continuous cultures? p 330 N92-29736  
Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737  
On the estimation of bioenergetic parameters p 330 N92-29738  
Flux-capacity relationships of Acinetobacter calcoaceticus enzymes during xylose oxidation p 331 N92-29739  
Analysis and experimental testing of a bottleneck model for the description of microbial dynamics p 331 N92-29740  
Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 N92-29759  
Sequential application of data reconciliation for sensitive detection of systematic errors p 332 N92-29760
- HEITMEYER, CONSTANCE L.**  
Interface styles for adaptive automation p 359 A92-44913
- HELLINGA, C.**  
The use of state estimators (observers) for on-line estimation of non-measurable process variables p 331 N92-29755  
State estimation and control of the IBE-fermentation with product recovery p 331 N92-29756  
A low sensitivity observer for complex biotechnological processes p 331 N92-29757

## K

- KADOO, ATSUSHI**  
The anthropometric survey for JASDF men and women - 1988. I - Methods and statistics of body dimensions p 336 A92-47500
- KAHN, ARTHUR**  
Behavioral analysis of management actions in aircraft accidents p 347 A92-45001
- KAISER, ROBERT H.**  
Incremental transfer study of scene detail and visual augmentation guidance in landing training p 348 A92-45022
- KAKIMOTO, YUKIKO**  
The anthropometric survey for JASDF men and women - 1988. I - Methods and statistics of body dimensions p 336 A92-47500
- KANAS, NICK**  
Socio-cultural issues during long duration space missions [SAE PAPER 912075] p 353 A92-45452
- KANKI, BARBARA G.**  
Communication variations related to leader personality p 341 A92-44934
- KARSH, ROBERT**  
Program Cluster: An identification of fixation cluster characteristics [AD-A247014] p 354 A92-28396
- KATOH, ZOJIRO**  
The anthropometric survey for JASDF men and women - 1988. I - Methods and statistics of body dimensions p 336 A92-47500
- KAY, GARY G.**  
COGSCREEN - Personal computer-based tests of cognitive function for occupational medical certification p 332 A92-45010
- KENNEDY, ROBERT S.**  
Variables affecting simulator sickness - Report of a semi-automatic scoring system p 333 A92-45029  
Use of a motion sickness history questionnaire for prediction of simulator sickness p 334 A92-45818
- KERIMOV, S. A.**  
Effect of vibration on the metabolism of gamma-aminobutyric acid in the brain for different functional states of the adrenal cortex p 327 A92-46601
- KHLIFI, M.**  
Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447
- KING, TERESA**  
The effects of task difficulty and resource requirements on attention strategies p 352 A92-45070
- KJELLBERG, ANDERS**  
Sustained attention and serial responding in heat - Mental effort in the control of performance p 334 A92-45819
- KLEIN, GARY A.**  
Training implications of a team decision model p 342 A92-44941  
Representing cockpit crew decision making p 350 A92-45057
- KOBUS, DAVID**  
Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes [AD-A247669] p 356 A92-28940
- KOMICH, J. N.**  
CRM scenario development - The next generation p 339 A92-44904
- KOONCE, JEFFERSON M.**  
Incremental transfer study of scene detail and visual augmentation guidance in landing training p 348 A92-45022  
Visual augmentation and scene detail effects in flight training p 349 A92-45023
- KOPILOV, A. N.**  
Effect of weak, extremely low-frequency magnetic fields on the time organization of exchange between thiol groups and lipid peroxidation products p 327 A92-46602
- KOSSLYN, STEPHEN M.**  
Neuropsychological components of object identification [AD-A247049] p 355 A92-28877
- KOTULAK, JOHN C.**  
Methods of visual scanning with night vision goggles [AD-A247470] p 370 A92-28944  
Visual acuity with second and third generation night vision goggles obtained from a new method of night sky simulation across a wide range of target contrast [AD-A248284] p 371 A92-29348
- KROIS, PAUL A.**  
Customizing the ATC computer-human interface via the use of controller preference sets p 361 A92-44968
- KUENEN, J. G.**  
Microbial aldonolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 A92-29735

## HELMREICH, ROBERT L.

- Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 A92-29758  
Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 A92-29759
- HELMREICH, ROBERT L.**  
Strategies for the study of flightcrew behavior p 343 A92-44948
- HERSCHLER, DANIEL A.**  
Skill factors affecting team performance in simulated radar air traffic control p 346 A92-44979
- HESS, ELIZABETH**  
Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 A92-29341
- HIENZ, ROBERT D.**  
Effects of ionizing radiation on auditory and visual thresholds [AD-A248199] p 329 A92-29410
- HIROFUJI, C.**  
Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817
- HO, WILLIAM**  
Effect of spatial frequency content of the background on visual detection of a known target p 353 A92-46277
- HOERMANN, HANS-JUERGEN**  
Exogenous and endogenous determinants of cockpit management attitudes p 344 A92-44956
- HOFER, ELFIE F.**  
Flight deck information management - A challenge to commercial transport aviation p 359 A92-44908
- HOLLANDS, J. G.**  
Judgments of change and proportion in graphical perception p 364 A92-46299
- HOLLEY, W. R.**  
Problems in mechanistic theoretical models for cell transformation by ionizing radiation [DE92-010265] p 336 A92-28278
- HOLMES, RICHARD E.**  
3-D TV without glasses p 367 A92-48541
- HONDA, YASUHIRO**  
Chemical studies on the existence of extraterrestrial life p 372 A92-46445
- HONDERD, G.**  
The use of state estimators (observers) on on-line estimation of non-measurable process variables p 331 A92-29755  
State estimation and control of the IBE-fermentation with product recovery p 331 A92-29756  
A low sensitivity observer for complex biotechnological processes p 331 A92-29757  
Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 A92-29758
- HOPKINS, WILLIAM D.**  
Language Research Center's Computerized Test System (LRC-CTS) - Video-formatted tasks for comparative primate research p 328 A92-48096  
Chimpanzee counting and rhesus monkey ordinality judgments p 328 A92-48097
- HORST, RICHARD L.**  
COGSCREEN - Personal computer-based tests of cognitive function for occupational medical certification p 332 A92-45010
- HOTES, ROBERT W.**  
Applying cognitive Instructional Systems Development to multinational airways facilities training p 345 A92-44971
- HOUSTON, A. G.**  
Statistical differentiation between malignant and benign prostate lesions from ultrasound images p 364 A92-46279
- HOVER, G. L.**  
Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 A92-29538
- HUDY, JOHN J.**  
The myth of the adventuresome aviator p 348 A92-45005
- HULBERT, M. S.**  
Bioluminescence in the western Alboran Sea in April 1991 [AD-A250016] p 329 A92-29089
- HULL, N.**  
The frozen pilot syndrome p 348 A92-45018
- HUNT, LYNN M.**  
Information processing in ab initio pilot training p 351 A92-45066
- HUNTER, NORWOOD R.**  
Portable dynamic fundus instrument [NASA-CASE-MS-C-21675-1] p 337 A92-28755

## HUNTINGTON, JUDITH L.

- On performing exobiology experiments on an earth-orbital platform with the Gas-Grain Simulation Facility p 373 A92-48100  
Collection of cosmic dust in earth orbit for exobiological analysis p 373 A92-48225
- HWOSCHINSKY, PETER V.**  
Information transfer limitations in ATC p 346 A92-44974

## I

- IBA, WAYNE**  
Acquisition and improvement of human motor skills: Learning through observation and practice [NASA-TM-107878] p 357 A92-29174
- INLOW, MARK**  
Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes [AD-A247669] p 356 A92-28940
- IRWIN, CHERYL M.**  
The impact of initial and recurrent cockpit resource management training on attitudes p 343 A92-44949
- ISHIHARA, A.**  
Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817
- ITOH, K.**  
Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817
- ITOH, M.**  
Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817

## J

- JACKSON, DOUGLAS E.**  
On the effect of range restriction on correlation coefficient estimation [AD-A248956] p 358 A92-29620
- JACKSON, WILLIAM G., JR.**  
Contact lens wear with the USAF protective integrated hood/mask chemical defense ensemble p 363 A92-45814
- JACOBS, BARRY L.**  
Physiological analyses of the afferents controlling brain neurochemical systems [AD-A248334] p 359 A92-29930
- JACOBSEN, LOWELL D.**  
Non-linear analysis of visual cortical neurons [AD-A250233] p 338 A92-29179
- JAMES, M.**  
Pilot attitudes to cockpit automation p 340 A92-44926
- JENSEN, RICHARD S.**  
International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vols. 1 & 2 p 339 A92-44901
- JOHNSON, NEIL A.**  
A new generation of crew resource management training p 344 A92-44959
- JOHNSON, WALTER W.**  
Time estimation in flight p 361 A92-44983
- JOHNSON, WILLIAM B.**  
Using intelligent simulation to enhance human performance in aircraft maintenance p 372 A92-30126
- JOHNSTON, WILLIAM A.**  
Studies of perceptual memory [AD-A250200] p 356 A92-29144
- JONES, RICHARD T.**  
Structural characterization of cross-linked hemoglobins developed as potential transfusion substitutes [AD-A246777] p 337 A92-28515
- JONES, SHERRIE A.**  
Variables affecting simulator sickness - Report of a semi-automatic scoring system p 333 A92-45029
- JONSSON, JON E.**  
Information management for commercial aviation - A research perspective p 359 A92-44905  
The role of behavioral decision theory for cockpit information management p 340 A92-44907
- JORDAN, JEFFREY A.**  
A dyadic protocol for training complex skills p 354 A92-46300
- JORGENSEN, WILLIAM F.**  
Embedding training in a system p 367 A92-48546
- JORNA, PETER G. A. M.**  
Heart rate variability as an index for pilot workload p 333 A92-45012

## KUO, PAUL

Laser surgery procedures in the operational KC-135E aviation environment p 335 A92-45823

## L

## LABO, JACK

Laser surgery procedures in the operational KC-135E aviation environment p 335 A92-45823

## LAKE, JAMES A.

Evidence that eukaryotes and eocyte prokaryotes are immediate relatives p 328 A92-47309

## LAM, KWOK-WAI

Investigation of laser-induced retinal damage [AD-A250173] p 338 N92-28920

## LANGERAK, J. A. C.

Analysis and experimental testing of a bottleneck model for the description of microbial dynamics p 331 N92-29740

## LAUTER, JUDITH L.

The Coordinated Noninvasive Studies (CNS) project, phase 1 [AD-A247159] p 337 N92-28397

## LAVOIE, D. M.

Bioluminescence in the western Alboran Sea in April 1991 [AD-A250016] p 329 N92-29089

## LAWTON, TERI B.

Method and apparatus for predicting the direction of movement in machine vision [NASA-CASE-NPO-17552-1-CU] p 370 N92-29129

## LAYTON, CHUCK

Research in cooperative problem-solving systems for aviation p 362 A92-45036

## LEAHY, RICHARD M.

Multiple dipole modeling and localization from spatio-temporal MEG data p 327 A92-45983

## LEE, ALFRED

Collaboration in pilot-controller communication p 341 A92-44938

## LEEDON, DENNIS K.

Aircrew coordination for Army helicopters - Research overview p 341 A92-44939

## LEEDS, JEFFREY L.

The prediction of engagement outcome during air combat maneuvering p 350 A92-45045

## LENOROVITZ, DAVID R.

Customizing the ATC computer-human interface via the use of controller preference sets p 361 A92-44968

## LENTSCH, STEVEN E.

Whole body cleaning agent containing N-acyltaurate [NASA-CASE-MS-C-21589-1] p 370 N92-29137

## LEONHARDT, CHARLENE

Effect of spatial frequency content of the background on visual detection of a known target p 353 A92-46277

## LEWIS, PAUL S.

Multiple dipole modeling and localization from spatio-temporal MEG data p 327 A92-45983

## LI, XIANG-GAO

The effects of microgravity on the character of progeny of *Drosophila melanogaster* p 328 A92-48630

## LICINA, JOSEPH R.

Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) 8 [AD-A248283] p 339 N92-29347

## LIERMAN, BRUCE

Cognitive task analysis of air traffic control p 345 A92-44972

## LIFSHITZ, S.

Man-in-the-loop study of filtering in airborne head tracking tasks p 365 A92-46763

## LILIENTHAL, MICHAEL G.

Use of a motion sickness history questionnaire for prediction of simulator sickness p 334 A92-45818

## LINDHOLM, TENNY A.

A framework for optimizing total training systems - Application to maintenance training and team training systems [SAE PAPER 911972] p 353 A92-45379

## LINDSAY, R. W.

A strategy for minimizing common mode human error in executing critical functions and tasks [DE92-011839] p 355 N92-28775

## LINDSETH, GLENDA N.

Flight anxiety of civilian student pilots p 348 A92-45019

## LINDSETH, PAUL D.

Flight anxiety of civilian student pilots p 348 A92-45019

## LINKE-HOMMES, ASTRID

The membrane-electrolyte system - Model of the interaction of gravity with biological systems at the cellular level p 328 A92-48624

## LINTERN, GAVAN

Incremental transfer study of scene detail and visual augmentation guidance in landing training p 348 A92-45022

Visual augmentation and scene detail effects in flight training p 349 A92-45023

Visual properties for the transfer of landing skill p 349 A92-45024

## LITTLE, WILLIAM

A survey of naval aviator opinions regarding unaided vision training topics p 347 A92-44991

## LLANERAS, ROBERT E.

Instructional strategy for aircrew coordination training p 342 A92-44994

## LOEW, MURRAY H.

Medical imaging VI - Image processing; Proceedings of the Meeting, Newport Beach, CA, Feb. 24-27, 1992 [SPIE-1652] p 364 A92-46276

## LOFARO, RONALD J.

An overview of human factors R&D in flightdeck automation - The National Plan for Aviation Human Factors p 361 A92-45033

## LOGAN, AILEEN L.

The utilization of the aviation safety reporting system - A case study in pilot fatigue p 333 A92-45020

## LUBNER, M.

Towards the validation of the five hazardous thoughts measure p 351 A92-45061

## LUJIKX, G. C. A.

Modelling and experimental validation of carbon dioxide evolution in alkalophilic cultures p 330 N92-29734

## LUKITO, G.

Flux-capacity relationships of *Acinetobacter calcoaceticus* enzymes during xylose oxidation p 331 N92-29739

## LUNINA, N. V.

Effect of the blocking of beta receptors on the state of the lysosomal apparatus in neutrophilic leukocytes in the peripheral blood of rabbits subjected to immobilization stress p 328 A92-46603

## LUO, SHU-MING

An extension of human optimal control model p 363 A92-45948

## LUTFI, R.

Additivity and auditory pattern analysis [AD-A250580] p 358 N92-29592

## LUYBEN, K. C. A. M.

Linear relations in microbial reaction systems: A general overview of their origin, form, and use p 330 N92-29733

Modelling and experimental validation of carbon dioxide evolution in alkalophilic cultures p 330 N92-29734

Microbial aldonolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735

The bioreactor overflow device: An undesired selective separator in continuous cultures? p 330 N92-29736

Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737

On the estimation of bioenergetic parameters p 330 N92-29738

Flux-capacity relationships of *Acinetobacter calcoaceticus* enzymes during xylose oxidation p 331 N92-29739

Analysis and experimental testing of a bottleneck model for the description of microbial dynamics p 331 N92-29740

The use of state estimators (observers) for on-line estimation of non-measurable process variables p 331 N92-29755

State estimation and control of the IBE-fermentation with product recovery p 331 N92-29756

A low sensitivity observer for complex biotechnological processes p 331 N92-29757

Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 N92-29758

Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 N92-29759

Sequential application of data reconciliation for sensitive detection of systematic errors p 332 N92-29760

## M

## MAHER, JOHN W.

Why pilots are least likely to get good decision making precisely when they need it most p 350 A92-45058

## MAHMOOD, M. M.

In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397

## MAIN, ROBERT G.

Integrating the affective domain into the instructional design process [AD-A249287] p 355 N92-28880

## MAKEIG, SCOTT

Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes [AD-A247669] p 356 N92-28940

## MALLERY, CARL J.

Effects of gyro-fitness training on airsickness management p 348 A92-45013

## MANLIGAS, CAROL L.

Minimum audible movement angle as a function of the azimuth and elevation of the source p 364 A92-46295

## MANNING, CAROL A.

ATCS field training performance and success in a supervisory selection program p 345 A92-44963

## MANNING, JOHN M.

Alcoholism - An equal opportunity disease p 332 A92-45007

## MARKOWITZ, J.

Towards the validation of the five hazardous thoughts measure p 351 A92-45061

## MARTI, KURT

Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179

## MARTINIUK, V. S.

Effect of weak, extremely low-frequency magnetic fields on the time organization of exchange between thiol groups and lipid peroxidation products p 327 A92-46602

## MASCHKE, PETER

Exogenous and endogenous determinants of cockpit management attitudes p 344 A92-44956

## MASTROIANNI, GEORGE R.

Effects of gyro-fitness training on airsickness management p 348 A92-45013

## MASTROPAOLO, JOSEPH A.

Range, energy, heat of motion in the modified NBC, anti-g, tank suit p 365 A92-46795

## MASUI, KAZUYA

The second flight simulator test of the head-up display for NAL QSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 N92-28831

## MATIN, LEONARD

Visual perception of elevation [AD-A248338] p 357 N92-29420

## MATSUMOTO, JOY HAMERMAN

Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 N92-28744

## MATTHIAS, BRANDON

The strategic integration of perception and action p 352 A92-45071

## MCALINDON, PETER J.

Investigation and evaluation of a computer program to minimize VFR flight planning errors p 362 A92-45062

## MCCANN, ROBERT S.

Attentional issues in superimposed flight symbology p 361 A92-44986

## MCCAULEY, MICHAEL

Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 N92-28744

## MCCLOSKEY, K.

Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535

The use of a tactile device to measure an illusion p 367 A92-48537

## MCCLUMPHA, A.

Pilot attitudes to cockpit automation p 340 A92-44926

## MCCOY, C. E.

Research in cooperative problem-solving systems for aviation p 362 A92-45036

## MCCOY, WILLIAM E., III

Taxonomy of ATC operator errors based on a model of human information processing p 346 A92-44980

## MCDONALD, BENJAMIN R.

Interactive video disk as an instructional tool in CRM programs p 362 A92-45040

## MCLEOD, R. K.

The frozen pilot syndrome p 348 A92-45018

## MCNEESE, MICHAEL D.

An integrated methodology for knowledge and design acquisition p 366 A92-48526

## MEEHAN, JAMES W.

The effect of accommodation on retinal image size p 335 A92-46297

Apparent size and distance in an imaging display p 364 A92-46298

## MEEHAN, RICHARD T.

Portable dynamic fundus instrument [NASA-CASE-MS-C-21675-1] p 337 N92-28755

**MEDELSON, M. L.**  
Somatic gene mutation in the human in relation to radiation risk [DE92-009459] p 337 N92-28685

**MERHAV, S. J.**  
Man-in-the-loop study of filtering in airborne head tracking tasks p 365 A92-46763

**MILLER, ROBERT E., II**  
Contact lens wear with the USAF protective integrated hood/mask chemical defense ensemble p 363 A92-45814

**MITTLEMAN, MICHAEL**  
A survey of naval aviator opinions regarding unaided vision training topics p 347 A92-44991

**MIZUMOTO, KIYOSHI**  
The anthropometric survey for JASDF men and women - 1988. I - Methods and statistics of body dimensions p 336 A92-47500

**MOLINIER, G.**  
Vigilance of aircrews during long-haul flights p 333 A92-45021

**MOLLARD, R.**  
Vigilance of aircrews during long-haul flights p 333 A92-45021

**MOLLOY, ROBERT**  
Effects of shifts in the level of automation on operator performance p 340 A92-44912

**MONTEMERLO, MELVIN D.**  
Aerospace crew station design [ISBN 0-444-87569-7] p 363 A92-45301

**MORAWSKI, JANUSZ M.**  
Pragmatic simulation, basics and techniques p 361 A92-45030

**MORGAN, BEN B., JR.**  
The assessment of coordination demand for helicopter flight requirements p 342 A92-44943

**MORRISON, GREGORY A.**  
Incremental transfer study of scene detail and visual augmentation guidance in landing training p 348 A92-45022

**MORRISON, JEFFREY G.**  
Human performance in complex task environments - A basis for the application of adaptive automation p 340 A92-44911

**MORROW, DANIEL**  
Collaboration in pilot-controller communication p 341 A92-44938

**MORTIMER, RUDOLF G.**  
Some factors associated with pilot age in general aviation crashes p 333 A92-45016

**MOSHER, JOHN C.**  
Multiple dipole modeling and localization from spatio-temporal MEG data p 327 A92-45983

**MOSIER, KATHLEEN L.**  
Expert decision-making strategies p 341 A92-44936

**MPITSOS, GEORGE J.**  
In search of a unified theory of biological organization: What does the motor system of a sea slug tell us about human motor integration? [AD-A250223] p 356 N92-29119

**MURPHY, ELIZABETH**  
Exploring conceptual structures in air traffic control (ATC) p 345 A92-44970

**MURRAY, JERRY**  
Army-NASA aircrew/aircraft integration program: Phase 4 A(3)I Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413

**MURTHY, G.**  
In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 N92-29397

**MUSCH, M. G.**  
Analysis and experimental testing of a bottleneck model for the description of microbial dynamics p 331 N92-29740

**MYERS, JENNIFER G.**  
Candidate performance in a supervisory selection program and subsequent selection decisions p 345 A92-44964

**MYERS, KYLE J.**  
Task performance on constrained reconstructions - Human observer performance compared with sub-optimal Bayesian performance p 354 A92-46278

N

**NAGASAWA, YUKO**  
The anthropometric survey for JASDF men and women - 1988. I - Methods and statistics of body dimensions p 336 A92-47500

**NAVARRO-GONZALEZ, RAFAEL**  
Chemical studies on the existence of extraterrestrial life p 372 A92-46445

**NELSON, E. D.**  
Psychoactive drugs - Effects on cockpit performance p 332 A92-45008

**NELSON, JAMES H.**  
Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system [AD-A247167] p 336 N92-28242

**NEUKOM, CHRISTIAN**  
Army-NASA aircrew/aircraft integration program: Phase 4 A(3)I Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413

**NGUYEN, THAHN**  
Effect of spatial frequency content of the background on visual detection of a known target p 353 A92-46277

**NIELSEN, RONALD A.**  
The interactive effects of cockpit resource management, domestic stress, and information processing in commercial aviation p 348 A92-45017

**NISHI, SHUJI**  
The anthropometric survey for JASDF men and women - 1988. I - Methods and statistics of body dimensions p 336 A92-47500

**NOORMAN, HENDRIK JAN**  
Methodology on monitoring and modelling of microbial metabolism [ETN-92-91745] p 330 N92-29732  
Linear relations in microbial reaction systems: A general overview of their origin, form, and use p 330 N92-29733  
Modelling and experimental validation of carbon dioxide evolution in alkalophilic cultures p 330 N92-29734  
Microbial aldonoalactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735  
The bioreactor overflow device: An undesired selective separator in continuous cultures? p 330 N92-29736  
Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737  
On the estimation of bioenergetic parameters p 330 N92-29738  
Flux-capacity relationships of Acinetobacter calcoaceticus enzymes during xylose oxidation p 331 N92-29739  
Analysis and experimental testing of a bottleneck model for the description of microbial dynamics p 331 N92-29740

**NORTON, JEFFREY E.**  
Using intelligent simulation to enhance human performance in aircraft maintenance p 372 N92-30126

**NUSINOV, M. D.**  
Chemistry of the interstellar medium - An evolutionary dead end? p 372 A92-46446

**OKUSHI, JUN**  
Architectural studies relating to the nature of human body motion in microgravity [SAE PAPER 912076] p 363 A92-45453

**OLASON, SUSAN C.**  
Customizing the ATC computer-human interface via the use of controller preference sets p 361 A92-44968

**OLDING, BILL**  
Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) B [AD-A248283] p 339 N92-29347

**OLESKO, BRIAN**  
Dynamic contrast sensitivity p 347 A92-44989

**OLFF, MIRANDA**  
Topographic EEG correlates of perceptual defensiveness p 333 A92-45015

**ONDREJKO, MICHAEL**  
The strategic integration of perception and action p 352 A92-45071

**ORASANU, JUDITH**  
Information transfer and shared mental models for decision making p 341 A92-44937

**OSCZEWSKI, RANDALL**  
Modelling of heat and moisture loss through NBC ensembles [AD-A245939] p 368 N92-28346

**PAILLOUS, P.**  
Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447

**PALMER, EVERETT**  
Electronic checklists - Evaluation of two levels of automation p 360 A92-44924

O

P

**PALMER, MARK T.**  
Communication variations related to leader personality p 341 A92-44934

**PALTA, JIWAN P.**  
Utilization of potatoes for life support systems. II - The effects of temperature under 24-h and 12-h photoperiods p 365 A92-48396

**PAN, BO-RONG**  
Changes of serum cortisol, insulin, glucagon, tyroxines and cyclic nucleotides pre- and post-flight in pilots p 335 A92-45946

**PANG, CHENG**  
Cold and hypoxia p 335 A92-45950

**PAPAGIANNIS, MICHAEL D.**  
What makes a planet habitable, and how to search for habitable planets in other solar systems p 372 A92-46443

**PARASURAMAN, RAJA**  
Effects of shifts in the level of automation on operator performance p 340 A92-44912

**PARKER-HANEY, ELIZABETH**  
The effects of unique encoding on the recall of numeric information p 351 A92-45067

**PAWLIK, EUGENE A., SR.**  
Aircrew coordination for Army helicopters - An exploration of the attitude-behavior-performance relationship p 342 A92-44940  
Aircrew coordination for Army helicopters - Improved procedures for accident investigation p 342 A92-44945

**PECARIC, M.**  
Determination of a pressure breathing schedule for improving +Gz tolerance p 334 A92-45815

**PENA, THOMASINA**  
Yellow lens effects upon visual acquisition performance p 334 A92-45813

**PEREZ, MANUEL A.**  
Interface styles for adaptive automation p 359 A92-44913

**PERROTT, DAVID R.**  
Minimum audible movement angle as a function of the azimuth and elevation of the source p 364 A92-46295

**PETERSON, RIC D.**  
Contact lens wear with the USAF protective integrated hood/mask chemical defense ensemble p 363 A92-45814

**PHIL, M.**  
Towards the validation of the five hazardous thoughts measure p 351 A92-45061

**PHILIPPOZ, JEAN-MICHEL**  
Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179

**PICCIONE, DINO**  
The use of simulation in human factors test and evaluation of the LH helicopter p 361 A92-45031

**PIJPERS, E. W.**  
Fighter pilot training: The contribution of simulation [NLR-TP-89311-U] p 358 N92-29871

**PILLALAMARRI, RAMAKRISHNA S.**  
Program Cluster: An identification of fixation cluster characteristics [AD-A247014] p 354 N92-28396

**PIRONNEAU, O.**  
Theoretical and experimental investigations on the fast rotating clinostat p 329 A92-48631

**PISTRE, MICHEL**  
SAGES - A system optimising each trainee's course towards a final level which will be the purpose of the training period p 349 A92-45039

**PITTS, DAVID E.**  
Statistical differentiation between malignant and benign prostate lesions from ultrasound images p 364 A92-46279

**PLANEL, H.**  
Theoretical and experimental investigations on the fast rotating clinostat p 329 A92-48631

**PLATT, PHILIP A.**  
Low-cost approaches to virtual flight simulation p 367 A92-48545

**PLOURDE, J. V.**  
Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 N92-29538

**POE, GINA R.**  
EEG correlates of critical decision making in computer simulated combat p 333 A92-45014

**POLLEN, DANIEL A.**  
Non-linear analysis of visual cortical neurons [AD-A250233] p 338 N92-29179

**PONNAMPERUMA, CYRIL**  
Chemical studies on the existence of extraterrestrial life p 372 A92-46445

**POTTS, RUSSELL O.**  
Gordon research conference on Barrier Function of Mammalian Skin [AD-A248556] p 339 N92-29577

- PRAKTIK, JOLANDE**  
KLM feedback and appraisal system for cockpit crew members p 344 A92-44960
- PREDMORE, STEVEN C.**  
Microcoding of communications in accident investigation - Crew coordination in United 811 and United 232 p 343 A92-44950
- PREMKUMAR, S. B.**  
Statistical differentiation between malignant and benign prostate lesions from ultrasound images p 364 A92-46279
- PRESTRUDE, A. M.**  
Dynamic contrast sensitivity p 347 A92-44989
- PREVOST, MICHAEL**  
Army-NASA aircrew/aircraft integration program: Phase 4 A(3)I Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413
- PRINCE, CAROLYN**  
Instructional strategy for aircrew coordination training p 342 A92-44942
- PROVINES, WAYNE F.**  
Yellow lens effects upon visual acquisition performance p 334 A92-45813
- Q**
- QUANDIEU, P.**  
Study of the loss of consciousness inflight by fighter aircraft pilots [ONERA-RTS-11/3446-EY] p 338 N92-28844
- R**
- RABY, MIREILLE**  
Strategic behaviour in flight workload management p 352 A92-45074  
Individual differences in strategic flight management and scheduling p 352 A92-45076
- RAHE, ALTON J.**  
Yellow lens effects upon visual acquisition performance p 334 A92-45813
- RAKELS, J. L. L.**  
Microbial aldonolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735
- RASH, CLARENCE E.**  
Visual acuity with second and third generation night vision goggles obtained from a new method of night sky simulation across a wide range of target contrast [AD-A248284] p 371 N92-29348
- RASPOJNIK, WILLIAM B.**  
The prediction of engagement outcome during air combat maneuvering p 350 A92-45045
- RAULIN, F.**  
Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447
- RAZMJOU, SHAHRAM**  
Sustained attention and serial responding in heat - Mental effort in the control of performance p 334 A92-45819
- REDDING, RICHARD E.**  
Cognitive task analysis of air traffic control p 345 A92-44972
- REDDIX, M. D.**  
Delays in laser glare onset differentially affect target-location performance in a visual search task [AD-A246708] p 355 N92-28557
- REE, MALCOLM J.**  
On the effect of range restriction on correlation coefficient estimation [AD-A248956] p 358 N92-29620
- REED, RICK**  
Effect of spatial frequency content of the background on visual detection of a known target p 353 A92-46277
- REGAL, DAVID**  
Synthetic vision in the Boeing high speed civil transport p 360 A92-44927
- REGIAN, J. W.**  
A dyadic protocol for training complex skills p 354 A92-46300
- REISING, JOHN**  
Cockpit design consideration for highly agile aircraft p 362 A92-45051
- REISING, JOHN M.**  
The effect of adaptive function allocation on the cockpit design paradigm p 360 A92-44914
- REISWEBER, DEBORAH A.**  
Visual properties for the transfer of landing skill p 349 A92-45024
- REITSTETTER, RAVEN**  
The membrane-electrolyte system - Model of the interaction of gravity with biological systems at the cellular level p 328 A92-48624
- REPPERGER, D. W.**  
Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535
- RICHARDSON, W. K.**  
Language Research Center's Computerized Test System (LRC-CTS) - Video-formatted tasks for comparative primate research p 328 A92-48096
- RICHOLLEY, G.**  
Theoretical and experimental investigations on the fast rotating clinostat p 329 A92-48631
- RICKS, WENDELL R.**  
Information management for commercial aviation - A research perspective p 359 A92-44905
- RIVERA, MARIA C.**  
Evidence that eukaryotes and eocyte prokaryotes are immediate relatives p 328 A92-47309
- ROARK, M.**  
Methodology for motion base simulation of closed loop supermaneuvers on a centrifuge simulator p 366 A92-48535
- ROBE, R. Q.**  
Evaluation of Night Vision Goggles (NVG) for maritime search and rescue [AD-A247182] p 371 N92-29538
- ROBERTS, RALPH J., JR.**  
The strategic integration of perception and action p 352 A92-45071
- RODVOLD, MICHELLE**  
Collaboration in pilot-controller communication p 341 A92-44938
- ROGERS, DWAYNE H.**  
The use of an expert critic to improve aviation training p 350 A92-45049
- ROGERS, STEVEN**  
Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 N92-28744
- ROGERS, WILLIAM H.**  
Information management for commercial aviation - A research perspective p 359 A92-44905  
Information management - Assessing the demand for information p 359 A92-44906
- ROMEIN, B.**  
On the estimation of bioenergetic parameters p 330 N92-29738
- ROSKE, CLARENCE E.**  
Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 N92-29758  
Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 N92-29759  
Sequential application of data reconciliation for sensitive detection of systematic errors p 332 N92-29760
- ROSENBERG, CRAIG**  
Relationship between surface texture and object density on judgements of velocity, altitude, and change of altitude p 347 A92-44990
- ROSKE-HOFSTRAND, RENATE**  
Exploring conceptual structures in air traffic control (ATC) p 345 A92-44970
- ROSS, LEONARD E.**  
Professional pilots' evaluation of the extent, causes, and means of reduction of alcohol use in aviation p 348 A92-45009
- ROSS, SUSAN M.**  
Professional pilots' evaluation of the extent, causes, and means of reduction of alcohol use in aviation p 348 A92-45009
- ROUSE, WILLIAM B.**  
Big graphics and little screens - Designing graphical displays for maintenance tasks p 364 A92-46105
- RUDOLPH, FREDERICK M.**  
Diverter - Perspectives on the integration and display of flight critical information using an expert system and menu-driven displays p 361 A92-45035
- RUMBAUGH, DUANE M.**  
Language Research Center's Computerized Test System (LRC-CTS) - Video-formatted tasks for comparative primate research p 328 A92-48096  
Chimpanzee counting and rhesus monkey ordinality judgments p 328 A92-48097
- RUSSOTTI, JOSEPH S.**  
Masking in three-dimensional auditory displays p 364 A92-46294
- S**
- SAFAROV, M. I.**  
Effect of vibration on the metabolism of gamma-aminobutyric acid in the brain for different functional states of the adrenal cortex p 327 A92-46601
- SAJDA, PAUL**  
Object discrimination based on depth-from-occlusion [AD-A248104] p 358 N92-29560
- SALAS, EDUARDO**  
Instructional strategy for aircrew coordination training p 342 A92-44942  
The assessment of coordination demand for helicopter flight requirements p 342 A92-44943  
Collective behavior and team performance p 354 A92-46296
- SALINAS, AL**  
Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 N92-28744
- SALOMON, RALF**  
Improvement of connectionist learning processes, working according to the gradients method [ETN-92-91335] p 355 N92-28787
- SANFORD, BEVERLY D.**  
Attentional issues in superimposed flight symbology p 361 A92-44986
- SARTER, NADINE B.**  
The Flight Management System - 'Rumors and facts' p 341 A92-44933
- SAVAGE-RUMBAUGH, E. S.**  
Language Research Center's Computerized Test System (LRC-CTS) - Video-formatted tasks for comparative primate research p 328 A92-48096  
Chimpanzee counting and rhesus monkey ordinality judgments p 328 A92-48097
- SCHAFFER, LAUREN E.**  
Comparison of current Shuttle and pre-Challenger flight suit reach capability during launch accelerations p 363 A92-45824
- SCHATZ, ALBRECHT**  
The membrane-electrolyte system - Model of the interaction of gravity with biological systems at the cellular level p 328 A92-48624
- SCHIRMER, JENNIFER U.**  
Menstrual history in altitude chamber trainees p 335 A92-45822
- SCHOEN, ROBERT J.**  
Effects of gyro-fitness training on airsickness management p 348 A92-45013
- SCHROEDER, DAVID J.**  
Cognitive indicators of ATCS technical ability and performance in a supervisory selection program p 345 A92-44966
- SCHWARZ, RAY P.**  
Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity [NASA-TP-3200] p 370 N92-28897
- SEAGRAVE, RICHARD C.**  
Space life support engineering program [NASA-CR-190448] p 369 N92-28671
- SELF, ROBERT**  
Laser surgery procedures in the operational KC-135E aviation environment p 335 A92-45823
- SHANKAR, RENUKA**  
Army-NASA aircrew/aircraft integration program: Phase 4 A(3)I Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413
- SHEBILSKIE, WAYNE L.**  
A dyadic protocol for training complex skills p 354 A92-46300
- SHEPHERD, WILLIAM T.**  
Human factors in aircraft maintenance and inspection p 372 N92-30125
- SHROYER, DAVID H.**  
A new generation of crew resource management training p 344 A92-44959
- SIEM, FREDERICK M.**  
Personality assessment in proposed USAF pilot selection and classification systems p 353 A92-45077
- SIMMON, DAVID A.**  
Taxonomy of crew resource management - Information processing domain p 344 A92-44957
- SIMON, ROBERT**  
Aircrew coordination for Army helicopters - An exploration of the attitude-behavior-performance relationship p 342 A92-44940  
Aircrew coordination for Army helicopters - Improved procedures for accident investigation p 342 A92-44945
- SIMS, EDWARD M.**  
Specifying performance for a new generation of visionics simulators p 367 A92-48544
- SINGH, GURMUKH**  
Comparative analysis of MMPI profiles in two groups of ab-initio flying trainees p 347 A92-45004
- SINGH, INDRAMANI**  
Effects of shifts in the level of automation on operator performance p 340 A92-44912
- SLEPENKOV, P. L.**  
Key problems of medical examinations by aviation physicians p 336 A92-49229

- SMIT, J.**  
G-tolerance and spatial disorientation: Can simulation help us? p 337 N92-28534
- SMITH, GEORGE**  
The effect of accommodation on retinal image size p 335 A92-46297
- SMITH, MARTIN G.**  
Variables affecting simulator sickness - Report of a semi-automatic scoring system p 333 A92-45029
- SMITH, PHILIP J.**  
Research in cooperative problem-solving systems for aviation p 362 A92-45036
- SMOLICZ, TOMASZ**  
'Pilot error' as information problem p 350 A92-45059
- SOINILA, SEPPO**  
In search of a unified theory of biological organization: What does the motor system of a sea slug tell us about human motor integration? [AD-A250223] p 356 N92-29119
- SORENSEN, H. B.**  
Media selection analysis - Implications for training design [SAE PAPER 911971] p 353 A92-45378
- SPENCE, IAN**  
Judgments of change and proportion in graphical perception p 364 A92-46299
- SPIRO, RAND J.**  
Learning, teaching, and testing for complex conceptual understanding [AD-A248728] p 356 N92-29142
- SPRING, EDMUND**  
The human element in air traffic control (ATC) p 346 A92-44973
- SPUDIS, PAUL D.**  
An argument for human exploration of the moon and Mars p 362 A92-45250
- STARK, EDWARD A.**  
Motion cuing for marginal flight - Is it information or isn't it? p 361 A92-45032
- STARR, WILLIAM K.**  
A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer [AD-A246683] p 368 N92-28286
- STASHKOV, A. M.**  
Effect of weak, extremely low-frequency magnetic fields on the time organization of exchange between thiol groups and lipid peroxidation products p 327 A92-46602
- STAVELAND, LOWELL**  
Army-NASA aircrew/aircraft integration program: Phase 4 A(3) Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 N92-29413
- STEFFEN, KENNETH L.**  
Utilization of potatoes for life support systems. II - The effects of temperature under 24-h and 12-h photoperiods p 365 A92-48396
- STEPHENSON, STANLEY D.**  
The effects of student-instructor interaction and paired/individual study on achievement in computer-based training [AD-A248518] p 358 N92-29503
- STERMAN, MAURICE B.**  
EEG correlates of critical decision making in computer simulated combat p 333 A92-45014  
Topographic EEG correlates of perceptual defensiveness p 333 A92-45015
- STEVENS, LINDA**  
Exercise and three psychosocial variables: A longitudinal study [AD-A250649] p 339 N92-30216
- STOUFF, C.**  
Vigilance of aircrews during long-haul flights p 333 A92-45021
- STRAGISHER, GEORGE W.**  
Teaching an old dog new tricks - Concepts, schemata and metacognition in pilot training and education p 350 A92-45046
- STRYBEL, THOMAS Z.**  
Minimum audible movement angle as a function of the azimuth and elevation of the source p 364 A92-46295
- STURGES, CHARLES A.**  
Application of instructional systems development (ISD) principles to the Advanced Qualification Program (AQP) p 344 A92-44961
- SULLIVAN, DENNIS J.**  
Interactive video disk as an instructional tool in CRM programs p 362 A92-45040
- SUYENOBU, BRANDALL Y.**  
EEG correlates of critical decision making in computer simulated combat p 333 A92-45014
- SWEZEY, ROBERT W.**  
Instructional strategy for aircrew coordination training p 342 A92-44942

- SWIERENGA, SARAH J.**  
Coding techniques for rapid communication displays p 360 A92-44928  
Cockpit resource management - A social psychological perspective p 344 A92-44958  
Social psychological metaphors for human-computer system design p 366 A92-48528

## T

- TAGGART, WILLIAM R.**  
Advanced CRM training for instructors and evaluators p 343 A92-44951
- TAGUCHI, S.**  
Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817
- TAKEUCHI, H.**  
Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817
- TAKEUCHI, YOSHINORI**  
The anthropometric survey for JASDF men and women - 1988. I - Methods and statistics of body dimensions p 336 A92-47500
- TANAKA, KEIJI**  
The second flight simulator test of the head-up display for NAL OSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 N92-28831
- TAYLOR, GERALD R.**  
Portable dynamic fundus instrument [NASA-CASE-MSC-21675-1] p 337 N92-28755
- TAYLOR, HENRY L.**  
Incremental transfer study of scene detail and visual augmentation guidance in landing training p 348 A92-45022
- THOMAS, MICHAEL**  
Stress management for the third revolution aviator p 339 A92-44903
- THORSDEN, MARVIN L.**  
Training implications of a team decision model p 342 A92-44941  
Representing cockpit crew decision making p 350 A92-45057
- TIBBITTS, THEODORE W.**  
Utilization of potatoes for life support systems in space. I - Cultivar-photoperiod interactions p 365 A92-48395  
Utilization of potatoes for life support systems. II - The effects of temperature under 24-h and 12-h photoperiods p 365 A92-48396  
Utilization of potatoes for life support systems in space. III - Productivity at successive harvest dates under 12-h and 24-h photoperiods p 365 A92-48397  
Utilization of potatoes for life support systems in space. IV - Effect of CO2 enrichment p 366 A92-48398  
Carbon dioxide effects on potato growth under different photoperiods and irradiance p 328 A92-48399
- TOBEY, WAYNE K.**  
Customizing the ATC computer-human interface via the use of controller preference sets p 361 A92-44968
- TRAUTMAN, EDWARD**  
A survey of naval aviator opinions regarding unaided vision training topics p 347 A92-44991
- TREDICI, THOMAS J.**  
Yellow lens effects upon visual acquisition performance p 334 A92-45813
- TRIGGS, THOMAS J.**  
Apparent size and distance in an imaging display p 364 A92-46298

## V

- VALAER, LAURA**  
The strategic integration of perception and action p 352 A92-45071
- VALOT, CLAUDE**  
Knowledge transfer and support systems in fighter aircraft p 362 A92-45047  
Role of pilot's metaknowledge of their own reliability and capabilities p 351 A92-45068
- VAN DER MEULEN, GERT**  
The emergency checklist, testing various layouts p 340 A92-44921
- VAN PATTEN, R. E.**  
The case for recurrent training on human centrifuges p 367 A92-48538
- VAN SANTEN, ALLEN R.**  
Range, energy, heat of motion in the modified NBC, anti-g, tank suit p 365 A92-46795
- VANDERHEIJDEN, REINIER THOMAS JACOBUS M.**  
State estimation and error diagnosis for biotechnological processes [ETN-92-91744] p 331 N92-29754
- The use of state estimators (observers) for on-line estimation of non-measurable process variables p 331 N92-29755
- State estimation and control of the IBE-fermentation with product recovery p 331 N92-29756
- A low sensitivity observer for complex biotechnological processes p 331 N92-29757
- Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 N92-29758
- Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 N92-29759
- Sequential application of data reconciliation for sensitive detection of systematic errors p 332 N92-29760
- VANDOORN, J. T. M.**  
Fighter pilot training: The contribution of simulation [NLR-TP-89311-U] p 358 N92-29871
- VANPATTEN, ROBERT E.**  
G-tolerance and spatial disorientation: Can simulation help us? p 337 N92-28534
- VEINOTT, ELIZABETH S.**  
Communication variations related to leader personality p 341 A92-44934
- VERMIJ, M.**  
The frozen pilot syndrome p 348 A92-45018
- VICKERS, BRIAN D.**  
Purification and storage of waste gases on Space Station Freedom [AIAA PAPER 92-3607] p 368 A92-49073
- VIDLICHER, MICHAEL A.**  
The effects of speech controls on performance in advanced helicopters in a double stimulation paradigm p 341 A92-44930  
An evaluation of strategic behaviors in a high fidelity simulated flight task - Comparing primary performance to a figure of merit p 351 A92-45069  
The Bedford scale - Does it measure spare capacity? p 352 A92-45075
- VIPOND, LESLIE K.**  
Revision of certification standards for aviation maintenance personnel p 359 N92-30127
- VOGELAAR, H. J. L.**  
Fighter pilot training: The contribution of simulation [NLR-TP-89311-U] p 358 N92-29871
- VOVK, S. V.**  
Effect of the blocking of beta receptors on the state of the lysosomal apparatus in neutrophilic leukocytes in the peripheral blood of rabbits subjected to immobilization stress p 328 A92-46603

## W

- WAAG, WAYNE L.**  
The prediction of engagement outcome during air combat maneuvering p 350 A92-45045
- WAGNER, ROBERT F.**  
Task performance on constrained reconstructions - Human observer performance compared with sub-optimal Bayesian performance p 354 A92-46278
- WALLACE-ROBINSON, JANICE**  
Publications of the environmental health program: 1980-1990 [NASA-CR-4455] p 338 N92-29341
- WALRATH, LARRY C.**  
Heart rate variability and auditory workload during noise stress - Speaker sex and bandpass effects on speech intelligibility p 333 A92-45011
- WALTERS, LAURIE C.**  
Personality assessment in proposed USAF pilot selection and classification systems p 353 A92-45077
- WANG, EN-TONG**  
Histaminergic response to Coriolis stimulation - Implication for transdermal scopolamine therapy of motion sickness p 334 A92-45816
- WANG, GONG-ZHI**  
The effects of microgravity on the character of progeny of *Drosophila melanogaster* p 328 A92-48630
- WANG, YU-MIN**  
Changes of serum cortisol, insulin, glucagon, thyroxines and cyclic nucleotides pre- and post-flight in pilots p 335 A92-45946
- WARREN, RONALD A.**  
The myth of the adventuresome aviator p 348 A92-45005
- WASHBURN, DAVID A.**  
Language Research Center's Computerized Test System (LRC-CTS) - Video-formatted tasks for comparative primate research p 328 A92-48096  
Chimpanzee counting and rhesus monkey ordinality judgments p 328 A92-48097
- WATSON, LAURANCE A.**  
Inner ear barotrauma - A case for exploratory tympanotomy p 335 A92-45821

**WEISMAN, GISELE**

The human factors of team-building implications for ab initio training p 346 A92-44978

**WELCH, DONALD A.**

A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer [AD-A246683] p 368 N92-28286

**WELLENS, A. R.**

Social psychological metaphors for human-computer system design p 366 A92-48528

**WENTLING, ROGER**

Effects of extremely high G acceleration forces on NASA's control and space exposed tomato seeds [AD-A247488] p 329 N92-28247

**WESTERLUND, EINAR J.**

The Pilot Judgement Styles Model super C - A new tool for training in decision-making p 351 A92-45063

**WHEELER, RAYMOND M.**

Utilization of potatoes for life support systems in space. I - Cultivar-photoperiod interactions p 365 A92-48395

Utilization of potatoes for life support systems. II - The effects of temperature under 24-h and 12-h photoperiods p 365 A92-48396

Utilization of potatoes for life support systems in space. III - Productivity at successive harvest dates under 12-h and 24-h photoperiods p 365 A92-48397

Utilization of potatoes for life support systems in space. IV - Effect of CO<sub>2</sub> enrichment p 366 A92-48398

Carbon dioxide effects on potato growth under different photoperiods and irradiance p 328 A92-48399

**WHITE, GEORGE**

Inappropriate functioning of the cockpit dominance hierarchy as a factor in approach/landing accidents p 348 A92-45006

**WICKENS, CHRISTOPHER D.**

Compatibility and consistency in aircrew decision aiding p 362 A92-45056

Strategic behaviour in flight workload management p 352 A92-45074

Individual differences in strategic flight management and scheduling p 352 A92-45076

**WIEBE, SCOTT**

The strategic integration of perception and action p 352 A92-45071

**WIENER, EARL L.**

Philosophy, policies, and procedures - The three P's of flight-deck operations p 360 A92-44925

**WILHELM, JOHN**

Crew member and instructor evaluations of line oriented flight training p 343 A92-44952

**WILKINS, THOMAS E.**

Avionics planning for future aeronautical systems - Pilot-vehicle interface (PVI) p 366 A92-48453

**WILLIAMS, DAVID R.**

Peripheral limitations on spatial vision [AD-A250579] p 358 N92-29591

**WILSON, P.**

Pilot attitudes to cockpit automation p 340 A92-44926

**WING, MICHAEL R.**

Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179

**WITTEN, MARK L.**

The chronic effects of JP-8 jet fuel exposure on the lungs [AD-A250308] p 338 N92-29123

**WITTMAN, WILLIAM T.**

Effects of gyro-fitness training on airsickness management p 348 A92-45013

**WOLF, DAVID A.**

Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity [NASA-TP-3200] p 370 N92-28897

**WOOD, EARL H.**

Self-protective anti-Gz straining maneuvers (AGSM) physiology p 336 A92-48536

**WOOD, RAWSON L.**

The interactive effects of cockpit resource management, domestic stress, and information processing in commercial aviation p 348 A92-45017

**WOODS, DAVID D.**

The Flight Management System - 'Rumors and facts' p 341 A92-44933

**WORKMAN, WILBUR T.**

Menstrual history in altitude chamber trainees p 335 A92-45822

**WYDEVEN, THEODORE**

Waste streams in a crewed space habitat. II p 365 A92-48174

**X****XU, CHANG-TAI**

Changes of serum cortisol, insulin, glucagon, thyroxines and cyclic nucleotides pre- and post-flight in pilots p 335 A92-45946

**Y****YACAVONE, DAVID W.**

Cervical injuries during high G maneuvers - A review of Naval Safety Center data, 1980-1990 p 334 A92-45820

**YAZAWA, KENJI**

The second flight simulator test of the head-up display for NAL QSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 N92-28831

**YEE, WILLIAM D.**

Target acquisition performance using spatially correlated auditory information over headphones p 347 A92-44988

**YOUNG, D. K.**

Bioluminescence in the western Alboran Sea in April 1991 [AD-A250016] p 329 N92-29089

**Z****ZAFF, BRIAN S.**

An integrated methodology for knowledge and design acquisition p 366 A92-48526

**ZALESNY, MARY D.**

Development of aircrew coordination exercises to facilitate training transfer p 342 A92-44944

**ZARE, RICHARD N.**

Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179

**ZENOBI, RENATO**

Organic compounds in the Forest Vale, H4 ordinary chondrite p 373 A92-48179

**ZHANG, YUN-RAN**

Analysis of the mechanism and protection of upper limb windblast flailing injury p 335 A92-45947

**ZHOU, DING-RONG**

Histaminergic response to Coriolis stimulation - Implication for transdermal scopolamine therapy of motion sickness p 334 A92-45816

**ZHU, JUN-MING**

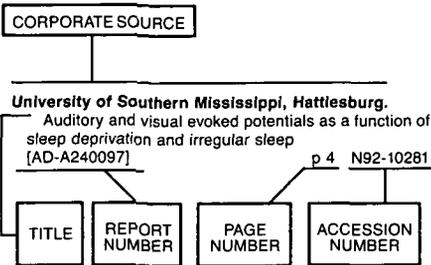
Observation of dynamic changes of rat soleus during tail suspension p 327 A92-45949

**ZUCKER, STEVEN W.**

Curvature estimation in orientation selection [AD-A247862] p 356 N92-28957

# CORPORATE SOURCE INDEX

## Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

### A

**Air Force Inst. of Tech., Wright-Patterson AFB, OH.**  
A study of pilot attitudes regarding the impact on mission effectiveness of using new cockpit automation technologies to replace the navigator/weapon system officer/electronic warfare officer  
[AD-A246683] p 368 N92-28286

**Analysis and Technology, Inc., New London, CT.**  
Evaluation of Night Vision Goggles (NVG) for maritime search and rescue  
[AD-A247182] p 371 N92-29538

**Argonne National Lab., IL.**  
A strategy for minimizing common mode human error in executing critical functions and tasks  
[DE92-011839] p 355 N92-28775

**Arizona Univ., Tucson.**  
The Coordinated Noninvasive Studies (CNS) project, phase 1  
[AD-A247159] p 337 N92-28397  
The chronic effects of JP-8 jet fuel exposure on the lungs  
[AD-A250308] p 338 N92-29123

**Army Aeromedical Research Lab., Fort Rucker, AL.**  
Methods of visual scanning with night vision goggles  
[AD-A247470] p 370 N92-28944  
Test and evaluation report of the physio control defibrillator/monitor model LIFEPAK (trademark) 8  
[AD-A248283] p 339 N92-29347  
Visual acuity with second and third generation night vision goggles obtained from a new method of night sky simulation across a wide range of target contrast  
[AD-A248284] p 371 N92-29348

**Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ.**  
Effects of extremely high G acceleration forces on NASA's control and space exposed tomato seeds  
[AD-A247488] p 329 N92-28247

**Army Biomedical Research and Development Lab., Fort Detrick, MD.**  
Environmental testing of the Xi Scan 1000, portable fluoroscopic and radiographic imaging system  
[AD-A247167] p 336 N92-28242

**Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA.**  
Effects of high terrestrial altitude on military performance  
[AD-A246695] p 336 N92-28288

### B

**Bionetics Corp., Cocoa Beach, FL.**  
Coupling plant growth and waste recycling systems in a controlled life support system (CELSS)  
[NASA-TM-107544] p 369 N92-28670

### C

**California State Univ., Chico.**  
Integrating the affective domain into the instructional design process  
[AD-A249287] p 355 N92-28880

**California Univ., Berkeley. Lawrence Berkeley Lab.**  
Problems in mechanistic theoretical models for cell transformation by ionizing radiation  
[DE92-010265] p 336 N92-28278

**Centers for Disease Control, Atlanta, GA.**  
Development of models for prediction of optimal lifting motion  
[PB92-164656] p 371 N92-29949

**Columbia Univ., New York, NY.**  
Visual perception of elevation  
[AD-A248338] p 357 N92-29420

### D

**Defence Research Establishment, Ottawa (Ontario).**  
Modelling of heat and moisture loss through NBC ensembles  
[AD-A245939] p 368 N92-28346

**Department of Energy, Washington, DC.**  
Primer on molecular genetics  
[DE92-010680] p 329 N92-28382

**Federal Aviation Administration, Washington, DC.**  
Human factors in aircraft maintenance and inspection  
p 372 N92-30125  
Revision of certification standards for aviation maintenance personnel  
p 359 N92-30127

### F

**Galaxy Scientific Corp., Atlanta, GA.**  
Using intelligent simulation to enhance human performance in aircraft maintenance  
p 372 N92-30126

**George Washington Univ., Washington, DC.**  
Publications of the environmental health program: 1980-1990  
[NASA-CR-4455] p 338 N92-29341

**Gordon Research Conferences, Inc., Kingston, RI.**  
Gordon research conference on Barrier Function of Mammalian Skin  
[AD-A248556] p 339 N92-29577

### H

**Harvard Coll. Observatory, Cambridge, MA.**  
The energetics and mechanics of load carrying  
[AD-A248441] p 371 N92-29227

**Howard Univ., Washington, DC.**  
Neuropsychological components of object identification  
[AD-A247049] p 355 N92-28877

**Human Engineering Labs., Aberdeen Proving Ground, MD.**  
Program Cluster: An identification of fixation cluster characteristics  
[AD-A247014] p 354 N92-28396

### I

**Iowa State Univ. of Science and Technology, Ames.**  
Space life support engineering program  
[NASA-CR-190448] p 369 N92-28671

### J

**Jet Propulsion Lab., California Inst. of Tech., Pasadena.**  
Method and apparatus for predicting the direction of movement in machine vision  
[NASA-CASE-NPO-17552-1-CU] p 370 N92-29129

**Jewish Hospital of Brooklyn, NY.**  
Study of SCN neurochemistry using in vivo microdialysis in the conscious brain: Correlation with overt circadian rhythms  
[AD-A247172] p 338 N92-28886

**Johns Hopkins Univ., Baltimore, MD.**  
Effects of ionizing radiation on auditory and visual thresholds  
[AD-A248199] p 329 N92-29410

### L

**Lawrence Livermore National Lab., CA.**  
Somatic gene mutation in the human in relation to radiation risk  
[DE92-009459] p 337 N92-28685

### M

**Massachusetts Inst. of Tech., Cambridge.**  
Super auditory localization for improved human-machine interfaces  
[AD-A250288] p 370 N92-29121

**Massachusetts Univ., Worcester.**  
Non-linear analysis of visual cortical neurons  
[AD-A250233] p 338 N92-29179

**McGill Univ., Montreal (Quebec).**  
Curvature estimation in orientation selection  
[AD-A247862] p 356 N92-28957

**Minnesota Univ., Minneapolis.**  
Psychophysical analyses of perceptual representations  
[AD-A246945] p 357 N92-29186

### N

**National Aeronautics and Space Administration, Washington, DC.**  
Philosophy, policies, and procedures - The three P's of flight-deck operations p 360 A92-44925  
Why pilots are least likely to get good decision making precisely when they need it most p 350 A92-45058  
Aerospace crew station design [ISBN 0-444-87569-7] p 363 A92-45301  
Man-in-the-loop study of filtering in airborne head tracking tasks p 365 A92-46763

**National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.**  
Training and cockpit design to promote expert performance p 340 A92-44917  
An evaluation of flight path management automation in transport category aircraft p 360 A92-44918  
Electronic checklists - Evaluation of two levels of automation p 360 A92-44924  
Philosophy, policies, and procedures - The three P's of flight-deck operations p 360 A92-44925  
The effects of speech controls on performance in advanced helicopters in a double stimulation paradigm p 341 A92-44930  
Communication variations related to leader personality p 341 A92-44934

SOURCE

- Coordination strategies of crew management  
p 341 A92-44935
- Expert decision-making strategies p 341 A92-44936
- Information transfer and shared mental models for decision making p 341 A92-44937
- Collaboration in pilot-controller communication p 341 A92-44938
- Lessons from cross-fleet/cross-airline observations - Evaluating the impact of CRM/LOFT training p 342 A92-44946
- Behavioral interactions across various aircraft types - Results of systematic observations of line operations and simulations p 343 A92-44947
- Strategies for the study of flightcrew behavior p 343 A92-44948
- The impact of initial and recurrent cockpit resource management training on attitudes p 343 A92-44949
- Microcoding of communications in accident investigation - Crew coordination in United 811 and United 232 p 343 A92-44950
- Advanced CRM training for instructors and evaluators p 343 A92-44951
- Crew member and instructor evaluations of line oriented flight training p 343 A92-44952
- Time estimation in flight p 361 A92-44983
- Visual cues to geographical orientation during low-level flight p 346 A92-44984
- Attentional issues in superimposed flight symbology p 361 A92-44986
- What makes a good LOFT scenario? Issues in advancing current knowledge of scenario design p 350 A92-45050
- On operator strategic behavior p 350 A92-45053
- Compatibility and consistency in aircrew decision aiding p 362 A92-45056
- Representing cockpit crew decision making p 350 A92-45057
- An evaluation of strategic behaviors in a high fidelity simulated flight task - Comparing primary performance to a figure of merit p 351 A92-45069
- The effects of task difficulty and resource requirements on attention strategies p 352 A92-45070
- Individual differences in strategic flight management and scheduling p 352 A92-45076
- Man-in-the-loop study of filtering in airborne head tracking tasks p 365 A92-46763
- Language Research Center's Computerized Test System (LRC-CTS) - Video-formatted tasks for comparative primate research p 328 A92-48096
- Chimpanzee counting and rhesus monkey ordinality judgments p 328 A92-48097
- On performing exobiology experiments on an earth-orbital platform with the Gas-Grain Simulation Facility p 373 A92-48100
- Waste streams in a crewed space habitat. II p 365 A92-48174
- Collection of cosmic dust in earth orbit for exobiological analysis p 373 A92-48225
- Utilization of potatoes for life support systems in space. I - Cultivar-photoperiod interactions p 365 A92-48395
- Utilization of potatoes for life support systems. II - The effects of temperature under 24-h and 12-h photoperiods p 365 A92-48396
- Utilization of potatoes for life support systems in space. III - Productivity at successive harvest dates under 12-h and 24-h photoperiods p 365 A92-48397
- Utilization of potatoes for life support systems in space. IV - Effect of CO<sub>2</sub> enrichment p 366 A92-48398
- Carbon dioxide effects on potato growth under different photoperiods and irradiance p 328 A92-48399
- Thermoregulation during spaceflight [NASA-TM-103913] p 337 A92-28420
- Crew station research and development facility training for the light helicopter demonstration/validation program [NASA-TM-103865] p 355 A92-28744
- Acquisition and improvement of human motor skills: Learning through observation and practice [NASA-TM-107878] p 357 A92-29174
- In vitro measurement of nucleus pulposus swelling pressure: A new technique for studies of spinal adaptation to gravity [NASA-TM-103853] p 329 A92-29397
- National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.**
- Carbon dioxide effects on potato growth under different photoperiods and irradiance p 328 A92-48399
- National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.**
- Comparison of current Shuttle and pre-Challenger flight suit reach capability during launch accelerations p 363 A92-45824
- Statistical differentiation between malignant and benign prostate lesions from ultrasound images p 364 A92-46279
- Portable dynamic fundus instrument [NASA-CASE-MS-21675-1] p 337 A92-28755
- Experimental measurement of the orbital paths of particles sedimenting within a rotating viscous fluid as influenced by gravity [NASA-TP-3200] p 370 A92-28897
- Whole body cleaning agent containing N-acyltaurate [NASA-CASE-MS-21589-1] p 370 A92-29137
- National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.**
- Information management for commercial aviation - A research perspective p 359 A92-44905
- Information management - Assessing the demand for information p 359 A92-44906
- The role of behavioral decision theory for cockpit information management p 340 A92-44907
- Effects of shifts in the level of automation on operator performance p 340 A92-44912
- Divertor - Perspectives on the integration and display of flight critical information using an expert system and menu-driven displays p 361 A92-45035
- On operator strategic behavior p 350 A92-45053
- Multi-Attribute Task Battery - Applications in pilot workload and strategic behavior research p 352 A92-45072
- National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.**
- Anthropomorphic teleoperation: Controlling remote manipulators with the DataGlove [NASA-TM-103588] p 369 A92-28521
- National Aeronautics and Space Administration. Pasadena Office, CA.**
- Method and apparatus for predicting the direction of movement in machine vision [NASA-CASE-NPO-17552-1-CU] p 370 A92-29129
- National Aerospace Lab., Amsterdam (Netherlands).**
- Fighter pilot training: The contribution of simulation [NLR-TP-89311-U] p 358 A92-29871
- National Aerospace Lab., Tokyo (Japan).**
- The second flight simulator test of the head-up display for NAL QSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 A92-28831
- Naval Aerospace Medical Research Lab., Pensacola, FL.**
- Delays in laser glare onset differentially affect target-location performance in a visual search task [AD-A246708] p 355 A92-28557
- Naval Health Research Center, San Diego, CA.**
- Lapses in alertness: Brain-evoked responses to task-irrelevant auditory probes [AD-A247669] p 356 A92-28940
- Exercise and three psychosocial variables: A longitudinal study [AD-A250649] p 339 A92-30216
- Naval Oceanographic and Atmospheric Research Lab., Bay Saint Louis, MS.**
- Bioluminescence in the western Alboran Sea in April 1991 [AD-A250016] p 329 A92-29089
- Naval Postgraduate School, Monterey, CA.**
- A profile of scientist and engineer training conducted by the Naval Avionics Center [AD-A245925] p 354 A92-28408
- Correlational analysis of survey and model-generated workload values [AD-A247153] p 368 A92-28518
- Netherlands Aerospace Medical Centre, Soesterberg.**
- G-tolerance and spatial disorientation: Can simulation help us? p 337 A92-28534

## O

- Oak Ridge National Lab., TN.**
- Primer on molecular genetics [DE92-010680] p 329 A92-28382
- Office National d'Etudes et de Recherches Aeronautiques, Paris (France).**
- Study of the loss of consciousness inflight by fighter aircraft pilots [ONERA-RTS-11/3446-EY] p 338 A92-28844
- Ohio State Univ., Columbus.**
- Demodulation processes in auditory perception [AD-A250203] p 356 A92-29146
- Oregon Health Sciences Univ., Portland.**
- Structural characterization of cross-linked hemoglobins developed as potential transfusion substitutes [AD-A246777] p 337 A92-28515
- Oregon State Univ., Newport.**
- In search of a unified theory of biological organization: What does the motor system of a sea slug tell us about human motor integration? [AD-A250223] p 356 A92-29119

## P

- Pennsylvania Univ., Philadelphia.**
- Biologically-based neural network model of color constancy and color contrast [AD-A248128] p 357 A92-29398
- Object discrimination based on depth-from-occlusion [AD-A248104] p 358 A92-29560
- Pittsburgh Univ., PA.**
- A systems theoretic investigation of neuronal network properties of the hippocampal formation [AD-A250246] p 357 A92-29334
- Princeton Univ., NJ.**
- Physiological analyses of the afferents controlling brain neurochemical systems [AD-A248334] p 359 A92-29930

## R

- Rochester Univ., NY.**
- Peripheral limitations on spatial vision [AD-A250579] p 358 A92-29591

## S

- Southwest Texas State Univ., San Marcos.**
- The effects of student-instructor interaction and paired/individual study on achievement in computer-based training [AD-A248518] p 358 A92-29503
- Sterling (Walter V.), Inc., Palo Alto, CA.**
- Army-NASA aircrew/aircraft integration program: Phase 4 A(3) Man-Machine Integration Design and Analysis System (MIDAS) software detailed design document [NASA-CR-177593] p 371 A92-29413

## T

- Technische Univ., Berlin (Germany, F.R.).**
- Improvement of connectionist learning processes, working according to the gradients method [ETN-92-91335] p 355 A92-28787
- Technische Univ., Delft (Netherlands).**
- Methodology on monitoring and modelling of microbial metabolism [ETN-92-91745] p 330 A92-29732
- Linear relations in microbial reaction systems: A general overview of their origin, form, and use p 330 A92-29733
- Modelling and experimental validation of carbon dioxide evolution in alkalophilic cultures p 330 A92-29734
- Microbial adonolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 A92-29735
- The bioreactor overflow device: An undesired selective separator in continuous cultures? p 330 A92-29736
- Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 A92-29737
- On the estimation of bioenergetic parameters p 330 A92-29738
- Flux-capacity relationships of Acinetobacter calcoaceticus enzymes during xylose oxidation p 331 A92-29739
- Analysis and experimental testing of a bottleneck model for the description of microbial dynamics p 331 A92-29740
- State estimation and error diagnosis for biotechnological processes [ETN-92-91744] p 331 A92-29754
- The use of state estimators (observers) for on-line estimation of non-measurable process variables p 331 A92-29755
- State estimation and control of the IBE-fermentation with product recovery p 331 A92-29756
- A low sensitivity observer for complex biotechnological processes p 331 A92-29757
- Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 A92-29758
- Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 A92-29759
- Sequential application of data reconciliation for sensitive detection of systematic errors p 332 A92-29760
- Texas Technological Univ., Lubbock.**
- Development of models for prediction of optimal lifting motion [PB92-164656] p 371 A92-29949
- Texas Univ., Arlington.**
- A study of the control problem of the shoot side environment delivery system of a closed crop growth research chamber [NASA-CR-177597] p 369 A92-28681

*CORPORATE SOURCE*

**Wisconsin Univ.**

**Texas Univ. Health Science Center, San Antonio.**  
Investigation of laser-induced retinal damage  
[AD-A250173] p 338 N92-28920

**U**

**Universal Energy Systems, Inc., San Antonio, TX.**  
On the effect of range restriction on correlation  
coefficient estimation  
[AD-A248956] p 358 N92-29620

**University of Southern Illinois, Springfield.**  
Learning, teaching, and testing for complex conceptual  
understanding  
[AD-A248728] p 356 N92-29142

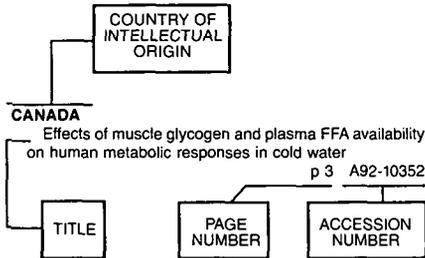
**Utah Univ., Salt Lake City.**  
Studies of perceptual memory  
[AD-A250200] p 356 N92-29144

**W**

**Wisconsin Univ., Madison.**  
Additivity and auditory pattern analysis  
[AD-A250580] p 358 N92-29592

# FOREIGN TECHNOLOGY INDEX

## Typical Foreign Technology Index Listing



Listings in this index are arranged alphabetically by country of intellectual origin. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the citation in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

### A

#### AUSTRALIA

- Team building following a pilot labour dispute - Extending the CRM envelope p 344 A92-44955
- Inner ear barotrauma - A case for exploratory tympanotomy p 335 A92-45821
- The effect of accommodation on retinal image size p 335 A92-46297

### C

#### CANADA

- The frozen pilot syndrome p 348 A92-45018
- Relationship between mental models and scanning behavior during instrument approaches p 349 A92-45043
- The Pilot Judgement Styles Model super C - A new tool for training in decision-making p 351 A92-45063
- Determination of a pressure breathing schedule for improving +Gz tolerance p 334 A92-45815
- Effect of spatial frequency content of the background on visual detection of a known target p 353 A92-46277
- Judgments of change and proportion in graphical perception p 364 A92-46299
- Modelling of heat and moisture loss through NBC ensembles [AD-A245939] p 368 N92-28346
- Curvature estimation in orientation selection [AD-A247862] p 356 N92-28957

#### CHINA, PEOPLE'S REPUBLIC OF

- Histaminergic response to Coriolis stimulation - Implication for transdermal scopolamine therapy of motion sickness p 334 A92-45816
- Changes of serum cortisol, insulin, glucagon, thyroxines and cyclic nucleotides pre- and post-flight in pilots p 335 A92-45946

- Analysis of the mechanism and protection of upper limb windblast flailing injury p 335 A92-45947
- An extension of human optimal control model p 363 A92-45948
- Observation of dynamic changes of rat soleus during tail suspension p 327 A92-45949
- Cold and hypoxia p 335 A92-45950
- The effects of microgravity on the character of progeny of *Drosophila melanogaster* p 328 A92-48630

### F

#### FRANCE

- Vigilance of aircrews during long-haul flights p 333 A92-45021
- SAGES - A system optimising each trainee's course towards a final level which will be the purpose of the training period p 349 A92-45039
- Knowledge transfer and support systems in fighter aircraft p 362 A92-45047
- Knowledge transfer and anticipation in airline piloting p 351 A92-45065
- Role of pilot's metaknowledge of their own reliability and capabilities p 351 A92-45068
- Apparent size and distance in an imaging display p 364 A92-46298
- Titan and exobiological aspects of the Cassini-Huygens mission p 372 A92-46447
- Theoretical and experimental investigations on the fast rotating clinostat p 329 A92-48631
- Study of the loss of consciousness inflight by fighter aircraft pilots [ONERA-RTS-11/3446-EY] p 338 N92-28844

### G

#### GERMANY, FEDERAL REPUBLIC OF

- Exogenous and endogenous determinants of cockpit management attitudes p 344 A92-44956
- Flying an aircraft as a problem solving process - About the Instrument-Failure-Simulator (IFS) as a test for pilot applicants p 351 A92-45060
- Culture-fairness of test methods - Problems in the selection of aviation personnel p 353 A92-45079
- The membrane-electrolyte system - Model of the interaction of gravity with biological systems at the cellular level p 328 A92-48624
- Improvement of connectionist learning processes, working according to the gradients method [ETN-92-91335] p 355 N92-28787

### I

#### INDIA

- Comparative analysis of MMPI profiles in two groups of ab-initio flying trainees p 347 A92-45004

#### IRELAND

- Inappropriate functioning of the cockpit dominance hierarchy as a factor in approach/landing accidents p 348 A92-45006

#### ISRAEL

- Man-in-the-loop study of filtering in airborne head tracking tasks p 365 A92-46763

### J

#### JAPAN

- Effect of hypobaric hypoxia on fiber type composition of the soleus muscle in the developing rat p 327 A92-45817
- The anthropometric survey for JASDF men and women - 1988. I - Methods and statistics of body dimensions p 336 A92-47500
- The second flight simulator test of the head-up display for NAL QSTOL experimental aircraft (ASKA) [NAL-TM-633] p 369 N92-28831

### N

#### NETHERLANDS

- The emergency checklist, testing various layouts p 340 A92-44921
- KLM feedback and appraisal system for cockpit crew members p 344 A92-44960
- Heart rate variability as an index for pilot workload p 333 A92-45012
- G-tolerance and spatial disorientation: Can simulation help us? p 330 N92-28534
- Methodology on monitoring and modelling of microbial metabolism [ETN-92-91745] p 330 N92-29732
- Linear relations in microbial reaction systems: A general overview of their origin, form, and use p 330 N92-29733
- Modelling and experimental validation of carbon dioxide evolution in alkalophilic cultures p 330 N92-29734
- Microbial aldonolactone formation and hydrolysis: Kinetic and bioenergetic aspects p 330 N92-29735
- The bioreactor overflow device: An undesired selective separator in continuous cultures? p 330 N92-29736
- Classification, error detection, and reconciliation of measurements in complex biochemical systems p 330 N92-29737
- On the estimation of bioenergetic parameters p 330 N92-29738
- Flux-capacity relationships of *Acinetobacter calcoaceticus* enzymes during xylose oxidation p 331 N92-29739
- Analysis and experimental testing of a bottleneck model for the description of microbial dynamics p 331 N92-29740
- State estimation and error diagnosis for biotechnological processes [ETN-92-91744] p 331 N92-29754
- The use of state estimators (observers) for on-line estimation of non-measurable process variables p 331 N92-29755
- State estimation and control of the IBE-fermentation with product recovery p 331 N92-29756
- A low sensitivity observer for complex biotechnological processes p 331 N92-29757
- Analytical tuning of a low sensitivity observer applied to a continuous ethanol fermentation with product recovery p 332 N92-29758
- Improved balancing methods and error diagnosis for bio(chemical) conversions p 332 N92-29759
- Sequential application of data reconciliation for sensitive detection of systematic errors p 332 N92-29760
- Fighter pilot training: The contribution of simulation [NLR-TP-89311-U] p 358 N92-29871

#### NEW ZEALAND

- Information processing in ab initio pilot training p 351 A92-45066

### P

#### POLAND

- Pragmatic simulation, basics and techniques p 361 A92-45030
- 'Pilot error' as information problem p 350 A92-45059

### S

#### SWEDEN

- Sustained attention and serial responding in heat - Mental effort in the control of performance p 334 A92-45819

### U

#### U.S.S.R.

- Chemistry of the interstellar medium - An evolutionary dead end? p 372 A92-46446

**UNITED KINGDOM**

Effect of vibration on the metabolism of gamma-aminobutyric acid in the brain for different functional states of the adrenal cortex

p 327 A92-46601

Effect of weak, extremely low-frequency magnetic fields on the time organization of exchange between thiol groups and lipid peroxidation products

p 327 A92-46602

Effect of the blocking of beta receptors on the state of the lysosomal apparatus in neutrophilic leukocytes in the peripheral blood of rabbits subjected to immobilization stress

p 328 A92-46603

Key problems of medical examinations by aviation physicians

p 336 A92-49229

**UNITED KINGDOM**

Pilot attitudes to cockpit automation

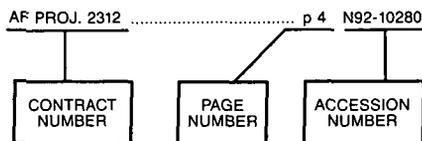
p 340 A92-44926

Pilot reaction to ultra-long-haul flying

p 344 A92-44954

# CONTRACT NUMBER INDEX

## Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under the contract are shown. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

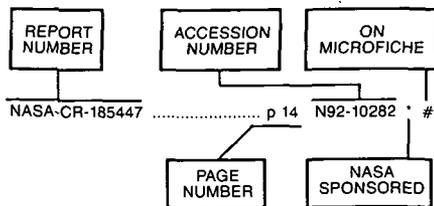
AF-AFOSR-0047-90 ..... p 338 N92-28886  
 AF-AFOSR-0100-91 ..... p 355 N92-28877  
 AF-AFOSR-0105-92 ..... p 357 N92-29186  
 AF-AFOSR-0146-91 ..... p 357 N92-29420  
 AF-AFOSR-0197-89 ..... p 357 N92-29334  
 AF-AFOSR-0208-91 ..... p 338 N92-28920  
 AF-AFOSR-0227-89 ..... p 356 N92-29146  
 AF-AFOSR-0240-87 ..... p 358 N92-29592  
 AF-AFOSR-0247-89 ..... p 338 N92-29179  
 AF-AFOSR-0260-89 ..... p 356 N92-28957  
 AF-AFOSR-0262-89 ..... p 356 N92-29119  
 AF-AFOSR-0275-89 ..... p 356 N92-29144  
 AF-AFOSR-0290-91 ..... p 339 N92-29577  
 AF-AFOSR-0292-88 ..... p 358 N92-29591  
 AF-AFOSR-0294-90 ..... p 359 N92-29930  
 AF-AFOSR-0312-90 ..... p 370 N92-29121  
 AF-AFOSR-0352-88 ..... p 337 N92-28397  
 AF-AFOSR-88-0298 ..... p 365 A92-46763  
 DA PROJ. 3M1-62787-A-79-B ..... p 371 N92-29348  
 DA PROJ. 3M1-62787-A-874 ..... p 336 N92-28242  
 DA PROJ. 3M1-62787-A-879 ..... p 337 N92-28515  
 DA PROJ. 3M4-63807-D-836 ..... p 370 N92-28944  
 DAAL03-88-K-0032 ..... p 339 N92-29347  
 DAHC35-89-D-0030 ..... p 371 N92-29227  
 DAHS35-89-D-0030 ..... p 342 A92-44940  
 DAMD17-89-C-9002 ..... p 342 A92-44945  
 DE-AC03-76SF-00098 ..... p 337 N92-28515  
 DE-AC05-84OR-21400 ..... p 336 N92-28278  
 DNA001-87-C-0277 ..... p 329 N92-28382  
 DRET-89-1208 ..... p 329 N92-29410  
 DTCG39-89-C-80671 ..... p 338 N92-26844  
 DTFA01-90-C-00045 ..... p 371 N92-29538  
 DTFA02-87-C-87069 ..... p 348 A92-45022  
 DTFA02-90-C-90118 ..... p 332 A92-45010  
 DTFA03-89-C-00023 ..... p 332 A92-45010  
 DTFA03-89-C-00043 ..... p 345 A92-44970  
 DTRS-57-87-C-00107 ..... p 372 N92-30126  
 F33615-89-C-0532 ..... p 345 A92-44970  
 F49620-88-C-0053 ..... p 360 A92-44928  
 F49620-90-C-0076 ..... p 344 A92-44958  
 MDA903-86-C-0169 ..... p 353 A92-45078  
 MDA903-89-C-0032 ..... p 358 N92-29620  
 NAGW-1128 ..... p 355 N92-28880  
 NAG1-1118 ..... p 358 N92-29503  
 NAG2-12 ..... p 349 A92-45023  
 NAG2-308 ..... p 349 A92-45024  
 NAG2-308 ..... p 342 A92-44941  
 NAG2-308 ..... p 365 A92-46763  
 NAG2-308 ..... p 350 A92-45053  
 NAG2-308 ..... p 360 A92-44918  
 NAG2-308 ..... p 352 A92-45076

NAG2-438 ..... p 328 A92-48096  
 NAG2-722 ..... p 328 A92-48097  
 NASA ORDER A-72145-C ..... p 369 N92-28671  
 NASW-4324 ..... p 350 A92-45057  
 NAS1-18028 ..... p 338 N92-29341  
 NAS1-18029 ..... p 340 A92-44907  
 NAS1-18029 ..... p 361 A92-45035  
 NAS1-18788 ..... p 359 A92-44906  
 NAS10-11624 ..... p 369 N92-28670  
 NAS2-12849 ..... p 355 N92-28744  
 NAS2-13210 ..... p 371 N92-29413  
 NCA2-441 ..... p 360 A92-44925  
 NCA2-484 ..... p 369 N92-28681  
 NCC2-136 ..... p 365 A92-48395  
 NCC2-136 ..... p 365 A92-48396  
 NCC2-136 ..... p 365 A92-48397  
 NCC2-136 ..... p 328 A92-48399  
 NCC2-286 ..... p 342 A92-44946  
 NCC2-286 ..... p 343 A92-44948  
 NCC2-286 ..... p 343 A92-44949  
 NCC2-286 ..... p 343 A92-44950  
 NCC2-286 ..... p 343 A92-44951  
 NCC2-286 ..... p 343 A92-44952  
 NCC2-301 ..... p 365 A92-48395  
 NCC2-301 ..... p 365 A92-48396  
 NCC2-301 ..... p 365 A92-48397  
 NCC2-301 ..... p 366 A92-48398  
 NCC2-301 ..... p 328 A92-48399  
 NCC2-327 ..... p 360 A92-44924  
 NCC2-327 ..... p 360 A92-44925  
 NCC2-327 ..... p 341 A92-44936  
 NCC2-486 ..... p 341 A92-44930  
 NCC2-486 ..... p 351 A92-45069  
 NCC2-486 ..... p 352 A92-45070  
 NCC2-632 ..... p 362 A92-45056  
 NCC9-16 ..... p 364 A92-46279  
 NIH-HD-06016 ..... p 328 A92-48097  
 NIH-RR-00165 ..... p 328 A92-48097  
 NIH-3505-RR-0801-1452 ..... p 364 A92-46295  
 NIOSH-R01-OH-02434 ..... p 371 N92-29949  
 NSERC-A-8351 ..... p 364 A92-46299  
 NSF BNS-90-25118 ..... p 364 A92-46295  
 NSF EAR-89-15829 ..... p 373 A92-48179  
 N00014-88-K-0077 ..... p 356 N92-29142  
 N00014-89-C-0047 ..... p 364 A92-46105  
 N00014-90-J-1864 ..... p 357 N92-29398  
 N61339-81-C-0105 ..... p 358 N92-29560  
 N61339-81-C-0105 ..... p 334 A92-45818  
 N61339-85-D-0044 ..... p 334 A92-45818  
 PROJ. 89-06 ..... p 369 N92-28521  
 RTOP 199-14-12-04 ..... p 329 N92-29397  
 RTOP 199-18-12-07 ..... p 337 N92-28420  
 RTOP 505-61-51 ..... p 355 N92-28744  
 RTOP 694-01-23-05 ..... p 370 N92-28897  
 W-31-109-ENG-38 ..... p 355 N92-28775  
 W-7405-ENG-36 ..... p 327 A92-45983  
 W-7405-ENG-48 ..... p 354 A92-46278  
 W-7405-ENG-48 ..... p 337 N92-28685

CONTRACT

# REPORT NUMBER INDEX

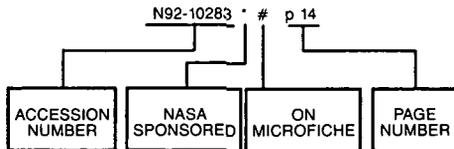
## Typical Report Number Index Listing



AFOSR-92-0146TR-PHASE-1	p 337	N92-28397	#	NASA-TM-103588	p 369	N92-28521	* #
AFOSR-92-0189TR	p 359	N92-29930	#	NASA-TM-103853	p 329	N92-29397	* #
AFOSR-92-0206TR	p 357	N92-29420	#	NASA-TM-103865	p 355	N92-28744	* #
AFOSR-92-0211TR	p 356	N92-28957	#	NASA-TM-103913	p 337	N92-28420	* #
AFOSR-92-0261TR	p 339	N92-29577	#	NASA-TM-107544	p 369	N92-28670	* #
AFOSR-92-0267TR	p 358	N92-29591	#	NASA-TM-107878	p 357	N92-29174	* #
AFOSR-92-0299TR	p 356	N92-29119	#	NASA-TP-3200	p 370	N92-28897	* #
AFOSR-92-0300TR	p 356	N92-29146	#	NHRC-90-39	p 356	N92-28940	#
AFOSR-92-0303TR	p 358	N92-29592	#	NHRC-91-31	p 339	N92-30216	#
AFOSR-92-0307TR	p 338	N92-29179	#	NLR-TP-89311-U	p 358	N92-29871	#
AFOSR-92-0308TR	p 356	N92-29144	#	NOARL-TN-212	p 329	N92-29089	#
AFOSR-92-0314TR	p 338	N92-29123	#	ONERA-RTS-11/3446-EY	p 338	N92-28844	#
AFOSR-92-0316TR	p 338	N92-28920	#	ORNL/M-2026	p 329	N92-28382	#
AFOSR-92-0363TR	p 357	N92-29334	#	PB92-164656	p 371	N92-29949	#
AFOSR-92-0392TR	p 370	N92-29121	#	REPT-001	p 357	N92-29420	#
AIAA PAPER 92-3607	p 368	A92-49073	#	REPT-255-6491-1	p 359	N92-29930	#
AL-CR-1992-001	p 358	N92-29620	#	RIA-91-29	p 357	N92-29174	* #
AL-TP-1992-0004	p 355	N92-28880	#	S-668	p 370	N92-28897	* #
AL-TR-1992-0003	p 358	N92-29503	#	SAE PAPER 911971	p 353	A92-45378	#
ANL/CP-75335	p 355	N92-28775	#	SAE PAPER 911972	p 353	A92-45379	#
ARAED-SP-91002	p 329	N92-28247	#	SAE PAPER 912075	p 353	A92-45452	#
CGR/DC-19/91	p 371	N92-29538	#	SAE PAPER 912076	p 363	A92-45453	#
CONF-9104298-2	p 337	N92-28685	#	SPIE-1652	p 364	A92-46276	#
CONF-9109107-5	p 336	N92-28278	#	TR-6	p 356	N92-29142	#
CONF-920538-18	p 355	N92-28775	#	UCRL-JC-109513	p 337	N92-28685	#
DE92-009459	p 337	N92-28685	#	US-PATENT-APPL-SN-251500	p 370	N92-29129	* #
DE92-010265	p 336	N92-28278	#	US-PATENT-APPL-SN-529427	p 370	N92-29137	* #
DE92-010680	p 329	N92-28382	#	US-PATENT-APPL-SN-562095	p 337	N92-28755	* #
DE92-011839	p 355	N92-28775	#	US-PATENT-CLASS-252-DIG.13	p 370	N92-29137	* #
ETN-92-91328	p 338	N92-28844	#	US-PATENT-CLASS-252-DIG.14	p 370	N92-29137	* #
ETN-92-91335	p 355	N92-28787	#	US-PATENT-CLASS-252-DIG.5	p 370	N92-29137	* #
ETN-92-91527	p 358	N92-29871	#	US-PATENT-CLASS-252-545	p 370	N92-29137	* #
ETN-92-91744	p 331	N92-29754	#	US-PATENT-CLASS-252-547	p 370	N92-29137	* #
ETN-92-91745	p 330	N92-29732	#	US-PATENT-CLASS-351-206	p 337	N92-28755	* #
HEL-TN-1-92	p 354	N92-28396	#	US-PATENT-CLASS-351-221	p 337	N92-28755	* #
INT-PATENT-CLASS-A61B-3/14	p 337	N92-28755	*	US-PATENT-CLASS-358-105	p 370	N92-29129	* #
INT-PATENT-CLASS-G06K-9/00	p 370	N92-29129	*	US-PATENT-CLASS-364-424.01	p 370	N92-29129	* #
ISBN 0-444-87569-7	p 363	A92-45301	*	US-PATENT-CLASS-382-1	p 370	N92-29129	* #
ISBN 0-8194-0804-2	p 364	A92-46276	#	US-PATENT-CLASS-382-22	p 370	N92-29129	* #
JTN-92-80351	p 369	N92-28831	#	US-PATENT-CLASS-4-661	p 370	N92-29137	* #
LBL-31398	p 336	N92-28278	#	US-PATENT-CLASS-424-70	p 370	N92-29137	* #
NAL-TM-633	p 369	N92-28831	#	US-PATENT-CLASS-901-1	p 370	N92-29129	* #
NAMRL-1367	p 355	N92-28557	#	US-PATENT-5,109,425	p 370	N92-29129	* #
NAS 1.15:103588	p 369	N92-28521	* #	US-PATENT-5,116,543	p 370	N92-29137	* #
NAS 1.15:103853	p 329	N92-29397	* #	US-PATENT-5,125,730	p 337	N92-28755	* #
NAS 1.15:103865	p 355	N92-28744	* #	USAARL-92-10	p 370	N92-28944	#
NAS 1.15:103913	p 337	N92-28420	* #	USAARL-92-5	p 339	N92-29347	#
NAS 1.15:107544	p 369	N92-28670	* #	USAARL-92-9	p 371	N92-29348	#
NAS 1.15:107878	p 357	N92-29174	* #	USAAVSCOM-TR-92-A-003	p 355	N92-28744	* #
NAS 1.26:177593	p 371	N92-29413	* #	USABRDL-9201	p 336	N92-28242	#
NAS 1.26:177597	p 369	N92-28681	* #	USARIEM-T2-92	p 336	N92-28288	#
NAS 1.26:190448	p 369	N92-28671	* #	USCG-D-03-92	p 371	N92-29538	#
NAS 1.26:4455	p 338	N92-29341	* #				
NAS 1.60:3200	p 370	N92-28897	* #				
NASA-CASE-MSC-21589-1	p 370	N92-29137	*				
NASA-CASE-MSC-21675-1	p 337	N92-28755	*				
NASA-CASE-NPO-17552-1-CU	p 370	N92-29129	*				
NASA-CR-177593	p 371	N92-29413	* #				
NASA-CR-177597	p 369	N92-28681	* #				
NASA-CR-190448	p 369	N92-28671	* #				
NASA-CR-4455	p 338	N92-29341	* #				
AFOSR-92-0104TR	p 338	N92-28886	#				
AFOSR-92-0105TR	p 357	N92-29186	#				
AFOSR-92-0136TR	p 355	N92-28877	#				
A-91108	p 329	N92-29397	* #				
A-91153	p 355	N92-28744	* #				
A-92043	p 337	N92-28420	* #				
A-92049	p 371	N92-29413	* #				
A-92138	p 369	N92-28681	* #				
AD-A245925	p 354	N92-28408	#				
AD-A245939	p 368	N92-28346	#				
AD-A246683	p 368	N92-28286	#				
AD-A246695	p 336	N92-28288	#				
AD-A246708	p 355	N92-28557	#				
AD-A246777	p 337	N92-28515	#				
AD-A246945	p 357	N92-29186	#				
AD-A247014	p 354	N92-28396	#				
AD-A247049	p 355	N92-28877	#				
AD-A247153	p 368	N92-28518	#				
AD-A247159	p 337	N92-28397	#				
AD-A247167	p 336	N92-28242	#				
AD-A247172	p 338	N92-28886	#				
AD-A247182	p 371	N92-29538	#				
AD-A247470	p 370	N92-28944	#				
AD-A247488	p 329	N92-28247	#				
AD-A247669	p 356	N92-28940	#				
AD-A247862	p 356	N92-28957	#				
AD-A248104	p 358	N92-29560	#				
AD-A248128	p 357	N92-29398	#				
AD-A248199	p 329	N92-29410	#				
AD-A248283	p 339	N92-29347	#				
AD-A248284	p 371	N92-29348	#				
AD-A248334	p 359	N92-29930	#				
AD-A248338	p 357	N92-29420	#				
AD-A248441	p 371	N92-29227	#				
AD-A248518	p 358	N92-29503	#				
AD-A248556	p 339	N92-29577	#				
AD-A248728	p 356	N92-29142	#				
AD-A248956	p 355	N92-29620	#				
AD-A249287	p 358	N92-28880	#				
AD-A250016	p 329	N92-29089	#				
AD-A250173	p 338	N92-28920	#				
AD-A250200	p 356	N92-29144	#				
AD-A250203	p 356	N92-29146	#				
AD-A250223	p 356	N92-29119	#				
AD-A250233	p 338	N92-29179	#				
AD-A250246	p 357	N92-29334	#				
AD-A250288	p 370	N92-29121	#				
AD-A250308	p 338	N92-29123	#				
AD-A250579	p 358	N92-29591	#				
AD-A250580	p 358	N92-29592	#				
AD-A250649	p 339	N92-30216	#				
AFIT/GLM/LSR/91S-62	p 368	N92-28286	#				

# ACCESSION NUMBER INDEX

## Typical Accession Number Index Listing



Listings in this index are arranged alphanumerically by accession number. The page number listed to the right indicates the page on which the citation is located. An asterisk (\*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A92-44901	p 339	A92-44965	p 345	A92-48179	p 373	N92-29503	#	p 358
A92-44902	p 339	A92-44966	p 345	A92-48225	p 373	N92-29538	#	p 371
A92-44903	p 339	A92-44968	p 361	A92-48395	p 365	N92-29560	#	p 358
A92-44904	p 339	A92-44970	p 345	A92-48396	p 365	N92-29577	#	p 339
A92-44905	p 359	A92-44971	p 345	A92-48397	p 365	N92-29591	#	p 358
A92-44906	p 359	A92-44972	p 345	A92-48398	p 366	N92-29592	#	p 358
A92-44907	p 340	A92-44973	p 346	A92-48399	p 328	N92-29620	#	p 358
A92-44908	p 359	A92-44974	p 346	A92-48453	p 366	N92-29732	#	p 330
A92-44910	p 359	A92-44978	p 346	A92-48526	p 366	N92-29733	#	p 330
A92-44911	p 340	A92-44979	p 346	A92-48528	p 366	N92-29734	#	p 330
A92-44912	p 340	A92-44980	p 346	A92-48533	p 366	N92-29735	#	p 330
A92-44913	p 359	A92-44983	p 361	A92-48535	p 366	N92-29736	#	p 330
A92-44914	p 360	A92-44984	p 346	A92-48536	p 336	N92-29737	#	p 330
A92-44916	p 340	A92-44986	p 361	A92-48537	p 367	N92-29738	#	p 330
A92-44917	p 340	A92-44987	p 346	A92-48538	p 367	N92-29739	#	p 331
A92-44918	p 360	A92-44988	p 347	A92-48541	p 367	N92-29740	#	p 331
A92-44921	p 340	A92-44989	p 347	A92-48544	p 367	N92-29754	#	p 331
A92-44924	p 360	A92-44990	p 347	A92-48545	p 367	N92-29755	#	p 331
A92-44925	p 360	A92-44991	p 347	A92-48546	p 367	N92-29756	#	p 331
A92-44926	p 340	A92-44992	p 347	A92-48547	p 368	N92-29757	#	p 331
A92-44927	p 360	A92-45001	p 347	A92-48548	p 354	N92-29758	#	p 332
A92-44928	p 360	A92-45003	p 347	A92-48624	p 328	N92-29759	#	p 332
A92-44930	p 341	A92-45004	p 347	A92-48630	p 328	N92-29760	#	p 332
A92-44933	p 341	A92-45005	p 348	A92-48631	p 329	N92-29871	#	p 358
A92-44934	p 341	A92-45006	p 348	A92-48632	p 329	N92-29930	#	p 359
A92-44935	p 341	A92-45007	p 332	A92-48633	p 329	N92-29949	#	p 371
A92-44936	p 341	A92-45008	p 332	A92-48634	p 329	N92-30125	#	p 372
A92-44937	p 341	A92-45009	p 348	A92-48635	p 329	N92-30126	#	p 372
A92-44938	p 341	A92-45010	p 332	A92-48636	p 329	N92-30127	#	p 359
A92-44939	p 341	A92-45011	p 333	A92-48637	p 329	N92-30216	#	p 339
A92-44940	p 342	A92-45012	p 333	A92-48638	p 329			
A92-44941	p 342	A92-45013	p 348	A92-48639	p 329			
A92-44942	p 342	A92-45014	p 333	A92-48640	p 329			
A92-44943	p 342	A92-45015	p 333	A92-48641	p 329			
A92-44944	p 342	A92-45016	p 333	A92-48642	p 329			
A92-44945	p 342	A92-45017	p 348	A92-48643	p 329			
A92-44946	p 342	A92-45018	p 348	A92-48644	p 329			
A92-44947	p 343	A92-45019	p 348	A92-48645	p 329			
A92-44948	p 343	A92-45020	p 333	A92-48646	p 329			
A92-44949	p 343	A92-45021	p 333	A92-48647	p 329			
A92-44950	p 343	A92-45022	p 348	A92-48648	p 329			
A92-44951	p 343	A92-45023	p 349	A92-48649	p 329			
A92-44952	p 343	A92-45024	p 349	A92-48650	p 329			
A92-44953	p 343	A92-45025	p 333	A92-48651	p 329			
A92-44954	p 344	A92-45026	p 361	A92-48652	p 329			
A92-44955	p 344	A92-45027	p 361	A92-48653	p 329			
A92-44956	p 344	A92-45028	p 361	A92-48654	p 329			
A92-44957	p 344	A92-45029	p 361	A92-48655	p 329			
A92-44958	p 344	A92-45030	p 361	A92-48656	p 329			
A92-44959	p 344	A92-45031	p 361	A92-48657	p 329			
A92-44960	p 344	A92-45032	p 361	A92-48658	p 329			
A92-44961	p 344	A92-45033	p 361	A92-48659	p 329			
A92-44962	p 345	A92-45034	p 361	A92-48660	p 329			
A92-44963	p 345	A92-45035	p 361	A92-48661	p 329			
A92-44964	p 345	A92-45036	p 362	A92-48662	p 329			
		A92-45037	p 349	A92-48663	p 329			
		A92-45038	p 349	A92-48664	p 329			
		A92-45039	p 349	A92-48665	p 329			
		A92-45040	p 362	A92-48666	p 329			
		A92-45041	p 362	A92-48667	p 329			
		A92-45042	p 349	A92-48668	p 329			
		A92-45043	p 349	A92-48669	p 329			
				A92-48670	p 329			
				A92-48671	p 329			
				A92-48672	p 329			
				A92-48673	p 329			
				A92-48674	p 329			
				A92-48675	p 329			
				A92-48676	p 329			
				A92-48677	p 329			
				A92-48678	p 329			
				A92-48679	p 329			
				A92-48680	p 329			
				A92-48681	p 329			
				A92-48682	p 329			
				A92-48683	p 329			
				A92-48684	p 329			
				A92-48685	p 329			
				A92-48686	p 329			
				A92-48687	p 329			
				A92-48688	p 329			
				A92-48689	p 329			
				A92-48690	p 329			
				A92-48691	p 329			
				A92-48692	p 329			
				A92-48693	p 329			
				A92-48694	p 329			
				A92-48695	p 329			
				A92-48696	p 329			
				A92-48697	p 329			
				A92-48698	p 329			
				A92-48699	p 329			
				A92-48700	p 329			
				A92-48701	p 329			
				A92-48702	p 329			
				A92-48703	p 329			
				A92-48704	p 329			
				A92-48705	p 329			
				A92-48706	p 329			
				A92-48707	p 329			
				A92-48708	p 329			
				A92-48709	p 329			
				A92-48710	p 329			
				A92-48711	p 329			
				A92-48712	p 329			
				A92-48713	p 329			
				A92-48714	p 329			
				A92-48715	p 329			
				A92-48716	p 329			
				A92-48717	p 329			
				A92-48718	p 329			
				A92-48719	p 329			
				A92-48720	p 329			
				A92-48721	p 329			
				A92-48722	p 329			
				A92-48723	p 329			
				A92-48724	p 329			
				A92-48725	p 329			
				A92-48726	p 329			
				A92-48727	p 329			
				A92-48728	p 329			
				A92-48729	p 329			
				A92-48730	p 329			
				A92-48731	p 329			
				A92-48732	p 329			
				A92-48733	p 329			
				A92-48734	p 329			
				A92-48735	p 329			
				A92-48736	p 329			
				A92-48737	p 329			
				A92-48738	p 329			
				A92-48739	p 329			
				A92-48740	p 329			
				A92-48741	p 329			
				A92-48742	p 329			
				A92-48743	p 329			
				A92-48744	p 329			
				A92-48745	p 329			
				A92-48746	p 329			
				A92-48747	p 329			
				A92-48748	p 329			
				A92-48749	p 329			
				A92-48750	p 329			
				A92-48751	p 329			
				A92-48752	p 329			
				A92-48753	p 329			
				A92-48754	p 329			
				A92-48755	p 329			
				A92-48756	p 329			
				A92-48757	p 329			
				A92-48758	p 329			
				A92-48759	p 329			
				A92-48760	p 329			
				A92-48761	p 329			
				A92-48762	p 329			
				A92-48763	p 329			
				A92-48764	p 329			
				A92-48765	p 329			
				A92-48766	p 329			
				A92-48767	p 329			
				A92-48768	p 329			
				A92-48769	p 329			
				A92-48770	p 329			
				A92-48771	p 329			
				A92-48772	p 329			
				A92-48773	p 329			
				A92-48774	p 329			
				A92-48775	p 329			
				A92-48776	p 329			
				A92-48777	p 329			
				A92-48778	p 329			
				A92-48779	p 329			
				A92-48780	p 329			
				A92-48781	p 329			
				A92-48782	p 329			
				A92-48783	p 329			
				A92-48784	p 329			
				A92-48785	p			

# AVAILABILITY OF CITED PUBLICATIONS

## IAA ENTRIES (A92-10000 Series)

Publications announced in *IAA* are available from the AIAA Technical Information Service as follows: Paper copies of accessions are available at \$10.00 per document (up to 50 pages), additional pages \$0.25 each. Standing order microfiche are available at the rate of \$1.45 per microfiche for *IAA* source documents and \$1.75 per microfiche for AIAA meeting papers.

Minimum air-mail postage to foreign countries is \$2.50. All foreign orders are shipped on payment of pro-forma invoices.

All inquiries and requests should be addressed to: Technical Information Service, American Institute of Aeronautics and Astronautics, 555 West 57th Street, New York, NY 10019. Please refer to the accession number when requesting publications.

## STAR ENTRIES (N92-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below, and their addresses are listed on page APP-4. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: CASI. Sold by the NASA Center for AeroSpace Information. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page APP-5.

NOTE ON ORDERING DOCUMENTS: When ordering publications from CASI, use the N accession number or other report number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, address inquiry to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on Engineering Sciences Data Unit (ESDU) topic categories can be obtained from ESDU International Ltd. Requesters in North America should use the Virginia address while all other requesters should use the London address, both of which are on page APP-4.

Avail: Fachinformationszentrum, Karlsruhe. Gesellschaft für wissenschaftlich-technische Information mbH 7514 Eggenstein-Leopoldshafen 2, Germany.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

- Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.
- Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration (JBD-4), Public Documents Room (Room 1H23), Washington, DC 20546-0001, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.
- Avail: NTIS. Sold by the National Technical Information Service. Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) are available. For information concerning this service, consult the NTIS Subscription Section, Springfield, VA 22161.
- Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.
- Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of \$1.50 each, postage free. (See discussion of NASA patents and patent applications below.)
- Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.
- Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed on page APP-4. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

### **FEDERAL DEPOSITORY LIBRARY PROGRAM**

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 53 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 53 regional depositories. A list of the regional GPO libraries, arranged alphabetically by state, appears on the inside back cover. These libraries are *not* sales outlets. A local library can contact a Regional Depository to help locate specific reports, or direct contact may be made by an individual.

### **PUBLIC COLLECTION OF NASA DOCUMENTS**

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and \* from ESA – Information Retrieval Service European Space Agency, 8-10 rue Mario-Nikis, 75738 CEDEX 15, France.

### **STANDING ORDER SUBSCRIPTIONS**

NASA SP-7011 supplements and annual index are available from the NASA Center for AeroSpace Information (CASI). Standing order subscriptions do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.

## ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics  
Technical Information Service  
555 West 57th Street, 12th Floor  
New York, New York 10019

British Library Lending Division,  
Boston Spa, Wetherby, Yorkshire,  
England

Commissioner of Patents and Trademarks  
U.S. Patent and Trademark Office  
Washington, DC 20231

Department of Energy  
Technical Information Center  
P.O. Box 62  
Oak Ridge, Tennessee 37830

European Space Agency-Information Retrieval Service  
ESRIN  
Via Galileo Galilei  
00044 Frascati (Rome) Italy

Engineering Sciences Data Unit International  
P.O. Box 1633  
Manassas, Virginia 22110

Engineering Sciences Data Unit International, Ltd.  
251-259 Regent Street  
London, W1R 7AD, England

Fachinformationszentrum Karlsruhe  
Gesellschaft für wissenschaftlich-technische  
Information mbH  
7514 Eggenstein-Leopoldshafen 2, Germany

Her Majesty's Stationery Office  
P.O. Box 569, S.E. 1  
London, England

NASA Center for AeroSpace Information  
P.O. Box 8757  
Baltimore, Maryland 21240-0757

National Aeronautics and Space Administration  
Scientific and Technical Information Program (JTT)  
Washington, DC 20546-0001

National Technical Information Service  
5285 Port Royal Road  
Springfield, Virginia 22161

Pendragon House, Inc.  
899 Broadway Avenue  
Redwood City, California 94063

Superintendent of Documents  
U.S. Government Printing Office  
Washington, DC 20402

University Microfilms  
A Xerox Company  
300 North Zeeb Road  
Ann Arbor, Michigan 48106

University Microfilms, Ltd.  
Tylers Green  
London, England

U.S. Geological Survey Library National Center  
MS 950  
12201 Sunrise Valley Drive  
Reston, Virginia 22092

U.S. Geological Survey Library  
2255 North Gemini Drive  
Flagstaff, Arizona 86001

U.S. Geological Survey  
345 Middlefield Road  
Menlo Park, California 94025

U.S. Geological Survey Library  
Box 25046  
Denver Federal Center, MS914  
Denver, Colorado 80225

# CASI PRICE TABLES

(Effective October 1, 1991)

## STANDARD PRICE DOCUMENTS

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	\$ 9.00	\$ 18.00
A02	12.50	25.00
A03	17.00	34.00
A04-A05	19.00	38.00
A06-A09	26.00	52.00
A10-A13	35.00	70.00
A14-A17	43.00	86.00
A18-A21	50.00	100.00
A22-A25	59.00	118.00
A99	69.00	138.00

## MICROFICHE

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	\$ 9.00	\$ 18.00
A02	12.50	25.00
A03	17.00	34.00
A04	19.00	38.00
A06	26.00	52.00
A10	35.00	70.00

## IMPORTANT NOTICE

CASI Shipping and Handling Charges  
U.S. — ADD \$3.00 per TOTAL ORDER  
Canada and Mexico — ADD \$3.50 per TOTAL ORDER  
All Other Countries — ADD \$7.50 per TOTAL ORDER  
Does NOT apply to orders  
requesting CASI RUSH HANDLING.  
Contact CASI for charge.

1. Report No. NASA SP-7011(368)		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Aerospace Medicine and Biology A Continuing Bibliography (Supplement 368)				5. Report Date November 1992	
				6. Performing Organization Code JTT	
7. Author(s)				8. Performing Organization Report No.	
9. Performing Organization Name and Address NASA Scientific and Technical Information Program				10. Work Unit No.	
				11. Contract or Grant No.	
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, DC 20546				13. Type of Report and Period Covered Special Publication	
				14. Sponsoring Agency Code	
15. Supplementary Notes					
16. Abstract This bibliography lists 305 reports, articles and other documents introduced into the NASA scientific and technical information system in September 1992.					
17. Key Words (Suggested by Author(s)) Aerospace Medicine Bibliographies Biological Effects			18. Distribution Statement Unclassified - Unlimited Subject Category - 52		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 100	22. Price * A05/HC

\*For sale by the National Technical Information Service, Springfield, Virginia 22161

# FEDERAL REGIONAL DEPOSITORY LIBRARIES

## **ALABAMA**

### **AUBURN UNIV. AT MONTGOMERY LIBRARY**

Documents Dept.  
7300 University Drive  
Montgomery, AL 36117-3596  
(205) 244-3650 FAX: (205) 244-0678

### **UNIV. OF ALABAMA**

Amelia Gayle Gorgas Library  
Govt. Documents  
Box 870266  
Tuscaloosa, AL 35487-0266  
(205) 348-6046 FAX: (205) 348-8833

## **ARIZONA**

### **DEPT. OF LIBRARY, ARCHIVES, AND PUBLIC RECORDS**

Federal Documents  
Third Floor State Capitol  
1700 West Washington  
Phoenix, AZ 85007  
(602) 542-4121 FAX: (602) 542-4400;  
542-4500

## **ARKANSAS**

### **ARKANSAS STATE LIBRARY**

State Library Services  
One Capitol Mall  
Little Rock, AR 72201  
(501) 682-2869

## **CALIFORNIA**

### **CALIFORNIA STATE LIBRARY**

Govt. Publications Section  
914 Capitol Mall - P.O. Box 942837  
Sacramento, CA 94237-0001  
(916) 322-4572 FAX: (916) 324-8120

## **COLORADO**

### **UNIV. OF COLORADO - BOULDER**

Norlin Library  
Govt. Publications  
Campus Box 184  
Boulder, CO 80309-0184  
(303) 492-8834 FAX: (303) 492-2185

### **DENVER PUBLIC LIBRARY**

Govt. Publications Dept. BS/GPD  
1357 Broadway  
Denver, CO 80203  
(303) 571-2135

## **CONNECTICUT**

### **CONNECTICUT STATE LIBRARY**

231 Capitol Avenue  
Hartford, CT 06106  
(203) 566-4971 FAX: (203) 566-3322

## **FLORIDA**

### **UNIV. OF FLORIDA LIBRARIES**

Documents Dept.  
Library West  
Gainesville, FL 32611-2048  
(904) 392-0366 FAX: (904) 392-7251

## **GEORGIA**

### **UNIV. OF GEORGIA LIBRARIES**

Govt. Documents Dept.  
Jackson Street  
Athens, GA 30602  
(404) 542-8949 FAX: (404) 542-6522

## **HAWAII**

### **UNIV. OF HAWAII**

Hamilton Library  
Govt. Documents Collection  
2550 The Mall  
Honolulu, HI 96822  
(808) 948-8230 FAX: (808) 956-5968

## **IDAHO**

### **UNIV. OF IDAHO LIBRARY**

Documents Section  
Moscow, ID 83843  
(208) 885-6344 FAX: (208) 885-6817

## **ILLINOIS**

### **ILLINOIS STATE LIBRARY**

Reference Dept.  
300 South Second  
Springfield, IL 62701-1796  
(217) 782-7596 FAX: (217) 524-0041

## **INDIANA**

### **INDIANA STATE LIBRARY**

Serials/Documents Section  
140 North Senate Avenue  
Indianapolis, IN 46204  
(317) 232-3678 FAX: (317) 232-3728

## **IOWA**

### **UNIV. OF IOWA LIBRARIES**

Govt. Publications Dept.  
Washington & Madison Streets  
Iowa City, IA 52242  
(319) 335-5926 FAX: (319) 335-5830

## **KANSAS**

### **UNIV. OF KANSAS**

Govt. Documents & Map Library  
6001 Malatt Hall  
Lawrence, KS 66045-2800  
(913) 864-4660 FAX: (913) 864-5380

## **KENTUCKY**

### **UNIV. OF KENTUCKY LIBRARIES**

Govt. Publications/Maps Dept.  
Lexington, KY 40506-0039  
(606) 257-3139 FAX: (606) 257-1563;  
257-8379

## **LOUISIANA**

### **LOUISIANA STATE UNIV.**

Middleton Library  
Govt. Documents Dept.  
Baton Rouge, LA 70803  
(504) 388-2570 FAX: (504) 388-6992

### **LOUISIANA TECHNICAL UNIV.**

Prescott Memorial Library  
Govt. Documents Dept.  
305 Wisteria Street  
Ruston, LA 71270-9985  
(318) 257-4962 FAX: (318) 257-2447

## **MAINE**

### **TRI-STATE DOCUMENTS DEPOSITORY**

Raymond H. Fogler Library  
Govt. Documents & Microforms Dept.  
Univ. of Maine  
Orono, ME 04469  
(207) 581-1680

## **MARYLAND**

### **UNIV. OF MARYLAND**

Hornbake Library  
Govt. Documents/Maps Unit  
College Park, MD 20742  
(301) 454-3034 FAX: (301) 454-4985

## **MASSACHUSETTS**

### **BOSTON PUBLIC LIBRARY**

Govt. Documents Dept.  
666 Boylston Street  
Boston, MA 02117  
(617) 536-5400 ext. 226  
FAX: (617) 267-8273; 267-8248

## **MICHIGAN**

### **DETROIT PUBLIC LIBRARY**

5201 Woodward Avenue  
Detroit, MI 48202-4093  
(313) 833-1440; 833-1409  
FAX: (313) 833-5039

### **LIBRARY OF MICHIGAN**

Govt. Documents Unit  
P.O. Box 30007  
Lansing, MI 48909  
(517) 373-0640 FAX: (517) 373-3381

## **MINNESOTA**

### **UNIV. OF MINNESOTA**

Wilson Library  
Govt. Publications Library  
309 19th Avenue South  
Minneapolis, MN 55455  
(612) 624-5073 FAX: (612) 626-9353

## **MISSISSIPPI**

### **UNIV. OF MISSISSIPPI**

J.D. Williams Library  
Federal Documents Dept.  
106 Old Gym Bldg.  
University, MS 38677  
(601) 232-5857 FAX: (601) 232-5453

## **MISSOURI**

### **UNIV. OF MISSOURI - COLUMBIA**

Ellis Library  
Govt. Documents  
Columbia, MO 65201  
(314) 882-6733 FAX: (314) 882-8044

## **MONTANA**

### **UNIV. OF MONTANA**

Maureen & Mike Mansfield Library  
Documents Div.  
Missoula, MT 59812-1195  
(406) 243-6700 FAX: (406) 243-2060

## **NEBRASKA**

### **UNIV. OF NEBRASKA - LINCOLN**

D.L. Love Memorial Library  
Documents Dept.  
Lincoln, NE 68588  
(402) 472-2562

## **NEVADA**

### **UNIV. OF NEVADA**

Reno Library  
Govt. Publications Dept.  
Reno, NV 89557  
(702) 784-6579 FAX: (702) 784-1751

## **NEW JERSEY**

### **NEWARK PUBLIC LIBRARY**

U.S. Documents Div.  
5 Washington Street  
P.O. Box 630  
Newark, NJ 07101-0630  
(201) 733-7812 FAX: (201) 733-5648

## **NEW MEXICO**

### **UNIV. OF NEW MEXICO**

General Library  
Govt. Publications Dept.  
Albuquerque, NM 87131-1466  
(505) 277-5441 FAX: (505) 277-6019

### **NEW MEXICO STATE LIBRARY**

325 Don Gaspar Avenue  
Santa Fe, NM 87503  
(505) 827-3826 FAX: (505) 827-3820

## **NEW YORK**

### **NEW YORK STATE LIBRARY**

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

## **NORTH CAROLINA**

### **UNIV. OF NORTH CAROLINA -**

**CHAPEL HILL**  
CB#3912, Davis Library  
BA/SS Dept.—Documents  
Chapel Hill, NC 27599  
(919) 962-1151 FAX: (919) 962-0484

## **NORTH DAKOTA**

### **NORTH DAKOTA STATE UNIV. LIBRARY**

Documents Office  
Fargo, ND 58105  
(701) 237-8886 FAX: (701) 237-7138  
In cooperation with Univ. of North  
Dakota, Chester Fritz Library  
Grand Forks

## **OHIO**

### **STATE LIBRARY OF OHIO**

Documents Dept.  
65 South Front Street  
Columbus, OH 43266  
(614) 644-7051 FAX: (614) 752-9178

## **OKLAHOMA**

### **OKLAHOMA DEPT. OF LIBRARIES**

U.S. Govt. Information Div.  
200 NE 18th Street  
Oklahoma City, OK 73105-3298  
(405) 521-2502, ext. 252, 253  
FAX: (405) 525-7804

### **OKLAHOMA STATE UNIV.**

Edmon Low Library  
Documents Dept.  
Stillwater, OK 74078  
(405) 744-6546 FAX: (405) 744-5183

## **OREGON**

### **PORTLAND STATE UNIV.**

Millar Library  
934 SW Harrison - P.O. Box 1151  
Portland, OR 97207  
(503) 725-3673 FAX: (503) 725-4527

## **PENNSYLVANIA**

### **STATE LIBRARY OF PENN.**

Govt. Publications Section  
Walnut St. & Commonwealth Ave.  
P.O. Box 1601  
Harrisburg, PA 17105  
(717) 787-3752

## **SOUTH CAROLINA**

### **CLEMSON UNIV.**

Cooper Library  
Public Documents Unit  
Clemson, SC 29634-3001  
(803) 656-5174 FAX: (803) 656-3025  
In cooperation with Univ. of South  
Carolina, Thomas Cooper Library,  
Columbia

## **TENNESSEE**

### **MEMPHIS STATE UNIV. LIBRARIES**

Govt. Documents  
Memphis, TN 38152  
(901) 678-2586 FAX: (901) 678-2511

## **TEXAS**

### **TEXAS STATE LIBRARY**

United States Documents  
P.O. Box 12927 - 1201 Brazos  
Austin, TX 78711  
(512) 463-5455 FAX: (512) 463-5436

### **TEXAS TECH. UNIV. LIBRARY**

Documents Dept.  
Lubbock, TX 79409  
(806) 742-2268 FAX: (806) 742-1920

## **UTAH**

### **UTAH STATE UNIV.**

Merrill Library & Learning Resources  
Center, UMC-3000  
Documents Dept.  
Logan, UT 84322-3000  
(801) 750-2684 FAX: (801) 750-2677

## **VIRGINIA**

### **UNIV. OF VIRGINIA**

Alderman Library  
Govt. Documents  
Charlottesville, VA 22903-2498  
(804) 924-3133 FAX: (804) 924-4337

## **WASHINGTON**

### **WASHINGTON STATE LIBRARY**

Document Section  
MS AJ-11  
Olympia, WA 98504-0111  
(206) 753-4027 FAX: (206) 753-3546

## **WEST VIRGINIA**

### **WEST VIRGINIA UNIV. LIBRARY**

Govt. Documents Section  
P.O. Box 6069  
Morgantown, WV 26506  
(304) 293-3640

## **WISCONSIN**

### **ST. HIST. SOC. OF WISCONSIN LIBRARY**

Govt. Publications Section  
816 State Street  
Madison, WI 53706  
(608) 262-2781 FAX: (608) 262-4711  
In cooperation with Univ. of Wisconsin-  
Madison, Memorial Library

### **MILWAUKEE PUBLIC LIBRARY**

Documents Div.  
814 West Wisconsin Avenue  
Milwaukee, WI 53233  
(414) 278-2167 FAX: (414) 278-2137

National Aeronautics and  
Space Administration  
Code JTT  
Washington, D.C.  
20546-0001  
Official Business  
Penalty for Private Use, \$300

**BULK RATE**  
**POSTAGE & FEES PAID**  
NASA  
Permit No. G-27

**NASA**

POSTMASTER: If Undeliverable (Section 158  
Postal Manual) Do Not Return

---