A DDC BIBLIOGRAPHY

ACCELERATION TOLERANCE

VOLUME I OF II VOLUMES

DDC-TAS-68-81

FEBRUARY 1969
P R E F A C E

The tolerance for acceleration has been studied by experimentation on the centrifuge using human and animal subjects. Body positioning relative to the direction of the increased gravitational forces was found to be critical. In an upright position, the gravitational shifts of blood may leave the brain cells without adequate blood and oxygen supply causing "grayout" or "blackout" at 4 to 6g. On the other hand, when the accelerating forces are encountered at a right angle to the longitudinal axis of the body, the general distribution of blood is less affected and g-loads up to ten to twelve times earth gravity can be tolerated for 2 to 3 minutes. Moving or lifting any part of the body against such high centrifugal forces is restricted, because of the disproportion between the appropriate muscle groups and the increased weight of the body parts. Respiration, which involves lifting the chest and/or abdominal cavity wall, will become a laborious task. In a recumbent or semirecumbent position, the astronaut's tolerance for acceleration is limited because of the severe oxygen lack developing in the most vitally important organic systems.

This bibliography compiles 99 unclassified and unlimited references of documents that have been cataloged in the DDC collection.

The following indexes are provided; the examples refer to citations that appear in this bibliography.
Subject Index

Asterisked descriptors that identify the most significant subjects of the report are arranged alphabetically in the subject index.

Example:

*ACCELERATION TOLERANCE
   Effect of Headward and Forward Accelerations on the Cardiovascular System*
   AD-255 298

Corporate Author/Monitoring Agency Index

This index arranges corporate authors and/or monitoring agencies alphabetically.

Example:

AFOSR-67-0871
   An Inexpensive Variable - Radius Centrifuge for Physiological Experiments.
   AD-650 331

Personal Author Index

This index contains entries arranged alphabetically by the last names of the authors of reports. When one author is responsible for several reports, the citations are arranged numerically by AD number.

Example:

*Brown, James H.
   *******

iv
Acquisition and Retention of Nystagmic Habituation
In Cats with Distributed Acceleration Experience.
AD-633 705

AD-Numeric Index
This index contains the AD number and page location of
each reference cited.
The unclassified and limited version of this bibliography
includes the unclassified and unlimited references. Volume II
of this bibliography appears as AD-850 750

BY ORDER OF THE DIRECTOR, DEFENSE SUPPLY AGENCY

OFFICIAL

ROBERT B. STEGMAYER, JR.
Administrator
Defense Documentation Center
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  PERSONAL AUTHOR ................................ P-1
  AD-NUMBER ...................................... A-1
HOW TO ORDER BIBLIOGRAPHY REPORTS (Inside back cover)

vii
EFFECT OF HEADWARD AND FORWARD ACCELERATIONS ON THE CARDIOVASCULAR SYSTEM

JAN 61

CONTRACT: AF33(616)978

DESCRIPTORS: ACCELERATION TOLERANCE, CARDIOVASCULAR SYSTEM, PHYSIOLOGY, RESPIRATION

UNCLASSIFIED
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200529

AD-297 737
DOUGLAS AIRCRAFT CO INC EL SEGUNDO CALIF
SOME NOTES ON THE PHYSIOLOGICAL TOLERANCE TO
ACCELERATION (U)
FEB 61 LEVEDAHL, B.H.
REPT. NO. ES 40283
CONTRAC T: NONR107600

UNCLASSIFIED REPORT

DESCRIPTORS: ACCELERATION TOLERANCE, MAN,
PRIMATES, BLACKOUT (PHYSIOLOGY), CARDIOVASCULAR
SYSTEM, DECELERATION, EJECTION SEATS, FATIGUE
(PHYSIOLOGY), PHYSIOLOGY, POSTURE, SURVIVAL (U)

UNCLASSIFIED
Stimulation of the rats' reticulo-endothelial system (RES) was effective in enhancing the tolerances to high G acceleration stress. Utilizing 10 daily consecutive intraperitoneal injections of endotoxin at increasing doses from 100 to 1200 micrograms, the median survival time of 122 rats undergoing 20 positive G acceleration was increased from a control level of 9.7 min to 14.2 min. One group of 48 rats has a median survival of 23.6 min compared to a control level of 11.3 min. The protective action of RES stimulation and the inhibitory action of RES blockade was effective in rats with normal or prolonged survival but not in rats with diminished tolerance before stimulation or blockade. An analysis of factors for optimal RES stimulation is presented as are possible mechanisms of action.
AD-262 438
ARMED FORCES-NRC COMMITTEE ON BIO-ASTRONAUTICS WASHINGTON D.C.
ROTATION DEVICES, OTHER THAN CENTRIFUGES AND MOTION SIMULATORS: THE RATIONALE FOR THEIR SPECIAL CHARACTERISTICS AND USE
APR 40 IV GUEDEY, FREDERICK E. GRAYBIEL, ASHTON
REPT. NO. P902

UNCLASSIFIED REPORT

DESCRIPTORS: AVIATION MEDICINE, FLIGHT SIMULATORS, PHYSIOLOGY, ROTATION, STRESS (PHYSIOLOGY), ACCELERATION, ACCELERATION TOLERANCE, BIOPHYSICS, FLIGHT, SPACE ENVIRONMENTAL CONDITIONS, SPACE FLIGHT, SPACE MEDICINE
AD-266 076
ARMED FORCES-NRC COMMITTEE ON BIO-ASTRONAUTICS WASHINGTON D C
HUMAN ACCELERATION STUDIES (U)
DEC 61  IV BATES,GEORGEICLARK, CARL C.
REPT. NO. 917

UNCLASSIFIED REPORT

DESCRIPTORS: *ACCELERATION, *INDEXES, *VOCABULARY, ACCELERATION TOLERANCE, CENTRIFUGES, SPACE MEDICINE, TEST EQUIPMENT (U)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. 200929

AD-266 077
ARMED FORCES-NRC COMMITTEE ON BIO-ASTRONAUTICS WASHINGTON D C
REPORTS ON HUMAN ACCELERATION (U)
DEC 61  IV  HIATT, EDWIN P.  IHEEHAN, J. P.
GALAMBOS, ROBERT
REPT. NO. 901

UNCLASSIFIED REPORT

DESCRIPTORS: ACCELERATION TOLERANCE, REPORTS, MAN,
PATHOLOGY, PHYSIOLOGY, SAFETY, SENSORY MECHANISMS,
STRESS (PHYSIOLOGY), STRESS (PSYCHOLOGY), TEST
METHODS, TESTS, THRESHOLDS (PHYSIOLOGY), VISION,
WOUNDS + INJURIES (U)

UNCLASSIFIED
MOTION DEVICES FOR LINEAR AND ANGULAR OSCILLATION AND FOR ABRUPT ACCELERATION STUDIES ON HUMAN SUBJECTS (IMPACT). A DESCRIPTION OF FACILITIES IN USE AND PROPOSED.

DEC 61 IV VON GIERKE, HENNING E. I
STEINMETZ, EUGENE E.
REPT. NO. 907

UNCLASSIFIED REPORT

DESCRIPTORS: ACCELERATION TOLERANCE, MAN, OSCILLATORS, TEST FACILITIES, AIR BURST, DECELERATION, IMPACT SHOCK, LINEAR ACCELERATORS, MOTHERS, MOTION SICKNESS, PARTICLE ACCELERATORS, PHYSIOLOGY, TEST EQUIPMENT, VIBRATION, VOLUME
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200929

AO-268 189
UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES SCHOOL OF
MEDICINE
THE EFFECTS OF TRANSVERSE ACCELERATIONS AND
EXPONENTIAL TIME-LAG CONSTANTS ON COMPENSATORY
TRACKING PERFORMANCE
SEP 61 IV KASHLER, RICHARD C.
CONTRACT: F33615-66-C-5407
MONITOR: ASO TR61 457

UNCLASSIFIED REPORT

DESCRIPTORS: ACCELERATION TOLERANCE, RECORDING
SYSTEMS, ANALYSIS OF VARIANCE, ERRORS, HUMAN
ENGINEERING, MAN, MEASUREMENT, PHOSPHONITRILE
CHLORIDES, REACTION (PSYCHOLOGY), REFLEXES, ROLL,
STRESS (PHYSIOLOGY)

A STUDY WAS CONDUCTED TO DETERMINE THE EFFECTS AND
INTERACTIONS OF FRONT-TO-BACK TRANSVERSE
ACCELERATIONS, IN THE MAGNITUDES OF 0, 3 G, AND 6 G,
AND EXPONENTIAL TIME-LAG CONSTANTS OF 0.1, 1.0 AND
3.0 SECONDS ON HUMAN CONTROL PERFORMANCE ON A
COMPENSATORY TRACKING TASK. IN GENERAL, THE
RESULTS SUBSTANTIATED PREDICTIONS OF HUMAN TRACKING
PERFORMANCE BASED ON NELSON'S U-HYPOTHESIS AND
PRINCIPLE OF GENERALITY. CONCEPTS FROM
INFORMATION THEORY ARE INTRODUCED TO EXPLAIN CERTAIN
LEARNING PHENOMENA WHICH OCCURRED IN THE COURSE OF
THE EXPERIMENT. (AUTHOR)
SYMPTOMATOLOGY DURING PROLONGED EXPOSURE IN A CONSTANTLY ROTATING ENVIRONMENT AT A VELOCITY OF ONE REVOLUTION PER MINUTE

SEP 41 IV KENNEDY, ROBERT S.; GRAYBIEL, ASHTON
REPT. NO. 62

EIGHT SUBJECTS WERE SYSTEMATICALLY OBSERVED ON CERTAIN TASKS ABOARD THE PENSACOLA SLOW ROTATION ROOM AT A VELOCITY OF ONE RPM. PILOT EXPERIMENTS INDICATED THE GREAT MAJORITY OF UNSELECTED SUBJECTS WOULD BE SYMPTOM FREE AT THIS SPEED. CONSEQUENTLY, FOUR SUBJECTS WERE SELECTED WHOSE SUSCEPTIBILITY TO CANAL SICKNESS AND MOTION SICKNESS WAS FAR ABOVE AVERAGE. THE FINDINGS WARRANTED THE CONCLUSION THAT UNDER THE CONDITIONS OF THIS EXPERIMENT, ExPOSURE TO A CONSTANTLY ROTATING ENVIRONMENT ON ONE RPM DOES NOT HANDICAP THE PERFORMANCE OF PERSONS WITH FAR GREATER THAN AVERAGE SUSCEPTIBILITY TO CANAL SICKNESS.
THE APPEARANCE OF COMPENSATORY NYSTAGMUS IN HUMAN SUBJECTS AS A CONDITIONED RESPONSE DURING ADAPTATION TO A CONTINUOUSLY ROTATING ENVIRONMENT

AUG 61  IV  GUEORY, F. E.  JR.  IGRAYBIELE, A. I

SEVEN MEN LIVED IN A ROTATING ROOM (9.4 RPM) FOR 69 HOURS. CONTROLLED TESTS BEFORE AND DURING THIS INTERVAL DEMONSTRATED THAT CORIOLIS VESTIBULAR PHENOMENA INCLUDING CORIOLIS NYSTAGMUS DIMINISHED MARKEDLY. A COMPENSATORY NYSTAGMUS, INDUCED BY HEAD OR WHOLE BODY MOVEMENTS, WAS RECORDED MORE THAN ONE HOUR AFTER THE ROTATION HAD CEASED. FACTORS OF POSSIBLE SIGNIFICANCE IN CONDITIONING THE COMPENSATORY NYSTAGMUS ARE: (1) OTOPLITH AND PROPRIOCEPTOR SENSORY INFLUX PRIOR TO AND DURING DISCORDANT CANAL INPUT; (2) A CONSISTENT SENSORY INFLUX FOR EACH STIMULUS-PRODUCING MOVEMENT; (3) INTENTION IN STIMULUS-PRODUCING MOVEMENTS; AND (4) VISUAL INHIBITION. CONTRIBUTIONS OF COMPENSATORY AND AROUSAL FACTORS TO VESTIBULAR SUPPRESSION ARE CONSIDERED IN RELATION TO PRACTICAL PROBLEMS OF TRANSFER OF HABITUATION FROM ONE ACCELERATION ENVIRONMENT TO ANOTHER. (AUTHOR)
THE OIMETHYLAMINOETHYL ESTER OF PARACHLOROPHENOXYACETIC ACID ENHANCED SIGNIFICANTLY THE TOLERANCE OF RATS TO ACCELERATION AT 20 G. THE MEDIAN SURVIVAL TIME OF TREATED ANIMALS INCREASED TO 33.3 MIN, ALMOST A THREEFOLD INCREMENT. THE EFFECTIVENESS PERSISTED ONLY FOR A PERIOD OF 4 HOURS AFTER INJECTION. A LATENT PERIOD OF 2 TO 4 DAYS TREATMENT SEEMED NECESSARY BEFORE THE ENHANCED TOLERANCE TO ACCELERATION BECAME APPARENT. THE ACTIVITY OF THE DRUG WAS DOSE-DEPENDENT IN THAT NO SIGNIFICANT CHANGES IN ACCELERATION TOLERANCE WERE FOUND WITH A TOTAL INJECTION OF 90 MG. SIGNIFICANT INCREMENTS IN TOLERANCE WERE OBTAINED WITH 79 MG OF THE DRUG; MUCH LARGER INCREASES IN THE TOLERANCE TO ACCELERATION FOLLOWED ADMINISTRATION OF 100 MG OF LUCIORIL. THE NATURE OF THE PHARMACOLOGIC EFFECT SUGGESTS THAT THE DRUG ACTION PER SE IS MEDIATED VIA THE HYPOTHALAMIC AREA OF THE BRAIN; POSSIBLY IN INTERPLAY WITH THE BIOGENIC AMINES. THE LOW TOXICITY OF THE DRUG AND THE FACT THAT IT HAS ALREADY BEEN USED IN HUMANS IN HIGH DOSES WITH NO DELETERIOUS AND SOME PRESUMPTIVE BENEFICIAL EFFECTS LEADS TO THE PROPOSAL THAT THE COMPOUND MIGHT BE EFFECTIVE IN INCREASING HUMAN TOLERANCE TO ACCELERATION STRESS.
THE EFFECT OF G-FORCES (ACCELERATION AND DECELERATION) AND OF WEIGHTLESSNESS ARE DISCUSSED. TEST EQUIPMENT ARE ALSO MENTIONED.
UNCLASSIFIED

SCHOOL OF AEROSPACE MEDICINE BROOKS AFB TEX

RESPONSE OF MAMMALIAN GRAVITY RECEPTORS TO SUSTAINED TILT

IV CRAMER, ROBERT L. (U)

UNCLASSIFIED REPORT

DESIGNATORS: ACCELERATION TOLERANCE, EAR, NERVES, PROPRIOCEPTION, STIMULATION, STRESS (PHYSIOLOGY), WEIGHTLESSNESS (U)

STUDIES WERE MADE OF THE BEHAVIOR OF SINGLE CELLS OF THE PROJECTIONS OF THE OTOLITH ORGANS IN DECEREBRATE AND DECELLEBRATE CAT AS THE PREPARATION WAS MAINTAINED FOR EXTENDED TIMES IN DIFFERENT POSITIONS RELATIVE TO THE EARTH'S GRAVITATIONAL FIELD. IN EVERY CASE STUDIED, IT WAS FOUND THAT THERE WAS A RATHER VIGOROUS INITIAL RESPONSE TO THE TILT AND THAT THIS RESPONSE DIMINISHED CONSIDERABLY OVER 15 TO 30 SECONDS! THE STEADY-STATE SIGNAL TO TILT WAS RELATIVELY WEAK. (AUTHOR) (U)
THE PHYSIOLOGICAL RESPONSES OF CHIMPANZEEs TO SIMULATED LAUNCH AND RE-ENTRY ACCELERATIONS

JUL 62 IV STINGELY, NORMAN E. I

UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. 200929

AD-286 930
TRW SPACE TECHNOLOGY LABS REDONDO BEACH CALIF
PHYSIOLOGICAL AND PSYCHOLOGICAL EFFECTS OF SPACE
FLIGHT: A BIBLIOGRAPHY, VOLUME I: ACCELERATION,
DECELERATION, AND IMPACT

IV PRICE, J. F.

UNCLASSIFIED REPORT

DESCRIPTORS: *ACCELERATION, *ACCELERATION TOLERANCE,
*BIBLIOGRAPHIES, *DECELERATION, *SPACE FLIGHT, IMPACT
SHOCK, MAN, SPACE MEDICINE, STRESS (PHYSIOLOGY),
STRESS (PSYCHOLOGY), WEIGHTLESSNESS

A BIBLIOGRAPHY OF 1020 ANNOTATED REFERENCES ON
ACCELERATION, DECELERATION, AND IMPACT STUDIES.
THE AEROSPACE MEDICAL RESEARCH LABORATORIES' VERTICAL ACCELERATOR WAS DEVELOPED FOR BIOASTRONAUTICS RESEARCH TO SIMULATE VIBRATION AND BUFFETING ENCOUNTERED IN AEROSPACE OPERATIONS. THE DESIGN, MOTION CAPABILITIES, CONTROL AND SAFETY FEATURES ARE DESCRIBED. THIS VERTICAL ACCELERATOR CAN BE PROGRAMMED WITH PERIODIC OR RANDOM ACCELERATION PATTERNS OBTAINED FROM ACTUAL ENVIRONMENTAL MEASUREMENTS. IT IS A COMPLEX ELECTROMECHANICAL DEVICE EMPLOYING A UNIQUE TYPE OF FRICTION DRIVE TO MOVE A TEST PLATFORM WITH A 300-LB LOAD CAPACITY. THE ACCELERATOR, FOR CONTINUOUS OPERATION, CAN PRODUCE PEAK TO PEAK AMPLITUDES WITHIN 9 FT OVER THE FREQUENCY RANGE FROM 0.5 CPS TO 10 CPS. THE MAXIMUM ACCELERATION OUTPUT IS FROM 2.9 TO 3.6 DEPENDING ON LOAD AND PERMISSIBLE DISTORTION.

(AUTHOR)
STANDARDIZATION OF CONSTANTS FOR AGE ESTIMATION BY THE ARGON METHOD

UNCLASSIFIED REPORT

DESCRIPTORS:  •ACCELERATION TOLERANCE, •GEOLOGY, •ARGON

STANDARDIZATION OF CONSTANTS FOR AGE ESTIMATION BY THE ARGON METHOD.
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200929

AD-420 298
NAVAL AIR DEVELOPMENT CENTER JOHNsville PA AVIATION MEDICAL ACCELERATION LAB
THE EFFECT OF SEX ON THE G TOLERANCE OF RATS, REEVES, ELIZABETH I
AUG 63 10P
PROJ MROO 12 0002 3
MONITOR: NADC NA 6213

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTIONS: (ACCELERATION TOLERANCE, SEX), (SEX, ACCELERATION TOLERANCE), RATS, AGING (PHYSIOLOGY), WEIGHT, STRESS (PHYSIOLOGY), REPRODUCTIVE SYSTEM, SURVIVAL, PHYSIOLOGY

IDENTIFIERS: 1962

THREE GROUPS OF RATS WERE TESTED ON THE CENTRIFUGE AT 20 POSITIVE G TO ASCERTAIN WHAT EFFECT SEX MIGHT HAVE ON THE G TOLERANCE OF RATS. THE THREE GROUPS WERE: (1) AN EXPERIMENTAL GROUP OF 90 FEMALE RATS OF ABOUT 4-1/2 MONTHS OF AGE AT TIME OF CENTRIFUGATION, (2) A CONTROL GROUP OF 50 MALE RATS OF THE SAME AGE AND (3) A CONTROL GROUP OF 50 MALE RATS OF ABOUT THE SAME WEIGHT AS THE FEMALE EXPERIMENTAL GROUP. THE EXPERIMENT WAS PERFORMED TO DETERMINE ANY DIFFERENCES BETWEEN: (1) FEMALE AND MALE RATS OF THE SAME AGE, (2) FEMALE AND MALE RATS OF THE SAME WEIGHT, (3) FEMALE RATS IN THE ESTRUS AS OPPOSED TO THE DIESTROUS PHASE OF THE ESTRUS CYCLE AND (4) FEMALE RATS IN THE ESTRUS OR DIESTROUS PHASE AS COMPARED TO MALE RATS OF THE SAME AGE OR SAME WEIGHT. NO SIGNIFICANT DIFFERENCES WERE NOTED BETWEEN THE GROUPS.

(AUTHOR)
A preliminary study indicated that young rats have a greater resistance to acceleration stress of 20 positive G than do more mature rats. The present study compared the tolerance of one-month old rats with three-month old rats at 20 positive G and found that there was a significant difference in favor of the one-month old animals. Twenty rats, which survived the initial centrifugation at one month of age were retested at three months and showed no significant difference in tolerance when compared with control rats on the same age. (Author)
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200929

AD-424 030
NAVAL AIR DEVELOPMENT CENTER JOHNsville PA AVIATION
MEDICAL ACCELERATION LAB
PILOT BIO MEDICAL AND PSYCHOLOGICAL INSTRUMENTATION
FOR MONITORING PERFORMANCE DURING CENTRIFUGE SIMULATIONS OF SPACE FLIGHT,
OCT 67 29F CHAMBERS, RANDALL M. I
NELSON, JOHN G. I
MONITORI NAOC MA, NAVME 63085, NRO 09 13 60 02 4,
REPT. NO. 3

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (CENTRIFUGE, ACCELERATION TOLERANCE),
(MONITORS, CENTRIFUGES), (INSTRUMENTATION, SPACE MEDICINE), TRAINING, MEDICAL RESEARCH, PHYSIOLOGY,
PILOTS, MEASUREMENT, PERFORMANCE TESTS, BEHAVIOR,
PSYCHOLOGY

IDENTIFIERS: 1963, HUMAN CENTRIFUGE,
BIOMEDICAL MONITORING, X-20 SPACECRAFT, TOLERANCES (PHYSIOLOGY), PERFORMANCE (HUMAN)

THIS REPORT PRESENTS SOME OF THE RESULTS OF RECENT CENTRIFUGE ACCELERATION RESEARCH AND TRAINING PROJECTS IN WHICH THE BIOLOGICAL, PSYCHOPHYSIOLOGICAL AND PSYCHOLOGICAL PERFORMANCES OF PILOTS WERE MONITORED AND MEASURED. MONITORING AND RECORDING INSTRUMENTATION TECHNIQUES ARE DESCRIBED AND AN ATTEMPT IS MADE TO IDENTIFY AND QUANTIFY SOME OF THE CAPABILITIES AND LIMITATIONS OF PILOT PERFORMANCE DURING EXPOSURE TO ACCELERATIONS WHICH VARY IN MAGNITUDE, DURATION, DIRECTION, RATE OF ONSET, AND PROFILE COMPLEXITY. APPARATUS AND METHODS ARE PRESENTED AND DISCUSSED FOR MONITORING VISUAL DISTURBANCE, DISCRIMINATION, AND PERFORMANCE (HUMAN)

20

UNCLASSIFIED
THE EFFECT OF POSITIVE PRESSURE BREATHING ON ARTERIAL OXYGEN SATURATION AND PULMONARY VENTILATION IN SUBJECTS EXPOSED TO HIGH TRANSVERSE ACCELERATION, (U) REED, JOHN H., JR. BURGESS, B. F., JR. SANDELER, HAROLD I.
MONITOR: NAOC MA 622

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*PRESSURE BREATHING, OXYGEN CONSUMPTION), ACCELERATION TOLERANCE, ARTERIES, ELECTROCARDIOGRAPHY, PHYSIOLOGY, SPACE MEDICINE, RESPIRATION, STRESS (PHYSIOLOGY), ACCELERATION, CENTRIFUGES, MAN
IDENTIFIERS: OXYGEN SATURATION, 1969

TWENTY-TWO CENTRIFUGE RUNS WERE PERFORMED ON EIGHT SUBJECTS IN WHOM ARTERIAL OXYGEN SATURATION WAS CONTINUALLY MONITORED, WHILE THE SUBJECTS WERE EXPOSED TO VARIOUS TRANSVERSE ACCELERATIONS +6G AT A SEAT ANGLE OF 6 DEGREES HEAD UP. THESE RUNS WERE MADE DURING CONDITIONS OF BREATHING: AIR, AIR POSITIVE PRESSURE, PURE OXYGEN, AND PURE OXYGEN POSITIVE PRESSURE. THE POSITIVE PRESSURE WAS METERED AUTOMATICALLY TO PROVIDE 9 MM HG PER G ABOVE AMBIENT PRESSURE. THE RESULTS OF THIS EXPERIMENT SHOW THAT THE SLOPE OF THE CURVE OF OXYGEN SATURATION PLOTTED AGAINST TIME FOR AIR AND AIR POSITIVE PRESSURE DECREASED APPROXIMATELY 9 PERCENT EVERY 10 SECONDS, BEGINNING 10 TO 20 SECONDS AFTER THE ONSET OF THE ACCELERATION. DURING THE OXYGEN BREATHING STUDIES, A LOWERING IN ARTERIAL OXYGEN SATURATION WAS OBSERVED APPROXIMATELY 100 SECONDS AFTER THE ONSET OF ACCELERATION. A METHOD IS SUGGESTED FOR ESTIMATING PHYSIOLOGICAL LIMITS FOR THEORETICAL PROFILES OF ACCELERATION & PLOTTED AGAINST TIME. (AUTHOR)
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200529

AD-426 900
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

PHYSIOLOGICAL REACTIONS OF THE HUMAN ORGANISM DURING
THE ACTION OF ACCELERATIONS, MAXIMUM IN TIME AND
INTENSITY, DIRECTED ALONG THE SPINE BREAST AXIS. (U)

MONITOR: FTD TT62 1095

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: TRANS. FROM BYULETEN'
EKSPERIMENTAL'NOY BIOLOGII I MEDITISNY, NO. 7, PP.
24-29, 1963.

DESCRIPTORS: (ACCELERATION TOLERANCE, MAN),
(PHYSIOLOGY, ACCELERATION TOLERANCE), RESPI
RATION, REACTION (PSYCHOLOGY), CARDIOVASCULAR
SYSTEM, VISUAL ACUITY, ELECTROENCEPHALOGRAPHY,
AVIATION MEDICINE, (U)

IDENTIFIERS: ELECTROMYOGRAPHY, 1963, LONGITU
DINAL AXIS, (U)

TRANSLATION OF FOREIGN RESEARCH ON THE PHYSIOLOGICAL
REACTIONS OF THE HUMAN ORGANISM DURING THE ACTION OF
ACCELERATIONS, MAXIMUM IN TIME AND INTENSITY, DIRECTED ALONG
THE SPINE BREAST AXIS.
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200329

AO-429 027
FROST ENGINEERING DEVELOPMENT CORP DENVER COLO
HUMAN BODY DYNAMICS UNDER SHORT-TERM ACCELERATION. (U)

REPT. NO. 119 2
CONTRACT: N167 19747X

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (ACCELERATION TOLERANCE, MATHEMATICAL MODELS), MODELS (SIMULATIONS), THEORY DYNAMICS, MAN, EXPERIMENTAL DATA, POSTURE, ANALOG COMPUTERS, BIOPHYSICS

THIS REPORT REVIEWS THE DEVELOPMENT OF THE THEORY OF BODY DYNAMICS AND SHOWS HOW IT CAN BE USED TO OBTAIN SOLUTIONS TO IMPORTANT ENGINEERING PROBLEMS. (AUTHOR)

UNCLASSIFIED
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO
THE EFFECT OF TRANSVERSE ACCELERATION ON OXYGEN
TENSION IN BRAIN TISSUE.
JAN 69 12P KOVALENKO, YE. A. IPOPkov, V.  
L. ICHERNYAKOV, I. N. I
MONITORI FTD TT69 1219

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: TRANS. FROM FIZILOGICHESKIY

DESCRIPTORS: (ACCELERATION TOLERANCE, BRAIN),
POSTURE, HYPOXIA, ELECTROENCEPHALOGRAPHY, DOGS,
PHYSIOLOGY (U)
IDENTIFIERS: TRANSVERSE ACCELERATION, 1963 (U)

TRANSLATION OF FOREIGN RESEARCH ON THE EFFECT OF
TRANSVERSE ACCELERATION ON OXYGEN TENSION IN BRAIN
TISSUE.
THE PROTECTION AGAINST THE EFFECTS OF HEADWARD ACCELERATION AFFORDED THE HUMAN BY HIS IMMERSION IN WATER TO THE LEVEL OF THE XYPOID TO THE THIRD RIB AT THE STERNUM HAS BEEN ASSAYED IN 15 TRAINED CENTRIFUGE SUBJECTS. VARIATIONS IN EAR OPACITY, EAR OPACITY PULSE, HEART RATE, RESPIRATION AND REACTION TIMES TO AUDITORY AND VISUAL STIMULI WERE RECORDED CONTINUOUSLY IN A SERIES OF 15 SUBJECTS DURING 15-SECOND EXPOSURES TO ACCELERATION WHILE SEATED IN A STEEL TUB MOUNTED IN THE COCKPIT OF THE MAYO CENTRIFUGE. NO SYSTEMATIC ALTERATIONS IN THE GENERAL PATTERN, CHARACTERIZED BY A PERIOD OF FAILURE DURING THE FIRST 5 TO 10 SECONDS FOLLOWED BY CARDIOVASCULAR COMPENSATION AND RECOVERY FROM VISUAL SYMPTOMS DURING THE LATTER PART OF THE EXPOSURE WERE OBSERVED DURING IMMERSION IN WATER. THE DECREMENTS IN EAR OPACITY ASSOCIATED WITH THE VARIOUS DEGREES OF VISUAL IMPAIRMENT WERE CLOSELY SIMILAR; HOWEVER, THE DECREMENTS IN EAR OPACITY PULSE AND INCREMENTS IN HEART RATE WERE SIGNIFICANTLY LESS DURING IMMERSION IN WATER THAN WHEN IN AIR. (AUTHOR)
Each of 19 human subjects was subjected alternately to a set of peak accelerations of 6 and 7 g on two separate occasions. Peak g was attained in approximately 70 seconds after the initiation of a symmetrical, sinusoidal acceleration profile. The best index of the level of consciousness appears to be the inverse relationship between the depth of blackout and the amplitude of EEG frequencies in the range of 9 cps. The lower delta frequencies were not used since artifacts due to electrode displacement resulting from head movement were seen most frequently in this range of frequencies. Moreover, the 9 to 7 cps frequency band is associated with cerebral hypoxia which occurs during positive acceleration. This frequency band was also shown to be related to performance of specific performance tasks. (Author)
AN ANALOG COMPUTER WAS USED TO COMPARE THE DYNAMIC RESPONSE OF AN ACCELEROMETER PLACED OVER THE STERNUM OF HUMAN TEST SUBJECTS DURING IMPACT IN +G SUB X DIRECTION WITH THE RESPONSE OF SECOND AND HIGHER ORDER SPRING-MASS SYSTEMS. IDENTITY OF THE RESPONSE MODES OF BOTH SYSTEMS, HUMAN AND MECHANICAL, WAS APPROXIMATED BY TRIAL AND ERROR MODIFICATION OF NATURAL FREQUENCY AND DAMPING COEFFICIENT OF THE COMPUTER MODEL USED. WITH RESTRICTION TO ONLY A FEW CASES INVESTIGATED AND TO THE PARTICULAR TEST CONDITIONS, BEST COMPLIANCE OF COMPLETE RESPONSE COVERAGE IS CONSIDERED TO RESULT FROM THE APPLICATION OF A SINGLE SPRING-MASS SYSTEM OF IRREGULARLY VARYING DAMPING COEFFICIENT. A PARAMETRIC ANALYSIS OF THE SINGLE SPRING-MASS SYSTEM IS PRESENTED TO AID THE USE OF STANDARDIZED IMPACT PROFILES. THE USEFULNESS OF THE METHOD OF RESPONSE APPROXIMATION HAS BEEN ESTABLISHED, BUT THE VALIDATION OF THE UNDERLYING CONCEPT OF RESPONSE PREDICTABILITY NEEDS FURTHER INVESTIGATION. (AUTHOR)
FIVE STUDIES CONCERNING THE POTENTIAL OF A CENTRIFUGE IN AN ORBITAL LABORATORY WERE CONDUCTED. THE FIRST THREE STUDIES INCLUDE CONSEQUENCES OF HEART-TO-FOOT GRADIENTS ON TOLERANCE TO POSITIVE ACCELERATION, A PARAMETRIC STUDY OF THE POWER REQUIREMENTS OF A SHORT RADIUS CENTRIFUGE, AND A TECHNIQUE UTILIZING THE CENTRIFUGE FOR DETERMINING BODY MASS IN A NULL GRAVITY STATE. THE SALIENT GENERALIZATION FROM STUDIES IN WHICH BED REST WAS USED AS THE ANALOG OF NULL GRAVITY WERE PRESENTED. THE FOURTH STUDY WAS CONDUCTED TO STUDY THE INFLUENCE OF PERIODIC CENTRIFUGATION AS A METHOD OF ALLEVIATING PHYSIOLOGICAL DISTURBANCES, WITH EMPHASIS ON THE CARDIOVASCULAR SYSTEM, BROUGHT ABOUT BY 20 DAYS OF BED REST. IT WAS SHOWN THAT MOTION SICKNESS IN THE SUBJECTS WAS NOT A PROBLEM WHEN EXPOSED TO HIGH ANGULAR RATES OF ROTATION. DETERIORATION PRODUCED BY RECUMBENCY WAS ALLEVIATED BY PERIODIC CENTRIFUGATION, AND SUBJECTS EXPOSED TO +4GZ FOUR TIMES DAILY SHOWED LESS LABILITY OF BLOOD PRESSURE THAN DID THOSE RECEIVING LESS ACCELERATION. THE FIFTH STUDY EXTENDED THE RESULTS OF THE FOURTH STUDY BY INCREASING THE INTEGRATED G-TIME, ADDED APPROXIMATELY 700 KCAL OF EXERCISE, AND DISTRIBUTED THE RIDES OVER A 24-HR PERIOD AS CONTRASTED WITH THE 8-HR SCHEDULE OF THE PRIOR STUDY.
UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTIONS: (ACCELERATION TOLERANCE, SEMICIRCULAR CANALS), (SEMIRCULAR CANALS, ACCELERATION TOLERANCE), EAR, EYE, TEMPERATURE, STIMULATION, GRAVITY (ARTIFICIAL), THERMISTORS, CORNEA, RETINA, WATER, VELOCITY, LYMPH

IDENTIFIERS: NYSTAGMUS

SIXTEEN SUBJECTS WERE GIVEN CALORIC STIMULATION WHILE LYING IN PRONE AND SUPINE BODY POSITIONS. IT WAS FOUND THAT THE NYSTAGMIC RESPONSE IN THE SUPINE POSITION WAS SIGNIFICANTLY GREATER THAN THE RESPONSE IN THE PRONE POSITION. THESE FINDINGS CANNOT BE EXPLAINED ON THE BASIS OF A CUPULA-GRAVITY INTERACTION, ASSUMING THE CUPULA IS HEAVIER THAN THE SURROUNDING ENDOLYMPH. (AUTHOR)
SPEED, ACCELERATION, WEIGHTLESSNESS; SOME PROBLEMS IN PHYSICS AND PHYSIOLOGY IN CONNECTION WITH ATMOSPHERIC AND SPACE FLIGHTS,
JUN 69 154P ISAKOV, P. K. ISTASEVICH, R. S.;
MONITOR: FTD, TT MT62 107, 64 11861

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF MONO.

SKOROSTI, USKORENIA, NEVENOMOST'; NEKOTORE
VOPROSY FIZIKI I FIZIOLOGII PRIMENITEL'NO K
POLETAM V ATMOSFERE I KOSMICHESKOM PROSTRASTVE,
MOSCOW, 1962, 150P.

DESCRIPTORS: (SPACE FLIGHT, PHYSIOLOGY), VELOCITY,
ACCELERATION, WEIGHTLESSNESS, VESTIBULAR APPARATUS,
PHYSICAL FITNESS, ROCKETS, FUELS, SPACECRAFT,
ASTRONAUTS, STIMULATION, REFLEXES, SPACE MEDICINE,
BLOOD CIRCULATION, SHOCK (PATHOLOGY), USSR

SPEED, ACCELERATION AND WEIGHTLESSNESS ARE
CONSIDERED IN THE LIGHT OF NEW DATA. A SPECIAL
CHAPTER IS DEVOTED TO THE QUESTION OF WEIGHTLESSNESS,
IN WHICH THE PHYSICAL CONDITIONS ARISING FROM THIS
PHENOMENON AND ITS INFLUENCE ON THE HUMAN ORGANISM
AND ANIMALS UNDER SPACE-FLIGHT CONDITIONS ARE
REPORTED. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200929

AD-409 012
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO
COSMIC RESEARCH, 1964, VOL. 2, NO. 3, JUL 69 292P
MONITOR: FTD ,TT TT69 7701 69 71149

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANSL. OF
KOSMIcheskie IssleOovaniya (USSR) 1964, V. 2, NO. 9, P. 399-504.

DESCRIPTORS: (*SPACE FLIGHT, SCIENTIFIC RESEARCH),
(*ASTROPHYSICS, SCIENTIFIC RESEARCH), SATELLITES
(ARTIFICIAL), SPACE MEDICINE, SPACE PROPULSION, SPACE
STATIONS, SPACECRAFT, INTEGRATION, DIFFERENTIAL
EQUATIONS, MATHEMATICAL ANALYSIS, OPTICAL PROPERTIES,
CLOUDS, METEOROLOGICAL SATELLITES, PERTURBATION
THEORY, MAGNETIC FIELDS, INTERPLANETARY TRAJECTORIES,
ORBITAL TRAJECTORIES, RADIATION, HYPERSONIC FLOW,
PRESSURE SUITS, USSR

CONTENTS: INTERPLANETARY FLIGHTS WITH CONSTANT
OUTPUT ENGINES, THE ACCELERATION OF A SPACECRAFT
WITHIN THE RANGE OF PLANETARY INFLUENCE, ON SPACE-
FLIGHT TRAJECTORIES WITH A CONSTANT REACTION
ACCELERATION VECTOR, OPTIMUM TRAJECTORIES AND OPTIMUM
PARAMETERS FOR SPACE VEHICLES, METHOD OF QUICKEST
DESCENT AS APPLIED TO COMPUTATION OF INTERORBITAL
TRAJECTORIES WITH ENGINES OF LIMITED POWER, RADIATIVE
HEATING IN HYPERSONIC FLOW, OPTICAL PROPERTIES OF
CLOUDS, EQUATION FOR RELEVANCE OF INFORMATION FROM
WEATHER SATELLITES AND FORMULATION OF INVERSE
PROBLEMS, ANALYTICAL REPRESENTATION OF THE EARTH'S
MAGNETIC FIELD IN THE ORBITAL COORDINATE SYSTEM,
GEOGRAPHICAL DISTRIBUTION OF RADIATION INTENSITY IN
THE REGION OF THE BRAZILIAN MAGNETIC ANOMALY AT AN
ALTITUDE OF ABOUT 300 KM, INVESTIGATION OF
TERRESTRIAL RADIATION BELTS IN THE VICINITY OF THE
BRAZILIAN MAGNETIC ANOMALY AT ALTITUDES OF 229-249
KM, THE POSSIBILITIES OF REPLACING THE NITROGEN IN
THE AIR WITH HELIUM IN SPACEVEHICLE CABINS AND THE
EFFECTIVENESS OF USING A HELIUM-OXYGEN MIXTURE FOR
VENTILATION OF A SPACE-PRESSURE SUIT.

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UNCLASSIFIED
UNCLASSIFIED

GOCE REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200929

AD-608 919
CIVIL AERONAUTICAL INST OKLAHOMA CITY OKLA
TASK - CONTROL OF AROUSAL AND THE EFFECTS OF REPEATED
UNIDIRECTIONAL ANGULAR ACCELERATION ON HUMAN
VESTIGULAR RESPONSES,
NOV 67 37P  COLLINS, WILLIAM E. I
MONITORI CARI, 67 39

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE

DESCRIPTIONS: (ACCELERATION TOLERANCE; VESTIGULAR
APPARATUS); (VESTIGULAR APPARATUS; ACCELERATION
TOLERANCE); ACCELERATION, VIBRATION, LEARNING;
ADAPTATION (PHYSIOLOGY); HEARING, VISION, AUDITORY
PERCEPTION, STIMULATION, SENSORY MECHANISMS, VISUAL
PERCEPTION, SENSORY DEPRIVATION, MOTIVATION, AVIATION
MEDICINE, DECELERATION

IDENTIFIERS: NYSTAGMUS

SUBJECTS WERE EXPOSED TO A 10-DAY HABITUATION
SERIES OF 300 CW ACCELERATIONS IN TOTAL DARKNESS
WHILE PERFORMING ATTENTION-DEMANDING TASKS.
DECELERATIONS WERE SUBTHRESHOLD. PRELIMINARY AND
POST-TESTS INDICATED THAT SLOW-PHASE NYSTAGMUS AND
DURATION OF THE OCULAR RESPONSE DECLINED
BIDIRECTIONALLY AS A FUNCTION OF THE HABITUATION
TRIALS, BUT FREQUENCY OF NYSTAGMUS INCREASED DURING
THE STIMULUS PERIOD AND FOR A FEW SECONDS THEREAFTER.
THESE CHANGES WERE APPROXIMATELY EQUAL FOR BOTH
CW AND CCW STIMULATION. MEASUREMENTS OF
SUBJECTIVE VELOCITY WERE OBTAINED DURING SEVERAL
PRENO POST-TEST TRIALS BUT NEVER DURING THE HABITUATION
SERIES. A DECLINE IN THE INTENSITY OF THE SENSATION
TO CW ACCELERATION, BUT NOT TO CCW STIMULATION,
WAS PRODUCED BY THE HABITUATION SERIES. A SECOND
POST-TEST GIVEN AFTER ONE MONTH WITH NO INTERVENCING
STIMULATION SHOWED LITTLE OR NO RESTORATION OF
NYSTAGMUS. HOWEVER, THE SUBJECTIVE REACTION
DEMONSTRATED A CLEAR, ALTHOUGH INCOMPLETE PATTERN OF
RECOVERY. (AUTHOR)
FOUR EXPERIMENTS WERE PERFORMED TO DETERMINE THE EFFECTS OF WHOLE-BODY SINUSOIDAL VIBRATIONS IN THE X, Y AND Z AXES UPON DIAL READING PERFORMANCE. THE SUBJECTS WERE IN THE SEMISUPINE POSITION SO THAT THE FORCE OF GRAVITY WAS DIRECTED THROUGH THE X AXIS OF THE BODY. IN ALL FOUR EXPERIMENTS, PERFORMANCE AT 6, 11 AND 19 CPS WAS COMPARED AT VARIOUS LEVELS OF ACCELERATION AND WITH AND WITHOUT THE USE OF A HELMET RESTRAINT. FURTHER, PERFORMANCE WAS ASSESSED WITH AN EASY AND A DIFFICULT DIAL READING TASK. THE RESULTS INDICATED THAT PERFORMANCE WITH THE EASY TASK WAS RELATIVELY UNAFFECTED BY THE VIBRATION CONDITIONS WHILE LARGE AND SIGNIFICANT LOSSES IN PERFORMANCE OCCURRED WITH THE DIFFICULT TASK. MEAN ERRORS FOR THE DIFFICULT DIAL READING TASK INCREASED SIGNIFICANTLY AS ACCELERATION LEVEL OF VIBRATION INCREASED. THE RESULTS FURTHER INDICATED THAT THE EFFECTS OF HELMET RESTRAINT AND FREQUENCY UPON PERFORMANCE WITH THE DIFFICULT READING TASK VARIED WITH THE DIRECTION OF VIBRATION. THAT IS, THE USE OF A PROTECTIVE DEVICE TO RESTRICT HELMET MOVEMENTS: (A) IMPROVED PERFORMANCE AT ALL FREQUENCIES WHEN VIBRATION WAS IN THE X AXES; (B) IMPROVED PERFORMANCE AT 6 CPS, BUT DEGRADED PERFORMANCE AT 11 AND 19 CPS IN THE Y AXES.
Changes in the content of biologically active substances in rats under the action of radial accelerations.

In rats after repeated action of positive radial acceleration, the content of histamine increases in the mucous membrane of the intestine, and decreases considerably in the lungs and tissues of the brain. In the tissues investigated, there is an increase in the activity of the dynamoxygenase, and also in the adrenalin-like substances, especially in the lungs and the brain tissue. After a single action of negative accelerations in the tissues investigated, there is a lowering of the content of histamine and the activity of the dynamoxygenase, the content of adrenalin-like substances decreases in the mucous membrane of the intestine, and in the tissues of the brain, and in the lungs no change is noted. After multiple and often repeated action of positive accelerations in the investigated tissue, there is also a lowering of the histamine and content of adrenalin-like substances in the mucous membrane of the intestine and in the tissues of the brain. Under different conditions of the experiment there is a reduction in the excretion of 9-oxyindoluxus acid with the urine, whereby, the change in the excretion of acid also occurs with a definite dependence on the magnitude, the frequency and duration of the action. (Author)

UNCLASSIFIED
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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200929

AU-608 970
NAVAL SCHOOL OF AVIATION MEDICINE PENSACOLA FLA
THE EFFECT OF CHANGING THE RESULTANT LINEAR
ACCELERATION RELATIVE TO THE SUBJECT ON NYSTAGMUS
GENERATED BY ANGULAR ACCELERATION. (U)

DESCRIPTION NOTE: REPT. NO. 99,
SEP 64 44P LANSBERG, MARTIN P. I
GUEODT, FRED E., JR., GRAYBIELE, ASHTON I
PROJ: MR00517 6001 NASA ORDER NO. R97
TASK: 1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-608 971.

DESCRIPTIONS: "ACCELERATION TOLERANCE, SEMICIRCULAR
CANALS," "SEMICIRCULAR CANALS, ACCELERATION
TOLERANCE." DECELERATION, ROTATION, STIMULATION, EYE,
RECORDING SYSTEMS, SPACE MEDICINE (U)
IDENTIFIERS: NYSTAGMUS, OTOLITH SYSTEM (U)

THE EFFECT OF CENTRIPETAL ACCELERATION ON NYSTAGMUS
WAS STUDIED BY PLACING MEN AT RADII OF 17 AND 20 FEET
IN VARIOUS ORIENTATIONS RELATIVE TO THE CENTER OF
ROTATION. ANGULAR ACCELERATIONS AND DECELERATIONS
WERE APPROXIMATELY 10 DEG/SEC SQUARED. IN SOME OF
THESE DIFFERENT POSITIONS, THE PLANES OF THE
SEMICIRCULAR CANALS REMAINED UNCHANGED RELATIVE TO
THE PLANE OF ROTATION, BUT THE ORIENTATION OF THE
RESULTANT FORCE RELATIVE TO THE OTOLITH SYSTEM WAS
CHANGED. IN SEVERAL SUCH SITUATIONS THE MAGNITUDE,
PLANE, AND DIRECTION OF NYSTAGMUS WERE CHANGED BY
CENTRIPETAL ACCELERATIONS BETWEEN 1 AND 2 G-UNITS.
RESULTS ARE DISCUSSED IN TERMS OF OTOLITH
MODULATION OF SENSORY INPUT FROM THE SEMICIRCULAR
CANALS. (AUTHDR) (U)

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UNCLASSIFIED
INFLUENCE OF LABYRINTH ORIENTATION RELATIVE TO GRAVITY ON RESPONSES ELICITED BY STIMULATION OF THE HORIZONTAL SEMICIRCULAR CANALS.

DESCRIPTIVE NOTE: REPT. NO. 100.
SEP 64 10P CORREIA, MANNING J. I
GUEDDY, FRED E., JR.
PROJ: MMO5 13 6001 NASA, ORDER R93
TASK: 1

SUPPLEMENTARY NOTE: SEE ALSO: AD-40B 970.

DESCRIPTORS: (ACCELERATION TOLERANCE, SEMICIRCULAR CANALS), (SEMICIRCULAR CANALS, ACCELERATION TOLERANCE), DECELERATION, ROTATION, STIMULATION, EYE, SPACE MEDICINE
IDENTIFIERS: NYSTAGMUS, OTOLITH SYSTEM

TWO EXPERIMENTS WERE CONDUCTED TO EXAMINE THE EFFECTS OF DIFFERENT ORIENTATIONS OF THE HORIZONTAL SEMICIRCULAR CANAL CUPULAE RELATIVE TO GRAVITY ON NYSTAGMIC OUTPUT FOLLOWING DECELERATION FROM ROTATION ABOUT THE EARTH-HORIZONTAL AXIS. DIFFERENCES IN NYSTAGMUS OUTPUT WITH DIFFERENT STOPPING POSITIONS WERE NOT ENTIRELY CONSISTENT WITH PREDICTIONS BASED ON THE ASSUMPTION THAT CUPULA DEFLECTION WAS INFLUENCED BY GRAVITY. A MORE PLAUSIBLE EXPLANATION, MODULATION OF CANAL-INITIATED RESPONSES BY OTOLITH ACTIVITY, WAS PRESENTED. A HIGH INCIDENCE OF MOTION SICKNESS WAS ENCOUNTERED WHILE ROTATING SUBJECTS ABOUT THE EARTH-HORIZONTAL AXIS AND IT WAS APPARENTLY CONTROLLED BY THE MENTAL TASK ASSIGNED TO THE SUBJECT. (AUTHOR)
UNCLASSIFIED

OEC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200829

AD-610 172
BROWN ENGINEERING CO INC HUNTSVILLE ALA
PHYSIO-MECHANICAL EFFECTS OF ACCELERATIONS ON HUMAN
BEINGS WORKING IN A ROTATING ENVIRONMENT. (U)
DESCRIPTIVE NOTE: TECHNICAL NOTE,
NOV 64 28P.
CREWS, HARRY C. JR.
REPT. NO. BROWNENG-R-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (ACCELERATION TOLERANCE, ADAPTATION
(PHYSIOLOGY)), (ROTATION, ADAPTATION (PHYSIOLOGY)),
STRESS (PHYSIOLOGY), REACTION (PSYCHOLOGY), CONFINED
ENVIRONMENTS, PERFORMANCE (HUMAN), THRESHOLDS
(PHYSIOLOGY), VESTIBULAR APPARATUS, SEMICIRCULAR
CANALS, PATHOLOGY, MATHEMATICAL ANALYSIS, MAINTENANCE
PERSONNEL, RADAR EQUIPMENT (U)
IDENTIFIERS: PHYSIO-MECHANICAL EFFECTS (U)

THE MECHANICAL FORCES ACTING UPON PERSONNEL AND
EQUIPMENT IN A ROTATING ENVIRONMENT ARE DESCRIBED.
THES FORCES ARE USED TO EXPLAIN THE OBSERVED
PHYSIOLOGICAL AND PSYCHOLOGICAL REACTIONS OF
PERSONNEL. PROCEDURES AND PRACTICES ARE
RECOMMENDED TO HOLD ADVERSE REACTIONS TO AN
ACCEPTABLE MINIMUM. (AUTHOR) (U)
THE PROBLEM OF DEVELOPING QUANTITATIVE STANDARDS AND DESIGN LIMITS FOR HUMAN EXPOSURES TO DYNAMIC ACCELERATION IS DISCUSSED. THE CONCEPT OF THE DEVELOPMENT OF A MECHANICAL IMPEDANCE MODEL OF THE HUMAN TO QUANTITATE ENERGY TRANSFER FROM THE ENVIRONMENT TO THE HUMAN IS REVIEWED. THE METHODS OF MEASUREMENT AND CALCULATION OF IMPEDANCE AS WELL AS SOME CURRENT RESULTS ARE DISCUSSED. THE UTILIZATION OF THE IMPEDANCE RESULTS IN THE PROCESS OF PROTECTION SYSTEM DEVELOPMENT IS PRESENTED AS A CRITERION FOR PERFORMANCE. THE MEANING OF THE IMPEDANCE RESULTS AND THEIR CORRELATION WITH TOLERANCE EXPERIMENTATION IS DISCUSSED. (AUTHOR)
UNCLASSIFIED

A restraint system for application in RSUBZ and -GSUBX acceleration environments with emphasis upon knee and lower leg restraints. (U)

DESCRIPTIVE NOTE: FINAL REPT. FOR DEC 63-FEB 64, DEC 64 ISP VAN PATTEN, ROBERT E. I

REPT. NO. AMRL-TR-64-144

PROJ. 7222

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (ACCELERATION TOLERANCE, SAFETY HARNESS), (SAFETY HARNESS, ACCELERATION TOLERANCE), ASTRONAUTS, SAFETY DEVICES, GRAVITY (ARTIFICIAL), LEG, HEAD, BODY, YAW, DESIGN, HUMAN ENGINEERING (U)

THIS REPORT DESCRIBES THE DEVELOPMENT OF A LOWER LEG RESTRAINT SYSTEM DESIGN SUITABLE FOR USE IN YAW (R SUB Z) AND TRANSVERSE P-A G (-G SUB X) ACCELERATION ENVIRONMENTS. THE DESIGN IS BASED UPON THE PRINCIPLE OF AVOIDING RESTRAINING FORCE CONCENTRATIONS ALONG THE ANTERIOR CREST OF THE TIBIA AND HAS BEEN WORN WITH COMFORT FOR PERIODS OF UP TO THREE MINUTES WITH THE LEGS IN A 9.8 G FIELD. (AUTHOR) (U)
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SUPPLEMENTARY NOTE: AVAILABLE COPY WILL NOT PERMIT FULLY LEGIBLE REPRODUCTION. REPRODUCTION WILL BE MADE IF REQUESTED BY USERS OF OOC. COPY IS AVAILABLE FOR PUBLIC SALE. PREPARED IN COOPERATION WITH MAYO GRADUATE SCHOOL OF MEDICINE, ROCHESTER, MINN.

DESCRIPTORS: (*ACCELERATION TOLERANCE, BLOOD ANALYSIS), (*THORAX, ACCELERATION TOLERANCE), OXYGEN CONSUMPTION, RESPIRATION, BLOOD VOLUME, ARTERIES, VEINS, LUNGS, GRAVITY, ANESTHESIA, DOGS

SIX DOGS UNDER MORPHINE-PENTOBARBITAL ANESTHESIA WERE EXPOSED TO FORWARD ACCELERATIONS OF 2, 4 AND 6G FOR ONE MINUTE AND 6G FOR THREE MINUTES WHILE IN THE HORIZONTAL, 15 DEGREES HEAD-UP AND 15 DEGREES HEAD-DOWN POSITIONS BREATHING ROOM AIR. EXPOSURES TO 6G WERE REPEATED BREATHING 99.6% OXYGEN. OXYGEN SATURATION AND OPACITY AT 800 MILLIMICRONS OF BLOOD WERE RECORDED CONTINUOUSLY BY CUVETTE OXIMETERS. PULMONARY ARTERIAL-VENOUS SHUNTING WAS ESTIMATED FROM BLOOD OXYGEN SATURATIONS. NO SYSTEMATIC CHANGES IN FEMORAL ARTERY OXYGEN SATURATION OCCURRED AT 2G WHILE A SMALL AVERAGE DECREASE WAS OBSERVED AT 4G (14%). DECREASES OCCURRED AT 6G AVERAGING 11 (5-17) PER CENT AT THE END OF THE 60-SECOND EXPOSURE. RETURN TO CONTROL (6G) VALUES WAS NEARLY COMPLETE 90 SECONDS AFTER THE EXPOSURE. OXYGEN INHALATION DELAYED BUT DID NOT PREVENT THE DECREASE. THESE DECREASES ARE BELIEVED DUE TO PULMONARY ARTERIAL-VENOUS SHUNTING. THE AVERAGE INCREASE IN PULMONARY ARTERIAL-VENOUS SHUNT OVER 1G VALUES ESTIMATED AT THE END OF 60-SECOND EXPOSURES TO 6G WHEN BREATHING AIR WAS 17 (11-31) PER CENT. VALUES FOR SHUNTS AT 6G, WHEN BREATHING OXYGEN, WERE SIMILAR.
END-EXPIRATORY PLEURAL PressURES IN DOGS IN SUPINE AND PRONE BODY POSITIONS STUDIED WITHOUT THORACOTOMY.


MONITOR: AML, TR-44-123

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (ACCELERATION TOLERANCE, THORAX), (THORAX, ACCELERATION TOLERANCES), PRESSURE, POSTURE, CANNULATION, RECORDING SYSTEMS, RESPIRATION, HEART, LUNGS, WEIGHT, DOGS, MEASUREMENT.

INTRAPLEURAL Pressures were measured simultaneously by saline-filled catheters from 2 to 9 different sites in the potential right pleural space of nine anesthetized dogs while the animals were supported in the supine and prone positions by means of molded half-body casts. Intrapleural tips of the catheters were placed at heart level in the cephalo-caudal dimension at ventral (retrosternal) and dorsal (paravertebral) sites in the thorax. The site of each catheter tip was measured from biplane X-rays taken in each position. The average vertical distance between the dorsal and ventral catheter tips was 10±6 (S±E± of mean = 0±9) cm. in the supine position. Mean end-expiratory pressure at the superior (ventral) catheter tip was -11±9 (±0±7) cm. H2O as compared to -9±0 (±0±5) cm. H2O at the dependent (dorsal) site giving an average gradient of 0±64 (= 0±04) cm. H2O/cm. vertical distance between the two recording sites. The respective values in the prone position were: -9±0 (±0±6) cm. H2O superior (dorsal) site; 0±7 (±0±5) cm. H2O dependent (ventral) site; gradient: 0±91 (±0±08) cm. H2O/cm. vertical distance. The slightly positive value for retrosternal pleural pressure and the greater dorsal-ventral gradient when in the prone position, may be due to the weight of the heart. During the increase in weight induced by acceleration, these pressures were multiplied roughly in proportion to the g level and (U)
TOLERANCE TO THE TRANSVERSE (+Gx) ACCELERATION OF A SIMULATED GEMINI RE-ENTRY PROFILE WAS DETERMINED BEFORE AND AFTER 4 WEEKS OF ABSOLUTE BED REST. TOLERANCE TO HEADWARD (+Gz) ACCELERATION WAS STUDIED BEFORE AND AFTER 4 WEEKS OF ABSOLUTE BED REST AND 2 WEEKS OF MODIFIED BED REST AS JUDGED BY THE DEGREE OF PHYSICAL DISCOMFORT, THE ABILITY TO RESPOND TO A CENTRAL LIGHT, OR THE PRESENCE OF ELECTROCARDIOGRAPHIC ABNORMALITIES. TOLERANCE TO +Gx WAS UNAFFECTED BY 4 WEEKS OF ABSOLUTE BED REST. IN EACH SUBJECT STUDIED, HEART RATES DURING PEAK ACCELERATION WERE HIGHER AFTER BED REST THAN BEFORE AS JUDGED BY THE LEVEL OF ACCELERATION AT WHICH CENTRAL VISION WAS LOST, NO SIGNIFICANT CHANGE IN TOLERANCE TO HEADWARD (+Gz) ACCELERATION OF RAPID ONSET WAS OBSERVED AFTER 2 WEEKS OF MODIFIED BED REST OR AFTER 4 WEEKS OF ABSOLUTE BED REST. AFTER EACH TYPE OF BED REST, THE MAJORITY OF THE SUBJECTS HAD DECREASED TOLERANCE TO HEADWARD (+Gz) ACCELERATION OF GRADUAL ONSET, BUT THE MEAN DECREASE WAS NOT STATISTICALLY SIGNIFICANT. MEAN HEART RATES AT EQUIVALENT LEVELS OF +Gz WERE SIGNIFICANTLY HIGHER AFTER BOTH PERIODS OF BED RESTS. THE ONLY ARRHYTHMIA OF CLINICAL IMPORTANCE NOTED WAS THE APPEARANCE OF BURSTS OF PREMATURE ATRIAL CONTRACTIONS DURING G.o.R. + Gz IN 1 SUBJECT AFTER 2 WEEKS OF BED REST. (AUTHOR)
HUMAN SUBJECT TOLERANCE TO ACCELERATIONS OF GREATER THAN ONE SECOND DURATION IS SUMMARIZED FOR THE ORTHODGNAL X, Y, AND Z AXES. BECAUSE EACH INVESTIGATOR AT EACH LABORATORY UTILIZES DIFFERENT RESTRAIN SYSTEMS, BODY POSITIONS, AMBIENT TEMPERATURES, ETC, AND MOST IMPORTANT, UTILIZES DIFFERENT CRITERIA OF 'TOLERANCE,' THE DATA ARE REFERENCED AND PRESENTED IN TABLES AND GRAPHS FOR EACH MAJOR CATEGORY (DIRECTION) OF ACCELERATION. THE POINTS PRESENTED IN THE GRAPHS AND TABLES ARE USUALLY THE HIGHEST VALUES ACHIEVED IN EACH SERIES THERE WERE SUBJECTS WHO COULD NOT TOLERATE THE GIVEN DIRECTION, AMPLITUDE, AND DURATION. (AUTHOR)
MAN'S VOLUNTARY, SUBJECTIVE, SHORT-TIME TOLERANCE LIMITS TO SINUSOIDAL VIBRATIONS AT FREQUENCIES BETWEEN 2 AND 20 CPS IN THE THREE ORTHOGONAL AXES HAVE BEEN DETERMINED. THE GENERAL SHAPE OF A SERIES OF CURVES DEPICTING TOLERABLE LEVELS OF VIBRATION ACCELERATION AS A FUNCTION OF FREQUENCY HAS BEEN DEFINED. TWO DIFFERENT SUPPORT AND RESTRAINT SYSTEMS HAVE BEEN EMPLOYED AND THE INFLUENCE OF THE SYSTEM USED ON THE TOLERANCE LIMITS REACHED HAS BEEN DISCUSSEO. REASONS FOR THE OBSERVED DIFFERENCES HAVE BEEN ANALYZED. IT HAS BEEN FOUND THAT THE MAGNITUDE OF ACCELERATION TOLERATED AT EACH FREQUENCY AND, TO SOME EXTENT, THE TYPE OF SYMPTOM ARE INFLUENCED BY BOTH THE EXPERIMENTAL DESIGN AND THE SUPPORT AND RESTRAINT SYSTEM USED. FURTHERMORE, THE TYPE OF SYMPTOM OCCURRING APPEARS TO BE SOMEWHAT DEPENDENT UPON THE ACCELERATION LEVEL REACHED. EMPHASIS IS GIVEN TO THE FACT THAT, FOR MANNED SPACE VEHICLES, HIGH AMPLITUDES OF VIBRATION IN THE 1 TO 20 CPS FREQUENCY RANGE ARE TO BE AVOIDED IF POSSIBLE. IF THIS IS NOT POSSIBLE, THE RESULTS SUGGEST THAT FUTURE DESIGN CONSIDERATIONS INCLUDE PROVISION FOR CLOSE COUPLING OF BODY AND HEAD (WITH HELMET AND LINEAR) TO THE SUPPORT SYSTEM TO IMPROVE TOLERANCE TO THE FREQUENCIES BELOW 10 CPS. BETWEEN 10 AND 20 CPS, METHODS OF ISOLATING THE BODY AND PARTICULARLY THE HEAD FROM VIBRATION INPUT OF HIGH...
Changes in spontaneous activity as a measure of sensitivity to rotation in the white rat.

SUPPLEMENTARY NOTE: Joint Rept. with National Aeronautics and Space Administration, Washington, D.C.

Descriptors: (rotation, sensitivity), (acceleration tolerance, rats), behavior, motion, vestibular apparatus, stimulation, psychophysiology, aviation medicine, stress physiology.

Fifty-six unrestrained rats were individually exposed to a rotation speed between 0–10 RPM. Their activity was measured using a four point scale: (0) no activity, (1) grooming and sniffing, (2) moderate running, and (3) rapid running. Amount of activity decreased as a function of rotation speed from 6 to 10 RPM, where it reached a lower limit plateau. Rate of decline within this speed range was also directly related to velocity. Postrotation activity was suppressed up to five minutes. The rats showed considerable sensitivity to Coriolis stimuli generated during constant speed of rotation. A relationship was found between duration and magnitude of stimulation. These findings are encouraging for the use of behavioral methods in studying sensitivity to motion.
RESTRAINT TEST METHODS ARE REVIEWED WITH REFERENCE TO A MATHEMATICAL MODEL OF THE DYNAMICS OF THE HUMAN BODY. THIS APPROACH IS SUGGESTED SO THAT THE MECHANICAL CHARACTERISTICS OF RESTRAINT SYSTEMS CAN BE EVALUATED IN TERMS OF THEIR INFLUENCE ON THE DYNAMIC RESPONSE OF THE HUMAN BODY IN ANY ACCELERATION ENVIRONMENT. ANTHROPOMORPHIC DUMMIES, ANIMALS, LIVE HUMANS AND HUMAN CADAVERS ARE DISCUSSED WITH RESPECT TO THEIR ADVANTAGES AND DISADVANTAGES IN RESTRAINT SYSTEM TESTS. THE CONCEPTS OF INJURY RISK, SUBJECT VARIABILITY, AND DYNAMIC AND ANATOMICAL DIFFERENCES BETWEEN ANIMAL AND HUMAN SUBJECTS ARE CONSIDERED. THE AVAILABLE METHODS FOR RESTRAINT TESTS ARE DISCUSSED IN TERMS OF THE AMOUNT AND KIND OF INFORMATION GENERATED AND A TEST TECHNIQUE IS RECOMMENDED. (AUTHOR)
EXPERIMENTAL DETERMINATION OF HUMAN VESTIBULAR SYSTEM RESPONSE THROUGH MEASUREMENT OF EYEBALL COUNTERROLL.

DESCRIPTIVE NOTE: MASTER'S THESIS.

ROCCAFORETE, PHILIP A.; HARTZLER, VICTOR L.

REPT. NO. GE/EE/65-11

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

AN INDIRECT MEASUREMENT OF THE HUMAN VESTIBULAR SYSTEM RESPONSE WAS OBTAINED THROUGH THE MEASUREMENT OF EYEBALL COUNTERROLL. HUMAN SUBJECTS WERE ROTATED ABOUT AN AXIS THROUGH THEIR LINE OF SIGHT AT ANGULAR VELOCITIES VARYING FROM 0-90 RPM. THE RIGHT EYE WAS PHOTOGRAPHED AND THE ANGLE OF EYEBALL COUNTERROLL WAS DETERMINED BY AN OPTICAL CORRELATION PROCESS. A MATHEMATICAL MODEL WAS FORMULATED USING FOURIER CURVE FITTING TECHNIQUES. THIS MODEL INDICATED THAT SUBJECTS WITH NORMAL VESTIBULAR FUNCTION DEMONSTRATE AN EYEBALL COUNTERROLL WHICH IS A FUNCTION OF ANGULAR VELOCITY AND POSITION WITH RESPECT TO THE VERTICAL. SUBJECTS WITH KNOWN VESTIBULAR DEFECTS DEMONSTRATED A SMALL COUNTERROLL.

(AUTHOR)
SIX MALE SUBJECTS WERE EXPOSED TO ACCELERATION FORCES UP TO 12 G RESULTANT FOR 9-10 SECONDS ON THE HUMAN CENTRIFUGE. DURING THESE EXPOSURES THEY WERE IN A MODIFIED SUPINATED POSITION IN WHICH THE BENT KNEES PLACED THE FEET AT A LEVEL SOMEWHAT BELOW THAT OF THE REST OF THE BODY. DURING ROTATION OF THE CENTRIFUGE THE SEAT PIVOTED SO THAT THE RESULTANT G FORCE WAS SUPPLIED TO THE SUBJECT IN A DIRECTION FROM CHEST TO BACK. CONSCIOUSNESS, VISION, AND VOLUNTARY FINGER MOVEMENTS AT THE HIGHEST S OBTAINABLE ON THIS CENTRIFUGE WERE NOT IMPAIRED UNDER THESE CONDITIONS. HUMAN TOLERANCE TO G FORCE UNDER THESE CONDITIONS SEEMED TO BE RESTRICTED BY RESPIRATION AND PAIN. EAR OPACITY AND EAR PULSE WERE RELATIVELY POOR INDICATORS OF THE CARDIOVASCULAR CHANGES TAKING PLACE UNDER THESE CONDITIONS. THE CARDIOVASCULAR SYSTEM, ACCORDING TO THE HEART RATE AND ELECTROCARDIOGRAM, 010 NOT SHOW SEVERE ENOUGH CHANGES TO CONSIDER IT AS ONE OF THE IMPORTANT FACTORS OF HUMAN TOLERANCE TO G FORCE UNDER THESE CONDITIONS. THE PRACTICALITY OF THIS POSITION FOR AIRCRAFT PERSONNEL WERE DISCUSSED. (AUTHOR)
THE INCIDENCE OF OBVIOUS SYMPTOMS DUE TO HIGH ACCELERATIONS IN INSTRUCTORS AND STUDENTS WAS ESTIMATED BY MEANS OF A QUESTIONNAIRE. ROUGHLY ONE-HALF HAD EXPERIENCED GREYOUT OR BLACK-OUT, AND ONE-EIGHTH BLACKED OUT FREQUENTLY. IN A PRIMARY SQUADRON THERE WAS LESS BLACK-OUT EXPERIENCED BY STUDENTS THAN AT A SQUADRON TRAINING IN GIVE BOMBING AND GUNNERY, WHERE ONE-QUARTER BLACKED OUT FREQUENTLY. FIFTEEN OF 16 PRIMARY INSTRUCTORS ADMITTED BLACKING OUT, ALMOST ONE HALF FREQUENTLY. FROM WHAT IS KNOWN OF THE G'S PRODUCED BY THE MANEUVERS RESPONSIBLE FOR BLACK-OUT, THE TOLERANCE FOR G OF ALL OF THESE INDIVIDUALS WAS LESS THAN ± 4 G, AND MOST OF THEM CERTAINLY LESS THAN ± 9 G, APPLIED FOR NOT MORE THAN 4 SECONDS. THERE WAS CONSIDERABLE IGNORANCE SHOWN AS TO THE CAUSES OF BLACK-OUT AND METHODS OF ITS PREVENTION. ABOUT HALF THE SUBJECTS DID NOT KNOW HOW THEIR TOLERANCE TO G COULD BE ALTERED. (AUTHOR)
THE ACCELERATION ENVIRONMENT PRODUCED BY THE WESTERN GEAR MODEL 4010 HIGH AMPLITUDE VIBRATION MACHINE WAS SURVEYED AT EVEN FUNDAMENTAL FREQUENCIES FROM 2 TO 20 CPS AT TWO LEVELS OF ACCELERATION, 1 G AND 2 G. THE FREQUENCY COMPONENTS OF THE MOTION UP TO 90 CPS WERE DETERMINED BY A M-H 9090 AUTOMATIC WAVE ANALYZER AND ARE PRESENTED IN THE FORM OF HARMONIC DISTRIBUTIONS FOR EACH FUNDAMENTAL. THE 'TOTAL DISTORTION FIGURE' AND 'OVERALL DISTORTION FIGURE' ARE USED AS MEASURES OF THE FIDELITY WITH WHICH THE ACCELERATION WAVE APPROXIMATES A PURE SINE WAVE OF THE FUNDAMENTAL FREQUENCY. THE DATA DICTATED THAT THE 1 G ACCELERATION WAS MORE DISTORTED THAN THE 2 G AND THAT AT BOTH LEVELS THE DISTORTION INCREASED WITH FREQUENCY. (AUTHOR)
THE OCCURRENCE OF COMPRESSION DEFORMITIES OF THE FOURTH AND FIFTH THORACIC VERTEBRAE IN A HUMAN TEST SUBJECT (OCS) EXPOSED IN LABORATORY EXPERIMENTS TO AN IMPACT ACCELERATION PROFILE SIMILAR TO THAT PRODUCED BY EJECTION SEAT ROCKETS IS REPORTED. THIS INJURY WAS PRESUMED TO BE THE RESULT OF AN IMPACT PROFILE HAVING A PEAK ACCELERATION OF 18.8G, A RATE OF ONSET OF 420G PER SECOND AND A BASELINE DURATION OF APPROXIMATELY 100 MILLISECONDS. THE SUBJECT’S LONG AXIS WAS INCLINED BACKWARD 34 DEGREES FROM THE VERTICAL FORCE VECTOR. THE DIAGNOSIS WAS ESTABLISHED UPON THE SUBJECT’S TERMINATION OF HAZARDOUS DUTY AND SEPARATION FROM THE SERVICE, APPROXIMATELY ONE YEAR AFTER THE PRESUMPTIVE DATA OF INJURY. THIS DOCUMENTED INJURY REPRESENTS A DEMONSTRABLE ENDPOINT IN IMPACT TOLERANCE OF A SUBJECT EXPOSED TO AN ACCELERATION ENVIRONMENT WHICH CAN BE SPECIFICALLY DESCRIBED. (AUTHOR)
LIKE ANY OTHER COMPLEX DYNAMIC SYSTEM THE HUMAN BODY RESPONS IN A COMPLEX WAY TO ACCELERATION INPUTS WHICH VARY RAPIDLY WITH TIME. THE NEED TO AVOID STRESSES LARGE ENOUGH TO CAUSE INJURY TO THE BODY USUALLY IMPOSES LIMITS ON THE PERMISSIBLE INPUT ACCELERATION. THE RESTRAINT SYSTEM INTERPOSED BETWEEN A VEHICLE AND ITS OCCUPANT CAN MODIFY THE PHYSIOLOGICAL EFFECTS OF A VEHICLE'S ACCELERATION - TIME HISTORY. THIS MODIFICATION SHOULD BE MADE AS FAVORABLE AS POSSIBLE BY MINIMIZING THE STRESSES GENERATED IN THE VEHICLE'S OCCUPANT. TO DETERMINE OPTIMUM DYNAMIC CHARACTERISTICS FOR THE RESTRAINT SYSTEM, ITS IMPORTANT CHARACTERISTICS, AND THOSE OF THE HUMAN BODY, NEED TO BE REPRESENTED IN TERMS OF A MATHEMATICAL OR 'DYNAMIC' MODEL. THROUGH SUITABLE ANALYSIS, EITHER MATHEMATICAL OR BY MEANS OF A COMPUTER, THOSE DYNAMIC CHARACTERISTICS OF THE RESTRAINT SYSTEM CAN BE DETERMINED WHICH WILL MINIMIZE THE PEAK STRESSES DEVELOPED IN ITS HUMAN OCCUPANT. A GENERAL THEORY OF SUITABLE DYNAMIC MODELS IS DEVELOPED FOR THIS TYPE OF PROBLEM. CLOSED FORM SOLUTIONS FOR A NUMBER OF SIMPLE CASES ARE PRESENTED. IN ADDITION A METHOD IS SHOWN WHICH PERMITS DEVELOPMENT OF SIMPLE DYNAMIC MODELS FOR THE HUMAN BODY UTILIZING EXISTING EXPERIMENTAL DATA.
A STUDY WAS MADE OF THE PIPE HAZARDS PECULIAR TO THE EQUIPMENT AND OPERATION OF THE USAF SCHOOL OF AEROSPACE MEDICINE HUMAN CENTRIFUGE AT BROOKS AIR FORCE BASE, SAN ANTONIO, TEXAS. THIS STUDY WAS BASED ON PRESENT AIR FORCE STANDARDS. NO MAJOR HAZARDS WERE FOUND, HOWEVER, RECOMMENDATIONS ARE PRESENTED WHICH PROVIDE MORE IN-DEPTH PROTECTION FOR THE CENTRIFUGE AS IT NOW EXISTS. THE MAJOR RECOMMENDATION IS THE INSTALLATION OF A FIRE-FOG DELUGE SYSTEM (WITH ALARM) IN THE PUMP ROOM AND SUB-PIT WHERE THE STORAGE OF COMBUSTIBLES IS NECESSARY. (AUTHOR)
AD-624 626 6/19
AERomedical RESEARCH LAB (671ST) HOLLOMAN AFB N MEX
MAXIMUM VOLUNTARY VENTILATION AFTER + G SUB X IMPACT
IN HUMANS. (U)
DESCRIPTIVE NOTE: INTERIM REPT. FOR FEB 69,
NOV 69 18P HANSON, PETER G. I
REPT. NO. TR-69-22
UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*ACCELERATION TOLERANCE,
RESPIRATION), (*RESPIRATION,
STRESS(PHYSIOLOGY)), LUNGS, BLOOD
CIRCULATION, PATHOLOGY, HUMANS, ANXIETY,
STRESS(Psychology) (U)

EIGHTEEN VOLUNTEER MALE SUBJECTS WERE EXPOSED TO 20
+ G SUB X IMPACT ON THE DAISY DECELERATOR.
MEASUREMENTS OF MAXIMUM VOLUNTARY VENTILATION
(MVV) OBTAINED 10 MINUTES PRIOR TO, IMMEDIATELY
AFTER AND 20 MINUTES AFTER IMPACT WERE COMPARED
WITH PREVIOUSLY DETERMINED BASELINE MVV VALUES. THE
RESULTS INDICATE THAT MVV PERFORMANCE IS ELEVATED
IMMEDIATELY AFTER IMPACT. IT IS SUGGESTED THAT
THIS RESPONSE IS RELATED TO SUBJECT ANXIETY WITH
ACCOMPANYING SYMPATHICOTONIA. (AUTHOR) (U)
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY    SEARCH CONTROL NO. 200529

AD-629 294  6/19
NAVAL AIR DEVELOPMENT CENTER JOHNSVILLE PA AEROSPACE
MEDICAL RESEARCH DEPT
CINERADIOGRAPHIC OBSERVATIONS OF HUMAN SUBJECTS
DURING TRANSVERSE ACCELERATIONS OF +9GX AND +
10GX. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
OCT 69  17P  SANDLER, HAROLD I
REPT. NO. NADC-MR-6901

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS:  (+HEART, ACCELERATION TOLERANCE),
(+ACCELERATION TOLERANCE, HEART), X-RAY
PHOTOGRAPHY MOTION PICTURES, THORAX,
STRESS(PHYSIOLOGY), HUMANS, RADIOGRAPHY (U)

X-RAY MOTION PICTURES WERE RECORDED FOR FIVE HUMAN
SUBJECTS DURING TRANSVERSE ACCELERATIONS OF +9GX
AND +10GX ON THE JOHNSVILLE CENTRIFUGE.
QUANTITATIVE MEASUREMENTS OF CHANGE IN A-P
CHEST DIAMETER AND HEART POSITION WERE MADE FROM
PHOTOGRAPHIC PRINTS OF THE FILMS. A SLIGHT BUT
SIGNIFICANT POSTERIOR DISPLACEMENT OF HEART POSITION
COULD BE DEMONSTRATED WHEN COMPARED TO CHANGE IN THE
A-P CHEST DIAMETER. (AUTHOR) (U)

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UNCLASSIFIED
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. ZO0929

AO-627 93C  19/12  14/2
SOUTHEAST RESEARCH INST SAN ANTONIO TEX DEPT OF STRUCTURAL
RESEARCH

SUMMARY OF COST AND TIME REQUIRED FOR MODIFICATIONS
AND CONVERSIONS ON THE USAF SCHOOL OF AEROSPACE
MEDICINE HUMAN CENTRIFUGE AND ROTATIONAL FLIGHT
SIMULATOR. (U)

DESCRIPTIVE NOTE: FINAL REPT., PHASE 2,
OEC 65 16P  PRIOR,A. J. EGGLESTON,L. A.

CONTRACT: AF41(609)-2719
PROJ: SWRI-03-1787

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*FLIGHT SIMULATORS, HYDRAULIC
FLUIDS), (*CENTRIFUGES, HYDRAULIC FLUIDS),
(*HYDRAULIC FLUIDS, FIRE SAFETY), MILITARY
REQUIREMENTS, HAZARDS, TIME STUDIES, COSTS,
SPACE MEDICINE, MECHANICAL DRAWINGS (U)

A STUDY WAS MADE OF THE FIRE HAZARDS PECULIAR TO
THE EQUIPMENT AND OPERATION OF THE USAF SCHOOL OF
AEROSPACE MEDICINE HUMAN CENTRIFUGE AND
ROTATIONAL FLIGHT SIMULATOR AT BROOKS AIR
FORCE BASE, TEXAS. THE STUDY WAS BASED ON
PRESENT AIR FORCE STANDARDS AND RECOMMENDATIONS WERE
OUTLINED IN PREVIOUS REPORTS WHERE HAZARDS EXCEEDED
ACCEPTABLE LIMITS. THE REPORT CONTAINS COST AND
TIME ESTIMATES FOR THE ACCOMPLISHMENT OF THE
RECOMMENDATIONS REFERRED TO ABOVE. (AUTHOR) (U)

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UNCLASSIFIED
UNCLASSIFIED

AERONAUTICAL RESEARCH LAB (6971ST) HOLLoman AFB N MEX
AN INVESTIGATION OF THE RELATIONSHIP BETWEEN
EXPERIENCE PARAMETERS AND SUBJECT ACCELERATION
RESPONSE IN EXPERIMENTAL IMPACT.

DESCRIPTIVE NOTE: REPT. FOR FEB 65, MAR 66 29P FOSTER, PETER I
REPT. NO. 69714RL-TR-66-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (ACCELERATION TOLERANCE, HUMANS), IMPACT SHOCK, EXPOSURE, ELECTROCARDIOGRAPHY, BLOOD PRESSURE, RESPIRATION, STATISTICAL ANALYSIS, TABLES, SPACE MEDICINE
IDENTIFIERS: EXPERIENCE

STUDIES OF HUMAN TEST SUBJECTS UNDERGOING SUSTAINED ACCELERATION ON THE CENTRIFUGE HAVE SHOWN THAT TOLERANCE INCREASES WITH EXPERIENCE. THIS FACT SUGGESTED THE NEED FOR AN INVESTIGATION TO DETERMINE IF A SIMILAR RELATIONSHIP EXISTED BETWEEN CERTAIN IMPACT EXPERIENCE PARAMETERS AND SUBJECT ACCELERATION RESPONSE, WHICH WAS USED AS AN INDICATOR OF SUBJECT TOLERANCE TO IMPACT EXPOSURE. A NUMBER OF HUMAN TEST SUBJECTS HAVING VARYING DEGREES OF EXPERIENCE WITH EXPERIMENTAL IMPACT ACCELERATION WERE EXPOSED TO IDENTICAL IMPACT PROFILES. CORRELATIONS OF EXPERIENCE FACTORS TO INDICATED TOLERANCE SHOWED NO SIGNIFICANT RELATIONSHIP. (AUTHOR)
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

HISTOMORPHOLOGICAL CHANGES IN THE INTERNAL EAR OF DOGS UNDER THE EFFECT OF RADIAL ACCELERATIONS.

MARKARYAN, S. S. IKOGAN, R. E.

REPT. NO. FTD-TT-69-1756,
MONITOR: TT 66-60995

TEN DOGS WERE SUBJECTED TO THE ACTION OF ACCELERATIONS WITHIN THE LIMITS OF 2.4 - 14.5G, THE TIME RANGING FROM 4 TO 20 MINUTES. IN THE INTERNAL EAR OF DOGS, THE VENOUS CIRCULATION BECAME DISTURBED, RESULTING IN PROTRACTED HEMORRHAGES IN THE PERILYMPHATIC SPACES OF THE COCHLEA AND SUBEPITHELIAL CONNECTIVE TISSUE OF SACE AND AMPULES. HEMORRHAGES IN THE INTERNAL EAR RESOLVED MUCH SLOWER THAN HEMORRHAGES OCCURRING IN THE MIDDLE EAR OR IN THE INTERNAL ACoustic MEATUS. (AUTHOR)
ANESTHETIZED DOGS WERE EXPOSED TO INCREASED GRAVITATIONAL STRESS IN THE HEAD-TO-TAIL DIRECTION AND ARTERIAL O₂ SATURATION AND ACID-BASE BALANCE CHANGES STUDIED. SIMULTANEOUS, DIRECT AND CONTINUOUS RECORDINGS WERE MADE OF ARTERIAL O₂ SATURATION AND PH AS WELL AS RESPIRATORY MINUTE VOLUME IN CENTRIFUGE RUNS. APPLICATION OF MODERATE G FORCES OVER SEVERAL MINUTES PRODUCED SEVERE HYPOXEMIA ALTHOUGH 100% O₂ WAS BREATHED AND HYPERVENTILATION WAS PRESENT, INDICATING A GREAT ALVEOLAR-ARTERIAL O₂ DIFFERENCE, AND ACCORDINGLY, A LARGE INTRAPULMONARY SHUNT. (AUTHOR)
ACCELERATION STRESS CONDITIONS WERE IMPOSED ON FOUR HEALTHY SUBJECTS RIDING THE HUMAN CENTRIFUGE. BLOOD BIOCHEMICAL ANALYSES WERE PERFORMED ON ALL SUBJECTS, WITH THE DEMONSTRATION OF AN INCREASE IN BLOOD GLUCOSE FOLLOWING CENTRIFUGATION IN THREE OF THE FOUR SUBJECTS, TWO OF WHOM DEVELOPED 'BLACKOUT'. ALL FOUR SUBJECTS DEVELOPED 'GREYOUT'. THE CHANGES IN BLOOD SUGAR MAY SUGGEST A RELATIONSHIP BETWEEN EPINEPHRINE SECRETION AND GRADUATED ACCELERATION STRESS RESULTING IN PHYSIOLOGICAL CHANGES IN THE SUBJECT. CHANGES IN POOLED PLASMA PHOSPHOLIPID FRACTIONS WERE DEMONSTRATED IN BLOOD SAMPLES OBTAINED BEFORE AND FOLLOWING ACCELERATION; THESE CHANGES SUGGEST THAT ACCELERATION MAY INTERFERE WITH INTRACELLULAR ENERGY TRANSFER MECHANISMS INVOLVING PHOSPHORYLATED COMPOUNDS ASSOCIATED WITH OXIDATIVE METABOLISM. THE PRELIMINARY RESULTS OF THE PILOT PROJECT INDICATE THAT FURTHER BIOCHEMICAL MEASUREMENTS MAY BE DESIRABLE IN ASSESSING ACCELERATION TOLERANCE IN MAN. (AUTHOR)
THE DISTRIBUTION OF BLOOD FLOW IN THE PULMONARY VASCULAR BED UNDER +GX (FORWARD OR TRANSVERSE ACCELERATION) WAS STUDIED BY THE INTRAVENOUS INJECTION OF RADIOACTIVE 131 IODINATED-MACRO AGGREGATED ALBUMIN (131I-MAA) IN THREE NORMAL SUBJECTS WHILE THEY WERE UNDER +Gx, +9Gx AND +8Gx ON A HUMAN CENTRIFUGE. THE RESULTING DISTRIBUTION OF RADIOACTIVITY IN THE LUNGS, REPRESENTING THE DISTRIBUTION OF PULMONARY BLOOD FLOW AT THE TIME OF INJECTION, WAS ASSESSED ONE TO THREE HOURS LATER BY LATERAL RADIOISOTOPE SCANNING. THE DISTRIBUTION OF PULMONARY BLOOD FLOW WAS NOT MARKEDLY DIFFERENT AT +1Gx, +9Gx, AND +8Gx DESPITE A HYDROSTATIC GRADIENT IN PULMONARY INTRAVASCULAR Pressures estimated to be 80 mm Hg under +8Gx. THESE FINDINGS INDICATE THAT UNDER +Gx (FORWARD OR TRANSVERSE ACCELERATION) UNLIKE +Gz (HEADWARD OR POSITIVE ACCELERATION) THE DISTRIBUTION OF PULMONARY BLOOD FLOW IS NOT MARKEDLY DISTORTED, AND THAT THE REGIONAL FLOW OF BLOOD IN THE LUNG MAY NOT BE SIGNIFICANTLY CHANGED BY HIGH INTRAVASCULAR Pressures. (AUTHOR)
Acquisition and Retention of Nystagmic Habitation in Cats with Distributed Acceleration Experience, (U)

Brown, James H.

Rept. No. USAMRL-697.

Proj: DA-30-14901671P.

Task: 08.


Supplementary note:

Descriptors: (Nystagmus, Acceleration Tolerance), Vestibular Apparatus, Aviation Medicine, Cats (U)

Identifiers: Habituation (U)

Fifty cats were exposed to a long series of angular accelerations during which experimental sessions were distributed from 1 to 14 days. A highly significant nystagmus response decline (habitation) resulted from this repeated exposure to angular acceleration. While the acquisition of nystagmic habituation was not influenced by different distributions of acceleration experience, retention was systematically affected. (Author) (U)
CARDIOVASCULAR EFFECTS OF ROTATION IN THE Z AXIS, (U)

URSCHEL, CHARLES W., IHOOD JR., WILLIAM B. 1

REPT. NO. AMRL-TR-69-56,
PRJ.: AF-7222

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTION: (ACCELERATION TOLERANCE, CARDIOVASCULAR SYSTEM), (ROTATION, STRESS (PHYSIOLOGY)), ARTERIES, VEINS, CANNULATION, BLOOD PRESSURE, BLOOD VOLUME, TOLERANCES (PHYSIOLOGY)

ROTATION OF THE SEATED SUBJECT ABOUT THE Z AXIS (RZ) RESULTS IN A RADIAL ACCELERATION GRADIENT IMPEDING VENOUS RETURN THEREBY REPRESENTING A CARDIOVASCULAR STRESS. THE CARDIOVASCULAR RESPONSES OF VOLUNTEER SUBJECTS INSTRUMENTED WITH INDOMELLING ARTERIAL AND VENOUS CATHETERS WERE MEASURED DURING FOUR ROTATIONAL PROFILES COMBINING TWO RATES OF ANGULAR ACCELERATION (0.1 AND 0.8 RADIAN PER SECOND PER SECOND) AND TWO ROTATIONAL SPEEDS (60 AND 120 RPM). THERE WAS A THREE-MINUTE PLATEAU AT PEAK VELOCITY. CENTRIPETAL ACCELERATION AT HAND/FOOT RADIUS (0.5 METERS) WAS 1.8 AND 7.9G AT 60 AND 120 RPM, RESPECTIVELY. ROTATION AT 60 RPM REPRESENTED NO SIGNIFICANT STRESS. THREE MINUTE 120 RPM RUNS HOWEVER CAUSED PROGRESSIVE TACHYCARDIA, NARROWING OF PULSE PRESSURE, AND A DROP IN MEAN ARTERIAL PRESSURE, THUS INFERENTIALLY A DROP IN CARDIAC OUTPUT. TOLERANCE WOULD THEREFORE BE EXPECTED TO BE LIMITED BY THE ABILITY OF THE CIRCULATION TO MAINTAIN VENOUS RETURN. (AUTHOR) (U)
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 200529

AD-674 919 6/19
NAVAL AIR DEVELOPMENT CENTER JOHNsville PA AEROSPACE MEDICAL RESEARCH DEPT
CATECHOL AMINE MEASUREMENTS ASSOCIATED WITH AUTONOMIC-Labyrinthine RESPONSES IN MAN EXPOSED TO POSITIVE (+Gz) ACCELERATION. (U)
DESCRIPTIVE NOTE: FINAL REPT., APR 66, I.B. YORK, ELIHU IBROWN, KENNETH R. IGOLFIEN, AALAN I
REPT. NO. NADC-MR-6602
MONITOR: NAVMED MR009.13-0002.19-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (+ACCELERATION TOLERANCE, +AMINES), (+EPINEPHRINE, EXCRETION), MOTION SICKNESS, VESTIBULAR APPARATUS, STRESS(Physiology), BLOOD PLASMA, URINE, MEASUREMENT (U)
IDENTIFIERS: CATECHOLAMINES (U)

FIVE NORMAL SUBJECTS AND TWO LABYRINTHINE-DEFFECTIVE SUBJECTS WERE EXPOSED TO ACCELERATION PROFILES CONSISTING OF LINEAR, ANGULAR AND COMBINED (LINEAR PLUS ANGULAR) STRESS. CATECHOL AMINES WERE MEASURED IN PLASMA AND URINE FOR BOTH GROUPS. A DEMONSTRATED RISE IN PLASMA NOR-EPINEPHRINE OCCURRED IN TWO OF THE FIVE NORMAL SUBJECTS, BOTH OF WHOM DEVELOPED MOTION SICKNESS FOLLOWING A 'COMBINED' ACCELERATION STRESS. THE NORMAL GROUP HAD MEASURABLE PLASMA EPINEPHRINE LEVELS, UNDER MOST CIRCUMSTANCES, WHEREAS THE LABYRINTHINE DEFECTIVE GROUP HAD NONE. ALTHOUGH THERE IS INSUFFICIENT DATA TO MAKE A CLEAR-CUT SEPARATION BETWEEN DIFFERENT TYPES OF ACCELERATION STRESS IN THE TWO GROUPS, AND THEIR ASSOCIATED BIOCHEMICAL RESPONSES; NEVERTHELESS, THERE IS SOME EVIDENCE TO SUGGEST THAT THE INTACT LABYRINTH IS A FACTOR INFLUENCING ELABORATION OF CATECHOL AMINES, WHICH IN TURN MAY BE IMPLICATED IN THE DEVELOPMENT OF MOTION SICKNESS. (AUTHOR) (U)

UNCLASSIFIED
BIOCHEMICAL CHANGES OCCURRING WITH ADAPTATION TO ACCELERATIVE FORCES DURING ROTATION,

APR 66 1SP

GRAYBIEL, ASHTON J

REPT. NO. NAMI-959,

CONTRACT: NASA ORPER-R-97,

MONITOR: NAVMED MRO09.13-0004, 29

FOUR YOUNG MEN LIVED IN A CONTINUALLY ROTATING ROOM, 15 FEET IN DIAMETER, FOR A PERIOD OF SIX DAYS. ROTATIONAL VELOCITIES ON SUCCEEDING DAYS WERE: 6.4, 6.9, 6.6, 10.0, 6.4, AND 7.2 RPM. STRESS EFFECTS MEASURED AS INCREASED EXCRETION RATES OF 17, 21 DIONROXYPREGNANE-20-ONES, EOSINOPAENIA, HYPERVENTILATION, AND NAUSEA WERE OBSERVED ON THE FIRST DAY OF ROTATION. HOWEVER, ADAPTATION WAS RAPID, AND NO FURTHER STRESS EFFECTS WERE OBSERVED EVEN WITH INCREASED ROTATIONAL VELOCITY. MILD DEGREES OF HYPERCALCIURIA, HYPERCAPNIA, AND DECREASED NOREPINEPHRINE EXCRETION RATES WERE OBSERVED DURING THE LAST FOUR DAYS OF THE EXPERIMENT AS A RESULT OF THE INCREASED TIME SPENT IN RECUMBENCY. (AUTHOR)
SEVEN AIR FORCE VOLUNTEERS WERE STUDIED ON A SHORT RADIUS (4 FOOT, 9 INCH) SPIN TABLE WITH THE SUBJECT RESTRAINED IN THE SUPINE POSITION, THE Z-AXIS ALONG THE RADIUS. ZERO GZ WAS EFFECTIVELY ACHIEVED AT EYE LEVEL; MAXIMUM G AT THE FEET. AT TWO ARBITRARILY SELECTED RATES OF ONSET (0.10 G PER SECOND AND 0.09 PER SECOND) THE TOLERANCE TO LEVELS UP TO 7G MAXIMUM AT THE FEET HAS BEEN DETERMINED. ELECTROCARDIOGRAM AND RESPIRATION WERE MONITORED. TOLERANCE END-POINTS WERE DEFINED AS PERIPHERAL LIGHT LOSS, CARDIAC RATES IN EXCESS OF 170 PER MINUTE, OR THE ONSET OF SUCH SUBJECTIVE SYMPTOMS AS NAUSEA, SWEATING, OR LIGHTHEADEDNESS. A LOGARITHMIC TIME DURATION CURVE MAY BE CONSTRUCTED FROM 7 G, TOLERABLE FOR 2 MIN. 41 SEC., THROUGH 1 G, TOLERABLE IN EXCESS OF TWO HOURS (AT WHICH EXPERIMENTS WERE ARBITRARILY TERMINATED). THIS CLEARLY EXCEEDS TOLERANCE TO STANDARD LONG ARM CENTRIFUGE ACCELERATION. AT HIGH G LEVELS, GREY-OUT AND TACHYCARDIA WERE FOUND TO BE LIMITING IN THE MID-ZONE RANGE MUSCULOSKELETAL DISCOMFORT OF THE BACK AND LOWER EXTREMITIES WAS PROMINENT, BUT NOT AS LIMITING AS IN STANDARD LOW GRADIENT GZ PROFILES. CORIOLIS PHENOMENA WERE MARKED, AND DEMANEOGED FIXATION OF HEAD POSITION. HEMATECRITS AND FREE FATTY ACIDS DID NOT CHANGE AS A FUNCTION OF G LOAD. (AUTHOR)
THE EFFECT OF ACCELERATIONS ON THE VESTIBULAR ANALYZER: BIBLIOGRAPHY*   (U)
JUN 66 29P  SMITH, JANICE L. I
REPT. NO.  ATD-66-62
MONITOR:  TT  66-61894

ARTERIAL BLOOD OXYGEN SATURATION WAS STUDIED BY EAR OXIMETRY IN 8 SUBJECTS UNDERGOING PROLONGED FORWARD (+GX) ACCELERATION. THE EFFECTS ON SATURATION OF VOLUNTARY BREATHING PATTERNS AND THE COMPOSITION OF THE INSPIRED GAS WERE NOTED. UNDER +GX SATURATION LEVELS WERE STABLE AFTER TWO MINUTES. THE DEGREE OF UNSATURATION COULD BE MODIFIED TO A SMALL EXTENT BY VOLUNTARY BREATHING EFFORTS. THE LEVEL OF SATURATION REACHED CORRELATED SIGNIFICANTLY WITH THE MINUTE VOLUME BREATHED. IN CONTRAST, UNDER +8GX SATURATION LEVELS WERE SIGNIFICANTLY LOWER AND WERE STILL FALLING AFTER TWO MINUTES. SATURATION LEVELS WERE NOT SIGNIFICANTLY CHANGED BY VOLUNTARY BREATHING EFFORTS AND THERE WAS NO SIGNIFICANT CORRELATION BETWEEN LEVEL OF SATURATION REACHED AND MINUTE VOLUME BREATHED. BREATHING OF OXYGEN DELAYED THE ONSET OF ARTERIAL BLOOD OXYGEN UNSATURATION. AFTER TWO MINUTES UNDER +8GX, LEVELS WERE 30% HIGHER WHEN THE SUBJECTS BREATHED OXYGEN THAN WHEN THEY BREATHED AIR. WHEN SUBJECTS CHANGED FROM AIR TO OXYGEN OR FROM OXYGEN TO AIR ON ATTAINING PEAK ACCELERATION, THE EFFECTS OF THE 'PREBREATHED' GAS WERE APPARENT FOR AS LONG AS TWO MINUTES, SUGGESTING THAT THE PREBREATHED GAS WAS EFFECTIVELY TRAPPED IN SOME PARTS OF THE LUNG.
THE NOTION OF THE HUMAN CENTER OF MASS AND ITS RELATIONSHIP TO THE MECHANICAL IMPEDANCE.

DESCRIPTIVE NOTE: FINAL REPT., 1 JAN-31 DEC 66. JUN 66 25P WEIS, EDMUND B. JR.

PRIMIANO, FRANK P. JR.

CONTRACT: AF 73(657)-10010.

PROJ: AF-7231.

TASK: 723101.

MONITOR: AMRL TR-69-50

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (CENTER OF MASS, HUMANS), (ACCELERATION TOLERANCE, CENTER OF MASS), VELOCITY, DAMPING, FORCE(MECHANICS), ACCELERATION, MOTION, BIPHYSICS, STRESS(PHYSIOLOGY), VIBRATION, FUNCTIONS, INTEGRAL TRANSFORMS, EQUATIONS OF MOTION

IDENTIFIERS: BIOMECHANICS


(AUTHOR)
UNCLASSIFIED

UNCLASSIFIED REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. 200929

AO-657 184  6/19  6/19
WILFORD HALL HOSPITAL (AIR FORCE) LACKLAND AFB TEX
AEROSPACE MEDICAL LAB (CLINICAL)
PHYSICAL CONDITIONING VERSUS +Gz TOLERANCE.  (U)
66  7P
COOPER, KENNETH H. 1
REPT. NO.  AMLC-TR-66-2,
PROJ:  AF-7736,

UNCLASSIFIED REPORT
AVAILABILITY: PUBLISHED IN AEROSPACE MEDICINE V37
NS #462-5 MAY 1966,
SUPPLEMENTARY NOTE:

DESCRIPTIONS:  (*PHYSICAL FITNESS, *ACCELERATION
TOLERANCE),  (*ENDURANCE, TRAINING),  ASTRONAUTS,
STRESS (PHYSIOLOGY),  EXERCISE,  OXYGEN
CONSUMPTION ;  SPACE MEDICINE  (U)

ENDURANCE TRAINING APPEARS TO INCREASE THE PILOT'S
RESISTANCE TO OTHER ENVIRONMENTAL STRESSES
ENCOUNTERED IN FLIGHT, BUT IT HAS NO EASILY DEFINABLE
EFFECT ON +Gz (FOR POSITIVE G) TOLERANCE.  AN
ATTEMPT WAS MADE IN THIS STUDY TO DETERMINE THE
EFFECT OF ENDURANCE TRAINING ON +Gz TOLERANCE IN
EXPERIENCED CENTRIFUGE SUBJECTS.  ELEVEN SUBJECTS
WERE DIVIDED INTO SIX EXERCISERS AND FIVE CONTROLS.
FOR THREE MONTHS THE EXERCISERS ENGAGED IN A DAILY
(FIVE TIMES A WEEK) PROGRESSIVE RUNNING PROGRAM
WHILE THE CONTROLS WERE ASKED TO AVOID VIGOROUS
EXERCISE.  FREQUENTLY DURING THIS PERIOD, ALL
ELEVEN SUBJECTS WERE SUBJECTED TO BOTH RAPID ONSET
AND GRADUAL ONSET RUNS ON THE USAF SCHOOL OF
AEROSPACE MEDICINE CENTRIFUGE.  AT THE
CONCLUSION OF THE THREE MONTHS, SIGNIFICANT
DIFFERENCES WERE NOTICED BETWEEN THE EXERCISE AND
CONTROL GROUPS IN ENDURANCE CAPACITY AS INDICATED BY
AN INCREASE IN MAXIMAL OXYGEN CONSUMPTION.
HOWEVER, NO SIGNIFICANT DIFFERENCE WAS NOTED
BETWEEN THE TWO GROUPS IN THEIR ABILITY TO TOLERATE
POSITIVE GS DURING EITHER GRADUAL OR RAPID ONSET
CENTRIFUGE RUNS.  IN THIS STUDY, NEITHER AN INCREASE
NOR A DECREASE IN +Gz TOLERANCE COULD BE CORRELATED
WITH ENDURANCE CAPACITY.  (AUTHOR)  (U)

70

UNCLASSIFIED
EFFECT OF ANTERIOR INTERCOSTAL NERVE BLOCK ON THE THRESHOLD OF THORACIC PAIN ASSOCIATED WITH GZ AND GX VIBRATION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
JUL 66 IDP HENZEL, J. H. I CLARKE, N. P. I
MOHR, G. C. I
REPT. NO. AMRL-TR-66-68,
PROJ: AF-7231,
TASK: 723101,

UNCLASSIFIED REPORT
AVAILABILITY: PUBLISHED IN AEROSPACE MEDICINE V77 N7 P682-7 JULY 1966.

INVESTIGATING THE ORIGIN OF CHEST PAIN ASSOCIATED WITH GZ PLUS OR MINUS NGZ AND GX PLUS OR MINUS NGX SINUSOIDAL VIBRATION, THE EFFECT OF ANTERIOR CHEST WALL ANESTHETIZATION WAS STUDIED. SUBJECTS WERE EXPOSED TO VIBRATION OF INCREASING AMPLITUDE AND THE ACCELERATION REQUIRED TO INDUCE PERCEPTIBLE CHEST PAIN WAS TAKEN AS THE THRESHOLD. TWO RANDOMLY ORDERED THRESHOLD DETERMINATIONS WERE MADE IN EACH TEST. IN ONE, VIBRATION WAS PRECEDED BY BILATERAL ANESTHETIZATION OF THE SECOND THROUGH SIXTH INTERCOSTAL NERVES. IN THE OTHER, INTRADERMAL INFILTRATION OF ANESTHETIC CREATED A SENSATION SOMEWHAT SIMILAR TO THIS WITHOUT ACTUALLY BLOCKING THE NERVES; THIS PROVIDED A CONTROL CONDITION WITH MINIMAL SUBJECTIVE BIAS FOR COMPARISON. SUBSEQUENT TO INTERCOSTAL NERVE BLOCK, THERE WAS A STATISTICALLY SIGNIFICANT (P<0.01) INCREASE IN THRESHOLD OF CHEST PAIN FOR BOTH ORIENTATIONS OF VIBRATION. THESE RESULTS STRONGLY SUGGEST THAT VIBRATION INDUCED CHEST PAIN ORIGINATES IN THE CHEST WALL AND NOT IN THE MORE CRITICAL CARDIAC-GREAT VESSEL COMPLEX. (AUTHOR)

UNCLASSIFIED
CONCOMITANT VISUAL STIMULATION, VARIOED BETWEEN FOUR GROUPS OF 20 YOUNG MEN EACH FROM TOTAL DARKNESS TO FULL ROOM ILLUMINATION, WAS INTRODUCED ON HABITUATION TRIALS THAT WERE INTERPOLATED BETWEEN TEST TRIALS. ALTHOUGH HIGHLY SIGNIFICANT DECREMENTS FOR NYSTAGMIC, OCULOGYRAL AND PSYCHOPHYSICAL RESPONSES WERE FOUND WITH REPEATED TESTING, THE DIFFERENT VISUAL CONDITIONS IN NO WAY ALTERED THIS HABITUATION. (AUTHOR)
SCHOOL OF AEROSPACE MEDICINE BROOKS AFB TEX
CARDIAC ARRHYTHMIAS OCCURRING DURING
ACCELERATION.

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JAN 66 11P  TORPHY, D. E.; LEVERETT, S. D.
LAMB, L. E. 1
REPT. NO. SAM-TR-65-293
TASK: 793003

UNCLASSIFIED REPORT
AVAILABILITY: PUBLISHED IN AEROSPACE MEDICINE V97
NI P92-8 JAN 1966.

DESCRIPTORS: (ARRHYTHMIA, ACCELERATION
TOLERANCE), HEART, ACCELERATION,
ELECTROCARDIOGRAPHY, SPACE MEDICINE

FORTY-TWO PILOTS WERE EXPOSED TO +Gx AND +Gz
ACCELERATION IN A VARIETY OF PROFILES AND THE
INCIDENCE OF ARRHYTHMIAS INVESTIGATED. +Gz
ACCELERATION DID NOT INCREASE THE INCIDENCE OF
ARRHYTHMIAS. +Gx ACCELERATION INCREASED THE
INCIDENCE OF ARRHYTHMIAS AND THIS INCREASE SEEMED
RELATED TO BOTH THE DEGREE AND DURATION OF
ACCELERATION. PREMATURE CONTRACTIONS, WITH AND
WITHOUT ABERRANT CONDUCTION, FROM BOTH THE ATRIA AND
VENTRICLES WERE NOTED. ONE SUBJECT HAD PAROXYSMAL
AURICULAR TACHYCARDIA WITH +Gz ACCELERATION.
POSSIBLE CAUSAL MECHANISMS ARE DISCUSSED.

(AUTHOR)
THE PERIODIC ANGULAR ROTATOR IS A NOVEL SERVOROTATOR DESIGNED FOR STUDIES OF THE DYNAMIC RESPONSE OF THE OCULOVESTIBULAR SYSTEM. IT WILL ROTATE A SINGLE SUBJECT ABOUT AN EARTH-VERTICAL AXIS IN A WIDE VARIETY OF STIMULUS WAVEFORMS. STEP FUNCTION, RAMP, AND SINUSOIDAL ANGULAR MOTIONS ARE GENERATED PRECISELY BY A CLOSED-LOOP POWER SERVOMECHANISM DRIVE SYSTEM. THE USE OF A LOW SPEED DC TORQUE MOTOR COUPLED DIRECTLY TO THE PAYLOAD RESULTED IN A SYSTEM WITH LOW ACOUSTIC NOISE AND MECHANICAL VIBRATION PROPERTIES, FAST DYNAMIC RESPONSE CHARACTERISTICS, AND A HIGH DEGREE OF COUPLING STIFFNESS. WHEN OPERATED IN A VELOCITY MODE OF CONTROL, THE DEVICE IS RATED TO PRODUCE A MAXIMUM ANGULAR VELOCITY OF 100 RPM EITHER CLOCKWISE OR COUNTERCLOCKWISE AT ANGULAR ACCELERATIONS UP TO 100 OEG/SQ SEC AND SINUSOIDAL OSCILLATION FREQUENCIES BEYOND 2.0 CPS. WHEN OPERATED IN THE ALTERNATIVE DISPLACEMENT MODE, SIMILAR RATINGS APPLY OVER A PLUS OR MINUS 180 DEGREE EXCURSION. (AUTHOR)
THE CORIOLIS ACCELERATION PLATFORM, A UNIQUE VESTIBULAR RESEARCH DEVICE,
OCT 66 J-6P MIXSON, W. CARROLL I
ANDERSON, JOHN J. I
REPT. NO. NAMI-980
MONITOR: NAVMED MON09, 04.0021-U8

THE REPORT PRESENTS A BRIEF DESCRIPTION OF THE CORIOLIS ACCELERATION PLATFORM, A NEW COMBINED LINEAR AND ANGULAR MOTION-PRODUCING VESTIBULAR RESEARCH DEVICE DEVELOPED TO STUDY THE BIOLOGICAL EFFECTS OF AEROSPACE ACCELERATION ENVIRONMENTS. THE PRIMARY ELEMENT OF THE DEVICE IS A 20-FT DIAMETER CAPSULE EQUIPPED WITH VARIOUS LIFE-SUPPORT EQUIPMENTS TO STUDY THE LONG-TERM EFFECTS OF CONTINUOUS ROTATION. A LOW RPM, DIRECT-COUPLED, DC TORQUE MOTOR OPERATED IN A CLOSED-LOOP, VELOCITY MODE, POWER SERVOMECHANISM CONFIGURATION Rotates THE DEVICE IN EITHER DIRECTION AT ANGULAR VELOCITIES EXTENDING TO 300 DEG/SEC AT ACCELERATIONS RANGING TO 19 DEG/SQ SEC. A SECOND ORIVE SYSTEM CAN BE PROGRAMMED TO PRODUCE TIME-VARYING RECTILINEAR TRANSLATIONS OF A SINGLE SUBJECT ALONG A TRACK STRUCTURE FIXED TO THE CAPSULE WHERE THIS FORM OF MOTION CAN OCCUR SINGLY, OR IN COMBINATION WITH ROTATION OF THE ENTIRE DEVICE. PEAK RATINGS OF THE LINEAR ORIVE SYSTEM INCLUDE A RADIAL DISPLACEMENT OF PLUS OR MINUS 20 FT, A LINEAR VELOCITY OF PLUS OR MINUS 16 FT/SEC, AND A LINEAR ACCELERATION OF 96 FT/SQ SEC (3 G). (AUTHOR)
Fifteen normal male subjects were repeatedly exposed to interacting angular accelerations (a positive acceleration immediately followed by a negative acceleration of equal intensity and duration). Pre- and post-test trials, consisting of standard single angular accelerations, permitted evaluation of the necessity for habituation of rest intervals between successively presented stimuli. Since significant response decrements were evident in both the post-test responses and responses to the interacting stimuli, it was concluded that nystagmic habituation may occur without nystagmus running to normal completion.
FAILURE OF ADAPTATION OF NYSTAGMIC EYE MOVEMENTS TO OCCUR UNDER CERTAIN CONDITIONS OF STIMULATION BY ANGULAR ACCELERATION HAS BEEN ASCRIBED TO A FAILURE TO ALLOW THE EYE-MOVEMENT RESPONSE TO RUN ITS COURSE.

IN THIS STUDY, 3 GROUPS OF SUBJECTS WERE TESTED UNDER CONDITIONS OF REPEATED ANGULAR ACCELERATIONS IN WHICH GROUP A RECEIVED UNIDIRECTIONAL STIMULATION, GROUP B RECEIVED BIDIRECTIONAL STIMULATION WITH BOTH RESPONSES ALLOWED TO RUN THEIR COURSE, AND GROUP C RECEIVED BIDIRECTIONAL STIMULATION BUT THE RESPONSE IN ONE DIRECTION WAS INTERRUPTED. ADAPTATION OCCURRED FOR ALL GROUPS IN SPITE OF THE DIFFERENT TEST PROCEDURES. OTHER IMPLICATIONS OF THE RESULTS ARE DISCUSSED.
THE CONSTRUCTION OF AN INEXPENSIVE (LESS THAN $8,000) VARIABLE-RADIUS CENTRIFUGE FOR PHYSIOLOGICAL EXPERIMENTS IS DESCRIBED AND ITS CAPABILITIES AS A TOOL FOR RESEARCH ARE GIVEN. THE MAXIMUM RADIUS OF THE CENTRIFUGE IS 4.3 M. IT IS CAPABLE OF ACCELERATING A 200-KG PAYLOAD TO APPROXIMATELY 10 G AT ANY RADIUS BETWEEN 1.9 AND 4.3 M. THE CENTRIFUGE IS MOBILE, RIDING ON THREE WHEELS, AND ITS WINGS ARE REMOVABLE. IN OPERATION IT RESTS ON THREE SPINDLES, ONE OF WHICH MAY BE EXTENDED TO TIP THE CENTRIFUGE AND PERMIT STATIONARY COUNTERBALANCING OF THE PAYLOAD. BALANCE OF THE STATIONARY OR MOVING CENTRIFUGE MAY ALSO BE MONITORED VIA ELECTRONIC STRAIN GAGES MOUNTED WITHIN ITS CENTRAL STATIONARY AXLE. NINE SLIP RINGS CARRY POWER TO THE MOVING FRAME AND PROVIDE IT WITH FOUR LOW-VOLTAGE SIGNAL CHANNELS AND A TELEVISION CHANNEL.
THE X-RAY MOTION MONITOR PROVIDES A NEW AND VERSATILE TOOL FOR EXPERIMENT AND RESEARCH WORK IN THE FIELD OF BIODYNAMICS. THE EQUIPMENT ESSENTIALLY CONSISTS OF A PULSED X-RAY SOURCE SYNCHRONIZED WITH A CLOSED CIRCUIT TV SYSTEM, UTILIZING A FLUORESCENT INTENSIFYING SCREEN TO CONVERT THE X-RAYS INTO A VISIBLE PATTERN. THE 'HEAD' PORTIONS OF THE EQUIPMENT ARE DESIGNED TO WITHSTAND ACCELERATION UP TO 117 METERS/SQ SEC WHILE RIGIDLY MOUNTED TO A TEST PLATFORM, AND UP TO 992 METERS/SQ SEC ON SPECIAL SHOCK FIXTURES DESIGNED FOR DROP TESTS. THE LIGHT OUTPUT OF THE FLUORESCENT SCREEN IS MATCHED WITH THE SPECTRAL RESPONSE OF THE IMAGE ORTHICON TUBE IN THE TV CAMERA TO PROVIDE PEAK PERFORMANCE WHILE EMPLOYING EXTREMELY LOW X-RAY DOSAGES. THE X-RAY SOURCE IS PULSED ON FOR ONLY 1/16 OF THE TOTAL OBSERVATION TIME (1 MILLISECOND FOR EVERY 167 MILLISECONDS). THE SYSTEM PERMITS VISUAL OBSERVATION, AND/OR CINE OR VIDEO TAPE RECORDING, OF AN X-RAY VIEW UP TO A SIZE OF 20 BY 20 INCHES OF THE INTERNAL ORGANS OF A LIVE TEST SUBJECT WHILE UNDER ACCELERATION OR SHOCK. IN ADDITION, SPECIAL VIDEO PROCESSORS IN THE SYSTEM PROVIDE VOLTAGE ANALOG OUTPUTS CORRESPONDING TO THE MOVEMENTS OF SELECTED INTERNAL TARGETS IN RELATION TO SOME FIXED INTERNAL OR EXTERNAL REFERENCE POINTS. THESE ANALOG SIGNALS CAN BE RECORDED BY GRAPHIC RECORDING DEVICES FOR REFERENCE AND LATER ANALYSIS. (AUTHOR)
UNCLASSIFIED

OCC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO: Z009247
AD-491 047 6/19 6/9
NAVAL AEROSPACE MEDICAL INST PENSACOLA FLA
CENTRIFUGATION OF THE WHITE-FRONTED CAPUCHIN MONKEY,
CEBUS ALBIFRONS (HUMBOLDT).
DESCRIPTIVE NOTE: JOINT REPT.,
DEC 66 19P KNEPTON JAMES C. JRI
REPT. NO. NAMI-997
MONITOR: NAVMED HRO09.04-0092-3

UNCLASSIFIED REPORT

DESCRIPTORS: (*ACCELERATION TOLERANCE,
MONKEYS), SPACE MEDICINE,
ELECTROCARDIOGRAPHY, BODY TEMPERATURE,
RESPIRATION, CENTRIFUGES

IN PREPARATION FOR BIOLOGICAL EXPERIMENTS ABOARD
ORBITING LABORATORIES THREE CEBUS ALBIFRONS, WHITE-
FRONTED CAPUCHIN MONKEY, WERE EXPOSED TO FIVE
HEADWARD-DIRECTED (+AZ) RESULTANT LINEAR
ACCELERATION STIMULI ABOARD A CENTRIFUGE AND THEIR
ECG'S, SKIN TEMPERATURES, AND BREATHING RATES
RECORDED. MARKED TACHYCARDIA WAS NOTED AT THE
START OF THE CENTRIFUGATION, FOLLOWED BY BRAYCARDIA
WITHIN 6 TO 7 MINUTES AT 7.9 G AND WITHIN 1 1/2
MINUTES AT 10.3 G. CONCOMITANT WITH THE ONSET OF
BRAYCARDIA, A LOUD SQUEAL WAS USUALLY HEARD.
THERE WERE NO S:GNIFICANT TEMPERATURE CHANGES, AND
BREATHING RATES DID NOT VARY FROM NORMAL. NORMAL
HEART RATE WAS RESTOREO UPON CESSATION OF
CENTRIFUGATION. IT APPEARS THAT THE CEBUS CAN
WITHSTAND THE ACCELERATION OF SPACE TRAVEL AND
THEREFORE WILL BE A GOOD EXPERIMENTAL ANIMAL IN THAT
ENVIRONMENT. (AUTHOR)

UNCLASSIFIED
A five year retrospective survey was undertaken in order to learn the consequences of acceleration exposure on human subjects. Utilizing a punched-card data system, 9071 human subject runs involving 980 individuals were analyzed. Symptomatology occurred in 79% of GZ runs and 52% of GX runs. During 2980 GZ runs greyout was noted 391 times and blackout 147 times; during 2997 GX runs, chest pain occurred 104 times, motion sickness 97 times, cardiac arrhythmia and dyspnea 29 times each. Miscellaneous complaints during acceleration included myalgia, headache and abdominal pain. No disabling sequelae were noted in any subject. A medical monitoring system comprised of voice communication, television observation, and electrocardiographic recording from the subject proved to be a safe system for recording minimal responses. As man is exposed to more hazardous environments of high-performance jet aircraft or space capsules, more detailed information involving further experimentation with the human centrifuge may be required, employing complex monitoring systems, in order to gain adequate knowledge of man's tolerance to acceleration, an important variable affecting manned flight. (author)
THE EFFECTS OF ONE HOUR OF UNINTERRUPTED -7GX ACCELERATION ON RATE OF URINE FLOW AND URINARY EXCRETION OF SODIUM, POTASSIUM, AND TOTAL SOLUTE WERE STUDIED IN RABBITS. URINE FLOW RATE DURING EXPOSURE TO ACCELERATION FELL TO AN AVERAGE OF 96 PER CENT OF CONTROL VALUES; URINARY EXCRETION OF SODIUM FELL CONCURRENTLY TO 49 PER CENT OF CONTROL, AND POTASSIUM TO 67 PER CENT. THERE WAS NO SIGNIFICANT CHANGE IN TOTAL SOLUTE EXCRETION. THE DECLINES OBSERVED WERE ABRUPT, AS WERE THE RETURNS TO CONTROL LEVELS AFTER ACCELERATION. THE DATA SUGGEST THAT HEMODYNAMIC RATHER THAN HORMONAL INFLUENCES WERE PRIMARILY RESPONSIBLE FOR THESE CHANGES. GROSS OR MICROSCOPIC HEMATURIA OBSERVED IN THE SEDIMENTS OF MOST ACCELERATION URINE SPECIMENS DISAPPEARED OR ABATED DURING THE RECOVERY PHASE. OCCASIONAL RED CELL CASTS INDICATED THAT THE HEMATURIA WAS DUE, AT LEAST IN PART, TO AN INTRARENAL LESION. (AUTHOR)
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20029

AD-660-287 6/19 5/10
ARMY MEDICAL RESEARCH LAB FORT KNOX KY
VISUAL-VESTIBULAR INTERACTION AND THRESHOLD FOR
ANGULAR ACCELERATION.

DESCRIPTIVE NOTE: FINAL REPT.,
OCT 67 12P MARSHALL JOHN E. 1
REPT. NO. USAMRL-754
PROJ. DA-1902940148619

UNCLASSIFIED REPORT

DESCRIPTORS: (ACCELERATION TOLERANCE,
VISION), VESTIBULAR APPARATUS,
THRESHOLDS (PHYSIOLOGY), ILLUMINATION,
SENSITIVITY, PSYCHOPHYSIOLOGY, STIMULATION

SUBJECTIVE RESPONSE LATENCIES FROM 36 SS WERE
USED AS AN INDEX OF THRESHOLD ACROSS FOUR INTENSITIES
OF ANGULAR ACCELERATION (1, 5, 9, 6, AND 12 DEGREES/
SEC SQ.) UNDER THREE DIFFERENT VISUAL CONDITIONS.
THOSE INCLUDED TOTAL DARKNESS (O), A SIMPLE,
STRUCTURED VISUAL ENVIRONMENT WHICH ROTATED WITH
SILA), AND A HOMOGENEOUS, ILLUMINATED VISUAL FIELD
(L). THE RESULTS INDICATE THAT WHILE
ILLUMINATION OF THE STRUCTURED VISUAL FIELD LOWERS
SUBJECTIVE THRESHOLD FOR ANGULAR ACCELERATION, ITS
DIFFERENTIAL EFFECT IS REDUCED WITH INCREASED
ACCELERATION INTEncISITIES. VISUAL FIELD
ARTICULATION ENHANCES THRESHOLD SENSITIVITY WHEN
COMPARED WITH DARKNESS, BUT NOT WHEN L X LA
COMPARISONS ARE MADE. (AUTHOR)

UNCLASSIFIED
THE SCHOOL OF AEROSPACE MEDICINE BROOKS AFB TEX

THE INFLUENCE OF CHRONIC ACCELERATION ON THE EFFECTS OF WHOLE BODY IRRADIATION IN RATS AT 760 MM OF MERCURY.

MAY 67 11P CASEY, HARDLO W.;
CORDY, DONALD 1; GOLDMAN, MARVIN I; SMITH, ARTHUR H.

REPT. NO. SAM-TR-66-347

UNCLASSIFIED REPORT

AVAILABILITY: PUBLISHED IN AEROSPACE MEDICINE V38 NS P451-7 MAY 1967.

DESCRIPTORS: "ACCELERATION TOLERANCE, WHOLE BODY IRRADIATION, RATS, ADAPTATION (PHYSIOLOGY), HISTOLOGY, LIPIDS, MORTALITY RATES, ACCELERATION, PATHOLOGY, BODY WEIGHT"

STUDIES OF THE COMBINED EFFECTS OF CHRONIC ACCELERATION AND ACUTE WHOLE BODY IRRADIATION WERE PERFORMED ON RATS. RATS EXPOSED TO ACCELERATIVE FORCES (2.0 TO 3.0G), PRODUCED BY CONTINUOUS CENTRIFUGATION, WERE OBSERVED FOR PERIODS UP TO FOUR MONTHS. DELETERIOUS EFFECTS WERE NOT PRODUCED BY ACCELERATION PER SE, AS PHYSIOLOGIC ADAPTATION WAS EVIDENT BY THE SEVENTH TO FOURTEENTH DAY. ON GROSS AND HISTOLOGIC EXAMINATIONS A DEPLETION OF BODY FAT DEPOSITS AND A REDUCTION IN BODY MASS WERE THE ONLY DETECTABLE DIFFERENCES IN ACCELERATED RATS WHEN COMPARED WITH CONTROL RATS. CONTINUOUS ACCELERATION, IMMEDIATELY FOLLOWING IRRADIATION, INCREASED RADIATION MORTALITY AND THE MORTALITY INCREASED PROGRESSIVELY WITH INCREASES IN THE ACCELERATIVE FORCE. PRIOR ADAPTATION OF RATS TO ACCELERATION HAD NO INFLUENCE ON THE INCREASED MORTALITY. DECELERATION TO NORMAL GRAVITY FOLLOWED BY IRRADIATION HAD NO EFFECT ON MORTALITY. IN ACCELERATED-IRRADIATED RATS THAT DIED, THE LESIONS FOUND BY GROSS AND HISTOLOGIC EXAMINATIONS WERE TYPICAL OF THOSE PRODUCED BY RADIATION. ACCELERATED RATS, SACRIFICED 30 DAYS FOLLOWING IRRADIATION, HAD LESIONS COMPARABLE TO NON-ACCELERATED IRRADIATED RATS INDICATING THAT THE PATHOLOGIC CHANGES PRODUCED BY IRRADIATION WERE NOT ALTERED BY ACCELERATION. THE RESULTS SHOW THAT THE BIOLOGIC RESPONSE TO WHOLE-BODY IRRADIATION IS ALTERED BY CHANGING THE WEIGHT TO MASS RATIO WITH ACCELERATIVE FORCES ABOVE NORMAL GRAVITY. THE EXACT CAUSE OF THE INCREASED MORTALITY WAS NOT DETERMINED. THESE FINDINGS SUGGEST ADDITIONAL...

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UNCLASSIFIED
FURTHER RESEARCH INTO THE EFFECT OF IONIZING RADIATION COMBINED WITH G-LOADING DURING SPACE FLIGHT.

I. IPANCHEKOVA, E. F., ISAKSONOV, P. I.

REPT. NO. SAM-TT-R-941-1267

SUPPLEMENTARY NOTE: TRANS. OF CONGRESS OF THE INTERNATIONAL ASTRONAUTICAL FEDERATION (18TH), BELGRAD, 29-30 SEP 67. PAPERS, NP, NO.

MATERIAL IS REVEALED REPRESENTING FURTHER DEVELOPMENT IN THE RESEARCH INTO THE RESPONSIVENESS OF AN IRRADIATED ORGANISM TO VARIOUS SPACEFLIGHT FACTORS. IN PARTICULAR, AN ATTEMPT WAS MADE TO EVALUATE THE ROLE OF PROCESSES ARISING WITHIN THE IRRADIATED ORGANISM AS IT RESPONDS TO 'CHRONIC' G-LOADING. PRINCIPLES CONCERNING THE FEASIBILITY OF EXTRAPOLATING OUR EXPERIMENTAL RESULTS TO MAN ARE OUTLINED AS WELL AS THE MANNER IN WHICH ORIENTATIONAL DATA WAS COLLECTED ON THE MAXIMUM POSSIBLE EXPOSURE (MPE) AS EVALUATED IN THE LIGHT OF CRITERIA FOR ACCELERATION TOLERANCE.
A NEW MAN-RATED VESTIBULAR RESEARCH DEVICE, IDENTIFIED AS THE COUNTERROTATOR (CORO), WAS DEVELOPED TO INVESTIGATE MAN'S RESPONSE TO THE DYNAMIC LINEAR ACCELERATION ENVIRONMENT AFFORDED BY COUNTERROTATION ABOARD A CENTRIFUGE. THE DEVICE PROPER IS A SMALL EARTH-VERTICAL ROTATOR WHICH UTILIZES A DC TORQUE MOTOR OPERATED AS A CLOSED-LOOP POSITION SERVO TO TURN A SEATED SUBJECT ABOUT HIS Z HEAD AXIS. WHEN INSTALLED ABOARD THE RADIAL ARM OF THE CORIOLIS ACCELERATION PLATFORM (CAP), A CENTRIFUGE-LIKE ROTATOR, THE CORO DRIVE SYSTEM WILL TRACK THE ANGULAR MOTIONS OF CAP OVER THE 0- TO 100-DEG/SEC VELOCITY RANGE AT ANGULAR ACCELERATIONS EXTENDING TO 15 DEG/SQ SEC. THE DEVICE IS RATED TO ACHIEVE THIS 1:1 COUNTERROTATION CAPABILITY IN LOW-LEVEL, VARIABLE MAGNITUDE, CENTRIPETAL ACCELERATION FIELDS EXTENDING FROM 0 TO 1.75 G NOMINAL. (AUTHOR)
VERTEBRAL COMPRESSION REPRESENTS A SIGNIFICANT PERCENTAGE OF THE MORBIDITY ASSOCIATED WITH UPWARD EJECTION. VERTEBRAL AND INTERVERTEBRAL STRUCTURE REACTS TO AND IS SOMETIMES IRREVERSIBLY ALTERED BY EJECTION ACCELERATION. DESIGN AND MATERIAL PROPERTIES OF THE NORMAL VERTEBRAL COLUMN ARE SUFFICIENTLY CONSTANT THAT WHEN STRUCTURAL CHARACTERISTICS ARE DEFINED AND ACCELERATION PROFILES KNOWN, PREDICTION OF FAILURE MAY BE MADE. COMPRESSIVE LOAD ANALYSES OF VERTEBRA-DISC COMPLEXES DEMONSTRATED THAT THE VERTEBRAL END-PLATES ARE THE INITIALLY FAILING STRUCTURES OF THE SPINAL COLUMN. FROM EXPERIMENTAL DATA ON VERTEBRAL BREAKING-LOADS, ACCEPTABLY ACCURATE PROBABILITY-OF-INJURY CURVES FOR STATIC LOADING WERE GENERATED. THESE DATA TOGETHER WITH DATA DESCRIBING THE DYNAMIC RESPONSE CHARACTERISTICS OF THE HUMAN BODY PERMIT CALCULATION OF THE PROBABILITY-OF-INJURY FOR DYNAMIC LOADING PRODUCED BY EXPOSURE TO IMPACT ACCELERATIONS. AS AN AID TO THE DESIGNER OF EJECTION SYSTEMS, APPLICATION OF THESE CONCEPTS SHOULD REFINE THE ESTIMATE OF 'SAFE' ACCELERATION PROFILES AND MINIMIZE THE RISK OF IRREVERSIBLE VERTEBRAL DEFORMATION. (AUTHOR)
PRELIMINARY INVESTIGATIONS INTO THE EFFECTS OF HIGH LINEAR ACCELERATIONS ON THE VESTIBULO-OCULAR RESPONSES TO BOTH CALORIC AND CORIOLIS STIMULATIONS WERE MADE. PILOTS WERE SUBJECTED TO SHORT-DURATION ACCELERATIONS ON THE USAF SCHOOL OF AEROSPACE MEDICINE CENTRIFUGE. A SPONTANEOUS SLOW-PHASE DOWNWARD NYSTAGMUS WAS OBSERVED IN SOME PILOTS IN POST-CENTRIFUGE TESTS. SOME PERIPHERAL AND CENTRAL-NEURAL MODIFICATION RESULTING FROM CENTRIFUGATION WAS OBSERVED. (AUTHOR)
UNCLASSIFIED

DESCRIPTORS:  (AVIATION MEDICINE, ACCELERATION TOLERANCE, STRESS (PHYSIOLOGY), ACCELERATION, FLIGHT SIMULATORS, PERFORMANCE (HUMAN), ROTATION, INSTRUMENTATION, MONITORS, RESPONSES, TELEMETERING DATA, BIOSENSORS)

PHYSIOLOGIC RESEARCH HAS EXPLORED THE RESPONSES OF HUMANS TO ROTATION AND ACCELERATION. THE TEST VEHICLE WAS THE ROTATIONAL FLIGHT SIMULATOR, AN AIR BEARING SUSPENDED SPHERE WITH UNRESTRICTED ROTATIONAL FREEDOM PROPELLED BY INTERNALLY MOUNTED INERTIA RINGS AND, LATER, BY A SINGLE AXIS EXTERNAL DRIVE ASSEMBLY. ENGINEERING EFFORTS ESTABLISHED THE DYNAMICS AND IMPROVED THE CONTROL OF THE VEHICLE. INSTRUMENTATION WAS PROVIDED FOR THE READOUT, DISPLAY, AND RECORDING OF SIGNIFICANT DATA SERVING FOR PHYSIOLOGIC EVALUATION AND MEDICAL MONITORING. THE DATA WERE TELEMETERED PICTORIAL DISPLAY OF THE SUBJECT AND TWO-WAY COMMUNICATION LINKS WERE PROVIDED. A TOTAL OF 198 EXPERIMENTS YIELDED VALID PHYSIOLOGIC AND HUMAN PERFORMANCE INFORMATION IN A ROTATIONAL ENVIRONMENT FROM FRACTIONAL TO 16 RPM AND FOR SEVERAL MINUTES TO A MAXIMUM OF 30 MINUTES. THE SUBJECTS CONSISTED OF 7 YOUNG, HEALTHY MALES. RESULTS INDICATED THAT THE RFS PROPERLY USED AND INSTRUMENTED REPRESENTS A VALUABLE AND UNIQUE TEST VEHICLE THAT CHANGES IN HEART RATE, AND ECG READINGS DEPENDED ON BODY POSITION WITH RESPECT TO GRAVITY; THAT ELECTRO-OCULOGRAF, SUBJECTIVE SENSATIONS, INCIPiENT NAUSEA, ANd ABILITY OF THE PILOT TO RIGHT THE STATIONARY SPHERE AFTER TUMBLING—ALL DEPENDED ON THE RATE, DURATION, AND AXIS PATTERN OF ROTATION. (AUTHOR)
UNCLASSIFIED

DESCRIPTIONS: (ACCELERATION, ADAPTATION (PHYSIOLOGY)), (VESTIBULAR APPARATUS, ACCELERATION TOLERANCE), EYE, REFLEXES, NYSTAGMUS, RESPONSES, ELECTROPHYSIOLOGY, PSYCHOPHYSICS, SPACE MEDICINE (U)

TWO INDEPENDENT GROUPS OF NORMAL HUMAN SUBJECTS WERE EXPOSED TO A NUMBER OF LONG-DURATION (UP TO 96 SEC), RELATIVELY HIGH-INTENSITY (2 DEGREES/SEC SQ - 24 DEGREES/SEC SQ) CONSTANT, ANGULAR ACCELERATIONS. NYSTAGMIC DECREMENTS DURING STIMULATION WERE CLEARLY EVIDENT. THE DECREMENTS WERE INITIATED AT ABOUT THE SAME TIME AFTER STIMULUS ONSET (30-35 SEC) FOR ALL ACCELERATIONS USED.

THE DECREMENTS IN THE NYSTAGMIC RESPONSES WERE COMPARED TO RELATED FINDINGS FOR BOTH SUBJECTIVE AND ELECTROPHYSIOLOGICAL RESPONSES. (AUTHOR) (U)
UNCLASSIFIED

THE REPORT DESCRIBES A GENERAL-PURPOSE INSTRUMENTATION SYSTEM DEVELOPED FOR USE IN CONJUNCTION WITH THE CORIOLIS ACCELERATION PLATFORM, A COMBINED LINEAR AND ANGULAR MOTION DEVICE RECENTLY INSTALLED AT THE VESTIBULAR RESEARCH FACILITIES OF THIS ACTIVITY. THE SYSTEM, BASED ON THE USE OF STANDARD COMMERCIALLY AVAILABLE EQUIPMENT, PROVIDES THE BASIC TRANSDUCERS, SIGNAL-CONDITIONING CIRCUITRY, AND RECORDING INSTRUMENTS REQUIRED FOR THE ACQUISITION, DISPLAY, AND STORAGE OF A WIDE VARIETY OF COMMONLY COLLECTED BIOLOGICAL AND BIDENVIRONMENTAL MEASUREMENT DATA. (AUTHOR)
THE BIBLIOGRAPHY ON THE EFFECTS OF ACCELERATION ON HUMANS AND ANIMALS INCLUDES 90 ARTICLES, 21 PAPERS AND DOCUMENTS, AND 4 BOOKS.
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. Z00929

AD-670 468  6/19
NAVAL AIR DEVELOPMENT CENTER JOHNSVILLE PA AVIATION
MEDICAL ACCELERATION LAB
PILOT PERFORMANCE AND TOLERANCE STUDIES OF ORBITAL
RE-ENTRY ACCELERATION.  
(U)
DESCRIPTIVE NOTE: LETTER REPT.,
SEP 58  9P  SHEPLER, HERBERT G. J
REPT. NO. NADC-MA-8
PROJECTED ADC AE-1412

UNCLASSIFIED REPORT

DESCRIPTORS: (ACCELERATION TOLERANCE, PILOTS),
PERFORMANCE (HUMAN), ATMOSPHERE ENTRY, SPACE
MEDICINE, VERTIGO, LIFT, OSCILLATION,
ASTRONAUTS  
(U)

THE REPORT CONCERNS A PRELIMINARY STUDY OF HUMAN
TOLERANCE TO THE RE-ENTRY ACCELERATIONS EXPECTED IN
ZERO LIFT VEHICLES. THE STUDY WAS UNDERTAKEN TO
ASCERTAIN WHETHER A HUMAN SUBJECT COULD TOLERATE
ORBITAL RE-ENTRY ACCELERATION PATTERNS ASSOCIATED
WITH THE NATIONAL ADVISORY COMMITTEE FOR
AERONAUTICS (NACA) MANNED SPACE CAPSULE.
(AUTHOR)  
(U)
THE EFFECT OF +2 GZ AND +2 GX ACCELERATION FOR 70 MIN ON THE PERIPHERAL VENOUS ADH LEVELS IN HUMAN SUBJECTS WAS STUDIED ON THE UNITED STATES AIR FORCE-SAM HUMAN CENTRIFUGE. A MEAN RISE IN THE BLOOD ADH LEVEL OF 2.97 MICRO U/ML (P < 0.09) WAS FOUND DURING THE +GZ RUNS, AND THIS RISE COULD BE INHIBITED BY HAVING THE SUBJECTS WEAR AN ANTI-G SUIT INFLATED TO 60 MM Hg. A MEAN DECREASE IN THE BLOOD ADH LEVEL OF 0.89 MICRO U/ML (P < 0.09) WAS FOUND DURING GX ACCELERATION.

THESE RESULTS SUPPORT THE ASSUMPTIONS OF PREVIOUS AUTHORS THAT CHANGES IN URINE VOLUME DURING +GZ AND +GX ACCELERATION ARE PROBABLY A RESULT OF CHANGES IN ADH SECRETION. (AUTHOR)
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. Z00929

AD-471 859  6/19
CIVIL AEROMEDICAL INST OKLAHOMA CITY OKLA
ADAPTATION TO VESTIBULAR DISORIENTATION. VI. EYE-
MOVEMENT AND SUBJECTIVE TURNING RESPONSES TO VARIOUS
DURATION OF ANGULAR ACCELERATION,
MAY 67 12P GUEDRY,FRED E. I
COLLINS, WILLIAM E. I
MONITORI FAA-AM  67-7

UNCLASSIFIED REPORT

DESCRIPTORS:  (*ACCELERATION TOLERANCE, 
*NYSTAGMUS), VESTIBULAR APPARATUS, 
ADAPTATION (PHYSIOLOGY), 
SENSATION (PHYSIOLOGY), RESPONSES, REFLEXES, 
SENSORY PERCEPTION, AVIATION MEDICINE

TURNING SENSATIONS AND EYE MOVEMENT RESPONSES 
DURING ANGULAR ACCELERATIONS MAY SHOW ADAPTATION 
EFFECTS OF SIGNIFICANCE TO UNDERSTANDING VESTIBULAR 
REACTIONS DURING CERTAIN AIRCRAFT MANEUVERS. IN 
THIS STUDY, A DIRECT RELATIONSHIP FOUND BETWEEN 
DURATION OF ACCELERATION AND (A) DECREASE OF 
RESPONSE DURUNG ACCELERATION, (B) RATE OF DECREASE 
OF RESPONSE AFTER ACCELERATION, AND (C) MAGNITUDE 
OF SECONDARY REACTION, IS REGARDED AS AN INDICATION 
OF A CENTRAL PROCESS WHICH LIMITS A PROLONGED 
VESTIBULAR PRIMARY REACTION. THE PROCESS IS 
MANIFESTED BY ITS INFLUENCE ON RELATIVELY BASIC 
REFLEX REACTIONS (NYSTAGMUS) IN THE CAT, AND IS 
MORE PROMINENTLY MANIFESTED IN MAN BY ITS INFLUENCE 
ON SENSORY PERCEPTION. (AUTHOR)  

UNCLASSIFIED
PERIPHERAL VENOUS RENIN LEVELS DURING +GZ ACCELERATION.

ROGGE, JAMES O.; IFASOLA, A.

REPT. NO. SAM-TR-67-267

UNCLASSIFIED REPORT


DESCRIPTORS: (PEPTIDE HYDROLASES, SECRETION), (ACCELERATION TOLERANCE, BLOOD CHEMISTRY), (STRESS PHYSIOLOGY), CARDIOVASCULAR SYSTEM, RESPONSES, PRESSURE SUITS, AUTONOMIC NERVOUS SYSTEM, SPACE MEDICINE

IDENTIFIERS: RENIN, ANGIOTENSINS

RENNIN SECRETION, AS MEASURED BY CHANGES IN PERIPHERAL VENOUS RENIN LEVELS, WAS USED TO EVALUATE THE PART PLAYED BY THE RENIN-ANGIOTENSIN SYSTEM IN THE RESPONSE TO +GZ ACCELERATION. CENTRIFUGE RUNS WERE DONE ON THE USAF SAM HUMAN CENTRIFUGE AND THE SUBJECTS WERE MEMBERS OF THE USAF SAM ACCELERATION/DECELERATION PANEL. A LARGER INCREASE IN THE RENIN LEVEL WAS FOUND EACH TIME THE RUN DURATION WAS INCREASED AT +2GZ. THE MEAN INCREASE IN THE 20 MINUTE SAMPLES WAS 0.36 NG./ML. (P<0.05) AND IN THE 30 MINUTE SAMPLES WAS 0.76 NG./ML. (P<0.01). A MEAN RISE OF 0.63 NG./ML. FOUND AFTER 20 MINUTES AT +2GZ WHILE WEARING AN ANTI-G SUIT, WAS NOT SIGNIFICANTLY DIFFERENT FROM THE RISE FOUND IN THE 30 MINUTE RUNS WITHOUT THE G-SUIT. THE RENIN-ANGIOTENSIN SYSTEM MAY PLAY A PART IN THE RESPONSE TO +GZ ACCELERATION, EITHER ALONE OR IN CONJUNCTION WITH THE AUTONOMIC NERVOUS SYSTEM. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. ZDDR29

AD-672 448  6/19
SCHOOL OF AEROSPACE MEDICINE BROOKS AFB TX
ABDOMINAL BLOOD FLOW CHANGES DURING ACCELERATION
STRESS IN ANESTHETIZED DOGS,
FEB 68  99  STONE, H. L.  IALEXANDER, W.
C. 1
REPT. NO.  SAH-TR-67-266

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN AEROSPACE MEDICINE, V37 N2
PI.19-II9 FEB 68.

DESCRIPTORS:  (ACCELERATION TOLERANCE,
CARDIOVASCULAR SYSTEM, BLOOD CIRCULATION,
ABDOMEN, STRESS (PHYSIOLOGY), BLOOD VOLUME,
MEASUREMENT, ELECTRODES, PULSE RATE, BLOOD
PRESSURE, IMPLANTS, TISSUES (BIOLOGY)

THE CHANGES IN ABDOMINAL BLOOD FLOW DURING
ACCELERATION STRESS WERE MEASURED BY A HYDROGEN
ELECTRODE TECHNIQUE USED IN NINE ANESTHETIZED DOGS.
THE ELECTRODES WERE IMPLANTED IN THE RENAL CORTEX,
ADRENAL GLAND, AND THE SMALL INTESTINE.
MEASUREMENTS OF TISSUE BLOOD FLOW, HEART RATE, AND
MEAN ARTERIAL PRESSURE WERE MADE AT LEVELS OF
ACCELERATION UP TO +12G IN THE SUPINE POSITION.
THE POSITION OF THE ANIMAL WAS CHANGED IN 10 DEGREE
INCREMENTS TOWARD THE HEAD-UP POSITION WITH 30
DEGREE-HEADUP TILT BEING THE MAXIMUM TILT USED.
THE ABOVE MEASUREMENTS WERE REPEATED AT EACH G
LEVEL UNTIL NO DISCERNIBLE TISSUE FLOW COULD BE
MEASURED.  THE TISSUE BLOOD FLOW WAS FOUND TO
REMAIN WITHIN NORMAL LIMITS UP TO 6 OR 8 +G IN THE
SUPINE AND 10 DEGREE-HEAD-UP POSITIONS, BUT WAS FOUND
TO BE SIGNIFICANTLY REDUCED ABOUT THESE G LEVELS;
IN THE 20- AND 30 DEGREE-HEAD-UP POSITIONS A MORE
RAPID DECLINE IN TISSUE FLOW OCCURRED.  THE CHANGES
IN MEAN ARTERIAL PRESSURE AND HEART RATE WERE
RECORDED.  IN OTHER INVESTIGATIONS THE MAGNITUDE OF
THE +Gz VECTOR DURING ACCELERATION STRESS SEEMS TO
DETERMINE THE POINT OF DETERIORATION OF
CARDIOVASCULAR FUNCTION, BUT AT HIGH +Gz
ACCELERATIONS, DETERIORATION OF CARDIOVASCULAR
FUNCTION WAS ALSO OBSERVED.  (AUTHOR)
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. Z00929

AO-672 927 6/19 19/2

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT
PARIS (FRANCE)

PRINCIPLES OF BIODYNAMICS: SECTION A, CHAPTER V,
DESCRIPTIVE CATALOG OF AEROSPACE MEDICAL BIODYNAMICS
FACILITIES IN THE UNITED STATES. (U) 60 79P

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: NATO FURNISHED.

DESCRIPTORS: (ACCELERATION TOLERANCE, TEST
FACILITIES), AVIATION MEDICINE, SPACE MEDICINE,
LABORATORY ANIMALS, HUMANS, VIBRATION,
ROTATION, CENTRIFUGES, FLIGHT SIMULATORS,
VELOCITY, TURBULENCE, ANALOG COMPUTERS,
MONITORS, LINEAR SYSTEMS, CATAPULTS,
ANTHROPOMETRY, IMPACT SHOCK, DROP TESTING
IDENTIFIERS: BIODYNAMICS, DISORIENTATION

THE DOCUMENT IS A DESCRIPTIVE CATALOG OF
AEROSPACE MEDICAL BIODYNAMICS FACILITIES IN THE
UNITED STATES. (U)
CORPORATE AUTHOR - MONITORING AGENCY

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  AD-490 481

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• BROWN ENGINEERING CO INC HUNTSVILLE
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• CIVIL AERomedical INST OKLAHOMA CITY
OKLA

• ADAPTATION TO VESTIBULAR
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ADAPTATION OF INTERRUPTING
NYSTAGMIC EYE MOVEMENTS WITH
OPPOSING STIMULI,
(FAA-AM-66-37)
AD-649 619

• ADAPTATION TO VESTIBULAR
DISORIENTATION; VI- EYE-MOVEMENT
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CHANGES IN THE CONTENT OF BIOLOGICALLY ACTIVE SUBSTANCES IN BRAIN TISSUE UNDER THE ACTION OF RADIAL ACCELERATIONS, (TT-69 71492) AO-607 878

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*FTD-TT69-1396
HISTOMORPHOLOGICAL CHANGES IN THE INTERNAL EAR OF DOGS UNDER THE EFFECT OF RADIAL ACCELERATIONS, (TT-69-60999) AO-630 991

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The tolerance for acceleration has been studied by experimentation on the centrifuge using human and animal subjects. Body positioning relative to the direction of the increased gravitational forces was found to be critical. In an upright position, the gravitational shifts of blood may leave the brain cells without adequate blood and oxygen supply causing "grayout" or "blackout" at 4 to 6g. This bibliography compiles 99 unclassified and unlimited references of documents that have been cataloged in the DDC collection. Volume II of this bibliography appears in a limited version and is designated by AD-850 750.
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