PROTECTIVE CLOTHING

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January 1975
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**KEY WORDS**

*Protective Clothing*  
Exposure Suits  
Fire Protective Clothing  
Coveralls  
Flight Clothing  
Rubber Gloves  
Gasproof Clothing  
Abstracts

**ABSTRACT**

This bibliography contains unclassified and unlimited citations on Protective Clothing. Discussed are protective clothing such as fire protective clothing, flight clothing, gasproof clothing, underwater clothing, pressure suits, and exposure suits. It also includes pertinent information on stress physiological, psychological and biological aspects of human performance in the use of protective clothing in actual test. *(See reverse)*

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**DD FORM 1473 EDITION OF 1 NOV 68 IS OBSOLETE**

UNCLASSIFIED
ITEM 19, (Cont'd)

Flight Helmets  Human Factors Engineering
Helmets        Pressure Suits
Thermal Insulation  Protective Masks
Shoes

ITEM 20, (Cont'd)

Computer-generated indexes of Corporate Author-Monitoring
Agency, Subject, Title and Personal Author are included.
FOREWORD

This unclassified and unlimited bibliography contains 236 selected citations of reports on Protective Clothing. These references provide information relating to specifications, design, fabrication techniques, synthetic fibers, textiles, plastics, heat tolerance, thermal stress, test analysis, and performance evaluation of materials used in protective clothing. Discussed are protective clothing such as fire protective clothing, flight clothing, gas-proof clothing, underwater clothing, pressure suits and exposure suits. It also includes pertinent information on stress physiological, psychological and biological aspects of human performance in the use of protective clothing in actual test.

These citations were taken from entries processed into the Defense Documentation Center's data bank during the period of January 1953 to September 1974.

Individual entries are arranged in AD number sequence under the heading AD Bibliographic References. Computer-generated indexes of Corporate Author-Monitoring Agency, Subject, Title, and Personal Author are provided.

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OFFICIAL

HUBERT E. SAUTER
Administrator,
Defense Documentation Center
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HIGH-ALTITUDE PRESSURE SUITS AND HERMETICALLY SEALED CABINS FOR STRATOSPHERIC FLIGHTS.

DESCRIPTIVE NOTE: TRANSLATIONS OF SOVIET-BLOC SCIENTIFIC AND TECHNICAL LITERATURE.
MAR 65 IEP
SPASSKIY, V. A.
REPT. NO. ATD-T-65-13


DESCRIPTORS: (PRESSURE SUITS, USSR); PRESSURIZED CABINS, HERMETIC SEALS, HIGH ALTITUDE, STRATOSPHERE; BREATHING APPARATUS, OXYGEN EQUIPMENT, REVIEWS, DESIG(U)

HIGH-ALTITUDE PRESSURE SUITS AND HERMETICALLY SEALED CABINS FOR STRATOSPHERIC FLIGHTS.
THE RESULTS OF PROJECT COLD CASE, AN INVESTIGATION OF THE COLD LAND SURVIVAL CAPABILITIES OF AIR FORCE PILOTS WEARING THE FULL PRESSURE HIGH ALTITUDE FLYING OUTFIT (A/P22S-2 AND A/P 22S-3) ARE PRESENTED IN THIS REPORT.

SIX SUBJECTS WEARING THESE GARMENTS WERE PLACED UNDER SIMULATED SURVIVAL CONDITIONS IN A WOODED AREA OF INTERIOR ALASKA NEAR FAIRBANKS. AMBIENT AIR TEMPERATURES REACHED -30 F AND WERE BELOW -27 F FOR AT LEAST 50% OF THE TIME. ON THE THIRD DAY AIR TEMPERATURES ROSE AND REMAINED AT -10 F UNTIL THE CONCLUSION OF THE TEST. THE TEST LASTED FOR 72 HOURS. TWO SUBJECTS WEARING THE FULL PRESSURE SUIT WITHOUT ADDITIONAL CLOTHING SURVIVED FOR 11 AND 30 HOURS. AT THE END OF THIS TIME THEY WERE FATIGUED AND MODERATELY HYPOTHERMIC. TWO SUBJECTS WITH THE FULL PRESSURE SUIT PLUS A NINEPIECE DOWN-FILLED SURVIVAL OUTFIT (CLOTHING OUTFIT, ARCTIC SURVIVAL) SURVIVED FOR 52 AND 72 HOURS. THE 52-HOUR SURVIVOR SUFFERED A NONCOLD INJURY WHICH NECESSITATED HIS REMOVAL. TWO SUBJECTS WITH THE FULL PRESSURE SUIT PLUS AN EXPERIMENTAL ADC WALK-AROUND SLEEPING BAG SURVIVED FOR 72 HOURS EACH. (AUTHOR)
COMPARATIVE EVALUATION OF USAF STANDARD A/P22S-2 AND IMPROVED A/P22S-2A HIGH ALTITUDE, FULL PRESSURE FLYING OUTFITS.

DESCRIPTIVE NOTE: TECHNICAL REPT.
APR 65 6IP GILLESPIE KENT W. 1
REPT. NO. SEG-TR-65-7

ENGINEERING TEST OF SPIKE RESISTANT INSOLE. (U)

DESCRIPTIVE NOTE: FINAL REPT., AUG 65 25P MANGUM, EDWIN W.  
PROJ: RDTE-IM643303D547 6010-01

UNCLASSIFIED REPORT

DESCRIPTORS: (SHOES, PROTECTIVE CLOTHING), ARMY EQUIPMENT, PERFORMANCE (ENGINEERING), SPIKES, PENETRATION, DEFORMATION, FRACTURE (MECHANICS), METAL PLATES, STEEL, BUCKLING, HEAT TRANSFER, LIFE EXPECTANCY, DESIGN, EFFECTIVENESS (U)

A SERIES OF EXPERIMENTAL PROCEDURES WAS ACCOMPLISHED TO DEMONSTRATE AND MEASURE THE PROTECTION X-20A (DYNASOAR) PILOTS OBTAIN BY WEARING THEIR CUSTOM FITTED PRESSURE GARMENTS WHILE EXPOSED TO SIMULATED MISSION CONDITIONS. MISSION CONDITIONS WERE SIMULATED TO THE EXTENT POSSIBLE WITH AVAILABLE ALTITUDE AND TEMPERATURE TEST FACILITIES. PHYSICAL CHARACTERISTICS OF THE GARMENTS WERE DETERMINED SUCH AS WEIGHT, PRESSURE DROP WITH FLOW, DIMENSIONAL STABILITY, VISUAL FIELDS, AND ACOUSTICAL ATTENUATION. (AUTHOR)
THE STUDY ATTEMPTS TO ESTABLISH AN OBJECTIVE BASELINE FOR EVALUATING THE FUNCTIONAL MOBILITY OF PRESSURE GLOVES. THE PURDUE PEGBOARD DEXTERITY TEST WAS EMPLOYED TO MEASURE HAND DEXTERITY UNDER THREE CONDITIONS: (1) SUBJECTS BAREHANDED, BUT WEARING AN UNPRESSURIZED A/P22S-2 FULL-PRESSURE SUIT ENSEMBLE; (2) SUBJECTS GLOVED (MARK-3/P-22S-2) AND SUITED, BUT NOT PRESSURIZED; (3) SUBJECTS GLOVED, SUITED, AND PRESSURIZED TO 2.5 PSI. THE PURDUE PEGBOARD DEXTERITY TEST WAS FOUND TO BE A DELICATE INDICATOR OF HAND DEXTERITY IN THE TEST CONDITIONS. THE TEST RESULTS SHOW A MARKED REDUCTION IN DEXTERITY EVEN WITH THE GLOVES AND SUIT UNINFLATED, AND AN ADDITIONAL LOSS WHEN GLOVES AND SUIT WERE INFLATED. THE DEGREE OF LOSS OF DEXTERITY IS BELIEVED TO PROVIDE AN OBJECTIVE MEASURE WHEREBY ONE OPERATIONAL ASPECT OF PRESSURE GLOVES MAY BE EVALUATED. (AUTHOR)
UNCLASSIFIED REPORT

BIBLIOGRAPHY SEARCH CONTROL NO. /Z0H08

AD-406 039
ANTIOCH COLL YELLOW SPRINGS OHIO

HEIGHT-WEIGHT SIZING OF PROTECTIVE GARMENTS; BASED ON JAPANESE AIR SELF-DEFENSE FORCE PILOT DATA, WITH FIT-TEST RESULTS. (U)

JUL 64 IV MCCONVILLE JOHN T. 1
ALEXANDER MILTON IKRAMER JAMES H. IFRITZ, EUGENE A. 1

CONTRACT: AF33 616 6792, AF33 657 9201
PROJ: 7184
TASK: 716408
MONITOR: ANRL, TDR 64 66

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*PROTECTIVE CLOTHING, ANTHROPOMETRY), (*FLIGHT CLOTHING, TESTS), EXPOSURE SUITS, PRESSURE SUITS, ARMED FORCES (FOREIGN), AIR FORCE, JAPAN, STATISTICAL DATA (U)


UNCLASSIFIED /Z0H08
The design and fabrication of an emergency breathing and suit pressurization system (ERSPS), capable of sustaining three full-pressure suited crewmen within the aerospace medical research laboratories life support system evaluator, has been investigated. Two operating modes are provided. One, when the evaluator is pressurized, the emergency breathing and suit pressurization system operates as an openloop system and ventilates the pressure suit with the ambient air. Two, when the evaluator is depressurized, the emergency breathing and suit pressurization system operates as a closed environmental control system, and provides the crewmen with a habitable atmosphere. In this latter mode, the system regulates the suit pressure, the CO$_2$ partial pressure, relative humidity, composition (100% O$_2$), and temperature of the ventilating air, and supplies oxygen for breathing and leakage make up as required. In all modes, the emergency breathing and suit pressurization system regulates the flow of ventilating atmosphere through the pressure suits.
Respiratory and Microclimate Temperatures Within the Parka Hood in Extreme Cold.

Descriptive Note: Final Rept.

Sep 64

Proj: 7164

Task: 716409

Monitor: AMRL

TDR64 79

Unclassified Report

Supplementary Note:


Identifiers: Microclimate Temperatures, Relaxation

The standard Air Force Arctic clothing was worn to determine if it provided adequate head protection in extremely cold temperatures. Subjects were exposed to -62C for 40 to 60 minutes in an environmental chamber. Possible respiratory problems and frostbite of the cheeks and nose were the primary concern. Subjects resting or exercising experienced no respiratory or frostbite problems. Air in the hood rapidly approached ambient conditions, because of the explosive nature of expiration and the strong convective air movement. Exercise increased the microclimate temperatures in the hood. The existing hood design was found to provide adequate head protection for AF personnel at more extreme temperatures than are normally encountered in the Arctic. (Author)
AN INVESTIGATION OF SANITIZING, DEODORIZING, AND ANTISTATIC AGENTS IS DESCRIBED. RECOMMENDATIONS ARE MADE FOR THE USE OF QUATERNARY AMMONIUM COMPOUNDS FOR SANITIZING AND DEODORIZING RUBBERIZED FLIGHT CLOTHING AND FOR THE USE OF NON-IONIC DETERGENTS FOR RENDERING SYNTHETIC MATERIALS ANTI-STATIC.

(AUTHOR) (U)
UNCLASSIFIED

INTEGRATED BACK-PACK MANEUVERING UNIT PROPULSION
STUDY AND EXHAUST PLUME HEATING ANALYSIS.

DESCRIPTION NOTE: ASTRONAUTICS ENGINEERING REPT. FOR DEC
62-JUN 63,
SEP 63 237P PRATT .C. L. IGODDNIGHT.F. H. I
REPT. NO: CVC-00+252
CONTRACT: AF33 657 10408
PROJ: 8170
TASK: 817008
MONITOR: ASD . TDR63 729

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: LEGIBILITY OF THIS DOCUMENT IS IN PART
UNSATISFACTORY, REPRODUCTION HAS BEEN MADE FROM BEST
AVAILABLE COPY.

DESCRIPTORS: (*ASTRONAUTS, SPACEBORNE), (*ROCKET MOTORS
(LIQUID PROPELLANT), PORTABLE EQUIPMENT), (*FLIGHT
CLOTHING, SPACE NAVIGATION), (*SPACE PROPULSION, FLIGHT
CLOTHING), FEASIBILITY STUDIES, MONOPROPELLANTS,
HYDROGEN PEROXIDE, EXHAUST GASES, HEAT TRANSFER, SPACE
ENVIRONMENTS, HALOGENATED HYDROCARBONS, SPECIFIC
IMPULSE; PERFORMANCE (ENGINEERING), GAS GENERATING
SYSTEMS; MILITARY PERSONNEL; ROCKET PROPULSION, WEIGHT
MANEUVERABILITY
IDENTIFIERS: ASTRONAUT MANEUVERING UNITS

TWO TECHNICAL PROBLEMS RELATED TO THE ASTRONAUT
MANEUVERING UNIT ARE TREATED: THE PROBLEMS
ARE: (1) HEATING ASSOCIATED WITH THE IMPINGEMENT
OF THE ROCKET EXHAUST ON SPACE SUIT SURFACES; AND
(2) THE PERFORMANCE OF INERT HEATED GASES AS
PROPELLANTS. METHODS FOR PREDICTING ROCKET EXHAUST
HEATING RATES IN SPACE ARE PRESENTED AND RESULTS ARE
COMPAIED WITH TEST DATA. EFFECTS OF PLUME HEATING
OF AN H2O2 MONOPROPELLANT EXHAUST FROM A TYPICAL
MOTOR PLACEMENT IS SUMMARIZED. THE RESULTS OBTAINED
FROM SEVERAL HEATED GAS PROPELLANT TESTS ARE REPORTED
AND COMPARED TO THEORETICALLY PREDICTED PERFORMANCE.
THE ANALYTICAL AND EXPERIMENTAL TECHNIQUES UTILIZED
ARE DISCUSSED IN DETAIL. THE REFRIGERANTS, FREON
115 AND FREON C318 SHOW THE HIGHEST DENSITY
IMPULSE AND LOWEST WEIGHT. FREON 115 IS
RECOMMENDED FOR USE DUE TO THE LOWER STORAGE
TEMPERATURE REQUIRED. (AUTHOR)
METABOLIC MECHANISMS OF MAN IN THE FULL PRESSURE SUIT; PHYSIOLOGICAL COST OF DONNING A FULL PRESSURE SUIT.

DEC 69  25P  HENDLER:EDWIN  IDERY:DONALD
W:  HILLER:NFIL 1
PROJ:  32
TASK:  R360FR101  200  1Q11  0101
MONITOR:  NAEC ACEL 527

SUPPLEMENTARY NOTE:

DESCRIPTION:  (*METABOLISM* AEROSPACE MEDICINE),  (*PRESSURE SUITS, STRESS (PHYSIOLOGY)), OXYGEN CONSUMPTION, PULSE RATE, ENERGY, PHYSIOLOGY, TIME STUDIES, EFFECTIVENESS, PROTECTIVE CLOTHING, VOLUME, EXERCISE (PHYSIOLOGY), NAVAL PERSONNEL

IDENTIFIERS:  MARK-4 PRESSURE SUITS

EXPERIENCED SUBJECTS DONNED THE U. S. NAVY MK-4 FULL PRESSURE SUIT UNDER CONDITIONS OF TIME AND DONNING SPACE LIMITATIONS. DIRECT AND INDIRECT MEASURES OF PHYSIOLOGICAL COST WERE MADE USING OXYGEN CONSUMPTION AND HEART RATE, RESPECTIVELY. APPROXIMATELY 1 KCAL OF ENERGY PER KG OF BODY WEIGHT WAS EXPENDED IN THE DONNING TASK. DONNING VOLUMES AS SMALL AS ABOUT 7 TIMES THE VOLUME OF THE SUBJECT'S BODY ACCOMMODATED THE DRESSING PROCEDURE WITH NO APPARENT INCREASES IN DONNING TIME NOR IN ENERGY EXPENDITURE. SUIT FIT WAS FOUND TO HAVE AN IMPORTANT EFFECT ON BOTH EFFORT AND TIME REQUIRED FOR DONNING. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /Z0M08

AD-A10 619
RAND DEVELOPMENT CORP CLEVELAND OHIO

THE USE OF LINES OF NONEXTENSION TO IMPROVE MOBILITY IN FULL-PRESSURE SUITS. (U)

DESCRIPTIVE NOTE:  FINAL REPT. MAR 63-MAR 64, NOV 64-1969

CONTRACT:  AF33 657 10192

PROJECT:  7184

TASK:  718490

MONITOR:  AMRL .  TR64 118

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS:  (PRESSURE SUITS, HUMAN FACTORS ENGINEERING), (ANTHROPOMETRY, PRESSURE SUITS), PERFORMANCE (HUMAN), PROTECTIVE CLOTHING, ANATOMY, MOTION, SKIN (ANATOMY), ELASTIC PROPERTIES, AVIATION PERSONNEL, ASTRONAUTS, DESIGN, MOBILE (U)

AN IMPORTANT OBJECTIVE IN THE DEVELOPMENT OF A FULL-PRESSURE SUIT FOR A HUMAN BEING IS TO PERMIT THE WEARER FULL MOBILITY WITHOUT INTERFERING WITH PHYSICAL CAPABILITY.  ALTHOUGH THE HUMAN SKIN IS STRETCHED DURING BODY MOTION, THERE IS VIRTUALLY NO STRETCH ALONG CERTAIN LINES, HERE CALLED "LINES OF NONEXTENSION."  THE INVESTIGATION WAS UNDERTAKEN TO DETERMINE THE EFFICACY OF UTILIZING LINES OF NONEXTENSION TO PROVIDE NATURAL MOBILITY AND MINIMAL BALLOONING IN FULL-PRESSURE SUITS.  THE PROGRAM OF INVESTIGATION PURSUED WAS:  (1) TO MAP OUT THESE LINES OF NONEXTENSION, (2) TO TEST WHETHER STRING ELEMENTS OF HIGH ELASTIC MODULUS, A CONNECTED NETWORK, COULD BE LAID ALONG THESE LINES OF NONEXTENSION WITHOUT PROVIDING ANY CONSTRAINT TO MOBILITY, (3) TO OBTAIN A HIGHLY MOBILE PRESSURE-RETAINING LAYER TO BE CONSTRAINED BY THE NET, AND (4) TO CONSTRUCT AND DEMONSTRATE AN ENTIRE PRESSURE-RETAINING GARMENT SYSTEM THAT MAKES USE OF ALL NECESSARY LAYERS AND STRING ELEMENTS IN A COMPLETELY CONNECTED, NETTED COVERING FOR THE BODY, WITH MINIMAL CONSTRAINT TO MOBILITY UP TO 5 PSI.  A MOBILE PRESSURE-RETAINING GARMENT WAS DEVELOPED BY BUILDING EACH STRUCTURAL, FUNCTIONAL LAYER INTO THE COMPOSITE GARMENT IN ACCORDANCE WITH THE BASIC DESIGN THEORY.  (AUTHOR) (U)

14

UNCLASSIFIED /Z0M08
SUPPLEMENTARY NOTE:

DESCRIPTIONS: (*ARMY PERSONNEL), (*ARCTIC REGIONS), (*PROTECTIVE CLOTHING), (*ACCLIMATIZATION), (*SCIENTIFIC RESEARCH), (*SHELTERS), (*HEATING), (*FEET), (*HANDS), (*CLIMATE), (*EXPOSURE SUITS), (*HEAT PRODUCTION), (*GLOVES), (*SHOES)

IDENTIFIERS: (*CLIMATE), (*COLD TOLERANCE)

THE RESULTS ARE SUMMARIZED OF A RESEARCH PROGRAM ON AUXILIARY HEATING WITH MINIMUM POWER. THE PROGRAM ESTABLISHED THE FEASIBILITY OF TWO APPROACHES: AUXILIARY HEATING FOR THE EXTREMITIES OF THE BODY AND A CONDITIONED AIR-CLOTHING SYSTEM THAT PROBABLY HAS PRIMARY APPLICATION IN HOT AND/OR TOXIC ENVIRONMENTS BUT COULD HANDLE COLD EASILY. PROTECTION OF THE INACTIVE SOLDIER IN EXTREMELY COLD ENVIRONMENTS WAS RESOLVED IN TERMS OF THE PARAMETERS OF WEIGHT AND COST. A 7-LB PROTOTYPE SYSTEM WAS ADEQUATE TO MEET MILITARY CHARACTERISTICS OF PROVIDING 8 HOURS OF PROTECTION FOR THE INACTIVE MAN AT -40 DEGREES F WITH A 3 MILE/HOUR WIND. IMPROVEMENT IN THE WEIGHT FACTOR CAN BE ANTICIPATED AS POWER SOURCE DEVELOPMENT IMPROVES OVER THE CURRENT 16 WATT-HOURS/POUND. A MORE IMMEDIATE USE OF AUXILIARY HEATED HARDWARE AND FOOTHARE IS IN AREAS WHERE POWER IS AVAILABLE SUCH AS MILITARY VEHICLES, RADIO AND RADAR EQUIPMENT, AND MISSILES. THE AUXILIARY HEATING SYSTEM DEVELOPED IS COMPATIBLE WITH A 12- OR 24-V AC OR DC POWER SOURCE.
A COMPARISON OF THREE FULL-PRESSURE SUITS IN TERMS OF CONTROL ACTIVATION TIME.

DESCRIPTIVE NOTE: FINAL REPT. FOR NOV 63-FEB 64;
DEC 64 22P SHARPEARL O 1
REPT. NO. TR-64-126
PROJ. 7184
TASK 718402

THREE PRESSURE SUITS, BOTH PRESSURIZED AND UNPRESSURIZED, WERE COMPARED ON THE BASIS OF TIMES TAKEN BY TWO SUBJECTS TO INITIATE ACTION AND TO REACH TO AND OPERATE CONTROLS LOCATED IN VARIOUS POSITIONS IN A SIMULATED WORKSPACE. THE SUITS COMPARED WERE THE APOLLO PHASE B, THE GEMINI G2C-1, AND THE APOLLO 1960 STATE-OF-THE-ART. THE CONTROLS USED WERE KNOBS, TOGGLE SWITCHES, AND PUSHBUTTONS. THE WORK AREA INVESTIGATED WAS SEMICIRCULAR, EXTENDING LEFT AND RIGHT 78 DEGREES, 34 TO 49 INCHES ABOVE THE FLOOR, AT A DISTANCE OF APPROXIMATELY 2 FEET. AVERAGE TIMES FOR EACH COMBINATION OF SUIT, SUIT CONDITION (PRESSURIZED OR UNPRESSURIZED), CONTROL TYPE, CONTROL LOCATION, AND HAND USED ARE PRESENTED. NO SUIT APPEARED TO BE UNEQUIVOCALLY SUPERIOR. TOTAL TIME TO INITIATE ACTION AND TO REACH TO AND OPERATE TOGGLE SWITCHES AND PUSHBUTTONS WAS TYPICALLY, ALTHOUGH NOT UNIVERSALLY, SHORTER WHEN WEARING THE APOLLO 1960 STATE-OF-THE-ART SUIT. TOTAL TIME TO INITIATE ACTION AND TO REACH TO AND OPERATE KNOBS WAS TYPICALLY, ALTHOUGH NOT UNIVERSALLY, SHORTER WHEN WEARING THE GEMINI G2C-1 SUIT. HOWEVER, NOT ALL LOCATIONS COULD BE REACHED WHEN WEARING THIS SUIT.
A REVIEW OF CURRENT CONCEPTS AND PRACTICES USED TO CONTROL BODY HEAT LOSS DURING WATER IMMERSSION, (U)

64 33P BECKMAN, E. L.
REPT. NO. MR-005-13-4001-06 R-3

SUPPLEMENTARY NOTE: PRESENTED TO THE AEROSPACE MEDICAL PANEL GENERAL ASSEMBLY OF ADVISORY GROUP FOR AERONAUTICAL RESEARCH AND DEVELOPMENT (14TH), HELD AT LISBON, PORTUGAL, 12 SEP 64. AVAILABLE COPY WILL NOT PERMIT FULLY LEGIBLE REPRODUCTION. REPRODUCTION WILL BE MADE IF REQUESTED BY USERS OF DDC. COPY IS AVAILABLE FOR PUBLIC SALE.

DESCRIPTORS: (PROTECTIVE CLOTHING, SURVIVAL(PERSONNEL)), (SURVIVAL(PERSONNEL), PROTECTIVE CLOTHING), (UNDERWATER CLOTHING, THERMAL INSULATION), BODY TEMPERATURE, HYPOThERMIA, HEAT PRODUCTION (BIOLOGY), TOLERANCES (PHYSIOLOGY), STRESS (PHYSIOLOGY), WATER, MOISTURE PROOFING, THERMAL CONDUCTIVITY, WOOLEN TEXTILES, SYNTHETIC RUBBER, FATS, MUSCLES, EXTREMITIES, SWIMMING, GLOVES, SHOES, EXPOSURE SUITS (U)
IDENTIFIERS: COLD TOLERANCE, IMMERSION (U)

THE PROBLEM OF PROVIDING ADEQUATE CLOTHING FOR PERSONNEL WHO EITHER DURING NORMAL OPERATIONS OR ACCIDENTALLY ARE IMMERSED IN COLD WATER HAS CONTINUED. TO CHALLENGE CLOTHING MANUFACTURERS. IN THE PAST DECADE THE DEVELOPMENT OF FOAMED PLASTICS AND OTHER CLOTHING MATERIALS HAS OFFERED NEW POSSIBILITIES. LIKEWISE ADVANCES IN ENERGY CONVERSION AND STORAGE SYSTEMS OFFER NEW SOLUTIONS TO THIS CRITICAL OPERATIONAL PROBLEM. THE BASIC PHYSICAL AND PHYSIOLOGICAL CONCEPTS WHICH RELATE TO THE PROBLEM OF LIMITING THERMAL LOSS FROM THE IMMERSED HUMAN WILL BE REVIEWED. NEWER TECHNICAL DEVELOPMENTS IN INSULATIVE CLOTHING AND SUPPLEMENTAL HEATING SYSTEMS WILL BE DISCUSSED WITH RELATION TO THESE BASIC CONCEPTS. (AUTHOR) (U)
WILEY POST: FIRST TEST OF HIGH ALTITUDE PRESSURE SUITS IN THE UNITED STATES.

DESCRIPTIVE NOTE: HISTORICAL NOTE:
SEP 64 6P WILSON, CHARLES L.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PUB. IN ARCH ENVIRON HEALTH V10 PB05-10 MAY 1965 (COPIES AVAILABLE FROM AUTHOR: HQ AFSC (SCTB) U.S.A.F. ANDREWS AIR FORCE BASE, WASHINGTON, D.C., 20331).

DESCRIPTORS: PRESSURE SUITS, TESTS, HIGH ALTITUDE, AVIATION PERSONNEL, UNITED STATES, DESIGN, TEXTILES, RUBBER COATINGS, FLIGHT TESTING, LIQUEFIED GASES, OXYGEN, HISTORY

THREE DIFFERENT HIGH ALTITUDE SUITS WERE DESIGNED AND TESTED FOR WILEY POST. THE REPORT CONTAINS A PHOTOGRAPH OF EACH OF THESE THREE SUITS. TWO LOW PRESSURE CHAMBER TESTS WERE CONDUCTED USING THE FINAL SUIT. THESE REPRESENT THE FIRST UNITED STATES TESTS OF A HUMAN SUBJECT IN A HIGH ALTITUDE PRESSURE SUIT AT LOW BAROMETRIC PRESSURES. POST EMPLOYED HIS SUIT ON AT LEAST TEN AND POSSIBLY 17 FLIGHTS AND USED LIQUID OXYGEN ON ALL SUCH FLIGHTS.
ACOUSTICAL EVALUATION OF X-20A DYNA-SOAR FULL-PRESSURE SUIT ASSEMBLIES. *(U)*

DESCRIPTIVE NOTE: FINAL REPT.

MAY 65 30P SOMMER, HENRY C. IMHILLE.

REPT. NO. AMRL-TR-65-86

PROJ: 7231

TASK: 723103

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (PRESSURE SUITS; ACOUSTIC PROPERTIES); (ASTRONAUTS, AUDITORY PERCEPTION); HELMETS; NOISE; SOUND TRANSMISSION; ATTENUATION; TRAINING; FLIGHT CLOTHING; EXPOSURE SUITS; AUDITORY SIGNALS; SPACECRAFT CABINS; EARPHONES; MICROPHONES; COMMUNICATION EQUIPMENT; BOOST GLIDE VEHICLES *(U)*

IDENTIFIERS: EVALUATION; X-20 SPACECRAFT *(U)*

Supplementary Note:

Descriptors: (Pressure Suits, Maneuverability), (Performance (Human), Space CFRWS), Motor Reactions, Performance (Human), Computers, Oscilloscopes, Rotation, Gloves, Inhibition, Design, Anthropometry, Tracking (U)

Identifiers: Mark-IV Pressure Suits (U)

Two subjects wearing Mark IV pressure suits, under both the pressurized and unpressurized condition, were tested on several performance tasks. The purpose of the study was to provide an evaluation of performance tasks under suit conditions. Results of the study indicated that the tasks can be successfully presented on an oscilloscope under computer control to evaluate performance capability of suited crew members. Two interesting effects identified in the experimental data were related to characteristics of the pressure suit when pressurized: (1) The subjects were hindered in the performance of a tracking task because they were unable to rotate their wrists, and (2) one subject had difficulty operating push buttons, which were separated by 5/8 in. between edges, because of the characteristics of the gloves included with the Mark IV suit. (Author) (U)
SPACE CLOTHING OF SUBJUGATORS OF OUTER SPACE: (U)

JUN 65  8P  KRICHAGIN, V. I
REPT. NO.  FTD-TT-65-604
MONITOR: TT  45-63335

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF

DESCRIPTORS:  (PRESSURE SUITS, ASTRONAUTS), (EXPOSURE
SUITS, ASTRONAUTS), AEROSPACE MEDICINE, SPACE
ENVIRONMENTS, DESIGN, USSR  (U)

TRANSLATION OF RUSSIAN RESEARCH: USES OF SPACE
CLOTHING FOR ASTRONAUTS.
THE PURPOSE OF THIS STUDY WAS TO TEST AND EVALUATE
THE U. S. AIR FORCE EXPERIMENTAL CUTAWAY TYPE
ANTI-BLACKOUT SUIT DESIGNATED MA-1. THE MA-1
ANTI-BLACKOUT SUIT WAS TESTED AND EVALUATED FOR ANTI-
BLACKOUT PROTECTION AT VARIOUS POSITIVE G LEVELS TO
THE POINTS OF GREYOUT AND BLACKOUT. THE RESULTS OF
THE ANTI-BLACKOUT PROTECTION AFFORDED BY THE ANTI-
BLACKOUT SUIT HAS BEEN PRESENTED IN TABLE FORM.
THE SUIT IS COMFORTABLE, PROVIDES ADEQUATE ANTI-
BLACKOUT PROTECTION, AND WOULD PROBABLY BE WELL
ACCEPTED BY FLEET PILOTS. NO MAJOR DIFFERENCES
WERE NOTED BETWEEN THE PROTECTION AFFORDED BY THE
MA-1 ANTI-BLACKOUT SUIT BETWEEN EXPERIENCED AND
INEXPERIENCED SUBJECTS. (AUTHOR)
UNCLASSIFIED

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TO DETERMINE THE SOUND ATTENUATION CHARACTERISTICS OF THE PROJECT MERCURY PREPRODUCTION FULL PRESSURE SUIT HELMET USING TWO DIFFERENT METHODS:

(1) PSYCHOPHYSICAL: THE DIFFERENCES BETWEEN A TRAINED LISTENER'S AUDITORY THRESHOLDS FOR VARIOUS TEST TONES WITHOUT HELMET AND THE THRESHOLDS OBTAINED WHILE WEARING THE HELMET DEFINED THE RELATIVE ATTENUATION VALUES AT LOW SOUND PRESSURE LEVELS.

(2) PHYSICAL: DIFFERENCES BETWEEN SOUND PRESSURES MEASURED OUTSIDE THE SUIT AND THOSE MEASURED UNDER THE RIGHT EARPHONE CUSHION BY A PROBE MICROPHONE WERE TAKEN AS ATTENUATION VALUES UNDER HIGH SOUND PRESSURE LEVEL (SPL) CONDITIONS.

MEASUREMENTS MADE UNDER LOW SPL CONDITIONS SHOW THAT THE 'REAL-EAR' ATTENUATION VALUES OBTAINED WITH TEST TONES 250 CPS, 500 CPS, 1000 CPS, 2000 CPS, 4000 CPS, 6000 CPS, AND 8000 CPS EXCEEDED PRE-ESTABLISHED SPECIFICATIONS.

ATTENUATION VALUES OBTAINED WITH TEST TONES 125 CPS, 1000 CPS, 2000 CPS, 3000 CPS, AND A WIDE BAND OF NOISE (20 TO 10,000 CPS) DID NOT MEET SPECIFICATIONS. THE ATTENUATION MEASURED BY PHYSICAL METHODS USING AS REFERENCE FREQUENCIES 125 CPS, 500 CPS, 1000 CPS, 2000 CPS, 3000 CPS, 4000 CPS, 6000 CPS, AND 8000 CPS EACH PRESENTED AT 120 DB SOUND PRESSURE LEVELS DID NOT MEET SPECIFICATIONS.

(AUTHOR)
STUDY AND DEVELOPMENT OF MATERIALS AND TECHNIQUES FOR PASSIVE THERMAL CONTROL OF FLEXIBLE EXTRAVEHICULAR SPACE GARMENTS.

DESCRIPTIVE NOTE: FINAL REPT. JUL 64-JUN 65, SEP 65-SEP 66. RICHARDSON, DAVID L.

CONTRACT: AF33(615)-1904

PROJECT: 6373

TASK: 637302

MONITOR: AMRL, TR-65-156

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (TEMPERATURE CONTROL, PROTECTIVE), (PROTECTIVE CLOTHING, SPACE ENVIRONMENT), THERMAL CONDUCTIVITY, THERMAL INSULATION, HELIUM, HEATING

THE PROGRAM ENCOMPASSED AN ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF THE APPLICATION OF PASSIVE THERMAL CONTROL TECHNIQUES TO EXTRAVEHICULAR FLEXIBLE SPACE GARMENTS IN 300 NAUTICAL MILE EARTH ORBITS. RESULTS INDICATE THAT PASSIVE THERMAL CONTROL BY VARYING THE ABSORPTANCE AND EMITTANCE OF THE OUTER SURFACE OF THE GARMENT IS NOT POSSIBLE WHEN INTERNAL HEAT GENERATED IS IN EXCESS OF 1500 BTU/HR. FOR ALL CONDITIONS, THE GARMENT'S SOLAR ABSORPTANCE SHOULD BE AS SMALL AS POSSIBLE AND ITS EMITTANCE AS LARGE AS POSSIBLE. BY CONTROLLING THE CONDUCTANCE OF THE SPACE SUIT WALL, INTERNAL HEATING RATES TO 2000 BTU/HR ARE ACHIEVABLE WHEN THE SUIT HAS AN ABSORPTANCE OF 0.17 AND AN EMITTANCE OF 0.85. A SOLAR PARASOL WITH SELECTED RADIATING PROPERTIES ON EACH SIDE ALLOWS FOR HIGHER INTERNAL HEATING RATES. EXPERIMENTS WERE MADE IN A SIMULATED NOON ORBIT WITH A CYLINDRICAL SECTION OF A SPACE SUIT WHICH WAS FIRST TESTED WITH AN EVACUATED INSULATION AND THEN WITH A HELIUM-FILLABLE INSULATION. THE RANGE OF AVERAGE CONDUCTANCE FOR THESE INSULATIONS WAS 0.3 TO 4.0 BTU/SQ FT HR F. A RANGE OF INTERNAL HEAT GENERATION FROM 600 TO 2100 BTU/HR WAS ACHIEVED WHEN THE EVACUATED INSULATION WAS FILLED WITH HELIUM. (AUTHOR)
A series of experiments has been designed to determine the water, energy, and protein requirements of man under various simulated aerospace conditions. The experiment described measured the effects of wearing a MA-10 pressure suit continuously for 14 days on the aforementioned measurements. A freshly prepared diet that closely matched proposed aerospace diets was fed to four human volunteers and coefficients of apparent digestibility and balances of the component nutrients were determined. The results showed that the wearing of unpressurized MA-10 suits under ambient conditions for 14 days did not affect the subjects' fluid intake and output. No significant changes were observed in digestibilities or balances of the nutrient components. Results indicated that the fresh food diets was very efficiently utilized. No significant changes in subject blood pressures, oral temperatures or pulse rates were observed during the experiment. All hematological and chemical analyses of blood were within the normal range and did not exhibit differences between experimental periods. The 2 day menu of fresh foods proved to be very acceptable and did not decrease in acceptability during the 42 day experiment. (U)
PROBLEMS OF MOVING THROUGH HATCHWAYS UNDER ZERO AND LUNAR GRAVITY CONDITIONS, AND RELATED DESIGN PROBLEMS OF HATCH SIZE AND SHAPE, WERE INVESTIGATED IN FLIGHT. SUBJECTS WERE TIMED AND PHOTOGRAPHED AS THEY ACCOMPLISHED VARIOUS MOTIONS DURING WEIGHTLESS AND LUNAR-GRAVITY MANEUVERS OF A LARGE CABIN AIRCRAFT. PERFORMANCE DATA ARE PRESENTED FOR VARIOUS COMBINATIONS OF CLOTHING, GRAVITY AND BODY-POSITION CONDITIONS. TIME AND CONTACT DATA ARE PRESENTED FOR THE EGRESS MOTION AS IT IS INFLUENCED BY CHANGES IN THE EXIT AREA. ORIENTATION PROBLEMS AND MANEUVERING TECHNIQUES, AS INFLUENCED BY AREA AND VOLUME RESTRICTIONS, ARE DISCUSSED. MOTIONS OF PRESSURE-SUITED SUBJECTS GENERALLY REQUIRED 30% MORE TIME THAN CORRESPONDING MOTIONS OF UNSUITED SUBJECTS; MOST MOTIONS REQUIRED 35% MORE TIME DURING ZERO G THAN DURING LUNAR G. NO SIGNIFICANT DIFFERENCES IN EGRESS TIMES WERE FOUND AMONG FOUR BODY-POSITIONS. COMPARED WITH 1 INCH OF EXIT CLEARANCE, 5 INCHES OF CLEARANCE IMPROVED EGRESS TIME BY APPROXIMATELY 6%. ACCURACY, RATHER THAN TIME OF MOTION, APPEARED TO BE A MORE SENSITIVE MEASURE OF OPERATOR PERFORMANCE FOR THE EGRESS TASK. A 95TH PERCENTILE SHOULDER PLANE WITH A 19±4-INCH MAJOR AXIS IS PROPOSED AS A BASIC EGRESS REFERENCE. (AUTHOR)
Efficacy of Pressure Suit Cooling Systems in Hot Environments.

Descriptive Note: Final Rept. for Jul-Dec 64; Oct 65. Vechte, James H.

Rept. No.: AMRL-TR-65-50
Proj. No.: AF-7164
Task No.: 716409

Three different air distributing systems and one water-cooled system were evaluated for efficacy in cooling a person in a full pressure suit. Five subjects participated in experiments at atmospheric pressure in a 43°C environment. The pressure suit was worn unpressurized and pressurized at 192 mm Hg. The results show the separate tubular air ventilating garment to be equal to or superior in evaporative cooling efficiency to either an extremity distributing system which is an integral part of the current operational full pressure suit; or to the standard Air Force ventilating garment. The water-cooled system was superior to all air distribution systems and the subjects were comfortable for the entire two-hour test period. In control experiments with no ventilation, tolerance limits were reached before the end of two hours. On the basis of these data, serious consideration of water-cooled suit systems for maintaining a person in thermal comfort under conditions of thermal stress should be continued.
Effects of Various Gases on Handgear Insulation

The effect of gases having different thermal conductivities on the thermal insulation of handgear was investigated. Experimental mittens with special plastic spacer interliners of various thicknesses were sealed between gas-impermeable outer and inner shells and filled first with room air (as control), then various experimental gases, and thermal insulation measured on a copper hand. Experimental gases included carbon dioxide, Freon-12, and helium. Comparative results are presented in terms of percentage insulation change (clo per inch); conductivity (k) values; and the measured thermal insulation (clo) values.

Before all tests each mitten was evacuated (13 cm Hg) to remove all entrapped air, then filled without contamination with the control, or experimental gas. Gas within the handgear was maintained at a constant positive pressure (7.6 mm water) throughout each experiment. Mean measurements showed significant increases (13-32%) of thermal insulation for Freon-12 and carbon dioxide, with decreased insulation observed with helium. Significance and some practical application of these results for protective clothing design are shown.

UNCLASSIFIED
RESEARCH WAS PERFORMED ON THE THERMAL-PHYSICAL PARAMETERS OF MATERIALS NECESSARY FOR PROTECTION AGAINST INTENSE THERMAL RADIATION. IN THE THEORETICAL STUDIES, A SIMPLIFIED MODEL OF THE FABRIC-SKIN SYSTEM WAS CHOSEN AND THE HEAT FLOW EQUATIONS WERE SOLVED USING AN EXPLICIT FINITE DIFFERENCE CALCULATION PROCEDURE PROGRAMMED FOR SOLUTION ON A CONTROL DATA G-150 DIGITAL COMPUTER. SEVERAL SAMPLE CALCULATIONS WERE COMPARED WITH RESULTS EXISTING IN THE LITERATURE AND A LIMITED PARAMETER STUDY WAS PERFORMED WITH VARIATION OF THE FABRIC SURFACE HEAT TRANSFER COEFFICIENTS. FABRIC TEST SAMPLES WERE IRRADIATED IN AN ARC IMAGE FURNACE TEST FACILITY AND THE HEATING AND DEGRADATION PROCESSES WERE QUALITATIVELY AND QUANTITATIVELY STUDIED WITH A MACH-ZEHNDER INTERFEROMETER. THIS INSTRUMENT PROVIDED FABRIC SURFACE TEMPERATURE DATA, HEAT TRANSFER COEFFICIENT INFORMATION, AND A BETTER INSIGHT INTO THE CHEMICAL PROCESSES TAKING PLACE. (AUTHOR)
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /ZOM08

UNCLASSIFIED

EVALUATION OF IMPROVED EXHALATION VALVE FOR HGU-8/P FLYING HELMET. (U)

DESCRIPTIVE NOTE:  FINAL REPT. AUG 63-DEC 65, APR 66 33P GOOD DONALD R. 1
PROJ: AF-913A-0000-97144.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

IDENTIFIERS: EVALUATION (U)

THE REPORT RECORDS THE RESULTS OF A COMPONENT IMPROVEMENT PROGRAM ON AN EXHALATION VALVE FOR THE HGU-8/P PARTIAL PRESSURE SUIT HELMET. THE PROGRAM WAS INTENDED PRIMARILY TO ELIMINATE THE TENDENCY FOR SUDDEN PRESSURE LOSS WITHIN THE HELMET CAUSED BY IMPROPER AND ERRATIC CLOSING CHARACTERISTICS OF THE EXHALATION VALVE AND TO MEET ADDITIONAL DESIGN OBJECTIVES OF GREATER OPENING SENSITIVITY, LOWER PRESSURE DROPS DURING FLOW CONDITIONS, AND AN OVERALL INCREASE IN RELIABILITY. THE VALVE AND ITS FUNCTION ARE DESCRIBED. INTERNAL FRICTION OF MOVING PARTS WAS REDUCED. THE OPENING OR 'CRACKING' PRESSURE WAS REDUCED AND THE DIFFERENTIAL PRESSURE UNDER FLOW CONDITIONS WAS IMPROVED SIGNIFICANTLY. TEST PROCEDURES AND RESULTS OBTAINED DURING LOW TEMPERATURE TESTS AND ROOM TEMPERATURE TESTS AT HIGH ALTITUDE ARE PRESENTED. IT IS CONCLUDED THAT THE IMPROVED DESIGN MEETS THE INITIAL OBJECTIVES OF THE PROGRAM. (AUTHOR) (U)

30

UNCLASSIFIED /ZOM08
THE PROBLEM OF PROVIDING ADEQUATE CLOTHING FOR PERSONNEL WHO EITHER ACCIDENTALLY OR OTHERWISE ARE IMMERSED IN COLD WATER HAS CONTINUED TO CHALLENGE CLOTHING MANUFACTURERS FOR THE PAST DECADE. THE DEVELOPMENT OF FOAMED PLASTICS AND OTHER CLOTHING MATERIALS OFFERS NEW POSSIBILITIES. LIKewise NEW ADVANCES IN ENERGY CONVERSION SYSTEMS OFFER NEW SOLUTIONS TO THIS CRITICAL OPERATIONAL PROBLEM. THE BASIC PHYSICAL AND PHYSIOLOGICAL CONCEPTS WHICH PERTAIN TO THE PROBLEM OF LIMITING THERMAL LOSS FROM THE IMMERSED HUMAN ARE REVIEWED. THE NEWER TECHNICAL DEVELOPMENTS IN INSULATIVE CLOTHING AND SUPPLEMENTAL HEATING SYSTEMS ARE REVIEWED. THE NEWER TECHNICAL DEVELOPMENTS IN INSULATIVE CLOTHING AND SUPPLEMENTAL HEATING SYSTEMS ARE REVIEWED AND DISCUSSED WITH RELATION TO THESE BASIC CONCEPTS.
A STUDY OF TECHNIQUES AND EQUIPMENT FOR THE EVALUATION OF EXTRAVEHICULAR PROTECTIVE GARMENTS. (U)

DESCRIPTIVE NOTE: FINAL REPT., AUG 64-JUN 65.

FERGUSON, PARRY, DAVID G.; CURRY, LEROY R., JR.; THOMASON, DONALD B.; ITOWLE, GEORGE B.;

REPT. NO. HSER-3671,

CONTRACT: AF 33(615)-1780,

PROJECT: AF-6301,

TASK: 630104,

MONITOR: AMRL TR-66-4

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTION: (*ASTRONAUTS; PRESSURE SUITS), (*PROTECTIVE CLOTHING; ASTRONAUTS), CLOSE ECOLOGICAL SYSTEMS; LIFE SUPPORT; SPACE ENVIRONMENTS; PERFORMANCE(HUMAN), MODELS(STIMULATIONS), ANTHROPOMETRY, THERMAL CONDUCTIVITY, HEAT TRANSFER, LOADS( FORCES), JOINTS( PHYSIOLOGY), METABOLISM, MOBILITY, TORQUE, GLOVES, HELMETS, RADIATION HAZARDS, DATA PROCESSING, TELEMETRY SYSTEMS, TEST METHODS, PARTIAL DIFFERENTIAL EQUATIONS, MATRICES(MATHEMATICS), GONIOMETERS, SPACE SIMULATION CHAMBERS, BODY TEMPERATURE, OXYGEN CONSUMPTION (U)

THE PURPOSE OF THIS STUDY WAS TO ESTABLISH A TEST METHODOLOGY AND A TEST SYSTEM FOR OBJECTIVE, QUANTITATIVE, AND ACCURATE EVALUATION OF EXTRAVEHICULAR SPACE PROTECTIVE GARMENTS. AREAS OF TESTING STUDIED INCLUDE FUNCTIONAL PERFORMANCE, LIFE SUPPORT, AND ENVIRONMENTAL PROTECTION. EMPHASIS IS PLACED ON THE PROBLEM OF SUIT TORQUE RESTRAINTS. IN MOBILITY, CONCEPTS FOR APPROPRIATE EVALUATION CRITERIA ARE DISCUSSED. THE INFORMATION PRESENTED AND CONCLUSIONS REACHED ARE THE RESULTS OF EXPERIENCE IN SUIT TESTING, TECHNICAL ANALYSIS, SEARCH OF THE LITERATURE, AND DISCUSSIONS WITH EXPERTS. THE NATURE AND CAUSES OF SUIT TORQUE RESTRAINT ARE DISCUSSED AND A PIN JOINED MODEL IS DEVELOPED FOR PRECISE DESCRIPTION OF SUIT TORQUES AND BODY INTERLINK ANGLES. VARIOUS TECHNIQUES FOR TORQUE VECTOR AND BODY ANGLE MEASUREMENTS ARE EXPLORED AND IT IS CONCLUDED THAT A POWERED ARTICULATED DUMMU AND AN INTRASUIT EXOSKELETAL ELECTROGONIOMETER WITH OFF-
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z04008

AD-636 044 9/11
BIOTECHNOLOGY INC ARLINGTON VA

EFFECTIVE LIFE SUPPORT HELMETS* (U)

63 1966P PARKER, JAMES F., JR. 1
DILLON, RICHARD F. 1
REPT. NO. 64-3,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SPONSORED IN PART BY ONR
PROCEEDINGS OF AN INVITED SYMPOSIUM, WASHINGTON, D.
C., 31 OCT-1 NOV 63.

DESCRIPTORS: (PRESSURE SUITS, HELMETS), (HELMETS,
*LIFE SUPPORT*, EFFECTIVENESS, SYMPOSIA, DESIGN, TEST
EQUIPMENT, OXYGEN, SAFETY)

CONTENTS: PHILOSOPHY OF CURRENT PROTECTIVE
HELMET; DEFECTS OF CURRENT NAVY HELMETS;
ACCIDENT DATA RELATED TO APH-5 PERFORMANCE;
IMPROVED ACCIDENT REPORTING PROCEDURES RELATED TO
HELMET PERFORMANCE; COOLING AND VENTILATION
REQUIREMENTS FOR LIFE SUPPORT HELMETS;
COMMUNICATIONS REQUIREMENTS FOR LIFE SUPPORT
HELMETS; LENS AND VISOR SYSTEMS INFLUENCING HELMET
DESIGN; OXYGEN REQUIREMENTS IN FUTURE HELMET
DESIGN; DYNAMIC TESTING OF PROTECTIVE HELMETS;
DESIGN CRITERIA AND PARAMETERS OF LIFE SUPPORT
HELMETS; NAVY PHILOSOPHICAL CONSIDERATIONS IN
FUTURE HELMET DESIGN; SUMMARY OF RECOMMENDED
SPECIFICATIONS FOR IMPROVED LIFE SUPPORT HELMET* (U)

33

UNCLASSIFIED /Z04008
The convector investigated was an experimental prototype designed as a body warmer to heat the space between the wearer's body and his outer apparel. Three prototypes were investigated under a series of conditions including standard, low-temperature, and operational. Under these conditions, data on ignition, fuel regulation, fuel consumption, convector thermal capacitance, and safety were obtained. Results of the investigation showed that operation of the prototype convectors can be regulated for consistent operation within 9 percent. If the fuel rate is monitored and controlled, the convector thermal capacitance may be regulated within 5 percent to assure the constancy of this variable when applied to human test subjects. Although there is a potential hazard of fire, heat injury and toxicity from use of the open-flame convector as a body warmer, its performance within safety threshold limits is obtainable. The fire and heat injury hazards are minimized when the fuel regulating valve is prewarmed at low temperatures and the burner is ignited in a shielded enclosure. Carbon monoxide concentration was reduced to acceptable threshold limits, less than 0.01 percent, when the convectors were operated at low-temperature operational conditions.
AN IMPROVED SIMPLEX KNITTED FABRIC WAS DEVELOPED FOR USE IN SUMMER FLYING GLOVES WHICH WOULD EFFECT BETTER PROTECTION IN THE EVENT OF EXPOSURE TO FLAMES AND REDUCE OR ELIMINATE THE DIFFICULTIES ENCOUNTERED WITH THE FILAMENT SIMPLEX FABRIC. THE FABRIC WAS TO CONFORM TO ALL THE REQUIREMENTS NEEDED FOR COMFORT, SERVICEABILITY AND PROTECTION. ALL MANUFACTURING TECHNIQUES UTILIZED IN THIS EFFORT WERE TO CONFORM TO AND BE COMPATIBLE WITH STANDARD COMMERCIAL METHODS FOR REPRODUCING THE FINISHED PRODUCT. THE PRIMARY DIFFICULTIES ENCOUNTERED IN THE FLEET EVALUATION OF THE FILAMENT GLOVE WERE LIMITED TO SEAM SLIPPAGE AND GLOVE FIT. SINCE THE SEAM SLIPPAGE PRESENTS A PROBLEM IN SERVICEABILITY, IT IS PROPOSED THAT THE YARN STRUCTURE BE MODIFIED FROM A CONTINUOUS FILAMENT YARN TO A YARN SPUN FROM SHORT LENGTH STAPLE FIBERS. THIS IN ITSELF WOULD EFFECT A GREATER DEGREE OF SURFACE COHESIVENESS WITHIN THE FABRIC STRUCTURE AND THUS HELP TO HOLD THE SEAMS IN PLACE. AS FAR AS THE GLOVE FIT IN THE THUMB AREA WAS CONCERNED, A SIMPLE MODIFICATION OF THE PATTERN ACCOMPLISHED THE CHANGE.
AN EVALUATION OF THE FOAMED NEOPRENE 'DIVER'S WET SUIT' AS A SURVIVAL GARMENT FOR HELICOPTER AIRCREWS (U)

DESCRIPTIVE NOTE: MEDICAL RESEARCH INTERIM REPT.
JUL 66 35P  REEVES,ELIZABETH 1STEPHENS,
MELVIN P• IBECkMAN,EDWARD L• 1
MONITOR: NAVMED MF-011*99-10017

THE TYPE OF FLIGHTS PERFORMED BY HELICOPTERS
REQUIRE PARTICULAR GARMENTS FOR THEIR AIRCREWS AS
FOLLOWS: (1) WATER ENTRY BY AIRCREW IS BY WAY OF
WATER COLLISION SO THAT THERE IS A HIGH PROBABILITY
OF DAMAGE TO THE SURVIVAL GARMENT! (2) THE SHORT
FLIGHT RADIUS OF THE HELICOPTER ENSURES THAT THE
TIME-DISTANCE FROM A POTENTIAL RESCUE PROM SHOULDE
BE RELATIVELY SHORT, SO THAT RESCUE SHOULD BE EXPECTED
IN LESS THAN 4 HOURS! (3) THE SUIT MUST BE
WEARABLE WITHOUT AN AIR VENTILATED SUIT FOR COOLING
AND STILL BE USABLE IN HIGH COCKPIT TEMPERATURES UP
TO 90F; AND, (4) THE LOW ALTITUDE OF FLIGHT
ALLOWS NO TIME TO DON OR ZIPPER UP A SURVIVAL GARMENT
SO THAT THERE SHOULD BE NO SIGNIFICANT PENALTY FOR
ENTERING THE WATER WITH THE GARMENT PARTIALLY
UNZIPPED. LABORATORY EXPERIMENTS USING A VARIETY
OF ANTIEXPOSURE ASSEMBLIES DEMONSTRATED THAT THE 3/16
INCH* FOAMED NEOPRENE WET SUIT, MITTENS, HOOD, AND
INSULATED RUBBER 'THERMAL' BOOTS PROVIDED THE MOST
COMFORTABLE AND EFFICIENT CONFIGURATION. TOLERANCE
TIMES WERE ESTABLISHED FOR SUCH CLOTHING IN 40, 50,
AND 60F. WATER. (AUTHOR)
VERSUS 'DRY' SUIT APPROACHES TO WATER IMMERSION PROTECTIVE CLOTHING: (U)

66 3P GOLDMAN, R. F. BRECKENRIDGE, J. R. TREEVES, E. BECKMAN, E. L. I

UNCLASSIFIED REPORT

AVAILABILITY: PUBLISHED IN AEROSPACE MEDICINE V37

SUPPLEMENTARY NOTE:

DESCRIPTORS: (PROTECTIVE CLOTHING, THERMAL INSULATION), FLIGHT CLOTHING, FLIGHT CREWS, AIR, WATER, SYNTHETIC RUBBER, COMPRESSIVE PROPERTIES, TEMPERATURE

IDENTIFIERS: IMMERSION, WATER

IMMERSION PROTECTION FLIGHT CLOTHING CAN BE OF EITHER A SKIN DIVER, 'WET' SUIT TYPE OR WATERPROOF, 'DRY' SUIT. A WATERPROOFED COOPER MANIKIN WAS USED TO STUDY THE INSULATIVE PROPERTIES OF BOTH TYPES OF SUITS, IN AIR AND ALSO DURING WATER IMMERSION. THE BULKIER CHARACTERISTICS OF THE DRY SUIT STUDIED; THE MARK 5A, PROVIDED GREATER INSULATION IN AIR THAN EITHER A 1/4 INCH OR 3/16 INCH UNICELL SPONGE, NEOPRENE WET SUIT. HOWEVER, DURING WATER IMMERSION, COMPRESSION OF THE 'DRY' SUIT BY THE WATER REDUCED THE INSULATION BY 75 PER CENT. THE INSULATION OF THE 'WET' SUITS WAS ALSO REDUCED BUT THESE SUITS ARE LESS COMPRESSIBLE AND THUS DURING WATER IMMERSION PROVIDE SIGNIFICANTLY MORE INSULATION THAN THE 'DRY' SUIT. (AUTHOR) (U)
DESIGN OF WOVEN AND LAMINATED FABRICS FOR TESTING OF THERMAL RESISTANCE

DESRIPTIVE NOTE: FINAL REPORT AUG 66 15P BROCKMANN, H. A. E.

CONTRACT: N62269-2231 TASK: RAE-00-0100/2021/0012-10-02

MONITOR: NAOC-MR 6612

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*THERMAL INSULATION, *TEXTILES), (*FIRE PROTECTIVE CLOTHING, THERMAL INSULATION), FIRE RESISTANT TEXTILES, LAMINATES, MANUFACTURING, EXPERIMENTAL DESIGN

IN AN EFFORT TO DEVELOP A SINGLE-LAYER FABRIC SPECIFICALLY CONSTRUCTED TO RESIST THERMAL RADIATION OF INTENSITY COMMENSURATE WITH THAT OF NUCLEAR DETONATIONS SEVERAL CONCEPTS WERE INVESTIGATED. THESE CONCEPTS WERE: (1) AIR SPACINGS INCORPORATED IN THE FABRIC BY WEAVING; (2) WEAVING INTO THE FABRIC A METALLIC SCRIM TO IMPede AND SPREAD LATERALLY THE HEAT PASSING THROUGH THE FABRIC; AND (3) INCORPORATING AN INSULATING LAYER BY LAMINATION BETWEEN TWO FABRIC LAYERS. FABRICS OF GOOD THERMAL RESISTANCE WERE OBTAINED AND CERTAIN PRINCIPLES WITH REGARD TO THERMAL PROTECTION WERE DERIVED FROM THE DATA GENERATED IN THIS STUDY TOGETHER WITH THOSE FROM EARLIER STUDIES ON FLAME CONTACT. FOREMOST AMONG THE LATTER IS THE FACT THAT AIR SPACING IS FAR MORE EFFICACIOUS AGAINST HEAT TRANSFER BY FLAME CONTACT THAN BY RADIATION.

(AUTHOR)
AN INVESTIGATION WAS CARRIED OUT TO DETERMINE THE EFFECTIVENESS OF NOMEX SUMMER FLYING COVERALLS PRINTED WITH A CAMOUFLAGE PATTERN AS COMPARED WITH THE STANDARD PLAIN OLIVE GREEN COVERALLS. LABORATORY TESTS INDICATED THAT CAMOUFLAGE PRINTING OF STAPLE NOMEX IN A RESIN-BONDED PIGMENT SYSTEM DOES NOT SIGNIFICANTLY ALTER THE FLAME-RESISTANT CHARACTERISTICS OF NOMEX. FIELD TESTS WITH MARINE UNITS SHOWED THAT THE CAMOUFLAGE SYSTEM CONSIDERED HERE OFFERED VERY LITTLE ADVANTAGE OVER THE ORDINARY OLIVE-GREEN NOMEX SUITS IN CONCEALMENT IN GREEN LEAFY AREAS AND NEITHER SUIT CONTRIBUTES TO CONCEALMENT IN PREDOMINANTLY BROWN SURROUNDINGS. (AUTHOR)
UNCLASSIFIED

SOVIET HIGH ALTITUDE EQUIPMENT FOR AIRCREW PROTECTION.

JUN 66 62P UMANSKII, S P. IREBROV, M. F G RABKIN, G. IBELEKII, B. L. ISOFRONOV, E. V. L
REPT. NO. ATD-66-67
MONITOR: TT 67-60028

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON SURVEYS OF FOREIGN SCIENTIFIC AND TECHNICAL LITERATURE. SPECIAL EXTENDED ABSTRACT AND TRANSLATIONS.

DESCRIPTORS: (*AEROSPACE CRAFT, AVIATION SAFETY), (*FLIGHT CLOTHING, HIGH ALTITUDE), FLIGHT CREWS, PRESSURE SUITS, HELMETS, PARACHUTES, EJECTION SEATS, JETTISONABLE EQUIPMENT, SPACECRAFT CABINS, ENVIRONMENT, OXYGEN MASKS, ACCELERATION, USSR

THE REPORT CONSISTS OF ABSTRACTS OF THE FOLLOWING TOPICS: THE PILOT ENDURANCE BARRIER PROTECTIVE EQUIPMENT FOR HIGH-ALTITUDE FLIGHTS, FUNCTIONS OF AUTOMATIC EQUIPMENT ON AIRCRAFT, FLIGHT SAFETY, CONSTRUCTION OF AIRCRAFT: AIRPLANES, ROCKETS, AND HELICOPTERS: AIRCRAFT EQUIPMENT.
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM08

AD-644 611 15/B 6/17
ARMY LIMITED WAR LAB ABERDEEN PROVING GROUND MD

VENTILATED FLIGHT SUIT. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
OCT 66 17P
HARDENBROOK, FREDERIC G. I
REPT. NO. LWL-TR-66-07
PROJ. 02-9-66

UNCLASSIFIED REPORT

DESCRIPTORS: (FLIGHT CLOTHING, TROPICAL REGIONS),
(AVIATION PERSONNEL, FLIGHT CLOTHING), VENTILATION,
COOLING, EFFICIENCY, PROTECTIVE CLOTHING, ENVIRONMENT,
AIR COOLED, LOGISTICS (U)

THE PURPOSE OF THIS DEVELOPMENT IS TO INCREASE THE
EFFICIENCY OF THE PILOT AND CO-PILOT OF THE MOHAWK
AIRCRAFT WHEN OPERATING IN HOT CLIMATES BY USING THE
PRINCIPLE OF EVAPORATIVE COOLING. TO DO SO, A
VENTILATED FLIGHT SUIT WAS DEVELOPED THROUGH
WHICH AMBIENT AIR COULD BE FORCED BY USING A SMALL
BLOWER AND FLEXIBLE TUBING CONDUCTING THE AMBIENT AIR
TO THE SUIT USING THE PERSPIRATION OF THE INDIVIDUAL
TO ACHIEVE THE COOLING. SERVICE TESTS MADE IN
SOUTH VIETNAM PROVED THE VENTILATED FLIGHT
SUIT INADEQUATE WHEN THE AIRCRAFT COOLING SYSTEM
WAS NOT IN OPERATION UNLESS A SUPPLEMENTARY
LIGHTWEIGHT, PORTABLE COOLING SYSTEM IS PROVIDED. (U)
UNCLASSIFIED

DEVELOPMENT OF THERMOELECTRIC HEATING AND VENTILATING SYSTEM (U)

DESCRIPTIVE NOTE: FINAL REPT* ON PHASE 3, 29 JUN 63-15 APR 65
APR 65 37P BERNARD ANDREW M. IFOX;
LEONARD J. 1
REPT NO: WAEC-65-264E
PROJ: 7X80-01-001

UNCLASSIFIED REPORT

DESCRIPTRORS: (Heaters, Exposure Suits), (Exposure Suits, *Cooling + Ventilating Equipment),
Thermodlectricity, Blowers, Generators, Packaging,
Portable Equipment, Performance (Engineering) (U)
IDENTIFIERS: Thermodlectric Power Generation (U)

THREE THERMOELECTRIC HEATING AND VENTILATING SYSTEMS FOR ENVIRONMENTAL CONTROL OF TROOPS WHEN EXPOSED TO EXTREME ENVIRONMENTS OR ENEMY IMPOSED HAZARDS WERE DELIVERED. MODIFICATIONS OF A BATTERY START, EASY FILL FUEL TANK AND A PACKAGE COVER WERE REQUESTED AFTER DELIVERY OF THE FIRST UNIT AND WERE THEN MADE TO ALL THREE UNITS. THE MODIFICATIONS INCREASED THE PACKAGE WEIGHT BUT WERE CONSIDERED NECESSARY FOR THE SUCCESS OF THE PROGRAM. IN GENERAL, THE UNITS PERFORMED WELL IN LABORATORY EVALUATION DELIVERING THE REQUIRED 18 CFM OF AIR AT 4 IN. STATIC WATER PRESSURE OR 26 WATTS OF ELECTRICAL POWER TO AN EXTERNAL LOAD. ADDITIONAL AREAS OF IMPROVEMENT BECAME EVIDENT DURING THE FABRICATION AND LABORATORY EVALUATION OF THE THREE UNITS. THE WEIGHT OF THE UNIT COULD BE REDUCED TO A MAXIMUM OF ELEVEN POUNDS FROM THE PRESENT 15.7 LBS., INCLUDING ALL PRESENT SPECIFICATIONS AND MODIFICATIONS. (AUTHOR) (U)
CHLORINE TRIFLUORIDE (CTF) HAS BEEN PROPOSED FOR USE IN AN IMPROVED MISSILE PROPELLANT SYSTEM SINCE THIS IS A STRONGER OXIDIZER THAN ANY USED HERETOFORE, IT WAS DESIRABLE TO EXAMINE ITS EFFECT ON MATERIALS USED, OR PROPOSED FOR USE, IN MAKING PROTECTIVE CLOTHING AND OTHER GEAR FOR DAMAGE CONTROL. NEOPRENE AND ARMALON (WOVEN POLYTETRAFLUOROETHYLENE LAMINATED WITH A CONTINUOUS SHEET OF POLYTETRAFLUOROETHYLENE-PROPYLENE) SHOWED PROMISE AS MATERIALS FOR THE CONSTRUCTION OF PROTECTIVE COVERALLS. IT WAS ALSO SHOWN THAT THESE MATERIALS MUST BE KEPT FREE OF LOCAL CONTAMINATION WITH SUBSTANCES EASILY IGNITED BY CTF, SUCH AS OIL AND GREASE, SINCE, ONCE IGNITED, THE UNCONTAMINATED PORTION MAY CONTINUE TO BURN, EVEN IN DILUTE CTF VAPOR. THE ARMALON SHOWED GREATER RESISTANCE TO CTF OVER A WIDER RANGE OF CONCENTRATION THAN THE NEOPRENE. BUTYL RUBBER COATED CLOTH AND VINYL COATED GLASS CLOTH WERE READILY IGNITED BY DILUTE CTF VAPOR, AND THEY APPEAR UNSUITABLE FOR PROTECTIVE CLOTHING. HYDRAZOID PROPELLANT FUELS WERE IGNITED BY CTF VAPOR IN CONCENTRATIONS AS LOW AS 1-1/2 PERCENT BY VOLUME. SAMPLES OF THE MATERIALS USED IN THE CONSTRUCTION OF THE NAVY OBA (OXYGEN BREATHING APPARATUS) WERE FOUND TO BE REACTIVE WITH CTF, HENCE, THE OBA MUST BE WORN INSIDE A GAS-TIGHT PROTECTIVE COVERALL.
A prototype extravehicular pressure suit assembly was designed and fabricated for use in earth and lunar environments. Conditions of space environment, preliminary design concepts, laboratory evaluations of materials, the intermediate model configuration, and the final suit assembly are described in detail. This assembly consists of special underwear, liner ventilation system, gas container, restraint layer and cover, insulation, micrometeorite protection, an outer reflective layer, and a life support system. The life support system is a liquid oxygen, semi-closed, recirculating-type backpack. The use of new materials distinguishes this assembly from current pressure suits. Recommendations for further research and development are included. (Author)}
SENSIBLE HEAT TRANSFER IN THE GEMINI AND APOLLO PRESSURE SUITS. (U)

DESCRIPTIVE NOTE: FINAL REPT. NOV 65-AUG 66.
KLEMM, F. K. JR.

CONTRACT: AF 33(615)-3370
PROJECT: AF-7146 AF-7222
TASK: 714409, 722207
MONITOR: AMRL 66-173

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: RESEARCH SUPPORTED IN PART BY NASA.

DESCRIPTORS: (PRESSURE SUITS, HEAT TRANSFER), SURFACE TEMPERATURE, HUMAN BODY, HEAT FLUX, ENVIRONMENTAL TESTS, HEAT TRANSFER COEFFICIENTS, CONVECTION (HEAT TRANSFER), TEMPERATURE, SPACE ENVIRONMENTS. (U)

IDENTIFIERS: APOLLO, GEMINI. (U)


45
DIVERS AND AVIATORS DOWNED IN THE OCEAN REQUIRE WARMING TO PREVENT EXCESSIVE LOSS OF BODY HEAT. A COMBINATION OF CHEMICAL HEATING AND FABRIC INSULATION WAS EVALUATED FOR THIS PURPOSE. CHEMICAL HEATING RESULTS FROM THE PROGRAMMED HEAT OF SOLUTION OF AN INEXPENSIVE CREAM IN WATER. LESS THAN 25 POUNDS PER HOUR FOR THE AVIATOR AND 5 POUNDS PER HOUR FOR THE WET-SUIT DIVER WILL PROBABLY BE REQUIRED TO PREVENT EXCESSIVE LOSS OF BODY HEAT. (AUTHOR)
UNCLASSIFIED REPORT

SEVERAL OF THE BLAST PROTECTIVE COMBAT BOOT CONCEPTS WHICH WERE DEVELOPED UNDER PHASE I OF THIS PROGRAM WERE FABRICATED AND PROOFTESTED UNDER PHASE II. ALL OF THE PROTECTIVE BOOTS INCORPORATED A HONEYCOMB FILLED SHANK. THE HIGH STRENGTH ALUMINUM HONEYCOMB FILLER RANGED FROM 2500 PSI TO ABOUT 4200 PSI NOMINAL CRUSHING STRENGTH. IN ADDITION TO THE PROTECTIVE SHANK, SEVERAL MODELS OF PROTECTIVE BOOTS WERE FABRICATED WITH WEDGE-SHAPED HEEL CUT OUTS AND/OR METAL HEEL COUNTERS. A TOTAL OF 150 PAIRS OF PROTECTIVE BOOTS WERE FABRICATED WITH EIGHT POSSIBLE COMBINATIONS OF THE VARIABLES STUDIED. SIXTY-FOUR CADAVER SPECIMENS PROTECTED BY VARIOUS TYPES OF BOOTS WERE BLASTLOADED WITH THE M-14 LAND MINE; 27% OF THE PROTECTIVE BOOTS WITH CONVENTIONAL COUNTERS RESULTED IN A FOOT DAMAGE LEVEL WHICH COULD POSSIBLY BE 'SAVAGED FROM AMPUTATION' WHILE 63% OF THE PROTECTIVE BOOTS INCORPORATING A METAL HEEL COUNTER WERE 'POSSIBLE SALVAGES.' THIS COMPARES TO A ZERO PERCENT RATE OF POSSIBLE SALVAGE WITH CONVENTIONAL FOOTWEAR. (AUTHOR)
IN PRELIMINARY STUDIES, A NEW PARTIAL-PRESSURE SUIT HAS BEEN DEVELOPED AS AN EMERGENCY GARMENT FOR HIGH-ALTITUDE AIRCRAFT FLIGHT, FOR CONTINUOUS WEAR IN EXTENDED SPACE FLIGHT, AND FOR CREWMEMBERS OF THE PROPOSED SUPERSONIC TRANSPORT. THE USAFSAM EXPERIMENTAL SUIT WAS DESIGNED FOR COMFORT IN THE UNPRESSURIZED STATE, YET TO PROVIDE ADEQUATE PRESSURE PROTECTION AT ALTITUDE. MECHANICAL PRESSURE IS APPLIED TO THE SKIN BY EXPANSION OF AIR SEALED IN RUBBER TUBES SEWED BETWEEN TWO LAYERS OF POROUS FABRIC. AIR IN THE TUBES EXPANDS AT ALTITUDE ACCORDING TO BOYLE'S LAW. IN MANNED FLIGHTS TO 75,000 FEET, SKIN PRESSURE MEASUREMENTS ARE EQUAL TO THOSE OF THE PARTIAL-PRESSURE SUIT YET AT GROUND LEVEL AND UP TO 25,000 TO 30,000 FEET, "SHIRT SLEEVE COMFORT" IS APPROACHED. (AUTHOR)
THE RESEARCH AND DEVELOPMENT OF AN ASPHERICAL GLASS FACEPIECE FOR A FULL PRESSURE SPACESUIT COMPATIBLE WITH AF HELMET AP-22F-2, CAPABLE OF PROTECTING AN ASTRONAUT FROM HAZARDS OF SPACE DURING A 4-HOUR EXTRAVEHICULAR MISSION ARE DESCRIBED. THE TRANSPARENCY WAS TO REMAIN FOG-FREE DURING A CONDITION OF ZERO AIR FLOW AND 100 PERCENT RELATIVE HUMIDITY. IN ADDITION, FACEPIECE DESIGN WAS TO PROVIDE SUFFICIENT ATTENUATION OF SOLAR ELECTROMAGNETIC RADIATION TO ASSURE AN ASTRONAUT MEAN FACIAL SKIN TEMPERATURE NOT IN EXCESS OF 100°F.

INITIAL EFFORT WAS DIRECTED TOWARD DEFINITION OF THE EXTREME SPACE ENVIRONMENTS FOR THE DEFINED ORBIT. THESE ENVIRONMENTS WERE SIMULATED IN THE LABORATORY FOR COMPATIBILITY TESTING OF CANDIDATE MATERIALS (GLASSES, OPTICAL COATINGS, AND ELECTRICALLY CONDUCTIVE COATINGS). ADDITIONAL TESTS WERE DEVISED TO INVESTIGATE THE EFFECTIVENESS OF ANTI-FOG DEVICES AND SOLAR REFLECTIVE COATINGS. TEST RESULTS INDICATE THAT, FOR THE PARTICULAR FACEPIECE CONFIGURATION AND INTERNAL AND EXTERNAL SPACESUIT ENVIRONMENTS DEFINED, A POWER DISSIPATION OF 0.33 WATT/SQ IN IS REQUIRED TO MAINTAIN A FOG-FREE FACEPIECE; AND A MEAN FACIAL SKIN TEMPERATURE OF 100°F WILL NOT BE EXCEEDED PROVIDED THE SOLAR RADIATION INCIDENT ON THE ASTRONAUT'S SKIN IS NOT GREATER THAN 0.43 SOLAR CONSTANT. FACEPIECE MATERIALS WERE SELECTED FROM CANDIDATES WHICH SATISFACTORILY WITHSTOOD THE EXTREME ENVIRONMENTAL
DIVERS' BODY HEAT LOSS: DESCRIBES A STUDY OF THE ENDURANCE OF UNDERWATER SWIMMERS WEARING A VARIETY OF FOAM NEOPRENE WET SUITS AND IMMERSED AT 30-32°F IN THE NEL ARCTIC POOL.


A STUDY WAS MADE PRIMARILY TO OBTAIN DATA APPLICABLE TO THE DESIGN OF AN OPTIMUM PROTECTIVE SUIT FOR DIVERS IN ARCTIC ENVIRONMENTS. THE EXPERIMENTAL METHOD EMPLOYED SWIMMERS WHO PERFORMED SHALLOW DIVES IN THE NEL ARCTIC POOL AT 30-32°F. SKIN TEMPERATURE WAS RECORDED BY THE USE OF SUITABLY LOCATED THERMISTORS, AND OTHER DATA WERE OBTAINED FROM BLOOD SAMPLES DRAWN IMMEDIATELY BEFORE AND AFTER EACH DIVE. RESULTS SUGGEST THAT A FOUR-PIECE FOAM NEOPRENE WET SUIT CONSISTING OF A 1/8-INCH TIGHT-FITTING INNER SUIT AND A 1/4-INCH SNUG-FITTING OUTER SUIT ALONG WITH TWO PAIRS OF NEOPRENE SOCKS AND MITTENS WOULD PROVIDE THE OPTIMUM COMBINATION OF PROTECTION AND MOBILITY FOR DIVERS IN ARCTIC WATERS.
A closed-cell foam was developed for integration into a partial pressure suit that would produce pressure on the human body to provide protection in a vacuum environment. A survey of literature and industrial organizations was followed by an extensive experimental study on known foam systems and the development of new foam systems. The evaluation and development of the foam composition and processing techniques are described. From this study, the formulation and processing of suitable vinyl closed-cell foams were developed with reproducible properties in controlled processes. Their physical properties passed successfully the required cycling test wherein the foams, properly restrained and exposed to vacuum, exerted a pressure response of 7 psia or 3.5 psia depending upon the process used. (Author)
SOME EFFECTS OF ABSORBENCY OF CLOTHING MATERIALS

JUN 56  AP  PRATT, R. L.  IFONSECA, G.  
F. WOODCOCK, A. H. 1  
REPT. NO. RESEARCH-STUDY-BP-3  
PROJ. DA-7-64-12-004A  

IT IS CONCLUDED THAT ABSORBED MOISTURE CAN CAUSE TRANSIENT EFFECTS IN HEAT TRANSFER WHICH ARE APPRECIABLE FOR AN HOUR OR MORE. THESE TRANSIENT EFFECTS MAY BE PUT TO ADVANTAGE BY USING ABSORBENT MATERIALS SUCH AS WOOL WHICH STABILIZES HEAT LOSS FROM A MAN WHO IS CHANGING HIS ENVIRONMENT SUCH AS GOING IN AND OUT OF HEATED BUILDINGS. HOWEVER, SUCH ABSORBENT MATERIALS WOULD BE A DISADVANTAGE TO PERSONS LIKE THE COMBAT SOLDIER WHO REMAINS IN A RELATIVELY STABLE OUTDOOR ENVIRONMENT BUT CHANGES HIS ACTIVITY. HENCE, NONABSORBENT MATERIALS SUCH AS SOME OF THE SYNTHETICS MAY BE PREFERABLE.
AN AUTOMATIC CONTROL SYSTEM FOR MAINTAINING
CONSTANCY OF SKIN TEMPERATURE (T \textsubscript{SUB S}) HAS BEEN
SHOWN TO BE FEASIBLE BY USING SPECIAL SENSORS TO
DETECT CHANGES IN T \textsubscript{SUB S} AND PROPORTIONAL FLUID
AMPLIFIERS TO REGULATE THE TEMPERATURE OF WATER
FLOWING THROUGH THE TUBING OF A WATER-COOLED
UNDERGARMENT. TESTS HAVE INDICATED THE RESPONSE OF
THE SYSTEM WHEN T \textsubscript{SUB S} INCREASED DUE TO EXERCISE
OR TO AN EXTERNAL HEAT LOAD. (AUTHOR) (U)
A PROTECTIVE PASSENGER SMOKE HOOD:

APR 67 12P MCFADDEN, ERNEST B. S.
REYNOLDS, H. I. IFUNKHOUSER, GORDEN E. I
MONITOR: FAA-AN 67-9

UNCLASSIFIED REPORT

DESCRIPTORS: (FIRE PROTECTIVE CLOTHING, BREATHING APPARATUS, POLYAMIDE PLASTICS, AMIDES, POLYMERS, FILMS, METAL COATINGS, AIRCRAFT FIRES, SMOKE, SURVIVAL PERSONNEL)

SEVERAL RECENT JET TRANSPORT ACCIDENTS HAVE FOCUSED THE ATTENTION OF THE AVIATION INDUSTRY UPON SMOKE AND TOXIC GASES AS CAUSAL FACTORS OF PASSENGER INCAPACITATION AND FAILURE TO EVACUATE AIRCRAFT BEFORE FIRE AND HEAT RENDER THE ENVIRONMENT UNINHABITABLE. IF IT WERE POSSIBLE TO PROVIDE PASSENGERS WITH A SHORT DURATION SUPPLY OF BREATHING AIR SUFFICIENT TO MAINTAIN THE PASSENGERS' MOBILITY AND ALLOW COMPLETION OF AIRCRAFT EVACUATION, SURVIVAL WOULD BE ENHANCED. SIMPLE, LIGHT-WEIGHT, BAG-SHAPED HOODS INCORPORATING A NECK SEAL WERE FABRICATED OF A THIN PLIABLE, HIGH-TEMPERATURE, TRANSPARENT, POLYIMIDE PLASTIC FILM. POLYIMIDE FILM HAS NO MELTING POINT BUT REPORTEDLY CHAR AT 1500 DEG F. IN A MORE ADVANCED DESIGN, THIN TRANSPARENT METALLIC COATINGS WERE APPLIED TO THE POLYIMIDE FILM IN ORDER TO REFLECT UP TO 90% OF THE RADIANT HEAT UPON EXPOSURE TO A SPECIFIC INFRARED HEAT FLUX. FACIAL SKIN TEMPERATURES OF 114-115 F WERE RECORDED ON TWELVE HUMAN SUBJECTS WEARING THE NON-METALIZED HOOD UNDER IDENTICAL CONDITIONS. SKIN TEMPERATURES OF THE SAME SUBJECTS WEARING THE METALIZED HOOD DID NOT EXCEED 99 F. CAPABILITY OF THE HOOD TO PROVIDE SHORT TERM AND EXTENDED PROTECTION FROM SMOKE AND FLAME INHALATION IN A FIRE ENVIRONMENT IS DISCUSSED. (AUTHOR)
LABORATORY SHRINKAGE EVALUATION OF NOMEX SUMMER FLIGHT SUITS.

APR 67 6P  KELLY, WARREN T
REPT. NO. NAEC-AML-2604
TASK: A32-013-200/1

UNCLASSIFIED REPORT

DESCRIPTORS: (FLIGHT CLOTHING, SHRINKAGE), (FIRE RESISTANT TEXTILES, SHRINKAGE), POLYAMIDE PLASTICS, CLEANING COMPOUNDS, CLEANING, CAMOUFLAGE

SHRINKAGE OF COVERALLS MADE OF OLIVE GREEN AND CAMOUFLAGE PRINTED NOMEX HERRINGBONE TWILL CLOTHS LAUNDERED BY FORMULA S IS REPORTED. COVERALL DIMENSIONS, EXCEPT FOR CROTCH SEAM THAT APPARENTLY PUCKERS, ARE NOT SHORTENED EXCESSIVELY.

(AUTHOR)
LONGITUDINAL AND CIRCULAR PRESSURE SEALING CLOSURES WERE DESIGNED AND DEVELOPED FOR FULL PRESSURE PROTECTIVE ASSEMBLIES FROM A DESIGN CONCEPT PROVIDED BY THE AEROSPACE MEDICAL RESEARCH LABORATORIES. INVENTION DISCLOSURE NUMBER 66/668.

THIS STUDY CONSISTED OF (1) DESIGNING PRESSURE CLOSURE DEVICES; (2) SELECTING SUITABLE MATERIALS FOR THE FABRICATION OF THE SEALING CLOSURE PARTS AND THE CYLINDERS TO INCLUDE THE CLOSURES; (3) SELECTING AN APPROPRIATE FABRICATION PROCESS FOR THE CLOSURE SEALING PARTS; AND (4) FABRICATING AND TESTING THE BREADBOARD AND DEMONSTRATION MODELS CONTAINING EITHER THE CIRCULAR OR LONGITUDINAL CLOSURES. AN EPDM ELASTOMERIC MATERIAL WAS FOUND TO BE SUITABLE FOR THE FABRICATION OF THE CLOSURE SEALING PARTS WHICH WERE MOLDED USING AN ESTABLISHED MOLDING TECHNIQUE. THE FABRICATED BREADBOARD AND DEMONSTRATION MODELS PASSED SUCCESSFULLY THE REQUIRED TESTS WHEREIN LEAK RATES WERE DETERMINED FROM 0 TO 5 PSIG, AND EXPOSURE TO PRESSURE UP TO 12 PSIG WERE PERFORMED. (AUTHOR)
AN INVESTIGATION WAS UNDERTAKEN TO TEST AND EVALUATE A WET SUIT WORN IN CONJUNCTION WITH THE MARK II ANTI-G SUIT UNDER ACCELERATION. EIGHT SUBJECTS WERE RUN ON THE CENTRIFUGE UNDER CONDITIONS OF NO PROTECTION, WEARING AN ANTI-G SUIT ONLY, WEARING AN ANTI-G SUIT UNDER THE WET SUIT, AND WEARING THE ANTI-G SUIT OVER THE WET SUIT. RESULTS INDICATED THAT ACCELERATION TOLERANCE WAS SIGNIFICANTLY IMPROVED BY THE USE OF THE ANTI-G SUIT, BUT THERE WAS NO STATISTICALLY RELIABLE DIFFERENCE BETWEEN THE ANTI-G SUIT ONLY AND THE TWO ANTI-G SUIT/WET SUIT COMBINATIONS. (AUTHOR)
UNCLASSIFIED

EVALUATION FOR SERVICE USE OF A PROTO-TYPE SWINMER'S RESCUE SUIT.

DESCRIPTIVE NOTE: MEMORANDUM REPT., MAR 58 13P RENTSCH, SAMUEL B., JR.
REPT. NO: SBNL-MEMO-58-1
PROJ: NAVMED-NN-21-01-20.01
TASK: NN-21-01-20.01-01

UNCLASSIFIED REPORT

DESCRIPTORS: (*SEA RESCUES, UNDERWATER CLOTHING),
(*UNDERWATER CLOTHING, PERFORMANCE ENGINEERING),
SWIMMING, DIVING, EFFECTIVENESS, BREATHING APPARATUS,
MOISTUREPROOFING, BUOYANCY, THERMAL INSULATION, ELASTIC
PROPERTIES, ACCEPTABILITY

THE INVESTIGATION WAS ONE OF A SERIES OF TESTS AND
EVALUATIONS OF PROTOTYPE RESCUE (SWIN) SUITS
CONDUCTED BY NAHRL IN COOPERATION WITH THE
RESEARCH SECTION OF THE NAVAL CLOTHING
SUPPLY OFFICE, BROOKLYN. THE SUIT WAS TRIED
OUT UNDER SERVICE OPERATING CONDITIONS DURING
EXERCISES ABOARD TWO SUBMARINE RESCUE AND SALVAGE
VESSELS (ASR'S 15 AND 16) DURING JUNE AND
JULY 1957 AND JANUARY 1958. THE SCOPE OF THE
EVALUATIONS INCLUDED SWIMMING, SURFACE DIVING,
FLOATING, SIMULATED RESCUING OF PERSONNEL, AND USE
WITH AN AQUA LUNG FOR SUCH PURPOSES AS EXAMINING THE
BOTTOM OF SHIPS, CHECKING ANCHOR CHAINS FOR FOULING,
AND FOR TAKING UNDERWATER PICTURES. A NUMBER OF
FAVORABLE FEATURES WERE NOTED--WATERPROOFNESS,
BUOYANCY, WARMTH, AND A NUMBER OF UNFAVORABLE
FEATURES WERE TABULATED FOR USE IN MODIFICATION
OF THESE SUITS, SUCH AS POOR LOCATIONS OF THE FLUTTER
VALVE AND THE CHIN SEGMENT OF THE FACE OPENING. IT
WAS DIFFICULT TO GET INTO THE SUIT AND TOOK TOO LONG
A TIME; AND THE MATERIAL WAS SO LIMITED IN ELASTICITY
AS TO CAUSE DISCOMFORT. (AUTHOR) (U)
UNCLASSIFIED

UNCLASSIFIED

DOE REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOH08

AD-663 886 6/7 6/17
NAVAL SUBMARINE MEDICAL CENTER GROTON, CONN

FIELD EVALUATION OF MODIFIED SUBMARINE RESCUE AND ESCAPE SUITS

DESCRIPTIVE NOTE: MEMORANDUM REPT*,
FEB 56 12P SCHULTE JOHN H
REPT. NO. NSHC-MR-56-3
PROJ. NAVMED-NM-002-013.01.03

UNCLASSIFIED REPORT

DESCRIPTORS: (SUBMARINE ESCAPE, UNDERWATER CLOTHING),
SEA RESCUES, COTTON TEXTILES, MODELS (SIMULATIONS),
UNDERWEAR, RUBBER, MANEUVERABILITY

THE STUDY EVALUATES MODELS OF THE TWO-PIECE
SUBMARINE RESCUE AND ESCAPE SUITS WHICH HAVE
INCORPORATED SEVEN ALTERATIONS RECOMMENDED ON THE
BASIS OF PREVIOUS FIELD TRIALS FOR SUBMARINE
RESCUE AND ESCAPE. THE GARMENT CONSIDERED MORE
SATISFACTORY IS THE TWO-PIECE SUIT OF TWO-WAY STRETCH
MATERIAL DYE INTERNATIONAL ORANGE, FITTED WITH A
NECK GASKET, HEAD STRAPS AND TWO RELIEF VALVES, ONE
AT THE BACK OF THE HEAD AND ONE BETWEEN THE
SHOULDER. (AUTHOR)
UNCLASSIFIED

DOE REPORT BIBLIOGRAPHY SEARCH CONTROL NO. Z0400

AD-663 907 6/11 6/17 6/19
NAVAL AIR DEVELOPMENT CENTER JOHNsville PA AEROSPACE CREW EQUIPMENT DEPT

PHYSIOLOGICAL EFFECTS OF DIFFERENT OXYGEN FLOW RATES AND AMBIENT TEMPERATURES ON PRESSURE-SUITED SUBJECTS PERFORMING WORK AT ALTITUDE

(U)

DESCRIPTIVE NOTE: PHASE REPT. DEC 67 13P
SANTAMARIA, LOUIS J. JR.
HORRIGAN, DAVID J. JR.
IRADLIFF, MEREDITH H.

REPT. NO. NADC-AC-6708
TASK: A34-531-060/20

UNCLASSIFIED REPORT

DESCRIPTORS: (PRESSURE SUITS, VENTILATION), (HEAT TOLERANCE, PRESSURE SUITS), OXYGEN, GAS FLOW, LIFE SUPPORT, ASTRONAUTS, SPACE FLIGHT, MANNED SPACECRAFT, EXERCISE (PHYSIOLOGY), BODY TEMPERATURE, PULSE RATE, BODY WEIGHT, SIMULATION

(U)

IN A SERIES OF TESTS CONDUCTED AT DIFFERENT AMBIENT TEMPERATURES, THE PHYSIOLOGICAL EFFECTS OF VARIOUS LEVELS OF FLOW RATE OF VENTILATING O2 WERE INVESTIGATED. PRESSURE-SUITED SUBJECTS UNDERWENT MODERATE WORK STRESS ON A BICYCLE ERGOMETER IN AN ALTITUDE CHAMBER MAINTAINED AT 5 PSIA. THE TEMPERATURE AND RELATIVE HUMIDITY OF THE VENTILATING O2 WERE MAINTAINED CONSTANT AT 55°F AND 90-95%, RESPECTIVELY; THE DURATION OF THE RUNS WAS FIXED AT 2 HOURS. WITHIN THE LIMITS OF THE AMBIENT TEMPERATURES AND VENTILATING FLOW RATES EMPLOYED IN THIS STUDY, ONLY SLIGHT ADVANTAGES WERE GAINED BY INCREASING FLOW RATE; AS OBSERVED IN TERMS OF THE PHYSIOLOGICAL MEASUREMENTS MADE IN THIS STUDY. (AUTHOR)

(U)
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 7Z0408

AD-664 122 6/17 11/5
TIHOKOL CHEMICAL CORP MARSHALL TEX LONGHORN DIV

SPCIAL SAFETY STUDY: TESTING 'NOMEX' MATERIAL AS
HEAT RESISTANT CLOTHING FOR INDUSTRIAL APPLICATION. (U)

JUL 67 44P
REPT. NO. LD-17-67
CONTRACT: DA-11-173-AMC-200(A)

UNCLASSIFIED REPORT

DESCRIPTORS: (FIRE RESISTANT TEXTILES: NYLON): (FIRE
PROTECTIVE CLOTHING, PERFORMANCE: ENGINEERING): FIRE
SAFETY, INSTRUMENTATION, TEST METHODS, HEAT TRANSFER:
HEAT FLUX, HEAT TOLERANCE, THRESHOLDS (PHYSIOLOGY):
STATIC ELECTRICITY, CLEANING, COSTS

IDENTIFIERS: NOMEX

THE OBJECTIVE OF THIS SERIES OF TESTS WAS TO
DETERMINE THE BEST COMBINATION OF PROTECTIVE CLOTHING
(UTILIZING 'NOMEX' MATERIAL) THAT WOULD PROVIDE
THE LINE WORKER OPTIMUM PROTECTION AGAINST INCIDENT
CONDITIONS. THE DATA WAS RECORDED AND DEVELOPED
FOR A PERIOD OF TIME UP TO FOURTEEN SECONDS. THE
FIRST THREE TO FIVE SECONDS, HOWEVER, ARE THE MOST
CRITICAL. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 720408

AD-665 042 15/5 6/17
ARMS RESEARCH INST OF ENVIRONMENTAL MEDICINE NATICK MASS

MOISTURE TRANSFER THROUGH IMPERMEABLE FOAM INSULATIONS

APR 67 5P FONSECA, GEORGE F. I

UNCLASSIFIED REPORT


DESCRIPTORS: (*PROTECTIVE CLOTHING, *EXPANDED PLASTICS), THERMAL INSULATION, MOISTURE, PERMEABILITY, TEXTILES, WIND, MATHEMATICAL ANALYSIS

THE BIOPHYSICAL CHARACTERISTICS OF PERFORATED FOAM SYSTEMS ARE PRESENTED IN TERMS OF EXPERIMENTALLY DETERMINED VALUES OF INSULATION AND MOISTURE VAPOR PERMEANCE (MVP). THE EFFECT OF WINDBREAK MOTION ON THE MOISTURE VAPOR TRANSFER THROUGH SUCH SYSTEMS IS DISCUSSED. A THEORETICAL COMPARISON AMONG SYSTEMS IS GIVEN IN TERMS OF ENVIRONMENTAL RANGE USING THE CONCEPT OF MOISTURE PERMEABILITY INDEX. (AUTHOR)
THE U.S. ARMY'S NEW NYLON FABRIC LAMINATE FLIGHT HELMET PROVIDES INCREASED CRASH AND BALLISTIC PROTECTION OVER THAT OF OTHER CURRENT U.S. MILITARY FLIGHT HELMETS. A NEWLY DEVELOPED RETENTION DEVICE, BASED ON AN ORTHOPEDIC SLING FOR NECK TRACTION, ASSURES RETENTION OF THE HELMET. A NEW VISOR OF POLYCARBONATE RESIN PROVIDES EYE PROTECTION AGAINST IMPINGING FRAGMENTS. IT RESISTS SHATTERING AND PENETRATION. RESEARCH STUDIES REVEAL THE FEASIBILITY OF ATTENUATING LOW FREQUENCY NOISE AT THE EAR, WITH RELATIVELY SMALL VOLUME EAR CUPS. (AUTHOR)
FLAME PROTECTION AFFORDED MICE BY A NONCOMBUSTIBLE GARMENT IN 100% OXYGEN ATMOSPHERES.

DESCRIPTIVE NOTE: REPT. FOR 24 MAY-8 JUN 67, SEP 67 23P MARGREAVES, JOHN J. IULVEDAL.

UNCLASSIFIED REPORT

THIRTY- NINE MICE, WITH HAIR CLIPPED OR UNCLIPPED, WERE CLOTHED IN A NONCOMBUSTIBLE GARMENT, BETA CLOTH, AND SUBJECTED TO FLAME IGNITION IN 100% OXYGEN ATMOSPHERES FROM 744 TO 190 MM HG TOTAL PRESSURE. THE EXPERIMENTAL RESULTS SHOWED THAT THE NONCOMBUSTIBLE GARMENT AFFORDED PROTECTION FROM COMBUSTION AND FLAME PROPAGATION ONLY IF THE ANIMAL’S HAIR HAD BEEN PREVIOUSLY CLIPPED. FURTHER STUDIES SHOULD BE CONDUCTED IN AN EFFORT TO ASSURE MAN’S PROTECTION. (AUTHOR)
UNCLASSIFIED

R & D REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /Z0308

AD-666 226  6/17  13/8
MINE SAFETY APPLIANCES CO  PITTSBURGH PA

ENGINEERING RESEARCH PROTOTYPE DISTRIBUTION SYSTEMS
FOR THERMALIBRIUM CLOTHING. (U)

DESCRIPTIVE NOTE: TECHNICAL REP. (FINAL), 9 JUL 66-
26 APR 67; OCT 67 45P  AUSTIN, HARRY W.  HESS, W.
CONTRACT: DA-19-129-AMC-118(N)
PROJ: DA-1CO256010A032
MONITOR: USA-NLABS.C/OH

UNCLASSIFIED REPORT

DESCRIPTORS: (PROTECTIVE CLOTHING, MANUFACTURING),
QUALITY CONTROL, DESIGN, TEST METHODS, VENTILATION,
VALVES, TEXTILES: MATERIALS, MILITARY SUPPLIES,
PRODUCTION, SPECIFICATIONS
IDENTIFIERS: THERMALIBRIUM CLOTHING

THE RESULTS OF MATERIAL OPTIMIZATION, FABRICATION
TECHNIQUES AND THE FABRICATION OF PROTOTYPE AIR
DISTRIBUTION SYSTEMS FOR THERMALIBRIUM CLOTHING ARE
SUMMARIZED. THE ENGINEERING RESEARCH EFFORT WAS
ACCOMPLISHED IN TWO WORK PHASES. THE INITIAL PHASE
WAS DIRECTED TO THE TESTING OF MATERIALS, THE
DEVELOPMENT OF FABRICATION TECHNIQUES AND THE
FABRICATION OF TWO PROTOTYPE SYSTEMS FOR DESIGN
VERIFICATION TESTING. THE SECOND PHASE OF THE
PROGRAM INVOLVED THE MODIFICATION OF PATTERNS, AND
THE FABRICATION OF 34 AIR DISTRIBUTION SYSTEMS ON A
MODIFIED PRODUCTION BASIS. THE COUNTER-FLOW SYSTEM
OF DISTRIBUTION VENTILATING AND/OR CONDITIONED AIR
FOR PROTECTIVE CLOTHING CAN BE MANUFACTURED UNDER
STANDARD PRODUCTION METHODS, USING COMMERCIALLY
AVAILABLE MATERIALS. (AUTHOR)
THE RESULTS OF THE ANALYSIS INDICATE THAT WHEN AN ASTRONAUT IN A FLEXIBLE ENCLOSURE (SOFT SPACE SUIT) WORKS ON THE SURFACE OF A LARGE SPACECRAFT, THE TEMPERATURES ON HIS EXTERNAL SURFACE ARE MARKEDLY INCREASED OVER THOSE WHICH OCCUR WHEN HE IS NOT NEAR THE SPACECRAFT. MOREOVER, PASSIVE THERMAL CONTROL OF THE ASTRONAUT IS NOT POSSIBLE WHEN HE IS NEAR THE SPACECRAFT. THE TECHNIQUES INVESTIGATED FOR THERMALLY COUPLING AN ASTRONAUT WITH HIS THERMAL CONTROL SYSTEM INCLUDE LIQUID COOLED UNDERGARMENTS, GAS COOLING, AND HEAT TRANSFER TO THE COOLED WALLS OF HIS ENCLOSURE. TECHNIQUES WERE INVESTIGATED FOR INCREASING THE CONDUCTANCE THROUGH SOFT SPACE SUIT INSULATIONS BY COMPRESSING THE INSULATION. THE INSULATION OF A CYLINDRICAL SECTION OF A SPACE SUIT ARM WAS MEASURED UNDER BOTH COMPRESSED CONDITIONS (3.7 PSIA) AND UNCOMPRESSED CONDITIONS IN SIMULATED NOON AND EARTH-UMBRA ORBIT-POSITIONS. THE RANGE OF CONDUCTANCE INCREASED FROM 0.26 BTU/SQ FT-HR DEGREES F UNCOMPRESSED TO 0.61 BTU/SQ FT-HR DEGREE F COMPRESSED. MEASUREMENTS WERE MADE IN SIMULATED NOON AND EARTH-UMBRA ORBIT POSITIONS OF THE THERMAL HEAT DISSIPATING CAPABILITY OF A LOUVER SYSTEM WHICH WAS DESIGNED FOR OPERATION IN THE SUN. A 6-INCH SQUARE MODEL HAD A NET HEAT FLOW FROM THE LOUVERS FOR THE FOUR ORBIT CONDITIONS TESTED (OPEN AND CLOSED IN THE SUN AND IN THE SHADE). THE LOUVER OPERATION CONTROLS MAINTAINED...
A field evaluation was conducted in accordance with reference (A) on the subject coverall to obtain information regarding the acceptability of first production lots. One thousand questionnaires were distributed to the fleet and 621 were returned to the aerospace crew equipment department representing a cross section of various activities. Coverall design was found acceptable for fleet use. (Author)
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /ZOM08

AD-669 139  6/17  1/3
JOHNS HOPKINS UNIV SILVER SPRING MD APPLIED PHYSICS
LAB

AIRCREW COOLING STUDY.  (U)

DESCRIPTIVE NOTE:  TECHNICAL MEMO.
JAN 68  180P  JURGENS, F.
REPT. NO.  APL-TG-945
CONTRACT:  NOW-62-0604

UNCLASSIFIED REPORT

DESCRIPTORS:  (@FLIGHT CREWS, COOLING), (@PROTECTIVE
CLOTHING, FLIGHT CREWS), NAVAL PERSONNEL, AIRCRAFT
EQUIPMENT, THERMAL INSULATION, AIR COOLED, LIQUID
COOLED, MOISTURE, TOLERANCES (PHYSIOLOGY), METABOLISM,
ENVIRONMENT, HEAT TRANSFER  (U)

THE NAVAL AVIATOR CANNOT WEAR SEPARATE GARMENTS FOR
THE WIDE VARIETY OF THERMAL ENVIRONMENTS IN WHICH HE
MUST WORK.  THE RESULTS OF A STUDY CONDUCTED TO
ASCERTAIN THE THERMAL CONTROL REQUIREMENTS OF THESE
AIRCrewMEN ARE PRESENTED.  THE STUDY SET OUT TO
DEFINE THE HEAT AND MOISTURE REMOVAL REQUIREMENTS
DURING GROUND AND FLIGHT OPERATIONS, TO LEARN THE
EFFECTS OF VARIOUS CLOTHING COMBINATIONS; AND TO
LEARN THE EFFECTS OF FLIGHT CONDITIONS ON THERMAL
MOISTURE CONTROL.  THE EFFECTS OF BOTH METABOLIC
ACTIVITY AND ENVIRONMENT ON BODY TEMPERATURE ARE
CONSIDERED; AND VARIOUS TECHNIQUES OF AIR AND LIQUID
COOLING IN A VARIETY OF GARMENTS ARE THEN REVIEWED IN
ORDER TO DETERMINE THE MOST EFFECTIVE WAYS OF KEEPING
BODY TEMPERATURES AT REASONABLE LEVELS.  IMMEDIATE
USE OF FORCED-AIR COOLING SUITS, MORE PRECISE
DETERMINATION OF THE LIMITS OF 'TOLERABLE' WORKING
CONDITIONS, AND FURTHER IMPROVEMENTS IN THE DESIGN OF
LIQUID-COOLED GARMENTS ARE RECOMMENDED.
(AUTHOR)  (U)

69

UNCLASSIFIED  /ZOM08
UNCLASSIFIED

UNCLASSIFIED REPORT

DESCRIPTORS: (PRESSURE SUITS, COOLING), HEAT PRODUCTION (BIOLOGY), THERMAL CONDUCTIVITY, HEAT FLUX, ISOCYANATE PLASTICS, EXPANDED PLASTICS, TEMPERATURE CONTROL, POROUS METALS, EXTRAVEHICULAR ACTIVITY, FEASIBILITY STUDIES, PERFORMANCE (ENGINEERING) (U)

IN THIS PROGRAM A FEASIBILITY STUDY WAS CONDUCTED OF A CONDUCTIVE COOLING SYSTEM FOR COOLING A MAN IN SPACE. IN THE CONCEPT STUDIED THE COOLING WAS PROVIDED BY A POROUS PLATE SURFLIMATOR AND CONTROLLED BY A VARIABLE THERMAL CONDUCTANCE LAYER. THE RESULTS OF THE TESTS PERFORMED DEMONSTRATE THE NEED FOR ADVANCES IN TECHNOLOGY AND FURTHER DEVELOPMENT WORK TO MAKE THIS CONCEPT FEASIBLE. (AUTHOR) (U)
THIS STUDY DETERMINES THE GENERAL PERFORMANCE AND SURVIVAL TIME AFFORDED BY THE BRITISH MARK VII SUBMARINE ESCAPE IMMERSION SUIT (SEIS). IN 29 DEGREES F. WATER, 10 DEGREES F. AIR, AND 20 MPH WIND SPEED IT WAS FOUND THAT THE BRITISH SUIT DID NOT PROVIDE THE 24-HOUR ESTIMATED SURVIVAL TIME AT THE SEVERE CONDITIONS LISTED ABOVE, AND THE FOUR SUBJECTS WERE TAKEN FROM THE WATER AFTER AN AVERAGE TIME OF 2.6 HOURS OF EXPOSURE. DAMAGE TO THE HANDS AND FEET WOULD PROBABLY OCCUR BETWEEN 5-1 AND 9.1 HOURS. DEATH WOULD PROBABLY OCCUR AFTER 5-6 TO 24 HOURS OF EXPOSURE. TESTS WERE ALSO CONDUCTED IN 90 DEGREES F. WATER AND 85 DEGREES F. IN STILL AIR. THESE TESTS INDICATED THAT NO MAJOR PROBLEM WILL BE ENCOUNTERED UNDER THESE CONDITIONS. THE ENVIRONMENTAL CONDITIONS WERE THEN CHANGED IN A STEP-WISE FASHION FROM 29 DEGREES F. WATER, 10 DEGREES F. AIR, AND 20 MPH WIND, UNTIL 24-HOUR ESTIMATED SURVIVAL TIME WAS OBTAINED AT 44 DEGREES F. WATER, 32 DEGREES F. AIR, AND 20 MPH WIND. 24-HOUR SURVIVAL MAY BE PREDICTED FOR MOST MEN, BASED ON RESULTS IN THE LIMITED NUMBER OF SUBJECTS USED IN THIS INVESTIGATION. (AUTHOR)
THE FIRST PART OF THIS REPORT, DEALING WITH HIGH-ALTITUDE CREW PROTECTION, IS BASED ALMOST ENTIRELY ON A DETAILED REVIEW OF SELECTED PORTIONS OF A MONOGRAPH BY S. P. UMANSKIY ENTITLED, PILOT AND COSMONAUT EQUIPMENT. IT CONTAINS A SECTION ON FLIGHT CLOTHING SUITABLE FOR VARIOUS SEASONS OF THE YEAR, GLOVES AND FOOT GEAR, HELMET LINERS, VENTILATED SUITS, ANTI-G SUITS, AND SURVIVAL EQUIPMENT (SEA SURVIVAL GEAR, SURVIVAL SUITS, LIFE JACKETS, LIFE RAFTS, AND AN EMERGENCY SURVIVAL PACK). IN ADDITION, THE FIRST PART OF THIS REPORT CONTAINS A BRIEF GLOSSARY OF ABBREVIATIONS USED IN SOVIET AIRCREW EQUIPMENT DESIGNATIONS AND A BRIEF COMMENTARY ON THE HANDBOOK ON ASTRONAUTICS BY N. YA. KONDRA'YEV AND V. A. ODINTSOV. THE SECOND PART OF THIS REPORT CONTAINS 30 ABSTRACTS RELATED TO SPACECRAFT LIFE-SUPPORT SYSTEMS. THEY DEAL LARGELY WITH RECENT DEVELOPMENTS IN SOVIET CHLORELLA RESEARCH WHICH ARE DIRECTLY APPLICABLE TO THE USE OF CHLORELLA FOR REGENERATION OF SPACECRAFT CABIN AIR AND TO THE POSSIBLE USE OF ALGAE AS A SOURCE OF FOOD FOR COSMONAUTS ON EXTENDED SPACEFLIGHTS. (AUTHOR)
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0M08

AD-669 230 6/7 6/17
COAST GUARD BALTIMORE NO FIELD TESTING AND DEVELOPMENT CENTER

EVALUATION OF ONE PIECE WET SUIT

DESCRIPTIVE NOTE: TEST REPT.
MAY 68 442 CUTHRELL, C. BUZARD R.
REPT. NO. 481 PROJ. CG-3986/01/01

UNCLASSIFIED REPORT

DESCRIPTORS: (#UNDERWATER CLOTHING, BUOYANCY), (#EXPOSURE SUITS, ACCEPTABILITY), PERFORMANCE (ENGINEERING), FLIGHT CLOTHING, LIFE PREServers, SYNTHETIC RUBBER, EFFECTIVENESS, SURVIVAL (PERSONNEL), FASTENINGS, PHOTOGRAPHS, TEST METHODS


(AUTHOR)
AN AIRMAN FORCED TO EJECT OVER ARCTIC TERRAIN OR COLD WATER IS FACED WITH A VERY BRIEF SURVIVAL PERIOD AFTER LANDING. (APPROXIMATELY THREE MINUTES IN 28°F WATER) THIS PERIOD OF TIME IS INSUFFICIENT TO INITIATE AND ACCOMPLISH A SUCCESSFUL RESCUE MISSION. A STUDY HAS BEEN MADE TO DETERMINE THE FEASIBILITY OF EXTENDING THE SURVIVAL PERIOD BY WARMING THE AIRMAN WITH HEAT GENERATED BY A RADIOISOTOPE. A CONCEPTUAL DESIGN HAS BEEN CREATED CONSISTING OF A NETWORK OF WATER FILLED TUBES WORN BENEATH AN INSULATED SUIT. WATER IN THE TUBES IS HEATED BY A 500 WATT RADIOISOTOPE TO WARM THE PILOT DURING A SURVIVAL SITUATION (28°F WATER OR -66°F AIR), AND IS COOLED BY AN 825 WATT REFRIGERATOR TO KEEP THE AIRMAN COMFORTABLE WHILE FLYING THE AIRCRAFT WITH CABIN TEMPERATURES UP TO 120°F. A THERMOELECTRIC POWER GENERATOR SUPPLIES 12 WATTS OF POWER FOR THE WATER PUMP. COMPARISON STUDIES OF SEVERAL RADIOISOTOPES HAVE BEEN MADE. SYSTEM CALCULATIONS AND COMPONENT CALCULATIONS SHOW THAT THE CONCEPT IS FEASIBLE AND PRACTICAL FOR EXTENDING THE SURVIVAL PERIOD INDEFINITELY. THE SURVIVAL SYSTEM WEIGHT IS ESTIMATED AT 80 POUNDS AND IS CONFIGURED TO FIT IN A USAF STANDARD EJECTION SEAT KIT. (AUTHOR)
UNCLASSIFIED

A0-671 681  6/17
RHODE ISLAND UNIV KINGSTON

FLOW OF HEAT AND VAPOR THROUGH COMPOSITE PERM-
SELECTIVE MEMBRANES UNDER SIMULATED CONDITIONS.  (U)

DESCRIPTIVE NOTE:  FINAL REPT. JAN 67-JAN 68.
JAN 68  38P  VOTTA, FERDINAND, JR

CONTRACT:  DAAG17-67-C-0061
PROJ:  DA-19025601A032
MONITOR:  USA-NLabs.C/0H

UNCLASSIFIED REPORT

DESCRIPTORS:  (PROTECTIVE CLOTHING, TEMPERATURE
CONTROL), HEAT TRANSFER, MASS TRANSFER, COMPOSITE
MATERIALS, EVAPORATION, SKIN (ANATOMY), MEMBRANES,
ENVIRONMENTAL TESTS, COOLING, SURFACE TEMPERATURE,
SIMULATION, VAPORIZATION.  PERMEABILITY  (U)

AN EXPERIMENTAL STUDY WAS MADE OF THE HEAT AND MASS
(WATER VAPOR) FLOW RATE THROUGH SEVERAL DIFFERENT
COMPOSITE CLOTHING SYSTEMS.  COOLING OF A SIMULATED
SKIN SURFACE WAS OBTAINED THROUGH VAPORIZATION OF
WATER FROM A WET WICK IN THE CLOTHING SYSTEM.
TESTS WERE CONDUCTED AT BOTH REDUCED AND AT
ATMOSPHERIC PRESSURE.  IN THE REDUCED PRESSURE
TESTS, COOLING RATES AS HIGH AS 182 BTU/(HR X
SQ.FT.) WERE OBTAINED WITH A SIMULATED SKIN
TEMPERATURE OF 91F.  EXCELLENT CONTROL OF THE
SIMULATED SKIN TEMPERATURE AT WIDELY VARYING HEAT
FLOW RATES WAS POSSIBLE.  TEMPERATURE CONTROL WAS
OBTAINED BY CONTROLLING THE WICK VAPORIZATION
PRESSURE.  BOTH FORCED AND NATURAL CONVECTION WERE
USED IN THE ATMOSPHERIC PRESSURE TESTS.  FORCED
CONVECTION WAS OBTAINED BY BLOWING AIR FROM A LARGE
FAN ACROSS THE SURFACE OF THE CLOTHING SYSTEM.
THE AIR VELOCITY WAS APPROXIMATELY 7 FT/SEC.
WHILE THE HEAT FLOW RATE DEPENDED SOMewhat UPON THE
TEMPERATURE AND THE HUMIDITY OF THE ROOM AIR, WHICH
WERE NOT CONTROLLED IN THESE TESTS.  THE RESULTS
INDICATED THAT HIGH COOLING RATES WERE POSSIBLE.
FOR A SIMULATED SKIN TEMPERATURE OF 91F, COOLING
RATES AS HIGH AS 200 BTU/(HR X SQ. FT.) FOR
FORCED CONVECTION AND 121 BTU/(HR X SQ. FT.)
FOR NATURAL CONVECTION WERE OBTAINED, WITH ROOM
AIR. (AUTHOR)  (U)
A METHOD OF RELATING PHYSIOLOGY AND MILITARY PERFORMANCE: A STUDY OF SOME EFFECTS OF VAPOR BARRIER CLOTHING IN A HOT CLIMATE. (U)

Ralph F. I. Joy, Robert J. T. Goldman

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN MILITARY MEDICINE, V133 N6 P456-470 JUN 68.

DESCRIPTORS: (PROTECTIVE CLOTHING, BIOLOGICAL WARFARE), HEAT TOLERANCE, MILITARY PERSONNEL, MALES, ACCLIMATIZATION, GROUP DYNAMICS, PHYSICAL FITNESS, MILITARY REQUIREMENTS, PERFORMANCE(HUMAN), PROTECTIVE MASKS, PHYSIOLOGY, UNDERWEAR, CANNULATION, WEATHER, GEOGRAPHY (U)
IDENTIFIERS: RECTAL TEMPERATURE, SUMMER (U)

IT IS OUR INTENT TO SUGGEST AN EXPERIMENTAL DESIGN WHICH WILL RELATE PHYSIOLOGICAL MEASUREMENTS TO INDIVIDUAL AND UNIT PERFORMANCE DURING MILITARY TASKS. IT MAY BE SUMMARIZED AS (A) THE SELECTION OF PHYSIOLOGICAL VARIABLES WHICH CAN BE DEMONSTRATED TO BE CLOSELY RELATED TO CLINICAL OR SUBCLINICAL CASUALTY PRODUCTION AND, (B) TEMPORALLY RELATING THESE TO THE OCCURRENCE OF INDIVIDUAL INEFFECTIVENESS IN TERMS OF JOB, UNIT PROGRESS, UNIT MISSION, AND ENVIRONMENTAL VARIABLES. (AUTHOR) (U)
APPLICATION OF THE RANQUE-HILSCH VORTEX TUBE TO AIRCREW COOLING PROBLEMS

DESCRIPTIVE NOTE: FINAL REPT. FEB-MAY 67, JUN 68 19P, VAN VERNON, ROBERT E., JR.
REPT. NO. AMRL-TR-67-124
PROJ. AF-7222

THE RANQUE-HILSCH VORTEX TUBE, A DEVICE WITH NO MOVING PARTS, PRODUCES SIGNIFICANT REFRIGERATION EFFECT WHEN DRIVEN BY COMPRESSED AIR. THIS REPORT DISSEMINATES UP-TO-DATE INFORMATION ON THE PERFORMANCE OF CURRENT VORTEX TUBES, REPORTS THE RESULTS OF AN AIRCREW COOLING EXPERIMENT USING THE DEVICE, AND SUGGESTS OTHER USES OF POTENTIAL INTEREST TO THE AIR FORCE. THE HISTORY OF THE VORTEX TUBE AND ITS BASIC THEORY ARE PRESENTED BRIEFLY.
ARMY AEROMEDICAL RESEARCH UNIT FORT RUCKER ALA

USER EVALUATIONS OF TWO AIRCREW PROTECTIVE HELMETS: (U)

AUG 68 37P BYNUM, JAMES A.
REPT. NO. USAARU-69-1
PROJ: DA-3AO-2560-1A819
TASK: 3AO-2560-1A819-036

UNCLASSIFIED REPORT

DESCRIPTORS: (flight crews, protective clothing); (helmets, performance (engineering)), human factors engineering, jet plane noise, attenuation, experimental design, analysis of variance, protection, design, weight, acceptability, decision making, voice communications (U)
IDENTIFIERS: EVALUATION (U)

TWO AIRCREW PROTECTIVE HELMETS WERE EVALUATED BY 24 INSTRUCTOR PILOTS WHO WERE DIVIDED EQUALLY INTO GROUPS SUBJECTED TO THREE AMBIENT NOISE ENVIRONMENTS. PILOTS RATED THE ARMY APH-5 AND THE SPH-3X (EXPERIMENTAL) ON EIGHT CATEGORIES DESIGNED TO ASSESS RELATIVE COMFORT, ACCEPTABILITY, AND NOISE ATTENUATION. RATINGS WERE COMPARED, USING A SPLIT-PILOT FACTORIAL ANALYSIS OF VARIANCE. (AUTHOR) (U)
UNCLASSIFIED

MANIKIN MEASUREMENTS OF THE NOISE ATTENUATION PROVIDED BY FLIGHT HELMETS.

AUG 68 22P FORSTALL, JOHN R.

REPORT NO. NAMI-1049

UNCLASSIFIED REPORT

DESCRIPTORS: Anthropometry, Noise, Models (Simulations), Ear Protectors, Ear, Sound Transmission, Acoustic Properties, Aircraft Noise, Attenuation

IDENTIFIERS: Flight Clothing, Helmets

MEASUREMENTS OF THE NOISE ATTENUATION PROVIDED BY FIVE FLIGHT HELMETS WERE OBTAINED ON A MANIKIN HEAD AND COMPARED WITH ATTENUATION MEASUREMENTS OBTAINED ON HUMAN SUBJECTS ACCORDING TO THE USASI STANDARD FOR EVALUATING REAL-EAR ATTENUATION AT THRESHOLD. THE TWO SETS OF MEASUREMENTS WERE SIMILAR. THE MANIKIN METHOD HAS CERTAIN ADVANTAGES WHICH SHOULD BE CONSIDERED IN TERMS OF THE PARTICULAR REQUIREMENTS OF AN EVALUATION PROGRAM: (1) A HELMET CAN BE OPTIMALLY FITTED WITH LITTLE EXPENDITURE OF TIME; (2) VARIABILITY INTRODUCED BY HUMAN FACTORS IS KEPT AT A MINIMUM; (3) HIGH LEVELS OF NOISE CAN BE USED AS THE TEST STIMULUS; (4) VISUAL AND AUDITORY MONITORING OF THE ATTENUATED NOISE PROVIDES THE EXPERIMENTER WITH A PRECISE APPRAISAL OF THE FIT AS ADJUSTMENTS ARE MADE; (5) MANIKIN MEASUREMENTS ARE PARTICULARLY USEFUL IN REVEALING IMPROVEMENTS IN ATTENUATION RESULTING FROM MINOR MODIFICATIONS. (AUTHOR)
DEVELOPMENT OF A LIGHTWEIGHT BUTYL-COATED STRETCH FABRIC (U)

DESCRIPTIVE NOTE: FINAL REPT 6 OCT 66-6 APR 68, APR 68 375 SHELLEY, JAMES P. I
CONTRACT: DAAG17-67-C-0009
PROJ: DA-1-J-025601-A-032
MONITOR: USA-NLABS+C/OM

UNCLASSIFIED REPORT

DESCRIP TOR S: (*COMPOSITE MATERIALS TEXTILES): (*PROTECTIVE CLOTHING, COMPOSITE MATERIALS); NYLON; BETYL RUBBER, AGING(MATERIALS); IMPREGNATION, PROTECTIVE TREATMENTS, THERMAL STABILITY, RUPTURE, TENSILE PROPERTIES, DEFECTS(MATERIALS) (U)

THE REPORT DISCUSSES THE DEVELOPMENT OF A TECHNIQUE FOR THE APPLICATION OF MULTIPLE THIN LAYERS OF BUTYL RUBBER ON A STRETCH NYLON SUBSTRATE. SEVERAL VARIATIONS IN THE PROCESS DESIGNED TO MINIMIZE FABRIC HANDLING WERE EXPLOR ED. (AUTHOR) (U)
UNCLASSIFIED

NAVAL SUBMARINE MEDICAL CENTER GROTON CONN SUBMARINE MEDICAL RESEARCH LAB

THERMAL EVALUATION OF A POLYVINYLCHLORIDE EXPOSURE SUIT (EMPERESS) AND COMPARISON WITH PRESENT SUBMARINE DECK EXPOSURE SUIT.

MAY 68

HALL DAVID A - NOBEL JOEL

REPT. NO. SHML-527

MONITOR: NAVMED

UNCLASSIFIED REPORT

DESCRIPTORS: (EXPOSURE SUITS, POLYVINYL CHLORIDE), SUBMARINE PERSONNEL, THERMAL INSULATION, EFFECTIVENESS, ACCEPTABILITY, THERMAL PROPERTIES

THE STUDY DETERMINED THE GENERAL PERFORMANCE AND SURVIVAL TIMES AFFORDED BY THE 'EMPERESS' POLYVINYLCHLORIDE EXPOSURE SUIT (PVCES) AND THE PRESENT SUBMARINE DECK EXPOSURE SUIT IN 44°F WATER, 32°F AIR, AND 20 MPH WIND SPEED. TESTS WERE ALSO CONDUCTED UTILIZING THE PVCES IN 44°F WATER, 20°F AIR, AND 20 MPH WIND, WITH: (A) MEN STANDING ONE-HALF HOUR IN THE WATER (SIMULATING BRIDGE WATCH); (B) MEN STANDING ONE HOUR OUT OF THE WATER, IN 20°F AIR, 20 MPH WIND (SIMULATING CONNING TOWER WATCH); MEN DRY, MOVING ABOUT THE HABITAT. IT WAS FOUND THAT THE PVCES DID PROVIDE REASONABLE SURVIVAL TIME AT THE EXTREME ENVIRONMENTAL CONDITION (44°F WATER, 32°F AIR, 20 MPH WIND) IN ALL SUBJECTS, AND THAT THE FOUR SUBJECTS WERE TAKEN FROM THE WATER AFTER AN AVERAGE TIME OF 1.8 HOURS OF EXPOSURE. IT WAS ESTIMATED THAT DAMAGE TO THE HANDS AND FEET WOULD PROBABLY OCCUR BETWEEN 3.4 AND 8.2 HOURS AND DEATH WOULD PROBABLY OCCUR BETWEEN 5.4 AND 16.1 HOURS OF EXPOSURE. WEARING THE SDES, THE FOUR SUBJECTS WERE TAKEN FROM THE WATER AFTER AN AVERAGE TIME OF 1.1 HOURS OF EXPOSURE. IT WAS ESTIMATED THAT DAMAGE TO THE HANDS AND FEET WOULD PROBABLY OCCUR BETWEEN 2.0 AND 4.4 HOURS, WHILE DEATH WOULD REQUIRE 4.0 TO 7.8 HOURS OF EXPOSURE. TESTS CONDUCTED ON THE PVCES SIMULATING BRIDGE AND CONNING TOWER WATCH CONDITIONS AND ALSO DURING THE DRY EXPERIMENTS INDICATED THAT NO DISCOMFORT WOULD BE ENCOUNTERED DURING THE NORMAL WATCH-STANDING TIME INTERVAL.

(AUTHOR)

81

UNCLASSIFIED
A review has been made of the literature in the area of acoustics, vibration, shock, and blast phenomena related to effects on the physiological system and attenuation effects of materials and devices. In addition, information from sources other than the literature pertinent to an evaluation of the significance of acoustic hazards in the military environment is also presented. Damage-risk and standards criteria are presented, and further studies are suggested to advance the state-of-the-art in acoustic hazards protection as well as to exploit the potentials of acoustic phenomena for the investigation of material properties.

(Author)
A PORTABLE TEST BATTERY FOR COMPARATIVELY EVALUATING OPERATOR PERFORMANCE IN FULL-PRESSURE SUIT ASSEMBLIES.

DESCRIPTIVE NOTE: FINAL REPT. JUN 67-MAR 68, OCT 68-66P SIEGEL, ARTHUR I. ILANTERMAN

RICHARD S. I

CONTRACT: F33615-67-C-1755
PROJ: AF-7184
TASK: 718402
MONITOR: AMRL TR-68-74

UNCLASSIFIED REPORT

DESCRIPTORS: (PRESSURE SUITS; PERFORMANCE(HUMAN)); TEST METHODS; TEST EQUIPMENT, HUMAN FACTORS ENGINEERING, JET FIGHTERS; LUNAR CRAFT; MOBILITY, PORTABLE EQUIPMENT; TRACKING, PULSE RATE, ANTHROPOMETRY

IDENTIFIERS: DEXTERTY, EVALUATION, F-111 AIRCRAFT, LUNAR EXCURSION MODULES

RECOMMENDATIONS FOR A PORTABLE BATTERY OF TESTS TO ASSESS HUMAN MOBILITY IN FULL-PRESSURE SUITS ARE PRESENTED. THE LITERATURE WAS REVIEWED TO DETERMINE THE TYPES OF INSTRUMENTS AND TESTS EMPLOYED BY PRIOR INVESTIGATORS. TASK ANALYSES WERE PERFORMED ON THREE ADVANCED VEHICLES TO DETERMINE THE BODY MEMBER-MOVEMENT FAMILIES MOST FREQUENTLY INVOLVED. A SET OF TESTS AND MEASUREMENTS IS SUGGESTED FOR THOSE MEMBER-MOVEMENT FAMILIES FOUND TO BE MOST FREQUENTLY INVOLVED IN ADVANCED FLIGHT. NECESSARY FUTURE STEPS FOR REALIZING THE PORTABLE BATTERY ARE SUGGESTED. THE TEST BATTERY RECOMMENDED INCLUDES THE PURDUE PEG BOARD FOR FINGER DEXTERITY, A SPECIALLY DESIGNED APPARATUS FOR THE STRENGTH OF VARIOUS BODY MOVEMENTS, A SINGLE DIMENSION TRACKING TASK FOR VARIOUS COORDINATION TESTS, A LEIGHTON FLEXOMETER, AND DIRECT MEASUREMENT DEVICES FOR RANGE OF MOVEMENT AND STATIC ANTHROPOMETRY MEASUREMENTS. (AUTHOR)
CONTINUED SUCCESS IN COPING WITH THE SPACE ENVIRONMENT HAS LED TO INCREASED CREWMAN CONFIDENCE IN HIS ABILITY TO PERFORM USEFUL WORK DURING EXTRATERRESTRIAL MISSIONS. FUTURE MISSIONS WILL REQUIRE ADVANCED SUIT/LIFE-SUPPORT-SYSTEM CONCEPTS. SUCH A CONCEPT MIGHT LOGICALLY TAKE THE FORM OF A SPACE SUIT FOR EXTRAVEHICULAR ACTIVITY WITH AN INTEGRATED ENVIRONMENTAL CONTROL SYSTEM. A DESIGN STUDY OF THIS CONCEPT HAS BEEN PERFORMED AND DRAWINGS PREPARED IN SUFFICIENT DETAIL TO PERMIT FABRICATION OF A WORKING MODEL IN A SUITABLY EQUIPPED MODEL SHOP. INTEGRATION OF THE ENVIRONMENTAL CONTROL SYSTEM WITHIN THE HARD TORSO OF THE SUIT ASSEMBLY RESULTED IN A SYSTEM HAVING A PACKAGING DENSITY APPROACHING 80 PERCENT AND ABLE TO PASS THROUGH A 27 INCH DIAMETER HATCH. THE SYSTEM WILL SUPPORT A CREWMAN WORKING AT 375 KCAL/HOUR FOR AN INDEFINITE TIME TO A RECHARGE IN SPACE CAPABILITY. (AUTHOR)
CLEARANCE AND PERFORMANCE VALUES FOR THE BARE-HANDED AND THE PRESSURE-GLOVED OPERATOR. (U)

DESCRIPTIVE NOTE: FINAL REPT.
AUG 66 164P
REPT. NO. AMRL-TR-66-24
PROJ. AF-7184
TASK: 710408

UNCLASSIFIED REPORT

DESCRIPTORS: (*PRESSURE SUITS, HUMAN FACTORS ENGINEERING), (*GLOVES, PERFORMANCE(HUMAN)), OPERATORS(PERSONNEL), ANTHROPOMETRY, STRENGTH(PHYSIOLOGY), PERFORMANCE(HUMAN), DESIGN, EFFECTIVENESS, AEROSPACE CRAFT, STATISTICAL PROCESSES, HANDS, TABLES(DATA) (U)
IDENTIFIERS: CLEARANCE, DIMENSIONS (U)

THE OUTFITTING OF THE PILOT AND THE COSMONAUT, (U)

JAN 67 142P UMANSKII, S. P. I
REPT. NO. FTD-HT-23-1314-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF MONO.

DESCRIPTORS: (*PROTECTIVE CLOTHING, ASTRONAUTS),
(*OXYGEN EQUIPMENT, ASTRONAUTS), (*PILOTS, FLIGHT CLOTHING), PRESSURE SUITS, HELMETS, LIFE SUPPORT,
VENTILATION, SURVIVAL KITS, BREATHING APPARATUS, HIGH ALTITUDE, USSR (U)
IDENTIFIERS: TRANSLATIONS (U)

THE BOOK PROVIDES THE NECESSARY INFORMATION ON
PROTECTIVE FACILITIES (PROTECTIVE CLOTHING, G-SUITS, HELMETS, OXYGEN SYSTEMS, AND SPACE SUITS)
AND OTHER EQUIPMENT THAT IS BEING OR WILL BE EMPLOYED
ON FLIGHTS INTO THE STRATOSPHERE AND OUTER SPACE.
(AUTHOR) (U)
MICROCLIMATE-CONTROLLED (THERMALIBRIUM) PROTECTIVE CLOTHING SYSTEM FOR MILITARY APPLICATIONS.

DESCRIPTIVE NOTE: TECHNICAL REPT., NOV 68, 29P, SPANOLEO A=1
REPT. NO: C/F/SEL-60
PROJ: DA-1-J-062110-A-533
MONITOR: USA-NLABS TR-68-58-CE

THERMALIBRIUM CLOTHING IS A SYSTEM OF HEAT-REGULATED PROTECTIVE ENSEMBLES DESIGNED TO PROTECT TROOPS EXPOSED TO EXTREME AND/OR TOXIC ENVIRONMENTS. THE DESIGN AND FUNCTIONAL CHARACTERISTICS OF THE VARIOUS COMPONENTS COMPRISING THERMALIBRIUM SYSTEMS ARE DESCRIBED. TYPICAL FUNCTIONAL SYSTEMS FOR USE IN U.S. ARMY AIRCRAFT AND TRACKED VEHICLES (TANKS), AND IN CHEMICAL AND BIOLOGICAL CONTAMINATED ENVIRONMENTS ARE DISCUSSED.

(AUTHOR)
THE DESIGN AND ENGINEERING OF A SPECIAL PROTECTIVE
ENSEMBLE FOR PERSONNEL WHO ARE REQUIRED TO DISPOSE OF
TOXIC MUNITIONS ARE DISCUSSED. THE VARIOUS
COMPONENTS COMPRISING THE OVERALL SYSTEM AND THEIR
SPECIFIC PROTECTIVE REQUIREMENTS ARE DESCRIBED.
PENFORMANCE CHARACTERISTICS OF FUNCTIONAL SYSTEMS
BUILT TO DATE ARE DISCUSSED. (AUTHOR) (U)
THE GENERAL CAPABILITIES OF A FREE-FLOODING HEAT REPLACEMENT GARMENT IN MAINTAINING THERMAL COMFORT IN 40°F WATER, AT BOTH SURFACE AND DEEP DIVING CONDITIONS, ARE CONSIDERED. SUIT INLET AND OUTLET TEMPERATURE, FLOW RATE, SKIN AND RECTAL TEMPERATURES, AND DIVERS' SUBJECTIVE COMFORT LEVEL WERE RECORDED. SUIT INLET TEMPERATURES WHICH PRODUCE A SUBJECTIVE RESPONSE OF THERMAL COMFORT BY THE DIVER (COMFORT ZONE INLET TEMPERATURE) AT VARIOUS FLOW RATES ARE PRESENTED FOR SURFACE CONDITIONS AND THROUGH USE OF A HEAT BALANCE EQUATION, FOR DEPTH CONDITIONS. WHILE THE SUIT IS CONSIDERED INEFFICIENT BECAUSE OF ITS HIGH POWER REQUIREMENTS, ESPECIALLY AT DEPTH, ITS WEARABILITY AND MODE OF HEAT TRANSFER MAKE IT AN EXCELLENT HEAT REPLACEMENT GARMENT. (AUTHOR)
A COOLING HOOD IN HOT-HUMID ENVIRONMENTS

DESCRIPTIVE NOTE: SPECIAL REPT.
JAN 69 39P KONZ STEPHAN A INENTWICH
M FRITZ
REPT. NO: THEMIS-SR-01
CONTRACT: F49620-68-C-0020
PROJ: AF-7921
TASK: 792108
MONITOR: AFOSR 69-0574TR

UNCLASSIFIED REPORT

DESCRIPTORS: (COOLING, HUMANS), (PROTECTIVE CLOTHING, COOLING), BODY TEMPERATURE, SKIN (ANATOMY), HEAT TOLERANCE, CONDUCTION (HEAT TRANSFER), LIQUID COOLED, STRESS (PHYSIOLOGY), SWEAT GLANDS, HUMIDITY, ENVIRONMENT

THIS PAPER DESCRIBES COOLING MAN WITH CONDUCTION SPECIFICALLY, COOL WATER IN TUBES OF A HOOD ON THE HEAD. THE RESULTS CAN BE SUMMARIZED AS FOLLOWS: HEAD TEMPERATURE WAS KEPT CONSIDERABLY LOWER AND SKIN AND RECTAL TEMPERATURES WERE KEPT LOWER; CARDIAC COST WAS REDUCED; SWEATING WAS AT APPROXIMATELY 40% OF THE RATE WITHOUT THE HOOD, AND PERMITTED EXPOSURE TIME TO HEAT STRESS WAS LONGER. (AUTHOR)
UNCLASSIFIED

AEROSPACE MEDICAL RESEARCH LABS WRIGHT-PATTERSON AFB OHIO

PRINCIPLES OF THE BOYLE'S LAW EMERGENCY PRESSURE SUIT AND THEIR APPLICATION. (U)

DESCRIPTIVE NOTE: FINAL REPT.
DEC 68 31P SCHUELLER OTTO I
REPT. NO. AMRL-TR-67-234
PROJ: AF-7144
TASK: 716411

UNCLASSIFIED REPORT

DESCRIPTORS: (PRESSURE SUITS, DESIGN), OXYGEN,
PERMEABILITY, FIRE SAFETY, GASES, HAZARDS, PROTECTION,
RESPIRATION, DESIGN, GAS CYLINDERS, HIGH ALTITUDE (U)

AN URGENT REQUIREMENT EXISTS FOR A SIMPLE, RELIABLE EMERGENCY PRESSURE SUIT, PERMEABLE TO AIR AND COMFORTABLE WHILE UNPRESSURIZED, THE CONDITION IN WHICH THE PRESSURE SUIT IS WORN MOST OF THE TIME. THE BOYLE'S LAW SUIT MEETS THESE ESSENTIAL REQUIREMENTS. IT USES THE EXPANSION OF GAS SEALED IN MULTIPLE TUBES FOR PRODUCING MECHANICAL COUNTERPRESSURE ON THE SKIN. OXYGEN IS USED IN THE MASK OR HELMET ONLY FOR BREATHING, THUS REDUCING VULNERABILITY AND FIRE HAZARD TO A MINIMUM. THIS REPORT ANALYZES THE PHYSICAL AND TECHNICAL PRINCIPLES OF THE BOYLE'S LAW SUIT AND THEIR PRACTICAL APPLICATION TOWARD IMPROVING DESIGN OF THE TUBE SYSTEM, MINIMIZING BULK, TUBE CHARGING PROCEDURES, AND SIZING AND ADJUSTMENT POSSIBILITIES. FINALLY, RECOMMENDATIONS FOR REDESIGNING THE OXYGEN REGULATOR TO MINIMIZE BREATHING EFFORT ARE GIVEN. (AUTHOR) (U)
UNCLASSIFIED

DESCRIPTION AND OPERATING INSTRUCTIONS FOR A 7-
CHANNEL TELEMETRY SYSTEM FOR PHYSIOLOGICAL
TEMPERATURES AND THE ELECTROCARDIOGRAM

DESCRIPTIVE NOTE: FINAL REPT - 1 JAN-1 JUL 66,
OCT 68 24p RATING: DAVID A. IMARKO
ADOLPH R. IKAUFMAN, WILLIAM C. I
REPT NO. AMRL-TR-68-140
PROJ: AF-7222
TASK: 722206

UNCLASSIFIED REPORT

PREVIOUS TELEMETRY DESIGNS WERE IMPROVED TO PRODUCE
A SYSTEM SPECIFIC TO THE PHYSIOLOGICAL EVALUATION OF
THE THERMAL ADEQUACY OF SPACE SUITS. A SMALL
SEVEN-CHANNEL PULSE DURATION MULTIPLEXED TELEMETRY
SYSTEM WHICH TRANSMITS AN ELECTROCARDIOGRAM, RECTAL
TEMPERATURE WITH AN ACCURACY BETTER THAN + OR -
0.05C, AND FIVE SKIN TEMPERATURES WITH AN ACCURACY
BETTER THAN + OR - 0.2C WAS CONSTRUCTED. THE
ENTIRE UNIT IS ENCLOSED IN A 13 BY 10 BY 5 CM BOX
WORN UNDER THE SPACE SUIT. COMPONENTS THAT HAVE
BECOME AVAILABLE SINCE CONSTRUCTION COULD REDUCE THIS
SIZE TO ONE-FIFTH WITHOUT SACRIFICING PERFORMANCE.
three mercury batteries (12 V) POWER THE
EQUIPMENT FOR 40 HOURS AND PROVIDE RELIABLE RECEPTION
AT DISTANCES OF 90 M. THE SYSTEM IS ACTIVATED BY
CONNECTING THE SENSOR HARNESS, AND THE OUTPUT IS
CHECKED AND CALIBRATED BY A 3-POSITION SWITCH. THE
UNIT HAS BEEN TESTED DURING EXERCISE STUDIES IN SPACE
SUITS AND DURING METABOLIC EXPERIMENTS ON MEN
EXERCISING IN COLD ENVIRONMENTS. IT PROVIDED
RELIABLE TRANSMISSION OF ACCURATE TEMPERATURE AND
HEART RATE DATA FOR BOTH LABORATORY AND FIELD
STUDIES. IT HAS SIMPLIFIED EXPERIMENTAL PROCEDURES
BY ELIMINATING ALL COMPLICATIONS OF HARD WIRE LEADS
PENETRATING PRESSURE SHELLS IN SPACE SUITS AND BY
COMPLETELY FREEING THE SUBJECT IN FIELD STUDIES.

(AUTHOR) 92

UNCLASSIFIED /Z0M08
SURVEY OF THERMAL CONTROL TECHNIQUES FOR EXTRAVEHICULAR SPACE SUITS

DESCRIPTIVE NOTE: FINAL REPORT 1 MAR 66-1 MAR 68, DEC 68 28P
HEDGE, J. C.

REPT. NO. IITRI-J6028-1
CONTRACT: AF 33(615)-3468
PROJ: 71641
TASK: 71641
MONITOR: AMRL TR-68-67

UNCLASSIFIED REPORT

DESCRIPTORS: (#PRESSURE SUITS, #THERMAL INSULATION), (#EXTRAVEHICULAR ACTIVITY, PRESSURE SUITS), THERMAL PROPERTIES, THERMAL STABILITY, ASTRONAUTS, PROTECTIVE CLOTHING, SPACE ENVIRONMENTS, HEAT, TEMPERATURE, SOLAR RADIATION, ALBEDO, SPACECRAFT, ORBITS, THERMAL CONDUCTIVITY, SURFACE PROPERTIES, MOBILITY, GLOVES, TOUCH, DESIGN, METABOLISM, BODY TEMPERATURE, BODY FLUIDS, HEAT PRODUCTION (BIOLOGY)

THERMAL PROTECTION OF THE EXTRAVEHICULAR ASTRONAUT WAS STUDIED WITH PARTICULAR ATTENTION TO THE RELATIONSHIP BETWEEN THERMAL PROTECTION AND MOBILITY. THE SPACE THERMAL ENVIRONMENT WAS REVIEWED WITH RESPECT TO THE SOURCES AND MAGNITUDES OF HEAT ENERGY DELIVERED TO THE ASTRONAUT. THE ASTRONAUT'S THERMAL PHYSIOLOGY WAS INVESTIGATED. THE BASIC THERMAL PROCESSES AVAILABLE FOR CONTROLLING THE SPACE SUIT TEMPERATURE WERE CONSIDERED AND THE STATE-OF-THE-ART OF ACTIVE AND PASSIVE THERMAL CONTROL SYSTEMS WAS REVIEWED. THE STUDY CONCLUDES THAT A PASSIVE SYSTEM ALONE CANNOT PROVIDE ADEQUATE EXTRAVEHICULAR THERMAL PROTECTION. RECOMMENDATIONS ARE MADE FOR INVESTIGATING HYBRID THERMAL CONTROL SYSTEMS AND FOR STUDYING MEANS TO IMPROVE THE THERMAL PROTECTION OF GLOVES WITH ADEQUATE TACTILITY. (AUTHOR)

93

UNCLASSIFIED

/2Z0M08
A POPULAR OUTLINE OF WORK DONE BY THE ALL-UNION SCIENTIFIC RESEARCH INSTITUTE OF THE SEWING INDUSTRY. THIS INSTITUTE PERFORMS COMPREHENSIVE TESTING AND FIELD EVALUATION OF ALL TYPES OF WORK CLOTHING, INCLUDING PHYSIOLOGICAL TESTS IN TEST CHAMBERS TO DETERMINE THE SUITABILITY OF WORK CLOTHING FOR THE TYPE OF WORK BEING DONE.

(AUTHOR)
A SILVERIZED NYLON, OPEN-WEAVE MICROWAVE PROTECTIVE SUIT AND COTTON TWILL OVERGARMENT, TO BE WORN OVER CONVENTIONAL NAVY WORK CLOTHING, WAS DEVELOPED TO PROTECT PERSONNEL WORKING IN THE HIGH-DENSITY RADIO FREQUENCY FIELDS OF THE LARGER AND MORE POWERFUL RADAR SCANNING SYSTEMS ANTICIPATED ABOARD NAVAL VESSELS AND AT SHORE INSTALLATIONS. SINCE TOTAL BODY HEAT ABSORPTION PER UNIT TIME IS A CRITICAL FACTOR FOR THE SURVIVAL OF PERSONNEL EXPOSED TO A MICROWAVE FIELD, A PHYSIOLOGICAL EVALUATION OF THE PROTECTIVE CLOTHING SYSTEM WAS PERFORMED TO DETERMINE IF THE CLOTHING ITSELF WAS RESPONSIBLE FOR ANY ADDITIONAL THERMAL STRESS IN A WARM ENVIRONMENT. FOR A SERIES OF TWO-HOUR PERIODS, TWO MALE SUBJECTS WEARING THIS CLOTHING IN A CLIMATIC CHAMBER WERE EXPOSED TO A TEMPERATURE OF 85 DEGREES F, A RELATIVE HUMIDITY OF 45 PERCENT, A WIND VELOCITY OF 11.5 MPH AND A SOLAR RADIATION OF 1.6 GM-CAL/SQ M/ MIN. THE PROTECTIVE CLOTHING SYSTEM DID NOT PLACE ANY SIGNIFICANT PHYSIOLOGICAL HEAT STRESS ON PERSONNEL IN THE WARM ENVIRONMENT AS COMPARED TO THE WEARING OF CONVENTIONAL NAVAL WORK CLOTHING ALONE. VISUAL ACUITY WAS DECREASED SLIGHTLY. (AUTHOR)
UNCLASSIFIED

REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOMDB

AD-A01 44
11/5 6/17
LITTON SYSTEMS INC. MINNEAPOLIS MINN APPLIED SCIENCE DIV

INVESTIGATIONS OF HEAT AND MASS (WATER VAPOR AND LIQUID) MOVEMENT THROUGH CLOTHING SYSTEMS. (U)

DESCRIPTIVE NOTE: FINAL REPT. 25 JUN 65-24 JUN 66, SEP 66 269 P
LARSEN R. E. IRUST L. W.
KYDD A. R. IGAVIN G. A.
CONTRACT: DA-19-129-AMC-683(N)
PROJ: DA-1-K-012501-A-032
MONITOR: USA-NLABS S/OM TR-69-31-CH 56

UNCLASSIFIED REPORT

DESCRIPTORS: (PROTECTIVE CLOTHING, TRANSPORT PROPERTIES), DESIGN, WATER VAPOR, WATER, TEMPERATURE, MODELS(SIMULATIONS), EVAPORATION, THERMOCOUPLES, TEXTILES, VENTILATION, MEASUREMENT, MATHEMATICAL ANALYSIS, FLOW CHARTING, ENVIRONMENTAL TESTS, HEAT TRANSFER, MASS TRANSFER

IDENTIFIERS: COMPUTER ANALYSIS

THE REPORT DISCUSSES RESEARCH OF THE INVESTIGATIONS OF HEAT AND MASS (WATER VAPOR AND LIQUID) MOVEMENT THROUGH CLOTHING SYSTEMS AND SUMMARIZES THE RESULTS OF A THEORETICAL AND EXPERIMENTAL RESEARCH PROGRAM. EXPERIMENTAL STUDIES INCLUDED MEASUREMENTS OF PROFILES OF MEAN AND FLUCTUATING VELOCITY, TEMPERATURE, AND WATER VAPOR CONCENTRATION FOR VARIOUS FABRIC SPACINGS AND VENTILATING VELOCITIES. TRANSFER COEFFICIENT DATA OBTAINED FROM THESE PROFILES WERE COMPARED WITH TOTAL WATER AND HEAT LOSS RATES. (AUTHOR)
UNCLASSIFIED

METEOROID THREAT TO EXTRAVEHICULAR SPACE SUIT ASSEMBLIES. (U)

DESCRIPTIVE NOTE: FINAL REPT 1 MAR 66-1 MAR 67,
JUN 69 22P ZIMMERMAN FRANK J. (U)

CONTRACT: AF 33(615)-3468

PROJECT: 7164-1

MONITOR: AMRL TR-68-86

UNCLASSIFIED REPORT

DESCRIPTORS: (*EXTRAVEHICULAR ACTIVITY, PRESSURE SUITS),
(*PROJECTILES, HAZARDS), (*PRESSURE SUITS,
VULNERABILITY), PARTICLES, SPACE CREWS, PROTECTIVE
CLOTHING, IMPACT PREDICTION, IMPACT SHOCK, SHOCK
RESISTANCE, PENETRATION, DAMAGE, AEROSPACE MEDICINE,
PROBABILITY, UNCERTAINTY, TEXTILES, EXPERIMENTAL DESIGN,
SPACE ENVIRONMENTS (U)

IDENTIFIERS: FLUX DENSITY, *METEOROIDS (U)

THIS REPORT UTILIZES MOST RECENT METEOROID FLUX
DATA AND ILLUSTRATES THE METHOD USED IN CALCULATING
THE PROBABILITY OF METEOROID PUNCTURE FOR A SPACE-
SUITE CREWMAN IN EARTH ORBIT. AN EXAMPLE OF THE
METHOD IS SHOWN AND UNCERTAINTIES IN THE PREDICTION
ARE REVIEWED. FINALLY, GUIDELINES ARE PRESENTED
THAT COULD BE FOLLOWED IN PLANNING AN EXPERIMENTAL
PROGRAM OF PENETRATION STUDIES ON SPACE SUIT
MATERIALS INTENDED TO RESOLVE SOME OF THESE AREAS OF
UNCERTAINTY. (AUTHOR) (U)
A series of diving equipment tests were performed at depths of 1000 and 850 feet during the joint Duke University/Navy 1000 feet saturation dive at Durham, North Carolina. Description of tests performed and results thereof are presented for documentation purposes. Recommendations for modifications and further testing are presented.
THEORETICAL THERMAL REQUIREMENTS FOR THE MARK II DIVING SYSTEM.

DESCRIPTIVE NOTE: MEDICAL RESEARCH INTERIM REPT., AUG 69, 46P. TAUBER, JOHN F.; RAWLINS, JOHN S. P.; IBONDI, KENNETH R.

PROJECT: M4306.20-60108
MONITOR: NAVMED M4306.02-60108

UNCLASSIFIED REPORT

DESCRIPTORS: (*UNDERWATER CLOTHING, THERMAL ANALYSIS), (*DIVING, DEEP SUBMERGENCE), HEAT TRANSFER, THERMAL STABILITY, HUMAN FACTORS ENGINEERING, CONFIGURATION, METABOLISM, UNDERWATER VEHICLES, PRESSURE, TEMPERATURE, ENVIRONMENT, MATHEMATICAL PREDICTION, CORRELATION TECHNIQUES, EXPERIMENTAL DATA

IDENTIFIERS: MARK-2 DEEP DIVE SYSTEMS, PERSONNEL TRANSFER CAPSULES

THEORETICAL HEATING REQUIREMENTS FOR THE MAINTENANCE OF THERMAL BALANCE IN A DIVER AT DEPTH AND THE PERSONNEL TRANSFER CAPSULE OF THE MARK II DEEP DIVE SYSTEM ARE CONSIDERED. THE EFFECTS OF RADIATION, CONDUCTION, FORCED AND NATURAL CONVECTION, METABOLIC HEAT GENERATION AND RESPIRATORY HEAT LOSS ARE CONSIDERED AND HEAT REPLACEMENT REQUIREMENTS FOR VARIOUS CONFIGURATIONS OF DIVER GARMENTS ARE PRESENTED AS FUNCTIONS OF AMBIENT PRESSURE, TEMPERATURE AND PTC OPERATING CONDITIONS. THERMAL REQUIREMENTS FOR HEATING THE PTC ITSELF ARE ALSO CONSIDERED. (AUTHOR)
EXPERIMENTS TO EVALUATE THE PERFORMANCE OF THE NSRDL HEATER PUMP WERE PERFORMED IN A COLD TANK. ONE TO THREE DIVERS WERE EMPLOYED, EACH WEARING A 3/16-INCH FOAM NEOPRENE WET SUIT OVER A WELSON TUNING SUIT. THE SYSTEM WAS OBSERVED DURING OVER 10 HOURS OF TESTING. THE DIVERS WERE MAINTAINED IN THESE CONDITIONS AT VARYING FLOW RATES AND SUIT INLET TEMPERATURES. (AUTHOR)
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /ZON08

AF-694 13/0  6/17  6/11  13/1
KANSAS STATE UNIV MANHATTAN INST FOR ENVIRONMENTAL
RESEARCH

PROCEEDINGS OF THE SYMPOSIUM ON INDIVIDUAL COOLING,
MARCH 17-18, 1969. (U)

JUL 69 785P  NEVINS, RALPH G.:
 Contract: F44620-68-C-0020
 Proj: AF-7921
 Task: 792108
 Monitor: AFOSR 69-2347TR

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON PROJECT THEMIS.

DESCRIPTORS: (*PROTECTIVE CLOTHING, ENVIRONMENT),
(*COOLING, *SYMPOSIA), PHYSIOLOGY, COOLING + VENTILATING
EQUIPMENT, EXTRAVEHICULAR ACTIVITY, LIFE SUPPORT, BODY
TEMPERATURE, NUCLEAR POWER PLANTS, HEAT TRANSFER, FLIGHT
CLOTHING, TEMPERATURE CONTROL, CONTROL SYSTEMS, PRESSURE
SUITS
IDENTIFIERS: THEMIS PROJECT

THE REPORT CONTAINS TWELVE PAPERS PRESENTED AT A
SYMPOSIUM ON INDIVIDUAL COOLING. (AUTHOR) (U)

UNCLASSIFIED /ZON08
The results of an anthropometric survey of USAF personnel wearing the A/P225-7 full pressure suit fitted in accordance with the USAF eight-size, height-weight sizing program are presented. One hundred and thirty-eight measures were taken on each of thirty-four subjects standing, sitting and supine, with the suit in the uninflated, inflated, and inflated-restrained conditions. Forty circumferences were measured on a separate sample of thirty-two subjects standing and sitting, with the suit uninflated and inflated. Pictorial and verbal descriptions of the dimensions and detailed numerical results, including clearance ranges, are presented. Graphs comparing various dimensions across suit sizes are presented in the appendix. (Author)
THE ESTABLISHMENT OF AN INFORMAL RAPPORT BETWEEN
THE AEROSPACE MEDICAL RESEARCH LABORATORY-
HA AT WRIGHT-PATTERSON AIR FORCE BASE AND
THE 4756TH PTF AT TYNDALL AIR FORCE BASE
LED TO THE COMPLETION OF TWO ENGINEERING ANTHROPOLOGY
RESEARCH PROJECTS AND THE COMMENCEMENT OF A THIRD.
A MAJOR ADVANTAGE OF THIS FIELD RESEARCH WAS THE
USE OF PILOTS AND PRESSURE SUIT EXPERIENCED PERSONNEL
AS SUBJECTS. ILLUSTRATIONS OF AN A/P 225-6
FULL PRESSURE SUITED PILOT IN A F-106 COCKPIT ARE
INCLUDED. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. /Z0M08

AD-699 170 6/11 15/5
NAVY EXPERIMENTAL DIVING UNIT WASHINGTON D.C.

AD HOC COMMITTEE REPORT.

DESCRIPTIVE NOTE: RESEARCH REPT. 7-25 JAN 68; 68 73P
MURODCH, RICHARD A.; IBEAGLES, JOHN A.; IELKINS, JAMES H.; IFORAN, MICHAEL J.;
JENKINS, WALLACE T.; I
REPT. NO. NEDU-RR-3-68

UNCLASSIFIED REPORT

DESCRIPTORS: (*UNDERWATER CLOTHING, MILITARY
REQUIREMENTS), (*DIVING, *LIFE SUPPORT), LOGISTICS,
HELMETS, BREATHING APPARATUS, GAS FLOW, COMMUNICATION
SYSTEMS, LOGISTICS, DECOMPRESSION SICKNESS

THE OBJECT OF THE STUDY WAS TO SURVEY THE FIELD OF
DIVING EQUIPMENTS, CATALOGUE DEFICIENCIES OF EXISTING
EQUIPMENTS, ENUMERATE EQUIPMENTS NOT NOW AVAILABLE
WHICH SHOULD BE DEVELOPED AND TO RECOMMEND SHORT AND
LONG RANGE DEVELOPMENT PROGRAMS. A SUMMARY OF COST
BY EQUIPMENT IS INCLUDED. (AUTHOR)

105

UNCLASSIFIED /Z0M08
DESCRIPTION AND EVALUATION OF A PORTABLE DRY-ICE WATER-CONDITIONED SUIT SYSTEM FOR AIRCREWMEMBERS

DESCRIPTIVE NOTE: INTERIM REPT.
NOV 69 22P ESPOSITO, JOHN J.
REPT. NO. NADC-AC-6906
PROJ. A34-531/202/70F12-424-402

A PORTABLE WATER-CONDITIONED SUIT SYSTEM, EMPLOYING A DRY-ICE COOLER DESIGNED AND CONSTRUCTED AT THE NAVAL AIR DEVELOPMENT CENTER AND A COMMERCIALLY AVAILABLE WATER-COOLED VEST, WAS EVALUATED BY EXPOSING TWO SITTING-RESTING SUBJECTS AT SEA LEVEL PRESSURE TO ENVIRONMENTS OF 105F AND 115F. TESTS WERE CONDUCTED WITH AND WITHOUT THE COOLING SYSTEM. SUBLIMATION OF APPROXIMATELY FIFTEEN POUNDS OF DRY-ICE KEPT THE SUBJECTS RELATIVELY FREE FROM EVIDENCES OF HEAT STRESS FOR PERIODS OF FOUR HOURS AT 115F. BASED ON A COMPARISON WITH A WET-ICE SYSTEM, THE DRY-ICE PORTABLE COOLER, POSSESSING SIGNIFICANT ADVANTAGES IN TERMS OF SIZE AND WEIGHT, PRODUCED EQUIVALENT COOLING OF THE SUBJECTS. (AUTHOR)
UNCLASSIFIED REPORT

A previous study was based on cold weather tests of the Sergeant Missile System which were held at the Eglin AFB Climatic Laboratory during the summer of 1959. The observations described in the present report were made in the same laboratory in 1962. Both studies are part of a continuing effort by the Quartermaster Corps to insure compatibility between the QM-equipped soldier and army military systems which he will be required to operate. The general purpose of these studies is to detect problems associated with QM clothing in the operation of army equipment systems, and to report these problems to the responsible design and development groups. (Author)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY  SEARCH CONTROL NO./Z0M08

AD-701 872  5/5  6/17  16/42  15/5
QUARTERMASTER RESEARCH AND ENGINEERING CENTER NATICK MASS

HUMAN FACTORS STUDY OF GMC CLOTHING AND EQUIPMENT
DURING COLD WEATHER TESTS OF THE PERSHING MISSILE SYSTEM
(U)

DESCRIPTIVE NOTE:  ENGINEERING PSYCHOLOGY RESEARCH STUDY
REPT.,
APR 62 16P  MCGRINNIS, JOHN M. I
ZIMMERER, THEODORE I
REPT. NO. QREC-EPR-1
proj: DA-7-x-9501001

UNCLASSIFIED REPORT

DESCRIPTORS: (SURFACE TO SURFACE MISSILES, ARMY
EQUIPMENT), (EXPOSURE SUITS, COMPATIBILITY), HUMAN
FACTORS ENGINEERING, COLD WEATHER TESTS, ARCTIC REGIONS,
ARMY OPERATIONS, LAUNCHING SITES, GROUND SUPPORT
EQUIPMENT, GLOVES, HEATERS
IDENTIFIERS:  PERSHING
(U)

THE PRIMARY PURPOSE OF THE PSYCHOLOGY LABORATORY
PARTICIPATION IN THE TEST WAS TO DETECT HUMAN FACTORS
PROBLEMS ASSOCIATED WITH QUARTERMASTER CORPS
STANDARD CLOTHING AND EQUIPMENT IN THE OPERATION OF
THE PERSHING MISSILE SYSTEM AND TO REPORT THESE
PROBLEMS TO THE RESPONSIBLE DESIGN AND DEVELOPMENT
GROUPS. SECONDARY GOALS WERE TO MAKE PRELIMINARY
STUDIES CONCERNING THE NEW EXPERIMENTAL INTEGRATED
CLOTHING SYSTEM, AND THE FEASIBILITY OF USING
ELECTRICALLY HEATED HANDWEAR FOR PERFORMING CRITICAL
TASKS DURING OPERATION OF THE PERSHING EQUIPMENT
(AUTHOR)

108

UNCLASSIFIED /Z0M08
SLEEPING PROTECTION FOR WARM AND COOL ENVIRONMENTS: THE EFFECT OF UTILIZING AN ATTACHABLE PONCHO LINER.

DESCRIPTIVE NOTE: RESEARCH STUDY REPT.
OCT 60 10P BYRON ROBERT F.
REPT. NO. QREC-FPB-2
PROJ. DA-7-X-9030001

FOUR COMBINATIONS OF ITEMS FOR PROVIDING ENVIRONMENTAL PROTECTION TO THE SLEEPING MAN UNDER COOL ENVIRONMENTAL CONDITIONS AND THREE COMBINATIONS IN A WARM ENVIRONMENT WERE EVALUATED IN TERMS OF THE SLEEPING PROTECTION PROVIDED BY EACH COMBINATION. OF PARTICULAR INTEREST IN THE STUDY WAS THE PERFORMANCE OF A QUARTERMASTER EXPERIMENTAL ATTACHABLE PONCHO LINER. (AUTHOR)
INVESTIGATION OF VIBRATION AND IMPACT PROTECTION OF THE HUMAN HEAD AND NECK. (U)

A SUMMARY OF THE INVESTIGATION LEADING TO THE FABRICATION OF A PROTOTYPE MODEL OF A HEAD AND NECK PROTECTIVE SYSTEM FOR AIRCREW MEMBERS IS PRESENTED. THE SYSTEM PROVIDES IMPACT, VIBRATION AND ENVIRONMENTAL PROTECTION FOR THE WEARER FROM 0 TO OVER 62,000 FEET ALTITUDE. THE SYSTEM CONSISTS OF A HELMET AND A PNEUMATICALLY OPERATED NECK RESTRAINT DEVICE WHICH IS USED TO STIFFEN THE COUPLING BETWEEN THE HELMET AND THE WEARER'S TORSO DURING VIBRATION AND ACCELERATION ENVIRONMENTS. (AUTHOR) (U)
THE DEVELOPMENT AND CONSTRUCTION OF A PERSONAL COOLING SYSTEM TO BE USED BY MILITARY PERSONNEL ENGAGED IN THE CLEARANCE AND DISPOSAL OF MUNITIONS IN THE FIELD IS DISCUSSED. THE TOTAL SYSTEM CONSISTS OF AN AIR DISTRIBUTION UNDERGARMENT AND A BATTERY-POWERED VENTILATING BACKPACK. THE VENTILATING BACKPACK IS DESIGNED TO PROVIDE 18 CFM OF AMBIENT AIR FOR VENTILATION OF THE TORSO TO RELIEVE THE HEAT STRESS IMPOSED ON THE INDIVIDUAL BY THE ARMORED CLOTHING WORN OVER THE AIR DISTRIBUTION SYSTEM. EACH CHARGE OF THE MODULAR RECHARGEABLE BATTERY ASSEMBLY PROVIDES ADEQUATE POWER TO OPERATE THE BLOWER FOR TWO HOURS. (AUTHOR)
A high altitude protection suit was developed of the partial pressure type that utilizes 40 sealed cells each containing a small air charge so they expand in accord with Boyle's Law when the atmospheric pressure is reduced. These independently acting, expandable, tubular cells are restrained within a stretch resistant but porous coverall in a manner to allow them to pressurize the body of the wearer. When the coverall is worn with pressure gloves, boots and a pressure helmet, it is possible to pressurize the entire body sufficiently for altitude exposure up to 100,000 feet for at least several minutes. The suit is fabricated of Nomex material, with pleated cells of polyurethane, and an inner comfort liner. The experimental suits were evaluated through actual wear in the altitude chambers at the USAF School of Aerospace Medicine. Results of these tests confirm the potential of this approach for providing aircrew protection. Further refinement is needed to obtain a design more suitable for use in the field and to assure balanced respiratory pressures.
EVALUATION OF A DIVER'S THERMONUCLEAR SWIMSUIT HEATER SYSTEM.

DESCRIPTIVE NOTE: MEDICAL RESEARCH INTERIM REPT., FEB 70 19P TAUBER, JOHN F.; RAWLINS, JOHN S.; P. IRONDI, KENNETH R. 1

PROJECT: M430607-1003

MONITOR: NAVMED M4306-07-1003-3

THE PRESENT STATE OF THE THERMONUCLEAR (I.E., RADIOISOTOPE HEAT SOURCE) DIVER HEATING SYSTEM IS DISCUSSED AND THE RESULTS OF THE ONLY DIVE TO DATE USING THIS SYSTEM ARE REPORTED. THE INLET AND OUTLET TEMPERATURES OF THE SYSTEM ARE RECORDED TOGETHER WITH THE TIME-COURSE OF SKIN AND RECTAL TEMPERATURES. IT IS CONCLUDED THAT THE SYSTEM IN ITS PRESENT STATE IS INCAPABLE OF MAINTAINING THERMAL BALANCE IN A DIVER AT DEPTH, AND ITS USE UNDER SEALAB III CONDITIONS WOULD ENTAIL A GRAVE RISK OF HYPOTHERMIA. (AUTHOR)
THE VORTEX TUBE IS CAPABLE OF PRODUCING REFRIGERATION WHEN DRIVEN BY COMPRESSED AIR. TO EVALUATE ITS AIRMAN COOLING CAPABILITIES, RESTING SUBJECTS WERE STUDIED IN A 54°C DRY BULB, 40°C WET BULB ENVIRONMENT WHILE WEARING AN MA-3 VENTILATING GARMENT. DURING THE FIRST SESSION, EACH SUBJECT WAS EXPOSED TO HIS SUBJECTIVE TOLERANCE WITHOUT THE VORTEX TUBE. WITH THE VORTEX TUBE PROVIDING 13°C INLET AIR TO THE MA-3, EACH SUBJECT WAS EXPOSED FOR A PERIOD EQUAL TO HIS ENDURANCE TIME (SECOND SESSION) AND FOR A PERIOD EQUAL TO TWICE HIS ENDURANCE TIME (THIRD SESSION). HEART RATE AND RECTAL TEMPERATURE WERE RECORDED CONTINUOUSLY. SWEAT LOSS AND SWEAT EVAPORATED WERE CALCULATED.
UNCLASSIFIED

DESCRIPTORS: (*ANTHROPOMETRY, MAN-MACHINE SYSTEMS), (*FLIGHT CLOTHING, *HUMAN FACTORS ENGINEERING), HIGH ALTITUDE, DESIGN, PRESSURE SUITS, AVIATION PERSONNEL (U)

THE REPORT REFLECTS RESEARCH ON VARIOUS PHASES OF THE DIMENSIONAL REQUIREMENTS OF THE PRESSURE SUITED MAN IN THE MAN-MACHINE SYSTEM. THE SPATIAL REQUIREMENTS FOR THE MAN IN A COCKPIT OR CAPSULE AND AN EJECTION AND ESCAPE MECHANISMS OR WEARING CLOTHING AS PROTECTION AGAINST HOSTILE ENVIRONMENTAL FACTORS, SUCH AS HEAT, COLD, VACUUM, HIGH G, AND RADIATION, PRESENT SEPARATE PROBLEMS FOR THE DESIGN ENGINEER THAT CAN BE HELPED EFFECTIVELY WITH THE APPLICABLE ANTHROPOLOGICAL DATA. (AUTHOR) (U)
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. Z0H008

AD-708 680 4/17 13/1
NAVAL CIVIL ENGINEERING LAB PORT HUENE ME CALIF

SEALAB III - DIVER'S ISOTOPIC SWIMSUIT-HEATER SYSTEM

DESCRIPTION NOTE: TECHNICAL NOTE.
MAY 70 128P BAYLES JOHN J. TAYLOR

DOUGLAS;

REPT. NO. NCEL-TN-1087
PROJ. NCEL-64-005

UNCLASSIFIED REPORT

DESCRIPTORS: (UNDERWATER CLOTHING, HEATING ELEMENTS),
DIVING, PLUTONIUM, RADIOACTIVE ISOTOPES, PLASTICS,
Pipes, Pumps, Hydrostatic Pressure, Protection,
Environmental Tests; Reliability, Specifications (U)
IDENTIFIERS: BACKPACKS, RADIOISOTOPE HEAT SOURCES,
SEALAB 3

THE ATOMIC ENERGY COMMISSION AND THE DEEP
SURMERSGENCE SYSTEMS PROJECT OFFICE INCLUDED
THE DEVELOPMENT AND EVALUATION OF AN ISOTOPIC
SWIMSUIT HEATING SYSTEM IN THE SEALAB III PROGRAM
TO DEMONSTRATE A USE OF ATOMIC ENERGY AS A METHOD FOR
PROVIDING SUPPLEMENTAL HEAT TO DIVERS. THE TASK OF
DEVELOPING A SWIMSUIT HEATING "PACKAGE" WAS ASSIGNED
TO THE NAVAL CIVIL ENGINEERING LABORATORY,
PORT HUENE ME, CALIFORNIA. THE "PACKAGE"
UTILIZES AEC FURNISHED PLUTONIUM 238 CAPSULES FOR
HEATING WATER WHICH IS PUMPED THROUGH A CLOSED-CYCLE
SYSTEM INCLUDING A DIVER'S UNDERGARMENT FITTED WITH
CLOSERLY SPACED PLASTIC TUBING. THE DIVER WEARS
A WET SUIT OVER THIS UNDERGARMENT TO AID IN RETAINING
THE HEAT PROVIDED. THE "PACKAGE" OR ISOTOPE
BACKPACK SEGMENT IS DESIGNED TO BE ATTACHED TO A
MODIFIED MARK VIII MIXED GAS BREATHING APPARATUS
BACKPACK. THE SPECIFICATIONS BASED UPON AVAILABLE
INFORMATION AT THE TIME OF INITIAL DEVELOPMENT
STAGES, DID NOT PROVIDE FOR SUFFICIENT ISOTOPE TO
PRODUCE ADEQUATE SUPPLEMENTAL HEAT. HOWEVER, THE
FINAL BACKPACK DESIGN DID NOT MATERIALLY AFFECT THE
DIVER'S CAPABILITIES AND THE SYSTEM WAS SUCCESSFULLY
TESTED WITH RESPECT TO ITS DESIGN OPERATIONAL
CHARACTERISTICS. (AUTHOR)

116

UNCLASSIFIED /Z0H008
EXTENSIVE INVESTIGATIONS OF SEWN SEAMS IN COATED FABRICS HAVE BEEN CONDUCTED. THE RELATIVE ROLL OF THREAD, SEWING MACHINE COMPONENTS, STITCH AND SEAM TYPES AND PROPERTIES OF FABRICS HAVE BEEN EVALUATED AS PARAMETERS INVOLVED IN SEAM LEAKAGE. UTILIZATION OF VARIOUS EXPERIMENTAL SEAM CONSTRUCTIONS, GASKETING, APPLICATION OF HEAT DURING SEAM SEWING AND OTHER TECHNIQUES WERE ATTEMPTED AS POTENTIALLY USEFUL APPROACHES IN COMBATING SEAM LEAKAGE.

(AUTHOR)

(U)
DEVELOPMENT OF PRACTICAL HIGH-INTENSITY THERMAL PROTECTION SYSTEMS

DESCRIPTIVE NOTE: INTERIM REPT.
JUL 70 2DP STOLL ALICE M. ICHIANTA
MARIA A. IJUDGE L. B. I
REPT NO. NADC-MR-7016
PROJ: A34-531/202/70F32-523-401

THE MILITARY REQUIREMENT FOR HIGH-INTENSITY THERMAL PROTECTION ENTAILS PROVISION OF A SYSTEM WHICH IS EFFECTIVE IN THE NUCLEAR WEAPON RANGE AND AT THE SAME TIME PRACTICAL FROM THE LOGISTICS POINT OF VIEW AND COMFORTABLE FOR EXTENDED PERIODS OF WEAR. WITH THESE ENDS IN MIND, SMALL-SCALE LABORATORY PROCEDURES AND FULL-SCALE EVALUATION PROCEDURES WERE DEVISED WHEREBY SPECIFIC SYSTEMS COULD BE DESIGNED TO MEET SPECIFIC NEEDS. THERMAL BARRIERS WERE DESIGNED THROUGH APPLICATION OF BASIC HEAT TRANSFER PRINCIPLES WITH CAREFUL CONSIDERATION FOR THE INFLUENCE OF THERMAL AND OPTICAL PROPERTIES OF MATERIALS ON HEAT EXCHANGE. IN THE PRESENT EXAMPLE A GREEN ASSEMBLY WAS DEVELOPED TO REPLACE A WHITE ONE DESIGNED FOR PROTECTION OF FLIGHT PERSONNEL FROM THE THERMAL EFFECTS OF NUCLEAR WEAPONS. IN THERMAL EXPOSURES DELIVERING APPROXIMATELY 50 CAL/(SQ CM) IN 2 SECONDS IN SOME AREAS, WITH AN OVERALL AVERAGE OF ABOUT 20 CAL/(SQ CM) IN 2 SECONDS, THE NEW SYSTEM OFFERED PROTECTION EQUAL TO THAT OF THE WHITE ASSEMBLY WHILE WEIGHING ONLY HALF AS MUCH AND REPRESENTING SIGNIFICANT ADVANTAGES IN COMFORT AND LOGISTICS. THE PROCEDURES DEVELOPED IN THIS STUDY ARE GENERAL IN NATURE AND WIDELY APPLICABLE TO THE DEVELOPMENT OF OTHER THERMAL PROTECTION SYSTEMS.

(AUTHOR)
EXPLORATORY DEVELOPMENT OF PRESSURE SUIT MOBILITY
JOINTS, GLOVES AND HELMET. (U)

DESCRIPTIVE NOTE: FINAL REPT. MAR 66-APR 69
APR 70 19P SLOWIK JOZEF IMARCUM ALFRED
BURNS MARVIN
RFPT. NO. IITRI-J6028-FR
CONTRACT: AF 33(615)-3468
PROJ: AF-7164
TASK: 716411
MONITOR: AMRL TR-69-64

A RESEARCH PROGRAM WAS CONDUCTED TO INVESTIGATE AND
DEVELOP APPROACHES FOR IMPROVING PRESSURE SUIT
MOBILITY AND COMFORT. NOVEL CONCEPTS WERE GENERATED
AND UNIQUE PROPERTIES OF MATERIALS WERE EXPLOITED TO
IMPLEMENT THESE CONCEPTS FOR VARIOUS PRESSURE SUIT
COMPONENTS. SINGLE PLANE MOBILITY JOINTS OF LOW
PROFILE FABRIC MATERIALS WERE MADE WITH MOBILITY
APPROACHING THAT OF HARD JOINTS. WORK WAS BEGUN TO
ADAPT THE SAME PRINCIPLES TO BIAXIAL JOINTS.
ADVANCED CONCEPTS FOR IMPROVING THE TACTILITY AND
MOBILITY OF PRESSURE GLOVES WERE IMPLEMENTED IN
SEVERAL MODELS OF EXPERIMENTAL GLOVES. EXPLORATORY
DEVELOPMENT OF PARTIAL PRESSURE HELMET WAS INITIATED
AS A PART OF THE BROAD SYSTEMS STUDY. THE THERMAL
CONTROL PROBLEMS AND MICROMETEOROID THREAT TO THE
EXTRAVEHICULAR CREWMAN WERE ALSO INVESTIGATED.

(AUTHOR)
HEAT IS TRANSFERRED THROUGH FABRICS BY CONVECTION, CONDUCTION AND RADIATION AND UNDER CERTAIN CIRCUMSTANCES BY VAPORIZATION. EACH MODE IS SUBJECT TO DIFFERENT PHYSICAL PRINCIPLES BUT THE EFFECT OF THE TOTAL HEAT ABSORBED BY UNDERLYING SKIN IS THE SAME: IF THE RESULTANT SKIN TEMPERATURE RISE IS SUFFICIENTLY HIGH AND MAINTAINED SUFFICIENTLY LONG, INJURY RESULTS. THE EXTENT OF INJURY IS PREDICTED UNDER CERTAIN CONTROLLED CONDITIONS AND THESE CONDITIONS MAY BE USED TO DISCLOSE PROTECTION PRINCIPLES APPROPRIATE TO EACH MODE OF TRANSFER.
UNCLASSIFIED

ONC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM08

AD-712 994 6/17

ARMY NATICK LABS MASS CLOTHING AND PERSONAL LIFE SUPPORT EQUIPMENT LAB

FLOW OF HEAT AND WATER VAPOR THROUGH PROTECTIVE CLOTHING.

DESCRIPTIVE NOTE: TECHNICAL REPT., AUG 70 22P VOTTA, FERDINAND, JR. ISPAINO

LEO A. I

REPT. NO. C/PLSEL-78

PROJ: DA-1-J-062110-A-533

MONITOR: USA-NLABS TR-71-S-CE

UNCLASSIFIED REPORT

DESCRIPTORS: (*PROTECTIVE CLOTHING, HEAT TRANSFER), WATER VAPOR, COOLING, ISOCYANATE PLASTICS, TEXTILES, NYLON, BODY TEMPERATURE, LAMINATES

IN A CONTINUING EFFORT TO IMPROVE THE COMFORT AND WORKING EFFICIENCY OF PERSONS WEARING VARIOUS PROTECTIVE CLOTHING SYSTEMS, A SWEATING CYLINDER TO TEST THE HEAT AND WATER VAPOR TRANSFER CHARACTERISTICS OF SUCH SYSTEMS WAS DESIGNED, CONSTRUCTED AND TESTED. WITH THIS EQUIPMENT, THE HEAT AND WATER VAPOR TRANSFER THROUGH A CARBON-TREATED POLYURETHANE-NYLON TRICOT LAMINATED CLOTHING SYSTEM WAS DETERMINED UNDER A WIDE RANGE OF SIMULATED ENVIRONMENTAL CONDITIONS. (AUTHOR)
TACTICAL IMPLICATIONS OF THE PHYSIOLOGICAL STRESS
IMPOSED BY CHEMICAL PROTECTIVE CLOTHING SYSTEMS. (U)

GOLDMAN, RALPH F. I

THE PAPER DETAILS THE SUBSEQUENT LABORATORY
STUDIES, DELINEATES THE PHYSIOLOGICAL PROBLEMS,
DESCRIBES SUBSEQUENT, SUCCESSFUL FIELD EVALUATIONS
AND SUGGESTS SOME OF THE TACTICAL LIMITATIONS IMPOSED
BY WEARING CURRENT CHEMICAL PROTECTIVE SYSTEMS. (U)

(AUTHOR)
UNCLASSIFIED

DNC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /20M08

AD-713 573  6/17
ARMY NATICK LABS MASS

MODERN COUNTER-SURVEILLANCE IN COMBAT CLOTHING. (U)

70  14P  RAMSLEY, A. 0: 1

UNCLASSIFIED REPORT
AVAILABILITY: MICROFICHE COPIES ONLY.

DESCRIPTORS: (*PROTECTIVE CLOTHING, *CAMOUFLAGE),
COLORS, REFLECTION, OPTICAL PROPERTIES, SOILS, TREES,
EXPERIMENTAL DATA, AERIAL PHOTOGRAPHY, SNIPERSCOPES,
INFRARED PHOTOGRAPHY, IMAGE INTENSIFIERS(ELECTRONICS) (U)
IDENTIFIERS: SURVEILLANCE (U)

THE PAPER DESCRIBES THE DEVELOPMENT OF A COLORANT
SYSTEM FOR COMBAT CLOTHING THAT SATISFIES THE
REFLECTANCE REQUIREMENTS FOR CAMOUFLAGE PROTECTION
AGAINST DETECTION BY ALL OF THE MODERN SURVEILLANCE
DEVICES, AS WELL AS BY VISUAL OBSERVATION. (AUTHOR) (U)
UNCLASSIFIED

UNCLASSIFIED REPORT

DESIGN PRINCIPLES FOR MICROCLIMATE-CONTROLLED PROTECTIVE CLOTHING SYSTEMS: PROTECTIVE CLOTHING SYSTEM FOR EXPLOSIVE ORDNANCE DISPOSAL: AIR-CONDITIONED CLOTHING FOR ARMY AIRCREW: AND PERFORMANCE EVALUATION OF AIR-CONDITIONED CLOTHING.
PERVAPOURATION OF WATER FROM A SPACE SUIT HAS BEEN PROPOSED AS A METHOD OF COOLING AN ASTRONAUT. THE PURPOSE OF THIS PROGRAM WAS TO INVESTIGATE THE VARIOUS PRINCIPLES, TECHNIQUES AND MATERIAL DESIGNS APPLICABLE TO THE ENGINEERING OF A SYSTEM CAPABLE OF TRANSFERRING UP TO 3000 BTU/HR. FOUR DIFFERENT APPROACHES WERE INVESTIGATED WITH AN EVENTUAL PROTOTYPE KEPT IN VIEW. (AUTHOR)
SUCCESSFUL COMPLETION OF A DESIGN STUDY OF AN EXTRAVEHICULAR SPACE SUIT ASSEMBLY WITH AN INTEGRATED LIFE SUPPORT SYSTEM HAS LED TO THE FABRICATION AND EVALUATION OF A HUMAN FACTORS MOCKUP. THIS MOCKUP CONSISTS OF A TWO-PIECE HARD TORSO WITH SOFT ARMS AND LEGS, A FULL BUBBLE HELMET AND PRESSURE GLOVES COMPLETE THE PRESSURE SUIT SYSTEM. THE HARD TORSO IS A VOLUMETRIC REPRESENTATION OF AN INTEGRAL LIFE SUPPORT SYSTEM. IT ALSO CONTAINS AN OPERATIONAL COLD-GAS PROPULSION SYSTEM AND CONTROLS AND DISPLAY PANELS. SIXTEEN THRUSTERS PROVIDE ACCELERATIONS OF 0.3 FT/SEC SQUARED IN THREE DEGREES OF TRANSLATION AND 10 TO 20 DEGREES OF ROTATION. (AUTHOR)
A TECHNIQUE FOR OPTIMAL FITTING OF FLIGHT HELMETS.

SFP 70 12P GREENE JAMES W. I
REPT. NO. NAHRL-1118
PROJ. MF12-524-005 A6340-6314/81F12-52-4402
MONITOR: NAVMED MF12-524-005-70088-1

UNCLASSIFIED REPORT

DESCRIPTORS: (EAR PROTECTORS, NAVAL AVIATION), (NOISE ATTENUATION), (HELMETS, COMPATIBILITY), OPTIMIZATION, HUMAN FACTORS ENGINEERING, TEST METHODS, AUDIOMETRY, THRESHOLDS (PHYSIOLOGY), EARPHONES
IDENTIFIERS: COMFORT, FLIGHT CLOTHING, HELMETS

ALTHOUGH FLIGHT HELMETS SELECTED FOR NAVY USE MAY POSSESS EXCEPTIONALLY GOOD NOISE ATTENUATION QUALITIES, MAXIMUM ATTENUATION MAY NOT ALWAYS BE REALIZED WHEN THE HELMET IS WORN, PARTICULARLY IF THE HELMET DOES NOT FIT. THE LACK OF A STANDARDIZED PROCEDURE FOR FITTING FLIGHT HELMETS OFTEN RESULTS IN A POOR COMPROMISE THAT SACRIFICES NOISE EXCLUSION FOR COMFORT. A PROCEDURE THAT INVOLVES THE USE OF A NOISE SOURCE AND AN AUTOMATIC RECORDING AUDIOMETER HAS BEEN DEVELOPED AS AN AID IN THE FITTING PROCESS. THE NOISE SOURCE ALLOWS THE AVIATOR TO DETECT ACOUSTICAL LEAKAGE AROUND HIS EARS SO THAT A BETTER FIT CAN BE EFFECTED. MASKED HEARING THRESHOLD LEVELS OBTAINED WITH THE HELMET'S EARPHONES MAY BE USED TO DEMONSTRATE IMPROVED PERFORMANCE.

AUTHOR
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOMOS

AD-719 106 6/17 14/2
ARMY TEST AND EVALUATION COMMAND ABERDEEN PROVING GROUND

CLOTHING (AVIATION)(U)

DESCRIPTIVE NOTE: FINAL REPT. ON MATERIEL TEST PROCEDURE.
DEC 70 23P
REPT. NO. MTP-7-8-087
PROJ: AMCR-310-6

UNCLASSIFIED REPORT

DESCRIPTORS: (FLIGHT CLOTHING, TEST METHODS), PROTECTION, HUMAN FACTORS ENGINEERING, ENVIRONMENTAL TESTS, VISUAL INSPECTION, LAUNDRY OPERATIONS, SURVIVAL KITS
IDENTIFIERS: COMFORT, COMMON ENGINEERING TEST PROCEDURES, EVALUATION (U)

TEST PROCEDURES ARE DESCRIBED TO DETERMINE THE DEGREES AND FORMS OF PROTECTION, AND THE RELATIVE COMFORT AND FUNCTIONAL PERFORMANCE OF FLIGHT CREW MEMBER CLOTHING. (AUTHOR) (U)
DESCRIPTION NOTE: MATERIEL TEST PROCEDURE.
JAN 68 18P
REPT. NO. MTP-8-2-041

THE DOCUMENT PROVIDES TEST METHODS AND TECHNIQUES NECESSARY TO DETERMINE THE TECHNICAL PERFORMANCE AND SAFETY ASPECTS OF CB PROTECTIVE BOOTS.
(AUTHOR)
THE DOCUMENT PROVIDES TEST METHODS AND TECHNIQUES NECESSARY TO DETERMINE THE TECHNICAL PERFORMANCE AND SAFETY ASPECTS OF THE TEST ITEM RELATIVE TO THE CRITERIA CITED IN APPLICABLE QUALITATIVE MATERIAL REQUIREMENTS (QMRR'S), SMALL DEVELOPMENT REQUIREMENTS (SDRR'S), TECHNICAL CHARACTERISTICS (TCR'S), AND AS INDICATED BY THE PARTICULAR DESIGN AND TO DETERMINE THE TECHNICAL SUITABILITY OF THE TEST ITEM FOR SERVICE TEST. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM08

AD-719 131 6/17 15/2 14/2
ARMY TEST AND EVALUATION COMMAND ABERDEEN PROVING GROUND MO

ARCTIC ENVIRONMENTAL TEST OF CB PROTECTIVE CLOTHING, PROTECTIVE MASKS AND WINTERIZATION KITS.

DESCRIPTIVE NOTE: FINAL REPT. ON MATIERIEL TEST PROCEDURE. JAN 70 12P
REPT. NO. MTP-8-4-006
PROJ: AMCR-310-6

UNCLASSIFIED REPORT

DESCRIPTORS: (*PROTECTIVE MASKS, TEST METHODS), (*PROTECTIVE CLOTHING, TEST METHODS), COLD WEATHER TESTS, RELIABILITY, CHEMICAL PROPERTIES, MAINTAINABILITY, HUMAN FACTORS ENGINEERING, BIOLOGICAL WARFARE AGENTS, CHEMICAL WARFARE AGENTS, PROTECTIVE MASKS, ARCTIC REGIONS

IDENTIFIERS: TOXIC AGENT PROTECTIVE CLOTHING, *ENVIRONMENTAL TEST PROCEDURES

THE PROCEDURES OUTLINED IN THIS MATIERIEL TEST PROCEDURE ARE DESIGNED TO DETERMINE AND EVALUATE THE PERFORMANCE CHARACTERISTICS OF CB PROTECTIVE CLOTHING, PROTECTIVE MASKS AND WINTERIZATION KITS IN ARCTIC ENVIRONMENTAL CONDITIONS. PROCEDURES ARE ALSO INCLUDED WHICH ARE APPLICABLE TO SURVEILLANCE (5 YEARS) TESTING OF SUBJECT ITEMS.

(AUTHOR)
UNCLASSIFIED

EXPLORE DEVELOPMENT OF PARTIAL PRESSURE HELMETS AND MOBILITY JOINTS FOR EMERGENCY PRESSURE SUIT OUTFITS.*  (U)

DESCRIPTIVE NOTE: FINAL REPT. 1 JUN 69-31 AUG 70, JAN 71 43P SLOWIK, JOSEF; MARCOM, ALFRED; SURNES, MARVIN.

REPT. NO: IITRI-J6181-FR

CONTRACT: F33615-69-C-1592

PROJ: AF-7164; IITRI-J6181

TASK: 716411

MONITOR: AMRL TR-70-111

UNCLASSIFIED REPORT

DESCRIPTORS: (PRESSURE SUITS, JOINTS); (HELMTS, JOINTS); MOBILITY, DACRON, DISTORTION, NETS; HIGH ALTITUDE.  (U)

ANISTROPIC DACRON NET PREPARED BY DISTORTION ON THE RIAS AND LOCKING WITH A POLYURETHANE SOLUTION WAS USED FOR EXPANDABLE PANELS ALONG WITH NON-EXPANDABLE FABRICS AND VOLUME TRANSFER BANDS TO FORM SEVERAL EXPERIMENTAL JOINTS. COMBINATIONS SHOWING PROPER FUNCTION IN A SINGLE PLANE WERE NOT FULLY ADAPTABLE TO MULTIPLE PLANE JOINTS WITHOUT RESORTING TO BULKY, RIGID PARTS. THE HELMET INCORPORATED A MANUALLY OPERATED PRESSURE VISOR, FACE-EAR SEALS, AND A MULTI-COMPARTMENTED BLADDER SYSTEM WHICH DOES NOT COVER THE CROWN OF THE HEAD THUS CANCELLING HELMET LIFTING FORCES. THE HELMET IS FUNCTIONAL AND HAS BEEN WORN AT 175 MM HG PRESSURE WITHOUT UNDUE DISCOMFORT. TOTAL WEIGHT AND BULK ARE LOW FOR A PRESSURE HELMET AND HIGH ALTITUDE TRIALS HAVE BEEN SUCCESSFUL. HEAD MOBILITY (LIMITED BY OMISSION OF A ROTARY BEARING AND SUIT-RIB OVERLAP), BETTER FACE-EAR SEALS, AND AUTOMATIC VISOR CLOSING WOULD BE ATTAINABLE IN A COORDINATED HELMET/SUIT SYSTEM DEVELOPMENT.  (AUTHOR)  (U)

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UNCLASSIFIED
UNCLASSIFIED

DESIGN AND FABRICATION OF A PASSIVELY PRESSURIZED SUIT.

DESCRIPTIVE NOTE: FINAL REPT. JUL 68-APR 70, JAN 71

28P

JOSEPH A.

PLESKUN, WALTER G. IRUSECKAS,

CONTRACT: F33657-68-C-1663

PROJECT: AF-7164

TASK: 716411

MONITOR: AMRL TR-70-120

UNCLASSIFIED REPORT

DESCRIPTORS: (PRESSURE SUITS, HIGH ALTITUDE),
PRESSURIZATION, FIRE RESISTANT TEXTILES, VALVES,
RESPIRATION, TESTS, CARDIOVASCULAR DISEASES, HELMETS (U)

THE PURPOSE OF THE EXPERIMENTAL EFFORT WAS TO EVOLVE NEW DESIGNS AND MANUFACTURING TECHNOLOGY APPLICABLE TO HIGH ALTITUDE PRESSURE SUITS. EMPHASIS WAS PLACED ON DEVELOPMENT OF BLADDERS USING AN ELASTOMERIC COMPOUND WHICH WOULD HAVE EXCELLENT AIR RETENTION FOR EXTENDED PERIODS OF TIME; WOULD HAVE THE CAPABILITY TO EXPAND SUFFICIENTLY TO SERVE AS A REDUNDANT SEGMENT FOR FAILED ADJACENT BLADDERS AND WOULD BE ECONOMICAL TO FABRICATE. ADDITIONAL EMPHASIS WAS PLACED ON THE DEVELOPMENT OF A RESTRAINT COVERALL WHICH WOULD SATISFY THE REQUIREMENTS FOR PASSIVE VENTILATION, UNPRESSURIZED MAXIMUM MOBILITY, ACCEPTABLE PRESSURIZED MOBILITY, LONG TERM COMFORT UNPRESSURIZED, ADEQUATE SKIN PRESSURE DURING PRESSURIZATION AND LOWEST POSSIBLE WEIGHT. (AUTHOR)
EXPERIMENTAL FIRES FROM POOLS OF BURNING AIRCRAFT FUELS WERE INSTRUMENTED WITH HEAT METERS TO DETERMINE HEAT FLUX DISTRIBUTIONS FOR APPLICATION TO THE DESIGN OF PROTECTIVE CLOTHING FOR FIREFIGHTING PERSONNEL. THE SPECTRAL DISTRIBUTION OF INFRARED RADIATION EMITTED BY FIRES WAS ALSO MEASURED. CONDITIONS AFFECTING THE FIRES AND THE RESULTING HEAT EFFECTS THAT WERE STUDIED WERE WIND VELOCITY, FUEL POOL AREA, TIME OF BURNING, ORIENTATION AROUND THE FIRE RELATIVE TO WIND DIRECTION, DISTANCE FROM THE FIRE, AND AN EXTRANEOUS OBJECT IN A FIRE. A MEANS BY WHICH EVALUATION OF REFLECTIVE CLOTHING CAN BE MADE IS DESCRIBED. (AUTHOR)
FLYING PERSONNEL RESEARCH COMMITTEE LONDON (ENGLAND)

A LABORATORY COMPARISON OF THREE METHODS OF PERSONAL CONDITIONING.

JAN 71 42P ALLAN, J. R. \#ALLNUTT, H. F. \#HANSON, R. \#DE G. \#IBEENY, H. \#ISHORT, B.

REPT. NO. FPRC-1307


DESCRIPTORS: (*FLIGHT CLOTHING, DESIGN), (*PILOTS, STRESS (PHYSIOLOGY)), TACTICAL BOMBING, AIRCRAFT CABINS, THERMAL STRESSES, SIMULATION, GREAT BRITAIN

TWELVE SUBJECTS WERE USED TO OBTAIN COMPARATIVE DATA BETWEEN A WATER COOLED, A CONVECTIVE AIR COOLED AND A REVERSE FLOW AIR COOLED PERSONAL CONDITIONING SYSTEM DURING LABORATORY SIMULATIONS OF A TYPICAL OPERATIONAL SORTIE IN A HOT CLIMATE. THE RESULTS Generally FAVOURED THE WATER COOLED SYSTEM ON PHYSIOLOGICAL, BEHAVIOURAL AND SUBJECTIVE GROUNDS. THE RESULTS OF THIS LABORATORY TRIAL MAY NOT NECESSARILY TRANSFER TO REALISTIC OPERATING CONDITIONS AND FURTHER FIELD TESTING BOTH IN FLIGHT AND USING APPROPRIATE GROUND EQUIPMENT WILL BE REQUIRED BEFORE IT CAN BE SHOWN WHETHER THESE ADVANTAGES CAN BE REALISED. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDM08

AD-723 030 15/5 14/2
ARMY TEST AND EVALUATION COMMAND ABERDEEN PROVING GROUND MD

CLOTHING (AVIATION).

DESCRIPTION NOTE: FINAL REPT ON MATERIEL TEST PROCEDURE.
MAR 71 34P
REPT NO. MTP-7-2-087
PROJ. AMCR-310-6

UNCLASSIFIED REPORT

DESCRIPTORS: (FLIGHT CLOTHING, TEST METHODS), MAINTENANCE, RELIABILITY, SAFETY, HUMAN FACTORS ENGINEERING, EXPOSURE (PHYSIOLOGY), ENVIRONMENTAL TEST (U)
IDENTIFIERS: COMMODITY ENGINEERING TEST PROCEDURES (U)

THE DOCUMENT PROVIDES TEST METHODOLOGY AND TESTING TECHNIQUES NECESSARY TO DETERMINE THE TECHNICAL PERFORMANCE AND SAFETY CHARACTERISTICS OF AVIATION TOOLS AND ASSOCIATED ACCESSORIES AS DESCRIBED IN MATERIEL NEEDS (MN) AND TO DETERMINE THE ITEM'S SUITABILITY FOR SERVICE TESTS. (AUTHOR) (U)

UNCLASSIFIED REPORT

DESCRIPTORS: (#PROTECTIVE CLOTHING, IMPREGNATION), (#CHEMICAL WARFARE AGENTS, PROTECTIVE CLOTHING), TANKS(CONTAINERS), CHEMICALS, PROCESSING, DYES, LAUNDRY OPERATIONS

THE OBJECT OF THE STUDY WAS TO IMPROVE CHEMICAL HANDLING PROCEDURES AND EQUIPMENT FOR USE IN CONVERTING LAUNDRY EQUIPMENT TO A CLOTHING IMPREGNATION UNIT. (AUTHOR)
WATER COOLED HOOD AFFECTS CREATIVE PRODUCTIVITY,

69 SP KONZ, S. IGUPA, V. K. 1

CONTRACT: F44620-68-C-0020
PROJ: AF-9563
MONITOR: AFOSR TR-71-1364

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN ASHRAE JNL., P40-43 JUL 69.

DESCRIPTORS: (*PERFORMANCE(HUMAN), *PROTECTIVE CLOTHING), (*HELMETS, COOLING), STRESS(PHYSIOLOGY), BODY TEMPERATURE, SWEAT GLANDS, PULSE RATE

THE EFFECT OF LOCALIZED COOLING OF THE HEAD WAS STUDIED IN A HEAT STRESS (100 F, 70% RH) ENVIRONMENT ON EIGHT MALE STUDENTS. PRODUCTIVITY ON A CREATIVE MENTAL TASK DECLINED 8% LESS WITH THE HOOD. RECTAL AND LIMB TEMPERATURE WERE NOT SIGNIFICANTLY AFFECTED BY THE HOOD BUT, WITH THE HOOD, THE HEAT TEMPERATURE RISE WAS 2 DEG F LESS. THE SWEAT RATE WHILE WEARING THE HOOD WAS SIGNIFICANTLY LESS. THE HEART RATE INCREASE WAS LOWER WITH THE HOOD. HEART BEAT VARIABILITY (AN INDEX OF STRESS) WAS AFFECTED BY THE HEAT AND, WITH THE HOOD, VARIABILITY DECREASED LESS AS WAS PREDICTED. (AUTHOR)
UNCLASSIFIED

DOE REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM08

AD-774 617 6/17 6/19
NAVY AIR DEVELOPMENT CENTER WARMINSTER PA AEROSPACE CREW
EQUIPMENT DEPT

PHYSIOLOGICAL EVALUATION OF SUBJECTS EXPOSED TO A COLD WATER ENVIRONMENT WHILE WEARING DIFFERENT PROTECTIVE SUIT ASSEMBLIES.

DESCRIPTIVE NOTE: INTERIM REPT.
M/R 71-18P SANTA MARIA LOUIS J. 1
RADLIEF MEREDITH M. 1
REPT. NO. NADC-AC-7101
PROJ. A340-5311/302-6/1F32-523-401

UNCLASSIFIED REPORT

DESCRIPTORS: (*UNDERWATER CLOTHING, LOW TEMPERATURE), (*PROTECTIVE CLOTHING, LOW TEMPERATURE), EFFICIENCY, UNDERWATER, ENVIRONMENT, PHYSIOLOGY, DESIGN, MATERIALS, TEMPERATURE, BODY TEMPERATURE, EXPOSURE (PHYSIOLOGY) (U)

THE PHYSIOLOGICAL RESPONSES OF TWO VOLUNTEER SUBJECTS EXPOSED TO AN EXTREME COLD WATER ENVIRONMENT (30°C) WHILE WEARING THE 3/16 INCH CHLOROPRENE WET SUIT, 1/8 INCH CHLOROPRENE WET SUIT, AND THE POLYVINYL CHLORIDE WET SUIT WERE INVESTIGATED UNDER TWO CONDITIONS OF USE: CONSTANT IMMERSION-FLOTATION (COND I) AND IMMERSION-FLOTATION FOR A TWO-MINUTE PERIOD FOLLOWED BY RAFT OCCUPANCY (COND II). IN VIEW OF EXPOSURE DURATION RANGING FROM 0.5-1.0 HR AND FROM 2.0-3.0 HR UNDER CONDITIONS I AND II, RESPECTIVELY, THE RESULTS INDICATE THAT SURVIVAL AND TISSUE DAMAGE PROTECTION IS AFFORDED, WITHIN EXPECTED LIMITS OF TIME UNDER BOTH EMERGENCY CONDITIONS FOR SEARCH AND RECOVERY, BY ANY OF THE CLOTHING ASSEMBLIES TESTED. IT IS RECOMMENDED, THEREFORE, THAT THE 1/8 INCH CHLOROPRENE WET SUIT BE CONSIDERED AS THE MOST ACCEPTABLE ON THE BASIS OF SUCH PHYSICAL CHARACTERISTICS AS REDUCED WEIGHT AND BULK. (AUTHOR) (U)
THE BEHAVIOR OF PROTECTIVE UNIFORMS IN LARGE-SCALE SIMULATED FIRES.

DESCRIPTIVE NOTE: TECHNICAL REPT.
MAR 71 541
REPT. NO. C/PL&EL-TE-177
PROJ: DA-1-0-24401-A-329
MONITOR: USA-MLABS TR-71-40-CE

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: ERRATA SHEET INSERTED.

DESCRIPTORS: (FLIGHT CLOTHING, HEAT RESISTANT MATERIALS, FIRE RESISTANT TEXTILES, MILITARY FACILITIES, TEST FACILITIES, JET ENGINE FUELS, FIRES, VISUAL INSPECTION, TEMPERATURE, SYNTHETIC FIBERS, ARMY RESEARCH)
IDENTIFIERS: JP-4 FUEL, EVALUATION

THE REPORT DESCRIBES A NEW TEST FACILITY DEVELOPED AT THE U. S. ARMY NATICK LABORATORIES FOR EXPOSING CLOTHED MANIKINS TO LARGE FUEL (JP-4) FIRES AND GIVES THE RESULTS OF EVALUATIONS MADE OF SEVERAL PROTECTIVE SYSTEMS DEVELOPED FOR HOT AND COLD WEATHER AVIATORS' UNIFORMS. (AUTHOR)
EFFICACY OF VENTILATING SYSTEMS.

VEGHTE, JAMES H.

PROJECT: AF-7222
TASK: 722207
MONITOR: AMRL TR-69-54

UNCLASSIFIED REPORT
AVAILABILITY: PURCHASE IN NASA AMES RESEARCH CENTER PORTABLE LIFE SUPPORT SYSTEMS, NASA SP-234 P151-177 NO.

DESCRIPTORS: (FLIGHT CLOTHING, VENTILATION), EQUILIBRIUM (PHYSIOLOGY), PHYSIOLOGY, HUMIDITY, TEMPERATURE, PERMEABILITY, EVAPORATION, PULSE RATE, SWEAT GLANDS, AEROSPACE MEDICINE

SEVERAL AIR-COOLED SYSTEMS AND ONE WATER-COOLED SYSTEM WORN UNDER FLIGHT CLOTHING WERE EVALUATED. THE SUBJECTS WERE EXPOSED TO AN ENVIRONMENT OF 43 C/45 MM HG WATER VAPOR PRESSURE AT SEA LEVEL. SWEAT LOSS, BODY TEMPERATURE, AND HEART RATE MEASUREMENTS WERE TAKEN. ALL SYSTEMS WERE FOUND TO AMELIORATE DISCOMFORT WITH THE WATER-COOLED SYSTEM SHOWING SLIGHT ENHANCEMENT OVER AIR SYSTEMS. PROVISIONS FOR COOLING THE FACE DECREASED DISCOMFORT. OPTIMAL VENTILATING SYSTEMS ARE PROPOSED FOR PERMEABLE AND IMPERMEABLE CLOTHING.
The Navy Clothing and Textile Research Unit is developing a damage control suit system to protect personnel in hazardous chemical, high temperature-humidity, and oxygen deficient environments. Data indicate the system will provide life support for an individual completely encapsulated from his environment for a maximum of 80 minutes at 140°F, while performing light activity, and for 120 minutes at 70°F, while moderately active.
CIVIL AEROMEDICAL INST OKLAHOMA CITY OKLA

PROTECTIVE SMOKE HOOD STUDIES,

DEC 70 66P MCFADDEN ERNEST E ISMITH
ROGER C. I MONITOR: FAA-AM 70-20

UNCLASSIFIED REPORT

DESCRIPTIONS: (*PROTECTIVE COVERINGS, SMOKE),
(*PROTECTIVE MASKS, SMOKE), (*FIRE PROTECTIVE CLOTHING,
EFFICIENCY), RESCUES, EVACUATION, PHYSIOLOGY

IDENTIFIERS: *PROTECTIVE HOODS

THE REPORT DESCRIBES THE EVALUATION AND TESTING OF
A HIGH-TEMPERATURE RESISTANT, TRANSPARENT, POLYIMIDE
HOOD DESIGNED TO PROTECT AIRCRAFT PASSENGERS AND CREW
FROM THE EFFECTS OF TOXIC FUMES, SMOKE AND FLAME
RESULTING FROM AN AIRCRAFT ACCIDENT. AS A 'GET-ME-
OUT' DEVICE, THE HOOD WAS DEVELOPED TO PROVIDE
PROTECTION OF THE RESPIRATORY SYSTEM AND MAINTAIN THE
OCCUPANT IN A CONSCIOUS AND MOBILE STATE SO THAT THE
AIRCRAFT CAN BE EVACUATED BEFORE SMOKE AND HIGH
TEMPERATURES RENDER THE CABIN ENVIRONMENT
UNINHABITABLE. CONSISTING OF A SERIES OF
INDEPENDENT STUDIES, THIS REPORT ENCOMPASSES
CONTRIBUTIONS FROM THE FIELDS OF PHYSIOLOGY,
PSYCHOLOGY, AND HUMAN FACTORS. THE GENERAL SMOKE
HOOD CONCEPT IS EXAMINED WITH RESPECT TO
ENVIRONMENTAL PROTECTION, VISION, HEARING, SAFETY
BRIEFINGS, AND THE EFFECT OF THE HOOD UPON VACUATION
EFFICIENCY. (AUTHOR)

UNCLASSIFIED

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UNCLASSIFIED /Z0M08
A WATER-COOLED SUIT WAS DEVELOPED FOR USE AS A DIRECT CALORIMETER WITH ERROR OF APPROXIMATELY ONE PERCENT WHEN HEAT LOSS WAS MATCHED TO HEAT PRODUCTION OVER A FULL 24-HOUR METABOLIC CYCLE. THE NEW SUIT WAS COUPLED WITH A PREVIOUSLY DEVELOPED METABOLIC RATE MONITOR IN A SERIES OF HUMAN EXPERIMENTS. IT WAS SHOWN THAT DURING 30-35 CONTINUOUS HOURS OF MONITORING BODY HEAT CONTENT IS NOT CONSTANT, EVEN AT REST, AND THERE IS CONSTANT SWING OF HEAT STORAGE OF SOME MAGNITUDE; STORAGE IS GENERALLY TEN PERCENT OF METABOLIC RATE. SECONDLY, IT WAS FOUND THAT THERE ARE SINUSOIDAL RHYTHMS IN HEAT PRODUCTION AND HEAT LOSS, WHICH ARE MATCHED BUT OUT OF PHASE, AND THE PHASE SHIFT CAN EXPLAIN THE ESTABLISHED CIRCADIAN RHYTHM IN RECTAL TEMPERATURE. THESE DATA ARE OF CONSIDERABLE INTEREST TO USAF LABORATORIES STUDYING PHYSIOLOGICAL ADJUSTMENTS FOLLOWING FLIGHTS OVER SEVERAL TIME ZONES, CHANGES IN BIOLOGICAL RHYTHMS DURING PROLONGED FLIGHTS, AND IN DESIGNING NEW PROTECTIVE EQUIPMENT. (AUTHOR)
DEVELOPMENT OF A HEATER-PUMP TO PROTECT A DIVER IN COLD WATER

IN AN EFFORT TO PROVIDE A MEANS OF KEEPING A DIVER WARM IN A COLD ENVIRONMENT FOR A USEFUL PERIOD OF TIME, A SERIES OF FIVE HEATER-PUMPS WAS PROGRESSIVELY DEVELOPED. THEY CIRCULATED HEATED WATER THROUGH A WELSON TUBING SUIT, WORN UNDER A NEOPRENE WET SUIT. IN EACH UNIT THE HOT WATER WAS PRODUCED IN A BOILER WITH A 750 WATT ELECTRIC IMMERSSION HEATER AND PUMPED IN A CLOSED SYSTEM THROUGH THE SUIT. WITH EFFICIENCIES OF ABOUT 85 PERCENT, DIVER COMFORT WAS MAINTAINED IN A 4 DEGREES C WATER. THE HEATER-PUMPS WERE DESIGNED TO OPERATE ON 24 VOLTS AT A DEPTH OF 600 FEET. THEY WERE DIVER TESTED IN AN OPEN TANK AND WITH SIMULATED LOADS, RECORDING TEMPERATURES AND FLOW RATES. THE RESULTS WITH THESE PROTOTYPE UNITS INDICATED THE FEASIBILITY OF A LOW-COST, SUCCESSFUL HEATER PUMP FOR EITHER BATTERY OR FOR UMBILICAL CABLE OPERATION. (AUTHOR)
THF TESTING OF THERMAL PROTECTIVE CLOTHING IN A REPRODUCIBLE FUEL FIRE ENVIRONMENT, A FEASIBILITY STUDY.

JUN 71 114P ALBRIGHT JOHN D. IKNOX FRANCIS S. III DUBOIS DAVID R. IKEISER GEORGE H. I

REPT NO USAARL-71-24

UNCLASSIFIED REPORT

DESCRIPTORS: (FIRE PROTECTIVE CLOTHING, TEST FACILITIES), (TEST FACILITIES, DESIGN), THERMAL RADIATION, TEXTILES, BURNS, LIFE SUPPORT, AVIATION SAFETY, FLAMMABILITY, AVIATION FUELS, FEASIBILITY STUDIES

THF REPORT SETS FORTH THE CONCEPTUAL DESIGN FOR A FACILITY INTENDED FOR DEVELOPMENT AND EVALUATION OF THERMAL PROTECTIVE CLOTHING IN A REPRODUCIBLE FUEL FIRE ENVIRONMENT. THE METHODS DEVELOPED RELATE THERMAL CHARACTERISTICS OF FABRICS TO BIOMEDICAL ASPECTS OF BURN PREVENTION. A NUMBER OF BIOENGINEERING PROBLEMS ARE IDENTIFIED, THE RESOLUTION OF WHICH IS EXPENSIVE AND TIME CONSUMING. IT IS CONCLUDED THAT CONSTRUCTION OF THE FACILITY DESIGNED IS TECHNICALLY FEASIBLE. DUE TO THE MAGNITUDE AND COMPLEXITY OF THE BIOENGINEERING PROBLEMS IDENTIFIED, AND BECAUSE OF ADVANCES IN LABORATORY TESTING METHODS, HOWEVER, CONSTRUCTION OF SUCH A FACILITY IS NOT CONSIDERED TO BE A PRUDENT EXPENDITURE OF PUBLIC FUNDS AT THIS TIME. OPERATIONALLY ORIENTED BIOENGINEERING/AEROMEDICAL EVALUATION OF THERMAL PROTECTIVE CLOTHING SYSTEMS REMAINS ESSENTIAL. (AUTHOR)
Preliminary Survey of Diver Anthropometrics.  

Descriptive Note: Final Rept., Jun 71.  
Beatty, Hugh T.; Berghage, Thomas E.; Chandler, Donald R.  
Rept. No. NEDU-RR-7-71  

Unclassified Report  

Descriptors: (*Anthropometry, Naval Personnel), (*Diving, Naval Personnel), (*Underwater Clothing, Design), Data, Statistical Analysis, Tables  

Anthropometric data for Navy divers were collected and analyzed for mean, standard deviation, skewness and kurtosis. The data were analyzed by computer percentiles calculated and printed out.  

(Author)
HUMAN FACTORS EVALUATION OF SUBMARINE ESCAPE: II-A: TOP EGRESS WITH THE BRITISH SUBMARINE ESCAPE IMMERSION SUIT AND THE STEINKE HOOD.

DESCRIPTIVE NOTE: INTERIM REPT. OCT 70 29P NYACK, BERNARD L. IWALTERS, GARY B. 1
REPT. NO: SMRL-644
PROJ: MF12.524.006
MONITOR: NAVMED MF12.524.006-9025B-38

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-718 855.

DESCRIPTORS: (*SUBMARINE ESCAPE, HUMAN ENGINEERING), (*UNDERWATER CLOTHING, SUBMARINE ESCAPE), (DECOMPRESSION SICKNESS, TIME, HATCHES, SUBMARINE PERSONNEL), (CORRELATION TECHNIQUES, SEA RESCUE EQUIPMENT, TESTS) (U)
IDENTIFIERS: *STEINKE HOODS, *SUBMARINE ESCAPE SUITS (U)

THE BRITISH MARK VII SUBMARINE ESCAPE IMMERSION SUIT (SEIS) WHICH PROVIDES THERMAL PROTECTION AND THE STEINKE HOOD WHICH DOES NOT, WERE EVALUATED FOR SINGLE-MAN AND GROUP ESCAPE (2- AND 3-MAN TEAMS) FROM A SIMULATED TOP EGRESS UNITED STATES NAVY ESCAPE TRUNK FOR BOTH ESCAPE APPLIANCES. EGRESS TIME INCREASED LINEARLY AS A FUNCTION OF TEAM SIZE. THREE-MAN TEAMS AND TWO-MAN TEAMS ESCAPED FASTER WITH THE SEIS THAN WITH THE STEINKE HOOD; THERE WAS NO DIFFERENCE FOR ONE-MAN ESCAPES. SINGLE-MAN ESCAPE TIMES WITH THE SEIS WERE COMPARABLE TO THOSE OBTAINED BY THE BRITISH. WHEN COMPARED WITH SIDE AND TUBE EGRESS, TOP EGRESS OFFERS A SUBSTANTIAL REDUCTION IN ESCAPE TIME AND THEREFORE IN TOTAL BOTTOM TIME. SAFE ESCAPES FROM DEPTHS OF 450 FEET BY TEAMS OF MORE THAN TWO MEN ARE FEASIBLE FROM A TOP HATCH CONFIGURATION BUT ARE NOT POSSIBLE FROM A SIDE OR TUBE EGRESS CONFIGURATION. A SUBMARINE ESCAPE SYSTEM EMPLOYING TOP EGRESS AND THE EXPOSURE PROTECTION OF THE SEIS IS RECOMMENDED. (AUTHOR) (U)

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A ROCKET PROPELLANT HANDLER'S SUIT FOR PROTECTION FROM CHLORINE TRIFLUORIDE AND ELEMENTAL FLUORINE. (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. SEP 69-OCT 70; AUG 71 60P MARTONE JOSEPH A. IBERGEN.

CONTRACT: F04611-69-C-0102

PROJECT: AF-30S8

MONITOR: AFRPL TR-71-44

UNCLASSIFIED REPORT

DESCRIPTORS: (*PROTECTIVE CLOTHING, *LIQUID ROCKET OXIDIZERS), (*FLUORINE, PROTECTIVE CLOTHING), DEGRADATION, CHLORINE COMPOUNDS, FLUORIDES, HALOGENATED HYDROCARBONS, TEXTILES, LIQUEFIED GASES

IDENTIFIERS: *CHLORINE FLUORIDE (CLF3), CHLORINE FLUORIDES, FLUORINATED POLYMERS

EXTRAEMELY POWERFUL AND HIGHLY TOXIC OXIDIZERS SUCH AS FLUORINE (F2) AND CHLORINE TRIFLUORIDE (CLF3) ARE CURRENTLY BEING STUDIED AT THE AIR FORCE ROCKET PROPULSION LABORATORY. A PROTOTYPE PROPELLANT HANDLER'S SUIT FOR PROTECTION AGAINST GASEOUS FLUORINE AND LIQUID CHLORINE TRIFLUORIDE HAS BEEN DEVELOPED AND OPERATIONALLY TESTED. THE EXPOSED COMPONENTS OF THIS GARMENT ARE MADE OF PERFLUOROPOLYMERS AND STAINLESS STEEL. THE COMPLETE SUIT AND SAMPLE COMPONENTS WERE EXPOSED TO BOTH GASEOUS FLUORINE AND LIQUID CHLORINE TRIFLUORIDE; THE SUIT REACTED WITH LIQUID CHLORINE TRIFLUORIDE AND THEREFORE FAILED TO PASS THE OPERATIONAL TEST. (AUTHOR)
THE PURPOSE OF THE EXPERIMENT WAS TO EVALUATE THE EFFECTIVENESS OF A TACTILE, PULSATING, WARNING SIGNAL UNDER G-LOAD CONDITIONS. SUBJECTS WERE REQUIRED TO RESPOND TO A TACTILE PULSATING SIGNAL IN THEIR ANTI-G SUIT WHILE UNDER VARYING G LOADS BY PULLING A TRIGGER ON THEIR CONTROL STICK. THE TACTILE 'G-LIMIT' WARNING PULSE PROVED TO BE A VERY EFFECTIVE SIGNALING DEVICE. NOT ONE WARNING SIGNAL AT ANY FREQUENCY WAS MISSED BY ANY SUBJECT. ONE SUBJECT EVEN REPORTED FEELING THE SIGNAL AFTER HE HAD BLACKED OUT WHICH POINTS OUT THE OBVIOUS ADVANTAGE OF A TACTILE WARNING IN NOT REQUIRING A PILOT VISUAL OR EVEN AUDIO ATTENTION. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM08

AD-732 429 11/5 6/17 13/12
ARMY AEROMEDICAL RESEARCH LAB FORT RUCKER ALA

ENGINEERING TEST OF LIGHTWEIGHT UNDERWEAR OF THE WINTER FLIGHT CLOTHING SYSTEM: THERMAL PROTECTION. (U)

JUN 71 46P KNOX, FRANCIS S. , III
MCCAHAN, GEORGE R. JR.; WACHTEL, THOMAS L. ;
TREVETIAN, WALTER P.; IMARTIN, ANDREW S.

REPT. NO. USAARL-71-19
PROJ. DA-3-A-062110-A-819

UNCLASSIFIED REPORT

DESCRIPTORS: (TEXTILES, FIRE SAFETY), (UNDERWEAR, THERMAL PROPERTIES), (FLIGHT CLOTHING, UNDERWEAR), JET ENGINE FUELS, BURNS, TESTS; ARMY RESEARCH, HEAT-RESISTANT MATERIALS. (U)
IDENTIFIERS: NOMEX FABRIC, THERMAL PROTECTION. (U)

EFFECTS TO IMPROVE FRICTIONAL QUALITIES ENTAILED THE TESTING OF VARIOUS TREAD DESIGNS, ADDITIVE MATERIALS SUCH AS CORK AND COTTON FLOCK, COMPOSITE SPECIMENS, AND CHANNELED AND SIPED SPECIMENS. TESTS WERE ALSO CONDUCTED AT ROOM TEMPERATURE AND IN SOME CASES AT OF. THE DATA OBTAINED SHOW (1) CHANGES IN TREAD DESIGN, COMPOSITES AND COARSE ADDITIVE MATERIALS ARE INEFFECTIVE IN IMPROVING FRICTION ON SMOOTH SURFACES; (2) SIPING OF FLAT SPECIMENS SHOWED SLIGHT IMPROVEMENT OF FRICTION ON WET SURFACES; (3) COMPOUNDS THAT RESIST HARDENING AT OF SHOW BETTER RETENTION OF FRICTION AT THAT TEMPERATURE; AND (4) THE ORDER OF SKID RESISTANCE OF SEVERAL COMPOUNDS CHANGES WHEN TESTED ON A DIFFERENT SURFACE. (AUTHOR)
UNCLASSIFIED

NAVY CLOTHING AND TEXTILE RESEARCH UNIT NATICK MASS

PHYSIOLOGICAL EVALUATION OF A COMMERCIALY
AVAILABLE ABANDON-SHIP SURVIVAL SUIT.

DESCRIPTIVE NOTE: TECHNICAL REPT.
NOV 71 25P SHAMPINE JAMES C. REINS
DALE A.
REPT. NO. TR-97 1-71

UNCLASSIFIED REPORT

DESCRIPTORS: (EXPOSURE SUITS, EFFICIENCY), FLOTATION,
TEMPERATURE, TOLERANCES(PHYSIOLOGY), NAVAL PERSONNEL,
LEAKAGE(FLUID), WATER, TEST METHODS, WEIGHT, NAVAL
RESEARCH

NAVY CLOTHING AND TEXTILE RESEARCH UNIT
(NCTR) PERSONNEL HAVE TESTED A COMMERCIALY
AVAILABLE ABANDON-SHIP SURVIVAL SUIT IN WATER AT
35F TEMPERATURE, WHICH IS COMPARABLE TO THAT FOUND
IN VARIOUS OCEANS THROUGHOUT THE WORLD. TEST
RESULTS INDICATE THAT THIS SUIT WILL GIVE PROTECTION
FROM EXPOSURE TO COLD WATER FOR PERIODS OF 13 HOURS
AND MORE WHEN WORN OVER ANY OF THE ENSEMBLES STUDIED
DURING THIS TEST PROVIDING NO OTHER STRESSES ARE
PRESENT WHICH COULD INFLUENCE THE USER'S TOLERANCE
TIME. THIS SUIT CAN BE DONNED QUICKLY BUT CANNOT
BE WORN OVER BULKY COLD-WEATHER CLOTHING.
UNCLASSIFIED

DEVELOPMENT AND EVALUATION OF AN OXYGEN-SENSING WARNING DEVICE.

DESCRIPTIVE NOTE: TECHNICAL REPT.: DEC 71 33P AUDET, NORMAN F.; ORNER, GEORGE M. I. REPT. NO. TR-98 6-71

THE NAVY CLOTHING AND TEXTILE RESEARCH UNIT HAS EVALUATED AN OXYGEN-SENSING WARNING DEVICE, DEVELOPED BY BECKMAN INSTRUMENTS, INC., TO BE USED AS A SAFETY FEATURE IN A DAMAGE CONTROL SUIT SYSTEM (DCSS) PRESENTLY UNDER DEVELOPMENT. THE O2 WARNING DEVICE, WHICH EMPLOYS A POLAROGRAPHIC OXYGEN SENSOR IN CONJUNCTION WITH CONTROL ELECTRONICS AND A VISUAL OUTPUT, PROVIDES A VISUAL WARNING IN THE EVENT OXYGEN CONCENTRATIONS IN THE DCSS ARE ABOVE OR BELOW CERTAIN PRESELECTED THRESHOLDS.
DEVELOPMENT OF THERMALLY DURABLE COATED FABRICS FOR USE IN FLIGHT GLOVES* (U)

DESCRIPTIVE NOTE: FINAL REPT. JUL 69-DEC 70, SFP 71 88P SKELTON JOHN IKASWELL ERNEST

CONTRACT: F33657-70-C-0152

MONITOR: ASD TR-71-47

UNCLASSIFIED REPORT

DESCRIPTORS: (GLOVES, THERMAL STABILITY), (FLIGHT CLOTHING, FIRE RESISTANT MATERIALS), FLIGHT CREWS, EXPERIMENTAL DESIGN, COATINGS, SHRINKAGE, HAZARDS, PERFORMANCE (HUMAN) (U)

THE FLIGHT GLOVES CURRENTLY SUPPLIED TO AIR FORCE FLIGHT CREW MEMBERS PROVIDE SOFTNESS, TACTILE RESPONSE, GRIPPING POWER AND DURABILITY. BUT IN CONTACT WITH FLAME OR IN HEATED ENVIRONMENTS, THEIR LEATHER BURNS, SHRINKS VIOLENTLY, AND BECOMES STIFF AND BRITTLE. BECAUSE OF POTENTIAL DANGER, AN EFFORT IS REPORTED TO DEVELOP MATERIALS WITH MECHANICAL PERFORMANCE CHARACTERISTICS SIMILAR TO THOSE OF LEATHER, BUT WHICH ARE FLAMEPROOF AND THERMALLY STABLE. (U)
MODIFICATIONS AND IMPROVEMENTS INCORPORATED INTO A THERMOELECTRIC HEATING AND VENTILATING SYSTEM ARE DESCRIBED. THE THERMOELECTRIC HEATING AND VENTILATING SYSTEM IS DESIGNED TO PROVIDE A FLOW OF TEMPERATURE REGULATED AIR FOR USE IN HEATING OR VENTILATING A SPECIALLY DESIGNED MILITARY CLOTHING ENSEMBLE. THE SYSTEM WEIGHS TEN POUNDS UNFUELED AND REQUIRED 0.26 POUNDS OF FUEL FOR EACH HOUR OF OPERATION. EIGHTEEN CUBIC FEET OF AIR (S.T.P. CONDITIONS) AT FOUR INCHES WATER COLUMN PRESSURE IS DELIVERED FOR USE IN KEEPING AN INDIVIDUAL IN THERMAL BALANCE WHEN OPERATING IN EXTREME ENVIRONMENTS (-40F TO +110F) OR WHEN EXPOSED TO HAZARDS. THE ELECTRICAL POWER REQUIRED TO OBTAIN THE FLOW OF AIR IS SUPPLIED BY A THERMOELECTRIC GENERATOR WHICH CONVERTS THERMAL ENERGY DIRECTLY INTO ELECTRICAL ENERGY. THE THERMAL ENERGY IS DERIVED FROM THE COMBUSTION OF LIQUID MILITARY FUELS: LEADED GASOLINE, KEROSENE, JP-4 AND DIESEL FUELS.
A new technique for pressurization and thermal control in a space workers garment has been investigated. The goal was to design and fabricate complete coveralls and helmet that would consider the space environment and achieve physiological protection with exceptional reliability and a minimum of complementary systems. The coveralls utilize mechanical counterpressure applied by an integument of closed cell material confined within a restraining garment. Thermal equilibrium is to be achieved by allowing natural physiological processes to control the evaporation of perspiration into the vacuum of space. (Author)
ELEVEN RUNS WERE MADE FOR THIS EVALUATION, ALL WITH THE SUBJECTS IMMERSED BUT NOT SUBMERGED IN 36°F WATER. FOUR RUNS WERE MADE UNDER RESTING CONDITIONS, AND FOUR UNDER SWIMMING CONDITIONS, TO TEST VARIOUS TYPES OF INSULATING UNDERCLOTHING WORN BELOW THE STANDARD SWIM SUIT. IN ADDITION, THREE DIVES WERE MADE UNDER SWIMMING CONDITIONS TO TEST THREE TYPES OF INSULATING SWIM SUITS. THE FOUR UNDERCLOTHING MATERIALS WERE: 1/8 IN. FLAT ENSOLOYE, 1/4 IN. FLAT ENSOLOYE, 1/4 IN. BUTTON ENSOLOYE, AND ONE SUIT OF 100% WOOL UNDERWEAR. THE THREE SWIM SUIT MATERIALS WERE: 1/4 IN. FLAT ENSOLOYE, 1/4 IN. FLAT CHEMICALLY BLOWN NEOPRENE, AND 1/4 IN. FLAT MECHANICALLY BLOWN LATEX.
THE INCREASING DEMAND BEING PLACED ON THE HUMAN HAND TO FUNCTION IN NEW ENVIRONMENTS REQUIRES EXAMINATION OF HOW PERFORMANCE IS AFFECTED BY THE REQUIRED SAFETY GLOVES. THE OBJECTIVE IN THIS RESEARCH IS TO HELP DETERMINE WHICH SAFETY GLOVE OR GLOVE TYPES ARE BEST SUITED FOR PARTICULAR WORK SITUATIONS WHEN THERE IS A CHOICE IN THE TYPE OF SAFETY GLOVE WHICH WILL SATISFY THE SAFETY REQUIREMENTS. THE PERFORMANCE OF TEN SUBJECTS PERFORMING FIVE SIMULATED WORK TASKS UNDER FIVE GLOVE CONDITIONS IS EXAMINED IN THIS REPORT. THE FIVE GLOVE CONDITIONS CONSIST OF BAREHAND AND LEATHER, TERRY CLOTH, NEOPRENE, AND PVC GLOVES.
DESCRIPTORS: (TEST FACILITIES, UNDERWATER CLOTHING), DEEP SUBMERSION, SIMULATORS, THICKNESS, THERMAL CONDUCTIVITY, DEFORMATION, HYDROSTATIC PRESSURE

THE NAVY CLOTHING AND TEXTILE RESEARCH UNIT (NCTRU) DEVELOPED A HYDROSPACE SIMULATOR FACILITY FOR TESTING MATERIAL PROPERTIES AT SEA DEPTHS TO 1,000 FSW. THE FACILITY CONTAINS THREE TESTERS TO STUDY MATERIAL THICKNESS, STRETCH-FLEX, AND THERMAL CONDUCTANCE PROPERTIES FROM NORMAL AMBIENT PRESSURES TO 1,000 FSW. THE EQUIPMENT COMPLEX ALSO INTEGRATES THE GAS CONTROL AND INSTRUMENTATION HARDWARE, TESTERS, AND PRESSURE CHAMBER EQUIPMENT NECESSARY FOR STUDYING THE MATERIAL PROPERTIES OUTLINED. THE MATERIAL PROPERTIES WHICH CAN BE STUDIED WITH THIS FACILITY ARE OF SIGNIFICANT IMPORTANCE IN THE DEVELOPMENT AND/OR SCREENING OF MATERIALS SUITABLE FOR DEEP SEA SWIMMERS' SUITS.

(AUTHOR)
THREE GROUPS OF MEN WEARING THE CBR PROTECTIVE UNIFORM WERE EXPOSED TO SIX CONDITIONS OF VARYING HEAT, HUMIDITY, WIND, EXERCISE, AND INITIAL WATER CONTENT OF THE CLOTHING. EACH CONDITION WAS REPEATED WITH AND WITHOUT A 2-MG DOSE OF ATROPINE SULFATE. IN TROOPS WEARING THE CBR PROTECTIVE UNIFORM WHO INJECT A 2-MG DOSE OF ATROPINE INTO THEMSELVES ON THE MISTAKEN ASSUMPTION OF AN EXPOSURE TO AN ANTICHOLINESTERASE AGENT, THE RISE IN RECTAL TEMPERATURE CAUSED BY THE INHIBITION OF SWEATING BY ATROPINE CAN BE KEPT WITHIN SAFE LIMITS IF EXERCISE IS AVOIDED AND THE CLOTHING IS WET WITH SWEAT AT THE TIME OF INJECTION. (AUTHOR)
FUNCTIONAL SPECIAL CLOTHING FOR BUILDERS, (U)

JAN 72 11P SHIBANOV, N. I
REPT. NO. FSTC-HT-23-368-71
PROJ: FSTC-T7U23012301

UNCLASSIFIED REPORT


DESCRIPTORS: (PROTECTIVE CLOTHING, CONSTRUCTION), CLIMATE, PERFORMANCE (HUMAN), PRODUCTION, FIRE PROTECTIVE CLOTHING, HEAT RESISTANT MATERIALS, COLD WEATHER TESTS, TROPICAL TESTS, ENVIRONMENTAL TESTS, USSR (U)

IDENTIFIERS: TRANSLATIONS (U)

SPECIAL PURPOSE PROTECTIVE CLOTHING FOR WORKMEN IN VARIOUS TYPES OF EMPLOYMENT, PARTICULARLY CONSTRUCTION ENGINEERING PERSONNEL, IS NECESSARY FOR PROFICIENT PERFORMANCE OF PRODUCTION OPERATIONS. THE REPORT DISCUSSES PROTECTIVE CLOTHING TO BE USED BY THOSE IN THE BUILDING INDUSTRY. (U)
CALCULATION OF THE THERMAL RESISTANCE OF THE AIR LAYERS IN AIR-PERMEABLE CLOTHING

YANKELEVICH, V. I.

REPT. NO. DRIC-TRANS-2717, DRIC-BR-300094

SUPPLEMENTARY NOTE: TRANS. OF IZVESTIYA VYSSHIKH UCHERNYKH ZAVEDENII. TEKHNOLOGIYA TEKSTILNOI PROMYSLENOSTI (USSR) N2 P111-115 1971, BY M. V. MIDDLETON.

THE THERMAL RESISTANCE OF THE AIR LAYERS IN CLOTHING WHICH ALLOWS AIR TO PERMEATE THROUGH IT WAS INVESTIGATED. THE METHOD DESCRIBED FOR CALCULATING THE THERMAL RESISTANCE OF AIR-PERMEABLE ARTICLES MAKING ALLOWANCE FOR THE THERMAL RESISTANCE OF THE AIR LAYER YIELDS RESULTS CLOSE TO THE EXPERIMENTAL ONES. THIS MAKES POSSIBLE THE RELIABLE DESIGN OF HEAT PROTECTIVE CLOTHING FOR ANY GIVEN CONDITIONS OF WORK OR CLIMATE.
UNCLASSIFIED

DEVELOPMENT OF AN INTEGRAL, NEOPRENE-COATED, ALUMINIZED, ASBESTOS CLOTH FOR FIRE FIGHTERS' SHIPBOARD COVERALLS.

DESCRIPTIVE NOTE: TECHNICAL REPT., AUG 72, 21P KUPFERMAN ZELIG I
REPT. NO. TR-103, 4-71

THE NAVY CLOTHING AND TEXTILE RESEARCH UNIT (NCTR) HAS DEVELOPED AN IMPROVED, NEOPRENE-COATED, ALUMINIZED, 1.2-POUND ASBESTOS CLOTH TO REPLACE THE NEOPRENE-COATED, ALUMINIZED, 11-OUNCE, GLASS/ASBESTOS, COTTON FABRIC FOR USE IN SHIPBOARD FIREFIGHTER'S COVERALLS. IN PRIOR TESTING, THE NEOPRENE-COATED, ALUMINIZED, 1.2-POUND ASBESTOS CLOTH DEMONSTRATED SIGNIFICANT IMPROVEMENTS OVER THE NEOPRENE-COATED, ALUMINIZED, 11-OUNCE, GLASS/ASBESTOS, COTTON FABRIC IN BOTH DURABILITY OF THE BASIC CLOTH AND ABRASION RESISTANCE OF THE ALUMINUM COATING. (AUTHOR)
EVALUATION OF HEAT LOSS FROM NAVY DIVERS' WET SUITS.

DESCRIPTIVE NOTE: TECHNICAL REPT., JUL 72 24P, REINS, DALE A., SHAMPINE, JAMES C., RFPT. NO. TR-102, 4-70

UNCLASSIFIED REPORT

IN A SERIES OF OVER 200 TESTS, SUBJECTS WORE STANDARD, 3/16 INCH, CLOSED-CELL NEOPRENE-FOAM, AIR-SEA RESCUE SUITS IN WATER OF 55, 45, AND 35 DEG. F. THE TESTS WERE DESIGNED TO IDENTIFY AREAS OF THE BODY WHERE MAJOR HEAT LOSSES OCCUR. OTHER PHYSIOLOGICAL PARAMETERS WERE MONITORED TO ASSURE THE PHYSICAL SAFETY OF TEST SUBJECTS WHILE BODY TEMPERATURE AND METABOLIC RATES WERE MEASURED. RECOMMENDATIONS ARE MADE AS TO AREAS IN WHICH INSULATIVE VALUES COULD BE INCREASED WITHOUT HAMPERING FREE MOVEMENT OF THE WEARER, AND DESIGN MODIFICATIONS ARE SUGGESTED TO LIMIT FREE MOVEMENT OF WATER INTO AND OUT OF THE SUIT. (AUTHOR)
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZDMOB

AD-748 091 6/17 14/2

ARMY TEST AND EVALUATION COMMAND ABERDEEN PROVING GROUND

COMBAT UNIFORMS. (U)

DESCRIPTIVE NOTE: FINAL REPT. ON TEST OPERATIONS
PROCEDURE.
JUN 72 16P
REPT. NO. TOP-10-3-021

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SUPERSEDES AD-873 486.

DESCRIPTORS: (PROTECTIVE CLOTHING, TEST METHODS),
SAFETY, TEST FACILITIES, ACCEPTABILITY, WEAR RESISTANCE,
MAINTAINABILITY, HUMAN FACTORS ENGINEERING, VALUE
ENGINEERING, ENVIRONMENTAL TESTS (U)
IDENTIFIERS: (COMBAT UNIFORMS, COMMODITY SERVICE TEST
PROCEDURE (U)

THE REPORT DESCRIBES A METHOD FOR EVALUATION OF
COMBAT UNIFORM OPERATIONAL AND FUNCTIONAL
CHARACTERISTICS. IDENTIFIES SUPPORTING TESTS,
FACILITIES, AND EQUIPMENT REQUIRED. PROVIDES
PROCEDURES FOR PREOPERATIONAL INSPECTION, PHYSICAL
CHARACTERISTICS, SAFETY, PERSONNEL TRAINING, SIZING,
FITTING, ISSUE, FUNCTIONAL SUITABILITY, DURABILITY,
MAINTAINABILITY, HUMAN FACTORS, AND VALUE ANALYSIS.
(AUTHOR) (U)

166

UNCLASSIFIED ZDMOB
A VENTILATING BACKPACK ASSEMBLY WAS DESIGNED TO PROVIDE 18 CFM OF FILTERED AIR TO A SPECIALLY DESIGNED MILITARY CLOTHING ENSEMBLE TO PROVIDE EXPLOSIVE ORDNANCE PERSONNEL WITH PROTECTION FROM CB AGENTS. THIS FILTERED AIR PROVIDES BREATHING AIR AND BODY VENTILATION WHILE A SUIT ED INDIVIDUAL PERFORMS VARIOUS TASKS IN A TOXIC (CB) ENVIRONMENT. THE REPORT DISCUSSES THE VARIOUS IMPROVEMENTS AND INNOVATIONS WHICH WERE INCORPORATED IN THE FINAL PRODUCTION MODEL. THE PROJECT CONSISTED OF FOUR PHASES: A PRODUCT ENGINEERING STUDY, PRODUCTION OF TEN PROTOTYPE UNITS, ENVIRONMENTAL TESTING AND ENGINEERING FIELD SUPPORT, AND THE PRODUCTION OF TWENTY-FIVE UNITS WITH EXTRA BATTERY PACKS.

(AUTHOR)
THE NAVY CLOTHING AND TEXTILE RESEARCH UNIT (NCTR) HAS DEVELOPED A BUOYANT-BALLISTIC PROTECTIVE VEST WHICH PROVIDES INHERENT BUOYANCY BY THE USE OF THREE PLIES OF 1/4-INCH UNICELLULAR POLYETHYLENE FOAM TOTALLING APPROXIMATELY 12 OUNCES. DESIGNED PRIMARILY FOR NAVAL CREWS SUBJECTED TO ENEMY SHELLING, THE VEST AFFORDS BALLISTIC PROTECTION BY employing SIX PLIES OF BALLISTIC NYLON CLOTH IN FRONT OF EIGHT PLIES OF A LIGHTWEIGHT, NEEDLFPUNCHED, POLYPROPYLENE FELT. IN ADDITION, EACH OF THE TWO BALLISTIC ASSEMBLIES ARE ENCAPSULATED IN EIGHT MIL VINYL FILM TO PREVENT WETTING-OUT AND TO IMPART ADDED BUOYANCY. BALLISTIC TESTS HAVE SHOWN THE NEW VEST TO HAVE EQUIVALENT BALLISTIC PROTECTION TO THE NYLON CLOTH VEST, AND POOL TESTS HAVE SHOWN EXCELLENT BUOYANCY CHARACTERISTICS.

(AUTHOR)
UNCLASSIFIED

ASSESSMENT OF THE THERMAL RESISTANCE OF CLOTHING,

OCT 72 9P VOINOV, YU. F. I KARLINA, K.

REPT. NO. ORIC-TRANS-2920, ORIC-BR-30290

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: TRANS. OF IZVESTIYA VYSSHIKH UCHERNYKH ZAVEDENII. TEKHOLOGLIYA LOGKOI PROMYSHLENNOSTI (USSR) NI P80-84 1972, BY B. F. TOMS.

DESCRIPTORS: (*HEAT RESISTANT MATERIALS, PROTECTIVE CLOTHING), (*PROTECTIVE CLOTHING, *THERMAL PROPERTIES), HEAT TRANSFER, STRESS (PHYSIOLOGY), MATHEMATICAL MODELS, THICKNESS, COSTS, DESIGN, USSR (U) IDENTIFIERS: THERMAL RESISTANCE, TRANSLATIONS (U)

IN THE THERMAL RESISTANCE OF CLOTHING A SUBSTANTIAL PART MAY BE PLAYED BY ANY OF THE COMPONENTS OF THE THERMAL RESISTANCE DEPENDING ON THE THICKNESS OF THE CLOTHING AND THE MAGNITUDE OF ITS OVERALL THERMAL RESISTANCE. (AUTHOR) (U)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0M08

AD-757 128  6/17  15/2  14/2
ARMY TEST AND EVALUATION COMMAND ABERDEEN PROVING GROUND MD

CLOTHING AND EQUIPMENT, INDIVIDUAL, PROTECTIVE, CB

DESCRIPTIVE NOTE: FINAL REPT. ON TEST OPERATIONS
PROCEDURE:
JUL 72  14P
REPT. NO. TOP-8-3-041

UNCLASSIFIED REPORT

DESCRIPTORS: (PROTECTIVE CLOTHING, TEST METHODS),
(CHEMICAL WARFARE AGENTS, PROTECTIVE CLOTHING), ARMY
EQUIPMENT, SAFETY, MILITARY REQUIREMENTS, COMPATIBILITY,
RELIABILITY, MAINTAINABILITY, HUMAN FACTORS ENGINEERING

THE REPORT DESCRIBES A METHOD FOR EVALUATION OF
INDIVIDUAL CLOTHING AND EQUIPMENT PROTECTION
CHARACTERISTICS RELATIVE TO CHEMICAL AGENTS
IDENTIFIES SUPPORTING TESTS, FACILITIES, AND
EQUIPMENT REQUIRED. PROVIDES PROCEDURES FOR
PHYSICAL CHARACTERISTICS, SAFETY, PERSONNEL TRAINING,
SIZING, FITTING, DONNING, DOFFING, COMPATIBILITY WITH
COMBAT TASKS, DURABILITY, RELIABILITY,
MAINTAINABILITY, HUMAN FACTORS, AND VALUE ANALYSIS
(AUTHOR)
Cold Water Evaluation of Environmental Marine Diving Suits. (U)

Descriptive Note: Technical Report, Nov 72 22P VEGHTE, JAMES H. IKLEMM, FRITZ K. I.
Rept. No. AMRL-TR-72-65
Proj: AF-7222
Task: 722212

Unclassified Report

Descriptors: (*Underwater Clothing, Effectiveness), Cold Weather Tests, Protective Clothing, Exposure (Physiology) (U)

The 24-Hour Cold Water Immersion - Life Raft Exposures Were Conducted in Our Laboratory Test Facility Involving Three Subjects in Each Exposure. Physiologic Data Were Obtained During These Exposures To Discern The Better Cold Water Protective Capabilities of Two Environmental Marine Diving Suits. The Swedish Unisuit Proved Thermally Superior to the Dunlop Suit. Several Recommendations Are Made. (Author) (U)
EVALUATION OF FIRE RETARDANT FABRICS

DESCRIPTIVE NOTE: TECHNICAL REPT.

ADOLF R. WILSON, CHARLES G. MARKO
REPT. NO. AMRL-TR-72-66
PROJ. 4F-7222

UNCLASSIFIED REPORT

DESCRIPTORS: (FIRE PROTECTIVE CLOTHING, HEAT RESISTANT PLASTICS), EFFECTIVENESS, NYLON, BENZIMIDAZOLES, FLIGHT CLOTHING, AIRCRAFT FIRES, HEAT TRANSFER; BURNS (INJURIES), SKIN (ANATOMY), HEAT TOLERANCE

IDENTIFIERS: *NOMEX POLYMERS, *BENZIMIDAZOLE POLYMERS

THE VALIDITY OF CURRENT EXPERIMENTAL METHODS OF EVALUATING FIRE RETARDANT CLOTHING IS DISCUSSED. TWO HEAT RESISTANT SYNTHETIC MATERIALS, NOMEX AND POLYBENZIMIDAZOLE (PBI), ARE COMPARED IN TERMS OF THEIR PHYSIOLOGIC PROTECTIVE CAPABILITIES. THE DATA INDICATES PBI IS SUPERIOR TO NOMEX IN AFFORDING SLIGHTLY LONGER PROTECTION. SEVERAL RECOMMENDATIONS ARE MADE. ALSO REPORTED BRIEFLY ARE RESULTS OF DETERMINING THE TOLERANCE TIME OF SKIN TO TEMPERATURE.
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0H08

AU-755 643 15/5 14/2

ARMY TEST AND EVALUATION COMMAND ABERDEEN PROVING GROUND

GARMENTS, OUTER (WET WEATHER) (U)

DESCRIPTIVE NOTE: FINAL REPT. ON TEST OPERATIONS
PROCEDURE.

DEC 72 14P RUSH, RAY I

REPT. NO. TOP-10-3-215
PROJ: AMCR-310-6

UNCLASSIFIED REPORT

DESCRIPTORS: (*PROTECTIVE CLOTHING, TEST METHODS),
VISUAL INSPECTION, SAFETY, MAINTAINABILITY, HUMAN
FACTORS, ENGINEERING, GLOVES, SHOES, OVERCOATS, MILITARY
REQUIREMENTS
IDENTIFIERS: COMBAT CLOTHING, EXPANDED SERVICE TEST
PROCEDURES

THE REPORT DESCRIBES A METHOD FOR EVALUATION OF WET
WEATHER CLOTHING OPERATIONAL AND FUNCTIONAL
PERFORMANCE CHARACTERISTICS. IDENTIFIES SUPPORTING
TESTS, FACILITIES, AND EQUIPMENT REQUIRED. PROVIDES
PROCEDURES FOR PREOPERATIONAL INSPECTION, PHYSICAL
CHARACTERISTICS, SAFETY, PERSONNEL TRAINING;
FUNCTIONAL SUITABILITY, DURABILITY, RELIABILITY,
MAINTAINABILITY, HUMAN FACTORS, AND VALUE ANALYSIS.
(AUTHOR)
DEVELOPMENT OF LAMINATED FABRIC MATERIALS.

DESCRIPTIVE NOTE: TECHNICAL REPT.,
AUG 72 26P DELAPP, DARWIN;
CONTRACT: DAAG17-72-C-0080
PROJ: DA-1-J-662713-D-J-40
MONITOR: USA-NLABS, C/PLSEL
TS-101

LABORATORY AND COMMERCIAL SCALE EXPERIMENTS PRODUCED A THREE LAYER LAMINATED FABRIC (5.2 oz/yd) EXHIBITING 21.5 PSI HYDROSTATIC RESISTANCE, AND PERMITTING 590 GRAMS PER SQUARE METER PFR 24 HOURS MOISTURE VAPOR TRANSMISSION. THE FUNCTIONAL AND PROCESSING CHARACTERISTICS OF SIX DIFFERENT POROUS POLYMER STRUCTURES, COMPRISING THE INNER LAMINATE LAYER, WERE EXPLORED. THE MECHANICAL OPERATION EVEN AT FULL SCALE PROCEEDED WITHOUT DIFFICULTY. THE LAMINATES WERE MADE BY USING POLY(L-BUTENE)-TETRAFLUOROETHYLENE 90%/10% AS THE FIBROUS POROUS POLYMER STRUCTURE AND POLYESTER OR NYLON AS THE TOP AND BOTTOM FACING MATERIAL.
ANALYSIS OF THE THERMAL RESPONSE OF PROTECTIVE FABRICS.

DESCRIPTIVE NOTE: TECHNICAL REPT. JUN 71-JUN 72.
JAN 73 220P HORSE, HOWARD L.; THOMPSON, JAMES G.; ICLARK, KIMBLE J.; GREEN, KENNETH A.; IMOY, CARL B.; I

CONTRACT: F33615-72-C-1298
PROJECT: AF-7320
TASK: 732002
MONITOR: AFML TR-73-17

THE OBJECTIVE OF THE PROGRAM WAS TO DEVELOP A THEORETICAL AND EMPIRICAL MATHEMATICAL RELATIONSHIP TO DEFINE THE FABRIC-SKIN SYSTEM'S RESPONSE WHEN EXPOSED TO A FUEL FIRE. CRITICAL FABRIC PARAMETERS, SUCH AS OPTICAL, THERMO-CHEMICAL AND PHYSICAL CHARACTERISTICS ARE DEFINED IN A MANNER WHICH WILL ALLOW THE FABRIC DESIGNER TO DEVELOP IMPROVED THERMALLY PROTECTIVE LIGHT WEIGHT FABRICS.

THE COMPUTER CODE EVALUATES THE MODEL PARAMETER VARIATION IN TERMS OF RESULTANT HUMAN SKIN BURNS. A COMPARISON OF THE ANALYTICAL MODEL RESULTS WITH LABORATORY AND FIRE PIT DATA DEMONSTRATES EXCELLENT CORRELATION WITHIN THE LIMITS OF THE PRESENT STUDY.

(AUTHOR MODIFIED ABSTRACT)
*G(Z) PROTECTION AFFORDED BY STANDARD AND PREACCELERATION INFLATIONS OF THE BLADDER AND CAPSTAN TYPE G-SUITS.

DESCRIPTIVE NOTE: FINAL REPT.
73 9P BURTON, RUSSELL R. J.
PARKHURST, MICHAEL J.; ILEVERETT, SIDNEY D. JR.
REPT. NO. SAM-TR-72-436.
PROJ. AF-7930
TASK: 793003

POSITIVE (+GZ) RAPID ONSET ACCELERATION TOLERANCES WERE DETERMINED ON 8 MALE SUBJECTS: WITHOUT A G-SUIT, G-SUIT NOT INFLATED AND G-SUIT INFLATED. THREE TYPES OF SUITS WERE USED ON EACH SUBJECT: STANDARD BLADDER, 300-12 PSI, AND TWO TYPES OF CAPSTAN SUITS WITH STANDARD AND MODIFIED ABDOMINAL BLADDER. TWO G-SUIT INFLATION PROCEDURES ALSO WERE USED IN DEVELOPING +G TOLERANCES: STANDARD INFLATION, WHICH BEGAN AT 1.5 PSI/G (ABDOMINAL BLADDER) AND 3 PSI/G (CAPSTAN), AND PREACCELERATION INFLATION (0.5 G FOR 10 SEC) PRIOR TO ACCELERATION ONSET, WHICH INVOLVED SUIT Pressures OF 3 PSI (ABDOMINAL BLADDER) AND 12 PSI (CAPSTAN), WITH SUIT INFLATION CONTINUOUSLY IMMEDIATELY UPON ACCELERATION ONSET. ACCELERATION MEAN TOLERANCES FOR THE 3 SUITS TESTED USING STANDARD INFLATION, RANGED FROM 4.5 TO 4.7 (+GZ).

*PREACCELERATION INFLATIONS OF 0.5 OR 10 SEC INCREASED MEAN +GZ TOLERANCES 0.4 TO 0.6 G ABOVE STANDARD INFLATION METHODS. PROCEDURAL DIFFERENCES IN PREACCELERATION SUIT INFLATION WERE CONSIDERED MAJOR REASONS FOR FINDINGS: AN INCREASE IN +GZ TOLERANCE IN THIS INVESTIGATION AS OPPOSED TO A DECREASE IN ACCELERATION TOLERANCES PREVIOUSLY REPORTED IN OTHER PRE-INFLATION STUDIES. (MODIFIED ABSTRACT)
BACKGROUND AND DEVELOPMENT OF BOYLE’S LAW

ALTITUDE SUITS

DESCRIPTIVE NOTE: TECHNICAL REPT.,

APR 73 51P BOWEN, J. D. I

REPT. NO. AMRL-TR-72-77

UNCLASSIFIED REPORT

DESCRIPTORS: (*PRESSURE SUITS, DESIGN), EFFICIENCY,

DECOMPRESSION, HIGH ALTITUDE, HUMAN FACTORS

ENGINEERING

IDENTIFIERS: IDEAL GAS LAW

ALL SIGNIFICANT AEROSPACE MEDICAL RESEARCH
LABORATORY (AMRL) INVESTIGATIONS OF DESIGN
APPROACHES AND TECHNIQUES APPLICABLE TO EMERGENCY
PRESSURE SUITS FOR FLIERS DURING THE 1960 TO 1972
PERIOD ARE DESCRIBED AND THE RESULTS SUMMARIZED.
THE FIRST PROMISING APPLICATION OF BOYLE’S LAW
THAT IS, THE VOLUME OF A BODY OF GAS AT CONSTANT
TEMPERATURE IS INVERSELY PROPORTIONAL TO THE ABSOLUTE
PRESSURE TO THE AUTOMATIC PRESSURIZATION OF A
SUIT WAS DEMONSTRATED AT THE SCHOOL OF AEROSPACE
MEDICINE, BROOKS AFB, TEXAS, BY DAVIS,
RITZINGER, ET AL, IN 1966. SUBSEQUENT EFFORTS
CAPTURED ON BY THE AMRL ARE REVIEWED IN SUFFICIENT
DETAIL TO PROVIDE CONTINUITY AND AN OVERVIEW OF THE
PROGRAM LEADING UP TO ITS TERMINATION AT THE
AEROSPACE MEDICAL RESEARCH LABORATORY IN THE
SPRING OF 1972 AND TRANSFER TO THE SCHOOL OF
AEROSPACE MEDICINE AT BROOKS AFB, TEXAS.
FINAL CONFIGURATIONS THAT WOULD FULFILL ALL AIRCREW
OPERATIONAL REQUIREMENTS ARE NOT FULLY DEVELOPED.
HOWEVER, MAJOR PROGRESS WAS ACHIEVED IN FABRICATION
TECHNIQUES AND IN THE VALIDATION OF FEATURES THAT
SHOULD FIND APPLICATION IN A NEARLY OPTIMUM PROTOTYPE
APPROACHING THE REAL NEEDS OF THE POTENTIAL USERS.

(MODIFIED AUTHOR ABSTRACT)
A prototype damage-control-suit system (DCSS) was designed and fabricated as part of the Navy Clothing and Textile Research Unit's (NCTRU) continuing program to conduct feasibility and prototype development studies on personnel life-support clothing systems for protection against various environmental hazards. The DCSS consists of a life-support pack, an impermeable suit with headpiece, boots, and gloves, and a communication headset. (Modified author abstract)
The objective of the program was to conduct a preliminary investigation of current boot materials used by Air Force fire fighting personnel and to demonstrate the capability of developing newer materials to enhance the reflective characteristics of future boot materials to provide superior protective qualities. Improved protection is required to ward off radiant energy from JP-4 fuel fires. Present Air Force boot materials are made of a neoprene binder with a carbon black filler. The approach taken was to determine the effect of various pigments, incorporated into the present neoprene binder, that are known to have specific reflective qualities for solar and infrared radiation. By varying the amount of pigment one could then determine the specific effects of the pigment and the binder. An attempt was also made to determine the effect of binder materials transparent in the infrared wavelength range.
ARMY TEST AND EVALUATION COMMAND ABERDEEN PROVING GROUND MD

COMBAT UNIFORMS AND PROTECTIVE EQUIPMENT

DESCRIPTIVE NOTE: FINAL REPT. ON TEST OPERATIONS PROCEDURE.

REPT. NO. TOP-10-2-021
PROJ: AMCR-310-6

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SUPERSEDES REPORT DATED 11 JAN 68
AD-721 610.

DESCRIPTORS: (PROTECTIVE CLOTHING, TEST METHODS), (ARMY EQUIPMENT, PROTECTIVE CLOTHING), RELIABILITY, PERFORMANCE (ENGINEERING), ACCEPTABILITY, ENVIRONMENTAL TESTS

IDENTIFIERS: COMBAT UNIFORMS, COMMODITY ENGINEERING TEST PROCEDURES, PERFORMANCE EVALUATION

THE PROCEDURE DESCRIBES A METHOD FOR EVALUATION OF COMBAT UNIFORMS AND PROTECTIVE EQUIPMENT OPERATIONAL AND FUNCTIONAL PERFORMANCE CHARACTERISTICS; IDENTIFIED SUPPORTING TESTS, FACILITIES, AND EQUIPMENT REQUIRED; DISCUSSES TEST PLANNING AND PREPARATION FOR TESTS; PROVIDES PROCEDURES FOR PHYSICAL CHARACTERISTICS, PROTECTION AGAINST AGENTS, SIZING, FITTING, DONNING, DOFFING, FUNCTIONAL SUITABILITY, LEAKAGE, WATER EXPOSURE, INFRARED REFLECTANCE, STATIC ELECTRICITY, FILTER GAS LIFE, LAUNDERABILITY, STORAGE, WATER IMMERSION, TRANSPORTABILITY, HUMAN FACTORS, RELIABILITY, DURABILITY, AND MAINTENANCE EVALUATION; APPENDIXES DISCUSS TEST COURSES, SIZING AND FITTING, DONNING AND DOFFING DATA, BOOT IMPREGNATING PROCEDURES; AND HANDWEAR TESTS. (AUTHOR)
THE NAVY CLOTHING AND TEXTILE RESEARCH UNIT (NCTR) HAS DEVELOPED A SWIMSUIT MATERIAL THAT MEETS THE REQUIREMENTS OF NAVY PERSONNEL WHO OPERATE AT GREAT SEA DEPTHS FOR LONG PERIODS OF TIME. TWO CHEMICALLY DISTINCT, FLEXIBLE, SYNTACTIC FOAMS - A UNIT-DEVELOPED POLYURETHANE, HOLLOW-Glass-MICROSPHERE COMPOSITE AND A PROPRIETARY POLYVINYLCHLORIDE, HOLLOW-Glass-MICROSPHERE COMPOSITE - HAVE BEEN PRODUCED WHICH MAY PROVE USEFUL FOR SWIMSUIT APPLICATIONS IN DEEP-SEA ENVIRONMENTS DOWN TO 1000 FSW. TESTS SHOWED THAT BOTH MATERIALS WERE ESSENTIALLY INCOMPRESSIBLE TO DEPTHS OF 1000 FSW (LESS THAN 3%) AND PROVIDED MORE INSULATION THAN CURRENTLY USED NEOPRENE-FOAM MATERIALS AT DEPTHS GREATER THAN 20 FSW. THE MATERIALS, HOWEVER, WERE CONSIDERABLY HEAVIER THAN THE FOAM ALTHOUGH SIGNIFICANTLY LESS DENSE THAN SEA WATER. STANDARD WET-STYLE SWIMSUITS WERE FABRICATED FROM THESE EXPERIMENTAL MATERIALS FOR VERIFICATION OF SAMPLE THERMAL-CONDUCTIVITY DATA. (MODIFIED AUTHOR ABSTRACT)
FOOTWEAR FOR INUNDATED AREAS.

DESCRIPTIVE NOTE: FINAL REPT., JUL 73 28P
SWAIN, DOUGLAS S. ISPAETH.
JEANNE F. I
REPT. NO. C/PLSEL-109
PROJ: DA-1-J-664713-D-547
MONITOR: USA-NLABS TR-73-57-CE

UNCLASSIFIED REPORT

DESCRIPTORS: (*FEET, *PROTECTIVE CLOTHING), INTEGUMENTARY DISEASES, SKIN (ANATOMY), INFANTRY, SOUTHEAST ASIA, VIETNAM, TROPICAL REGIONS
IDENTIFIERS: *FOOTWEAR, *IMMERSION FOOT

WARM WATER IMMERSION FOOT AND RELATED DERMATOLOGICAL PROBLEMS IN INUNDATED AREAS OF SOUTHEAST ASIA SERIOUSLY LIMITED THE COBATT EFFECTIVENESS OF LARGE NUMBERS OF OUR TROOPS, AS A CONTRIBUTION TO MINIMIZING THE OCCURRENCE AND INTENSITY OF THE PROBLEM, SPECIAL FOOTWEAR WAS DEVELOPED BY THE U.S. ARMY NATICK LABORATORIES TO PERMIT QUICKER DRYING OF THE SKIN ON THE FEET AND LEGS. THESE ITEMS INCLUDED A LIGHTWEIGHT NYLON SOCK TO REPLACE THE STANDARD WOOL SOCK; A SLIDE FASTENER FOR THE TROPICAL COMBAT BOOT TO ENCOURAGE QUICKER REMOVAL OF THE BOOTS WHEN AN OPPORTUNITY AROSE TO TAKE THEM OFF; AND A LIGHTWEIGHT COMFORT SHOE SIMILAR TO A TENNIS SHOE, THAT COULD BE TUCKED INTO A POCKET AND WORN LATER IN BIVOUAC AND BOOT CAMP AREAS IN PLACE OF A SOLDIER'S REGULAR BOOT BASED UPON THEIR SUCCESSFUL TESTING IN VIETNAM, THE ABOVE THREE ITEMS WERE ADOPTED IN MARCH 1970 AS STANDARD A ITEMS FOR ZONES 1 AND 2.

(AUTHOR)
UNCLASSIFIED

UNCLASSIFIED

ABSTRACT

The first generation of what may be considered a new concept in lightweight insulated military footwear in a pull-on type construction was produced by integrally casting and expanding liquid polyurethane systems. The footwear developed meets the original requirements established under this program to develop a lightweight impermeable boot with insulation sufficient to provide protection for 2 hours inactivity at -20F. The average weight of a size ten boot is 24 ounces, as compared with 44 ounces for the standard (black) insulated cold-wet boot. The water absorption of the new footwear is less than 5% by weight. The developed laboratory procedures were used to design and put into operation a pilot plant facility. Initial production of footwear indicates that the economics and processes involved may be satisfactory for the final commercialization of this new concept of lightweight insulated footwear. (Modified Author Abstract)
A REVIEW OF CURRENT INFORMATION CONCERNING HEAT REPLACEMENT WET-SUITS FOR DIVERS IS PRESENTED. THE LIMITATIONS OF PHYSIOLOGIC RESPONSE TO COLD, AIDED BY MODERN INSULATIVE GARMENTS, ARE DEFINED, AND THE NECESSITY FOR SUPPLEMENTAL HEAT IS DEMONSTRATED. DEVELOPMENTS IN ELECTRICALLY HEATED WET-SUITS AND HOT WATER SUITS ARE PRESENTED; AS WELL AS INFORMATION CONCERNING BATTERIES, CHEMICAL HEATERS AND RADIOISOTOPE-FUELED HEATERS. (AUTHOR)
IN WARM ENVIRONMENTS THE USE OF ATROPINE IN THE TREATMENT OF CASUALTIES FROM ANTICHOLINESTERASE AGENTS PRESENTS A POSSIBLE HAZARD BECAUSE THE INHIBITION OF SWEATING BY ATROPINE MAY LEAD TO A DANGEROUS RISE IN BODY TEMPERATURE. RECENTLY IT WAS SHOWN THAT AFTER A 2-MG DOSE OF ATROPINE SULFATE THE EFFECTS OF A DEFICIT IN SWEATING COULD BE AVOIDED BY ARTIFICIAL WETTING THE CLOTHING. ONE OBJECTIVE WAS TO TEST THIS CONCEPT WHEN THE DOSE WAS INCREASED TO 4 MG. AT THIS DOSE AND AN INDOOR TEMPERATURE OF 41°C, AN INITIAL WETTING OF THE CLOTHING WITH A LITRE OF WATER WAS INSUFFICIENT TO PREVENT AN INDECEPTIVE RISE IN BODY TEMPERATURE FOR 1 HOUR WHEN THE CLOTHING WAS INITIALLY DRY. THE BODY TEMPERATURE RISE AT THIS TIME WAS UNSAFE. A SECOND OBJECTIVE WAS TO EVALUATE THE EFFICIENCY OF EVAPORATIVE COOLING FROM WET CLOTHING AS A FRACTION OF THE EVAPORATIVE COOLING REQUIRED TO BALANCE THE HEAT EQUATION. THE CONCLUSIONS WERE AS FOLLOWS: THE ELEVATION OF BODY TEMPERATURE IN MEN WEARING THE TWO-LAYER CHEMICAL PROTECTIVE ASSEMBLY IN CONSEQUENCE OF THE INHIBITION OF SWEATING BY ATROPINE GIVEN FOR TREATMENT OF THE EFFECTS OF ANTICHOLINESTERASE AGENTS CAN BE PREVENTED BY ARTIFICIAL WETTING OF THE CLOTHING. THE EFFICIENCY OF EVAPORATIVE COOLING OF CLOTHED MEN DECREASES AS THE WATER CONTENT OF THE CLOTHING INCREASES. (MODIFIED AUTHOR ABSTRACT)
UNCLASSIFIED

AEROSPACE MEDICAL RESEARCH LAB WRIGHT-PATTERSON AFB

PHYSIOLOGICAL EFFECTS OF WEARING THE FIRE PROXIMITY SUIT ON CRASH TRUCK ALERT STATUS TO HOT-DRY AND HOT-HUMID ENVIRONMENTS* (U)

DESCRIPTIVE NOTE: FINAL REPT., NOV 73 14P

JAMES J. ISMILES, KENNETH A. IGERDING

REPT. NO. AMRL-TR-73-82

PROJ. AF-7222

TASK: 7222: 2

UNCLASSIFIED REPORT

DESCRIPTORS: *FIRE FIGHTING, *PROTECTIVE CLOTHING, HUMAN FACTORS ENGINEERING, ENVIRONMENTS, PHYSIOLOGICAL EFFECTS, FIRE RESISTANT TEXTILES, EXPOSURE(PHYSIOLOGY), HIGH TEMPERATURE, STRESS(PHYSIOLOGY) (U)

TESTS WERE CONDUCTED IN THE ALL WEATHER TEST FACILITY TO DETERMINE THE PHYSIOLOGIC PENALTY OF WEARING THE FIRE FIGHTER'S PROXIMITY SUIT FOR A 2-HOUR ALERT CYCLE IN THE CRASH TRUCK. HOT-DRY AND HOT-HUMID ENVIRONMENTS WERE PRODUCED IN THE CHAMBER WHICH DUPLICATED THE MOST SEVERE THERMAL CONDITIONS ANTICIPATED AT HOT WEATHER BASES. THREE SUBJECTS WEARING THE PROXIMITY SUIT (EXCEPT FOR GLOVES AND HELMET) WERE EXPOSED (TWICE EACH) TO EITHER THE HOT-DRY OR HOT-WET ENVIRONMENTS FOR 2 HOURS. IN HALF OF THE TESTS, THE PROXIMITY SUIT COAT WAS ALSO ELIMINATED FROM THE CLOTHING ASSEMBLY. FOR THE GIVEN HYPERTHERMIC CONDITIONS, THE 2-HOUR EXPOSURE PERIODS DO NOT ELICIT PHYSIOLOGIC RESPONSES OR SYMPTOMS INDICATIVE OF INCIPIENT HEAT EXHAUSTION ALTHOUGH SIGNIFICANT PHYSIOLOGICAL DECREMENTS WERE OBSERVED. FOR OPERATIONAL RELEVANCY, WHERE A RESCUE PROCEDURE COULD BE CALLED FOR TOWARD THE CONCLUSION OF THE THERMAL STRESS PERIOD, THE SUGGESTION IS MADE TO CONTINUE THIS EFFORT WITH A SERIES OF TESTS IN WHICH AN EXERCISE REGIMEN IS SUPERIMPOSED ON THE THERMAL STRESS EXPOSURE. (AUTHOR) (U)
EVALUATION OF MODIFIED DIVERS' DRESS.

DESCRIPTIVE NOTE: FINAL REPT.

SFR 60 14P GREENE J. L.

REPT. NO. NEDU-EVALUATION-3-61

PROJ: NS-146-200

UNCLASSIFIED REPORT

A DIVING DRESS OF SOMEWHAT MORE FLEXIBLE MATERIAL THAN IS IN THE STANDARD DRESS WAS EVALUATED ON A SIDE-BY-SIDE SUBJECTIVE EVALUATION WITH NEGATIVE RESULTS. THE EVALUATION IS CONSIDERED OF QUESTIONABLE VALUE SINCE THE DEPARTURE FROM STANDARD MATERIAL WAS NOT SIGNIFICANT. RECOMMENDATIONS TO CONTINUE EFFORTS TO IMPROVE THE STANDARD DRESS ARE NAME. (AUTHOR)
THE NAVY CLOTHING AND TEXTILE RESEARCH UNIT (NCTR) HAS DEVELOPED CLOTHING AND TEXTILE ITEMS FOR USE IN THE FIRE-HAZARDOUS, OXYGEN-ENRICHED ATMOSPHERES OF DIVERS' DECOMPRESSION CHAMBERS.

SMALL-SCALE LABORATORY TESTS ON THE FLAME RETARDANCY OF MATERIALS IN OXYGEN-ENRICHED ENVIRONMENTS LED TO THE SELECTION OF CANDIDATE MATERIALS OFFERING A POTENTIAL FOR USE. FULL-SCALE FLAMMABILITY TESTS WERE PERFORMED ON ITEMS MADE FROM MATERIALS SELECTED FOR FURTHER STUDY. ANALYSES OF ALL TEST RESULTS LED TO THE SELECTION OF DURETTE (MODIFIED NOMEX) FABRICS AS OFFERING THE BEST COMPROMISE CHOICE OF MATERIALS FOR USE IN END-ITEM CONSTRUCTIONS. CLOTHING AND TEXTILE ITEMS WERE MANUFACTURED AND FORWARDED TO SELECTED NAVY DECOMPRESSION-CHAMBER SITES, WHICH ARE USING THEM ON A PERMANENT BASIS. INFORMATION BASED UPON A LIMITED USE HAS SHOWN THE ITEMS TO BE ACCEPTABLE IN TERMS OF DESIGN, PERFORMANCE AND DURABILITY. STATIC GENERATION ON DURETTE MATERIALS, REPORTED BY SOME ACTIVITIES, CAN BE EFFECTIVELY CONTROLLED BY THE USE OF ANTI-STAT SOFTENERS DURING THE LAUNDRY CYCLE.
SUPPLEMENTARY NOTE: EDITED TRANs. OF IzVESTIYa (USSR) N280 P4: 29 NOV 73, BY FRANCIS T. RUSSELL.

DESCRIPTORS: FABRICS, PROTECTIVE CLOTHING, USSR, TRANSLATIONS

THIS NEWSPAPER ARTICLE TRANSLATION CONCERNS FABRICS MADE IN THE USSR FOR PROTECTIVE CLOTHING FOR CHEMISTS, PETROLEUM WORKERS, RAILROAD WORKERS AND WORKERS IN THE CELLULOSE, PAPER AND METAL INDUSTRIES.
UNCLASSIFIED

DOE REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 1ZOM08

AD-781 52U 6/17 15/2
OFFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

COVFRALL, CW PROTECTIVE STORAGE AND PACKAGING (U)

JUN 74 18P HART, J. E. IFUOCOR, P.

REPT. NO. DREO-R-696

UNCLASSIFIED REPORT

DESCRIPTORS: PROTECTIVE CLOTHING, CHEMICAL WARFARE AGENTS, STORAGE, PACKAGING, TEMPERATURE, DETERIORATION, HUMIDITY, POLYURETHANE RESINS, MOISTURE, CANADA (U)

NORMAL AND ACCELERATED STORAGE TESTS SHOWED THAT THE MATERIALS OF THE COVERALL CW PROTECTIVE WOULD REMAIN IN SERVICEABLE CONDITION FOR AT LEAST FIVE YEARS OF STORAGE UNDER TEMPERATE CONDITIONS. DETERIORATION OF THE CHEMICAL BARRIER IN HOT AND HUMID CONDITIONS WAS ATTRIBUTED TO HYDROLYSIS OF POLYURETHANE. PACKAGING TO PROTECT THE MATERIALS FROM ATMOSPHERIC POLLUTANTS AND HIGH HUMIDITY IS DISCUSSED. TESTS OF THE MOISTURE-PROOF, DEHYDRATED, PACKAGING SPECIFIED FOR THIS ITEM SHOWED THAT IT WAS ADEQUATE TO ENSURE SATISFACTORY STORAGE UNDER ADVERSE CONDITIONS. THE FEASIBILITY OF PREPARING GARMENTS FOR PACKAGING BY OVEN-DRYING WAS ESTABLISHED. (AUTHOR) (U)
A COLD WEATHER PROTECTION KIT FOR DOOR GUNNERS AND CREW WAS DEVELOPED FOR THE UH-1D/H HELICOPTER. THE KIT CONSISTS OF A BULKHEAD AND SLIDING DOORS WHICH PERMITS THE GUNNER'S COMPARTMENT TO BE PARTITIONED FROM THE REST OF THE AIRCRAFT INTERIOR. THE GUNNER IS DRESSED IN CLOTHING TO PROVIDE HIM SUFFICIENT PROTECTION WHILE THE REST OF THE CREW AND PASSENGERS ARE NOT EXPOSED. SEVERAL CLOTHING ENSEMBLES WERE TESTED. THE KIT AND TWO SETS OF COLD WEATHER CLOTHING WERE EVALUATED IN ALASKA. THE EVALUATION WAS FAVORABLE, EXCEPT FOR COMMENTS THAT THE DOOR GUNNERS WERE TOO WARM WHEN THE DOORS WERE CLOSED, AND LITTER AND PASSENGER CAPACITY WERE AFFECTED. (MODIFIED AUTHOR ABSTRACT)
Gagliardi Research Corp East Greenwich R I

DEVELOPMENT OF CHARCOAL IMPREGNATION PROCESS FOR CW PROTECTIVE OVERGARMENT.

CONTRACT: DA-19-129-AMC-675(N)
PROJ: DA-1K443303-0547

UNCLASSIFIED REPORT

DESCRIPTORS: (*PROTECTIVE CLOTHING, CHEMICAL WARFARE AGENTS), (*PROTECTIVE TREATMENTS, MANUFACTURING), IMPREGNATION, CHARCOAL, ISOCYANATE PLASTICS, EXPANDED PLASTICS, LAMINATED PLASTICS, REINFORCED PLASTICS, BINDERS, ADHESIVES, BONDING, TEXTILES, SCATTERING, ACRYLIC RESINS

THIS IS A FINAL REPORT ON THE DEVELOPMENT OF A CHARCOAL IMPREGNATION PROCESS FOR CW PROTECTIVE OVERGARMENT USING ACTIVATED CARBON A DISPERSING AGENT AND AN ACRYLIC EMULSION POLYMER BINDER ON A POLYURETHANE FLAME BONDED LAMINATE FABRIC. LABORATORY STUDIES, PLANT TRIALS AND PRODUCTION OF 8045 SQUARE YARDS OF FABRIC DELIVERED TO THE SPONSOR ARE DESCRIBED. (AUTHOR)
DEVELOPMENT, FABRICATION AND PROOFTESTING OF OPTIMUM FOOT PROTECTION AGAINST ANTI-PERSONNEL MINES USING A SUPPLEMENTARY DEVICE. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. 1 FEB-30 JUL 66 ON PHASE 2.
DEC 66 19P FUJINAKA, E. S. & MACDONALD, J. L.

CONTRACT: DA-19-129-GHC-379
PROJ: DA-1-K-643303-D-547
MONITOR: USA-NLabs, C/OM TR 67-45-CMTS-149

THE REPORT COVERS PHASE 2 OF A PROGRAM TO DEVELOP A SUPPLEMENTARY ITEM OF PROTECTIVE FOOTWEAR TO BE USED IN CONJUNCTION WITH A PREVIOUSLY DEVELOPED PROTECTIVE COMBAT BOOT. IT WAS DIRECTED TOWARD FABRICATION OF TEST PROTOTYPES FOR BLAST EVALUATION. THE SUPPLEMENTARY DEVICES WERE OF TWO TYPES, CONCEPT A AND CONCEPT B, BOTH USING AN IDENTICAL SOLID ALUMINUM SHANK. CONCEPT B INCORPORATED A SYSTEM OF REINFORCEMENT FOR THE UPPER PORTION OF THE FOOT. A DISCUSSION OF PRELIMINARY PROOFTESTING CONSIDERATIONS IS PRESENTED. THIS DISCUSSION INCLUDES THE RECOMMENDATION OF TEST PERSONNEL, THE QUANTITY OF TESTS, AND THE PROTECTIVE FOOTWEAR TO BE USED DURING TESTS. (AUTHOR) (U)
UNCLASSIFIED

EVALUATION OF CREW MEMBER'S IMPROVED FIRE RESISTANT FLIGHT COVERALLS.

DESCRIPTIVE NOTE: FINAL REPT. 1-30 APR 67, MAY 67

OAKES, KEITH W. I

PROJ: ACTIV-ACA-45/671

UNCLASSIFIED REPORT

FLIGHT COVERALLS MADE OF AN IMPROVED NOMEX FIRE RESISTANT MATERIAL WERE EVALUATED BY AVIATION UNITS IN VIETNAM. IF CERTAIN MODIFICATIONS ARE MADE, THE FIRE RESISTANT COVERALL TESTED IS SERVICEABLE, MAINTAINABLE, AND ACCEPTABLE FOR USE BY US ARMY AIRCRAFT CREW MEMBERS IN VIETNAM. SINGLE LAYER NOMEX HAS LITTLE BETTER FIRE RESISTANT QUALITIES THAN CHEMICALLY TREATED UNIFORMS. DOUBLE-LAYER NOMEX PROVIDES A SIGNIFICANT INCREASE IN PROTECTION OVER OTHER MATERIALS, TREATED OR UNTREATED.
LIGHTWEIGHT PONCHOS AND GROUND CLOTHS WERE EVALUATED IN VIETNAM TO DETERMINE SUITABILITY, DURABILITY, AND ACCEPTABILITY FOR USE BY US TROOPS IN VIETNAM. EVEN THOUGH FABRICATION MATERIAL WAS DURABLE IT WAS SOMETIMES AFFECTED BY TERMITE ATTACK AND INSECT REPELLENT. IF MATERIALS CAN BE DEVELOPED WHICH WILL NOT BE AFFECTED BY TERMITES AND INSECT REPELLENT SPRAYS, THE LIGHTWEIGHT PONCHO SHOULD BE PROCURED FOR ISSUE TO US ARMY TROOPS OPERATING IN VIETNAM. (AUTHOR)
THE PRESENT STATE-OF-THE-ART IN EXTRAVEHICULAR PROTECTIVE GARMENTS AND POSSIBLE NEW APPROACHES AND IDEAS SUITABLE FOR DEVELOPMENT HAVE BEEN INVESTIGATED. RECOMMENDATIONS ARE MADE FOR EXPLORATORY DEVELOPMENT PROGRAMS WHICH CAN ACHIEVE MAJOR ADVANCEMENTS IN EXTRAVEHICULAR PROTECTIVE TECHNOLOGY IN THE TIME PERIOD 10 TO 15 YEARS HENCE. THE STUDY INCLUDES A BRIEF LOOK AT THE POSSIBLE MISSIONS AND TASKS, A DEFINITION OF THE PROBLEMS OF PROTECTING MAN IN EARTH-ORBITAL SPACE, AN ANALYSIS OF THE PENDING TORQUES OF JOINTS IN PRESENT SPACE SUIT CONSTRUCTIONS, A DISCUSSION OF TOTAL ENCAPSULATION AND REMOTE HANDLING TECHNIQUES AND A DISCUSSION OF PROPOSED ADVANCED CONCEPTS, SOME OF WHICH MAY CONTRIBUTE TO ADVANCEMENT OF EV PROTECTIVE TECHNOLOGY. THE NEXT GENERATION OF EV PROTECTIVE GARMENTS, FOR ACTIVITY ON OR NEAR THE SURFACE OF A SPACE STATION IN A 300 N.M. EARTH ORBIT, WILL PROBABLY BE ANTHROPOMORPHIC AND CONSIST OF (1) HARD-SUIT CONSTRUCTION FOR THE TORSO AND THE SHOULDER, WAIST AND ELBOW JOINTS, (2) SOFT-SUIT CONSTRUCTION BELOW THE WAIST, (3) PORTABLE LIFE SUPPORT COMPONENTS WHICH ARE INTEGRATED INTO THE HARD SHELL, (4) LIFE SUPPORT COMPONENTS WHICH CAN BE REPLENISHED WHILE THE ASTRONAUT IS OUTSIDE OF THE SPACE STATION, (5) A LIQUID-COoled UNDERGARMENT FOR REMOVAL OF EXCESS METABOLIC HEAT, AND (6) AN EMERGENCY SEALING AND PRESSURIZATION SYSTEM WHICH IS AUTOMATICALLY ACTUATED IN THE EVENT OF GARMENT FAILURE. (AUTHOR)
UNCLASSIFIED

OPERATIONAL CHARACTERISTICS OF THE 1964 EXTRAVEHICULAR RESEARCH MODEL FULL PRESSURE ASSEMBLY.

DESCRIPTION NOTE: FINAL REPT. MAY 64-JAN 66, MAY 67. AFML-TR-66-179

PROJECT: AF7164

TASK: 716411

UNCLASSIFIED REPORT

DESCRIPTIONS: (PRESSURE SUITS, EXTRAVEHICULAR ACTIVITY), SPACE FLIGHT, FLIGHT CLOTHING, HELMETS, GLOVES, SHOES, DESIGN, CONSTRUCTION, INFLATABLE STRUCTURES, LEAKAGE (FLUID), HUMAN FACTORS ENGINEERING, TEMPERATURE CONTROL, BODY TEMPERATURE, ACOUSTIC PROPERTIES, PERFORMANCE (ENGINEERING), FAILURE (MECHANICS), VENTING, PRESSURE, PERFORMANCE (HUMAN)

THE FIRST EXTRAVEHICULAR RESEARCH MODEL FULL PRESSURE ASSEMBLY DESIGNED FOR OPERATION AT 5 PSIG WAS SUBJECT TO A SERIES OF TESTS TO DETERMINE THE OPERATIONAL CHARACTERISTICS OF THE ASSEMBLY. TEST DATA WERE OBTAINED AT 3.5-PSIG OPERATING PRESSURE TO PERMIT PERFORMANCE DATA COMPARISON WITH THE A/P22S-2 DATA AND DATA OBTAINED ON OTHER EXPERIMENTAL ASSEMBLIES DESIGNED TO OPERATE AT 3.5 PSIG. TEST DATA WERE ALSO OBTAINED AT 5-PSIG OPERATING PRESSURE. THESE TESTS INCLUDED THOSE CONSIDERED TO BE BASIC STANDARD PERFORMANCE TESTS FOR PROTECTIVE ASSEMBLIES. PARTICULAR EMPHASIS WAS PLACED ON TESTS CONDUCTED TO DETERMINE MOBILITY CHARACTERISTICS. IN GENERAL, THE MOBILITY OBTAINED WAS AN IMPROVEMENT OVER THAT OF THE A/P22S-2 FULL PRESSURE ASSEMBLY. (AUTHOR)
UNCLASSIFIED

THE SCIENTIFIC SECRETARY OF THE EAST GERMAN ASTRONAUTICAL SOCIETY H. PFÄFFE PREDICTS THAT ASTRONAUTS IN THE VERY NEAR FUTURE WILL EXTEND THE DURATION OF THEIR EXTRAVEHICULAR ACTIVITIES. THIS IS STATED TO BE ONE OF THE MOST PRESSING CURRENT PROBLEMS WHICH SPACE EXPERIMENTS ARE DESIGNED TO SOLVE. THE REQUIREMENT FOR ASTRONAUTS TO REMAIN LONGER OUTSIDE THEIR SPACECRAFT IS DUE TO SUCH EVENTUALITIES AS THE NEED TO REPAIR SPACECRAFT, THE ERECTION OF LARGE MANNED SPACE STATIONS, AND THE ACCOMPLISHMENT OF A MANNED LUNAR MISSION, A MANNED LANDING ON THE MOON'S SURFACE BEING SCHEDULED FOR 1970. BESIDES THE METHOD OF EGRESS USED BY LFOPOV, THRUSTERS IN THE FORM OF A 'ROCKET BELT' WILL ALSO BE USED TO CONTROL MOVEMENTS IN SPACE. COMPRESSED AIR OR HYDROGEN PEROXIDE ARE SUGGESTED FOR USE AS PROPELLANTS. THE 'ROCKET BELT' WILL BE PROVIDED WITH A STABILIZING DEVICE TO PREVENT THE ASTRONAUT FROM SPINNING, AS WOULD OCCUR IF THE IMPULSES OF THE SMALL ROCKET ENGINES DID NOT PASS THROUGH THE CENTER OF GRAVITY OF THE SYSTEM CONSISTING OF ASTRONAUT, SPACESUIT, AND EQUIPMENT. ANOTHER POSSIBILITY FOR WORKING OUTSIDE OF A SPACECRAFT IS TO USE A CAPSULE PROVIDED WITH MANIPULATORS. (AUTHOR)
UNCLASSIFIED

EVALUATION OF FIRE RETARDANT FLIGHT GLOVES (NOMEX).
(ACA-63/671). (U)

DESCRIPTIVE NOTE: FINAL REPT., JAN 68. 8P. ISAAC, JAMES E. I

UNCLASSIFIED REPORT

DESCRIPTORS: (*GLOVES, *FIRE RESISTANT TEXTILES),
(*FLIGHT CLOTHING, GLOVES), NYLON, FLIGHT CREWS,
AIRCRAFT FIRES, PROTECTION, QUESTIONNAIRES,
ACCEPTABILITY, PERFORMANCE (ENGINEERING), LIMITED WAR,
VIETNAM

IDENTIFIERS: NOMEX

THE EVALUATION WAS CONDUCTED BECAUSE OF A
REQUIREMENT TO AFFORD PROTECTION TO THE HANDS OF AIR
CREW Members WHO MAY BECOME EXPOSED TO FLASh: FIRES WHILE
IN PERFORMANCE OF THEIR AIRCrew DUTIES. THREE
HUNDRED PAIRS OF FLIGHT GLOVES COMPOSED OF A
COMBINATION OF *NOMEX* MATERIAL AND CABRETTA
LEATHER PRESENTLY IN USE BY THE US NAVY WERE
SELECTED. THEY WERE DISTRIBUTED ON 21 AUGUST
1967 AMONG A VARIETY OF UNITS THROUGHOUT VIETNAM
AND USED BY AIRCREW MEMBERS UNDER VARIOUS CONDITIONS
AND CLIMATE WHILE PERFORMING DUTIES AS AIR CREWMen IN
A VARIETY OF AIRCRAFT. A QUANTITATIVE AND
QUALITATIVE ANALYSIS WAS MADE THROUGH THE USE OF
QUESTIONNAIRES TO DETERMINE SUITABILITY, RUGGEDNESS,
CONTACT, ACCEPTANCE AND UTILITY. (AUTHOR)
DESCRIPTORS: (*FLIGHT CLOTHING, SHOES), (*SHOES, ACCEPTABILITY), DESIGN, LIFE EXPECTANCY, PERMEABILITY, WATER, LUBRICANTS, OILS, FASTENINGS

THE OBJECTIVES OF THIS TEST WERE TO DETERMINE THE OPERATIONAL SUITABILITY AND AIRCREW ACCEPTABILITY OF THE QUICK DONNING FLIGHT BOOT AS WELL AS TO IDENTIFY ANY DESIGN DEFICIENCIES OR MAINTENANCE PROBLEM AREAS. IT WAS CONCLUDED THAT THE BOOT IS SATISFACTORY FOR AIRCREW USE AND IS RECOMMENDED FOR PROCUREMENT AFTER THE ADOPTION OF A DIFFERENT NON-SKID SOLE AND HEEL. (AUTHOR)
UNCLASSIFIED

AN ENGINEERING TEST OF A JUNGLE HAT WITH HEADNET WAS CONDUCTED TO DETERMINE THE TECHNICAL PERFORMANCE AND SAFETY CHARACTERISTICS OF THE TEST ITEM AS DESCRIBED IN THE SDR AND AS INDICATED BY THE PARTICULAR DESIGN AND TO DETERMINE THE TECHNICAL AND MAINTENANCE SUITABILITY OF THE JUNGLE HAT WITH HEADNET FOR SERVICE TESTING. IT WAS CONCLUDED THAT THE JUNGLE HAT WITH HEADNET IS SUITABLE FOR SERVICE TESTING. IT WAS RECOMMENDED THAT THE HATS BE MARKED: *FOR HAND LAUNDERING ONLY*.
UNCLASSIFIED

UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0M08

AD-835 549  6/17  15/5
ARMY GENERAL EQUIPMENT TEST ACTIVITY FORT LEE VA

ENGINEERING TEST OF BOOT, COMBAT, MOUNTAIN AND SKI.

DESCRIPTIVE NOTE: FINAL REPT., JUN 68 33P

MANGUM, EDWIN W. I
PROJ: ROT/E-1-J-643303-0-547, USATECOM-837020
TASK: 1-J-643303-0-54712-D, 83702006

UNCLASSIFIED REPORT

DESCRIPTIONS: (*PROTECTIVE CLOTHING, ENVIRONMENTAL TESTS), (*SHOES, MOUNTAINS), SOCKS, MAINTENANCE, MOISTUREPROOFING, VISUAL INSPECTION, THERMAL INSULATION, LEATHER, COLD WEATHER TESTS; ARMY EQUIPMENT; MILITARY REQUIREMENTS, HEAT TRANSFER; PROTECTION; FIRE RESISTANT MATERIALS, FIRE PROTECTIVE CLOTHING
IDENTIFIERS: SIZES(DIMENSIONS), TEMPERATURE CYCLING

AN ENGINEERING TEST OF THE BOOT, COMBAT, MOUNTAIN AND SKI, WAS CONDUCTED TO EVALUATE THE MODEL NO. 1070 BOOT; TO EVALUATE THE SIZING AND FITTING CHARACTERISTICS IN CONSIDERATION OF THE TECHNICAL CHARACTERISTICS; AND TO PROVIDE TECHNICAL ASSISTANCE TO THE U.S. ARMY ARCTIC TEST CENTER (USAATC) IN THE INITIAL FITTING AND ISSUE OF THE TEST ITEM IN THAT PHASE OF THE SERVICE TEST. IT WAS CONCLUDED THAT THE MODEL 1070 MOUNTAIN AND SKI BOOT IS SATISFACTORY AS TO THE TECHNICAL CHARACTERISTICS INCLUDED IN THE QMR FOR THE SYSTEM OF LIGHTWEIGHT CLOTHING AND EQUIPMENT (LINCOLE) FOR WHICH TESTS WERE CONDUCTED.
THE PURPOSE OF TAC TEST 68-203, VENTILE ANTI-EXPOSURE SUIT, WAS TO DETERMINE THE COMFORT AND COMPATIBILITY OF THIS SUIT WHEN USED IN THE TACTICAL FIGHTER MISSION. THIS TEST WAS PERFORMED AT THE REQUEST OF THE AIR DEFENSE COMMAND (ADC) AND WAS A PORTION OF THE OVERALL VENTILE ANTI-EXPOSURE SUIT TEST PERFORMED BY ADC. MEMBERS OF THE 33 TAC FTR WG WORE THE VENTILE SUIT ASSEMBLY ON ALL TYPES OF MISSIONS IN F-4 AIRCRAFT. DATA WERE COLLECTED USING DAILY QUESTIONNAIRES, PLUS A MORE DETAILED QUESTIONNAIRE ADMINISTERED 30 DAYS AFTER THE TEST BEGAN. UPON COMPLETION OF THE TEST, EACH PILOT PROVIDED A STATEMENT COVERING PROBLEMS ENCOUNTERED, RECOMMENDATIONS FOR IMPROVEMENT, AND AN OVERALL STATEMENT OF ACCEPTANCE OR REJECTION OF THE SUIT DESIGN. ALL PILOTS INVOLVED IN TESTING THE SUIT SAID IT WAS ACCEPTABLE. PROBLEM AREAS WERE FOUND AND RECOMMENDATIONS SUBMITTED. AFTER THESE PROBLEMS ARE CORRECTED, THIS EXPOSURE SUIT IS RECOMMENDED FOR AIR FORCE PURCHASE.
THE PURPOSE OF THIS INVESTIGATION WAS TO CONDUCT A
RESEARCH AND DEVELOPMENT PROGRAM ON FULL PRESSURE
SUITS TO EVOLVE NEW TECHNIQUES AND DESIGNS TO
BE USED IN FABRICATION OF FULL PRESSURE SUITS USING
THE CORD RESTRAINED PRINCIPLE. THREE WORKING
LABORATORY MODELS WERE FURNISHED WITH MOBILITY JOINTS
THAT INCORPORATED CORD, RING AND STRETCH MATERIAL
COMBINATIONS. A VENTILATION LINER, FURNISHED WITH
THE GARMENT PROVIDED SUFFICIENT AIR FLOW TO MAINTAIN
AN ATMOSPHERE ADEQUATE FOR THE PHYSIOLOGICAL WELL-
BEING OF THE WEARER. (AUTHOR)
THE TWO-PART ARTICLE CONCERNS THE STORAGE OF CHEMICAL AGENTS AND SPECIAL CLOTHING FOR WORKING IN WAREHOUSES WHERE THESE CHEMICALS ARE STORED. VOLATILE CHEMICALS MUST BE STORED IN DRY, WELL-VENTILATED WAREHOUSES OF THICK WALLS AND SMOOTH CONCRETE FLOORS. THE CHEMICALS ARE STORED IN CONTAINERS (ACCORDING TO THE NATURE OF THE CHEMICAL) AND STORED SEPARATELY ACCORDING TO DESIGNATION. PERSONNEL WORKING IN THESE WAREHOUSES MUST WEAR GOOD PROTECTIVE CLOTHING TO PREVENT THE VOLATILE CHEMICALS FROM COMING INTO CONTACT WITH THEM. COVERALLS OF COTTON, WHICH ARE IMPENETRABLE BY DUST, RUBBERIZED OR PLASTIC-COATED APRON AND BREASTPLATE, COMBINATION MITTENS, AND A COTTON HOOD MAKE UP THE STANDARD UNIFORM. VARIATIONS OF THESE, PLUS ADDITIONAL CLOTHING FOR WORKING DURING THE WINTER ARE ALSO MENTIONED. (AUTHOR)
EVALUATION OF MANNED ORBITING LABORATORY
DESIGN DEFINITION PRESSURE GARMENTS.

DESCRIPTIVE NOTE: FINAL REPT. JAN-SEP 66.
JUL 68 65P
REPT. NO. AMRL-TR-66-235
PROJ: AF-7164
TASK: 716411

FOUR DESIGN DEFINITION PRESSURE SUITS PROCURED IN
CONNECTION WITH THE MANNED ORBITING LABORATORY
PROGRAM WERE INVESTIGATED. THESE PRESSURE GARMENT
ASSEMBLIES WERE DESIGNED TO FIT IN WITH THE PROPOSED
CREW CABINS AND RELATED EQUIPMENT AS WELL AS TO
SATISFY SAFETY AND FUNCTIONAL REQUIREMENTS
ANTICIPATED FOR THE TWO MAN CREW. THE REPORT
DEScribes THE PRESSURE GARMENT ASSEMBLIES, GIVES SOME
OF THE LOGIC INVOLVED IN DESIGN SELECTION, REVIEWS
THE EVALUATION PROCEDURES, AND PRESENTS THE RESULTS
OBTAINED IN THE BATTERY OF TESTS. CONCLUSIONS
COVER THE GENERAL CHARACTERISTICS AND SHORTCOMINGS OF
THE ASSEMBLIES AND OFFER AN UNOFFICIAL ESTIMATE OF
THE GENERAL SUITABILITY FOR THE MOL PROGRAM.

(AUTHOR)
AN INTERNAL CHEMICAL HEAT SOURCE FOR WET SUITS, BASED ON THE HEAT OF CRYSTALLIZATION OF A CHEMICAL OR MIXTURE OF CHEMICALS, HAS BEEN PROPOSED. INITIAL EXPERIMENTS INDICATE THAT THIS METHOD SHOWS CONSIDERABLE PROMISE, AND LITHIUM NITRATE TRINHYDRATE, M.p. 30°C (86°F), IS A GOOD CANDIDATE MATERIAL. THE INSIDE OF SAMPLE SUITING CONTAINING THIS MATERIAL WAS MAINTAINED WITHIN A FIVE-DEGREE RANGE FOR FIFTY MINUTES WHEN IMMERSED IN ICE WATER. PRELIMINARY TESTS WITH PROTOTYPE VESTS HAVE BEEN PERFORMED AND FURTHER INVESTIGATIONS ARE PLANNED.

(AUTHOR)
A METHOD AND RATING SYSTEM FOR EVALUATION OF THERMAL PROTECTION

DEC 68 25P STOLL, ALICE M. ICHIANTA, MARIA A.

REPT. NO. NADC-MR-6809 PROJ. A34531/202/69F3253401

UNCLASSIFIED REPORT

DESCRIPTORS: (PROTECTIVE CLOTHING, THERMAL INSULATION), TEXTILES, BURNS (INJURIES), PAIN, PHYSIOLOGY, THERMAL RADIATION

THERMAL PROTECTION RATING SYSTEMS FOR FABRICS, BASED ON PAIN AND BLISTER EFFECTS IN HUMAN SKIN, ARE CONSIDERED. IN TERMS OF: (1) PRECISE EVALUATIONS APPLICABLE TO ANY KNOWN TEMPERATURE-TIME PATTERN, AND (2) SIMPLE LABORATORY PROCEDURES TO PROVIDE A UNIVERSALLY USEFUL STANDARD RATING SYSTEM. THE FIRST SYSTEM WHICH IS MORE COMPREHENSIVE IS DIFFICULT AND REQUIRES COMPUTER OPERATIONS ROUTINELY; THE SECOND, DESCRIBED IN DETAIL, OFFERS A RATING SYSTEM WHICH IS SIMPLE, DIRECTLY RELATED TO PAIN AND BLISTER PARAMETERS, AND MAY BE UNDERSTOOD BY THE UNINITIATED AS WELL AS THOSE KNOWLEDGEABLE IN THE FIELD.

(AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /20H08

AD-846 605 6/17 5/9
ASTRO RESEARCH CORP SANTA BARBARA CALIF

SLIP NET MOBILITY JOINTS FOR PRESSURE SUITS.

DESCRIPTIVE NOTE: FINAL REPT. 1 APR 67-31 MAY 68,
NOV 68 96P FRASER A. F. IPREISWERK P.

REPT. NO. ARC-R-286
CONTRACT: F33615-67-C-1586
PROJ: 71641
TASK: 716411
MONITOR: AMRL TR-68-94

UNCLASSIFIED REPORT

DESCRIPTORS: (SPACE ENVIRONMENTS, LIFE SUPPORT),
(SPACE CREWS, PRESSURE SUITS), MANNED SPACECRAFT,
FATIGUE(MECHANICS), DACRON, JOINTS(PHYSIOLOGY),
MODELS(SIMULATIONS), HUMAN FACTORS ENGINEERING

THE RESULTS OF A 1-YEAR EXPERIMENTAL PROGRAM TO
DEVELOP AND EVALUATE FABRIC CONSTRAINT LAYERS FOR
PRESSURIZABLE SUITS ARE DESCRIBED. THE PRINCIPAL
OBJECT OF THE DEVELOPMENT WAS TO PRODUCE SOFT-
PRESSURE-SUIT COMPONENTS WITH MINIMUM CONSTRAINT TO
MOTION AND WITH MAXIMUM RANGE OF MOTION. A
SECONDARY GOAL WAS TO DEVELOP JOINT DESIGNS THAT
ALLOW THE USER TO MAINTAIN DISPLACED POSITIONS OF THE
LIMBS WITH MINIMUM USE OF SUSTAINING FORCE.
(AUTHOR)

210

UNCLASSIFIED /20H08
AN ENGINEERING TEST OF CLOTHING SYSTEM (SUMMER UNIFORM) FOR ARMY AVIATION CREW MEMBERS WAS CONDUCTED DURING THE PERIOD 10 JUNE - 15 NOVEMBER 1968 TO DETERMINE THE TECHNICAL PERFORMANCE AND SAFETY CHARACTERISTICS AS DESCRIBED IN THE SDR. THE TECHNICAL CHARACTERISTICS, AND AS INDICATED BY THE PARTICULAR DESIGN, AND TO DETERMINE THE TECHNICAL AND MAINTENANCE SUITABILITY OF THE UNIFORM FOR SERVICE TEST. IT WAS CONCLUDED THAT: THE SUMMER UNIFORM, AS DESCRIBED IN THE REPORT, MEETS THE OPERATIONAL REQUIREMENTS TO A DEGREE SUITABLE TO WARRANT SERVICE TESTING. IT WAS RECOMMENDED THAT: THE SLEEVE FASTENER BE ALTERED TO ALLOW A SNUG FIT! THE PATCH-TYPE SLEEVE POCKET ZIPPER BE REPLACED WITH A VELCRO FASTENER ALLEVIATING THE ACCESSIBILITY PROBLEM; SERIOUS CONSIDERATION BE GIVEN TO FAILURE OF MATERIAL TO EXHIBIT A HIGH DEGREE OF LIGHT PASTNESS NOT ONLY TO THE RESULTANT COLOR CHANGE, BUT ALSO TO THE EXTREME LOSS OF STRENGTH BEFORE THE UNIFORM IS APPROVED FOR ISSUES. (AUTHOR)
SERVICETESTOFFUNCTIONALUNIFORMFOR
ARMOREDVEHICLECREWMEN(SUMMER). (U)

DESCRIPTIVENOTE:FINALREPT.MAY-OCT68,
FEB6944P.KEELN,JOHN M.;INTERRETT,
DALE E.; I
PROJ:RDT&E-1-M-643303-D-547.USAECOM-18786131
TASK: I-M-643303-D-54735

UNCLASSIFIED REPORT

DESCRIPTORS: (**PROTECTIVE CLOTHING, ARMY PERSONNEL),
(*FIRE PROTECTIVE CLOTHING, ARMORED VEHICLES), HUMAN
FACTORS ENGINEERING, CLOTHING, GASPROOF CLOTHING,
CHEMICAL WARFARE AGENTS, RESPONSE(BIOLOGY),
ACCEPTABILITY, COMPATIBILITY, DESERT TESTS,
MAINTAINABILITY, POLYAMIDE PLASTICS, FASTENINGS,
DEFECTIONS(MATERIALS), LIFE EXPECTANCY, TANKS(COMBAT
VEHICLES), LAUNDRY OPERATIONS

IDENTIFIERS: ARMORED VEHICLES, PASSENGER VEHICLES, M-
113 VEHICLES, M-114 VEHICLES, M-551 VEHICLES, M-60
TANKS. SIZES(DIMENSIONS), SUMMER

THE TEST OBJECTIVE WAS TO DETERMINE THE SUITABILITY
OF THE SUMMER FUNCTIONAL UNIFORM FOR US ARMY USE.
TESTING WAS CONDUCTED ON ARMORED VEHICLES INCLUDING
M113 SERIES ARMORED PERSONNEL CARRIERS,
M60 SERIES TANKS, M114 SERIES COMMAND AND
RECONNAISSANCE CARRIERS AND M551 SHERIDAN
VEHICLES FOR A TOTAL OF 113 WEAR DAYS AND 29
LAUNDERINGS. THE UNIFORM MET SPECIFIED CRITERIA OF
THE SDP EXCEPT FOR SIZE, DURABILITY (LIFE OF 12
MONTHS) AND THE CAPABILITY OF BEING CLEANED IN THE
FIFL WITHOUT APPRECIABLE CHANGE IN SIZE, PROTECTION,
OR COLOR. EIGHT DEFICIENCIES AND TWO SHORTCOMINGS
WERE REVEALED. DEFICIENCIES WERE CATEGORIZED AS
ONE IN SIZING, THREE IN SEAM FAILURES, TWO ZIPPER
FAILURES, AND TWO HUMAN FACTORS. THE USAAREND
CONCLUDED THAT THE SUMMER FUNCTIONAL UNIFORMS FOR
ARMORED VEHICLE CREWEDS REQUIRE CORRECTION OF THE
DEFICIENCIES TO MAKE THEM SUITABLE FOR ARMY USE
UNDER INTERMEDIATE CLIMATIC CONDITIONS.
THE ENGINEERING TEST OF THE FUNCTIONAL SUMMER UNIFORM FOR ARMORED VEHICLE CREWMEN WAS CONDUCTED TO DETERMINE ITS TECHNICAL PERFORMANCE AND SAFETY CHARACTERISTICS AND TO DETERMINE THE TECHNICAL AND MAINTENANCE SUITABILITY OF THE UNIFORM FOR SERVICE TESTING. IT WAS CONCLUDED THAT THE SUMMER UNIFORM MEETS THE OPERATIONAL REQUIREMENTS TO A DEGREE SUFFICIENT TO WARRANT SERVICE TESTING. THE ONLY KNOWN USER SAFETY HAZARD IS WHEN THE FABRIC IDENTIFICATION TAGS ARE STAPLED TO THE INNER LAYER AND ARE NOT REMOVED FROM THE UNIFORMS. IT IS RECOMMENDED THAT: THE SHORTCOMINGS BE CORRECTED; A CHECK SIZING AND FITTING STUDY BE CONDUCTED TO ESTABLISH ADEQUACY OF PATTERN CORRECTIONS; AND LIMITED ADDITIONAL CHECK TESTING BE CONDUCTED TO ESTABLISH EFFECTIVENESS OF OTHER CORRECTIVE ACTIONS.
The report describes the pressure suit donning tests performed by the crew stations unassisted in a mock-up of the MOL suit stowage area during zero gravity conditions. The object of these tests was to determine the suitability of the space allotted for suit donning under actual zero-g conditions and to evaluate various proposed paint schemes for suit, helmet, gloves, and boots.
SERVICE TEST OF FUNCTIONAL UNIFORM FOR
ARMORED VEHICLE CREWMEN (WINTER).

DESCRIPTIVE NOTE: FINAL REPT: DEC 68-MAY 69;
JUL 69 3R0 PESCRO, ROBERT A. IDUNHAM
LAWRENCE E. I.
PROJ: RDT/E-I-M-6433303-D-547, USATECOM-18786132
TASK: I-M-6433303-D-54735

TEST OBJECTIVE WAS TO DETERMINE THE SUITABILITY OF
THE WINTER FUNCTIONAL UNIFORM FOR US ARMY USE.
TESTING WAS CONDUCTED ON ARMORED VEHICLES INCLUDING
M113 SERIES ARMORED PERSONNEL CARRIERS,
M60 SERIES TANKS, M114 SERIES COMMAND AND
RECONNAISSANCE CARRIERS, AND THE M551 ARMORED
RECONNAISSANCE/AIRBORNE ASSAULT VEHICLES FOR
A TOTAL OF 63 WEAR DAYS AND 22 LAUNDERINGS.
A GEMINI B SUIT OXYGEN DEMAND AND RELIEF REGULATOR VALVE, P/N 52-83700-1171, WAS EXPOSED TO A SIMULATED CABIN PRESSURE OF 0.1 PSIA FOR 33 DAYS. THE GAS SUPPLY TO THE REGULATOR WAS CLOSED DURING THE 33 DAY EXPOSURE, PERMITTING THE SIMULATED SUIT CIRCUIT PRESSURE TO DECAY TO 0.1 PSIA. FOLLOWING THE 33 DAY EXPOSURE THE REGULATOR OUTLET DEMAND DIAPHRAGM WAS SUBJECTED TO A REVERSE PRESSURIZATION OF 3.5 PSI SIMULATING THE REACTIVATION OF THE GEMINI B ENVIRONMENTAL CONTROL SYSTEM. THESE TESTS WERE PERFORMED TO DEMONSTRATE THAT THE QUALIFIED NASA GEMINI REGULATOR VALVE WOULD OPERATE SATISFACTORY WHEN EXPOSED TO THE GEMINI B CONDITIONS OF ORBITAL STORAGE AND REVERSE PRESSURE. FUNCTIONAL TESTS PERFORMED ON THE REGULATOR BEFORE AND AFTER THE 33 DAY EXPOSURE INDICATED THAT THE REGULATOR PERFORMANCE WAS SATISFACTORY EXCEPT THAT THE MAXIMUM SUIT PRESSURE CONTROL POINT AFTER THE EXPOSURE WAS OUT OF SPECIFICATION. (AUTHOR)
IT IS ANTICIPATED THAT THE WATER SEPARATOR PLATES IN THE SUIT HEAT EXchanger WILL BECOME DRY DURING THE ORBITAL STORAGE PHASE OF THE GEMINI 'B' MISSION. DRY WATER SEPARATOR PLATES PROVIDE A PATH FOR LEAKAGE OF CABIN ATMOSPHERE THROUGH THE SUIT HEAT EXCHANGER CONDENSATE OUTLET LINE TO THE WATER EVAPORATOR AND THEN OVERBOARD THROUGH THE RELIEF VALVE. THE PURPOSE OF THIS TEST WAS TO DETERMINE THE FEASIBILITY OF WETTING THE WATER SEPARATOR PLATES IN A DRY SUIT HEAT EXCHANGER WITH THE CONDENSATE NORMALLY COLLECTED WITHIN THE UNIT. THIS WAS DONE BY SUBJECTING THE HEAT EXCHANGER TO CONDITIONS THAT SIMULATED ITS OPERATION IN THE SPACECRAFT AND CONCURRENTLY MEASURING THE WATER OUTPUT AND GAS LEAKAGE THROUGH THE WATER SEPARATOR PLATES.
THE PURPOSE OF THE TEST WAS TO DETERMINE THE
SUITABILITY OF THE ARMORED VEHICLE CREWMEN'S
UNIFORM FOR USE BY THE US ARMY IN A NATURAL
HUMID TROPIC ENVIRONMENT. THE UNIFORM WAS TESTED
USING PERSONNEL REPRESENTATIVE OF THOSE WHO WOULD
NORMALLY WEAR THE UNIFORM TO PERFORM THEIR DUTIES.
TESTS WERE CONDUCTED TO DETERMINE FUNCTIONAL
SUITABILITY, MAINTAINABILITY, AND DURABILITY.
DURING THE TEST, TEST PARTICIPANTS RELATED THEIR
APPRAISAL OF THE TEST UNIFORM TO THE STANDARD FIELD
UNIFORM. RECORDERS FROM THE US ARMY TROPIC
TEST CENTER MADE OBSERVATIONS AND ADMINISTERED
QUESTIONNAIRES TO COLLECT DATA FOR THIS TEST.
DURING THE TEST ONE DEFICIENCY AND THREE
SHORTCOMINGS WERE FOUND. THE DEFICIENCY WAS
UNSUITABILITY FOR USE IN HUMID TROPIC ENVIRONMENT DUE
TO LACK OF TROOP ACCEPTANCE. THE FIRST TWO
SHORTCOMINGS INVOLVED FAILURES OF SLIDE FASTENERS ON
THE DROP SEAT AND BREAST POCKET. THE THIRD
SHORTCOMING CONSISTED OF SEAM SEPARATIONS AT THE
BREAST POCKET AND ADJUSTABLE WAIST. IT IS
CONCLUDED THAT THE TEST UNIFORM IS UNSUITABLE FOR USE
IN THE HUMID TROPIC ENVIRONMENT BASED ON TROOP
ACCEPTANCE. NO DEFINITE CONCLUSIONS WERE
FORMULATED CONCERNING COMFORT AND DURABILITY DUE TO
THE WIDE LATITUDE OF PARTICIPANT RESPONSE, LACK OF
CONTROL UNIFORM, AND STATISTICALLY SMALL SAMPLE SIZE.
IT IS RECOMMENDED THAT THE TEST ITEM NOT BE ADOPTED.
UNCLASSIFIED

UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z00/08

AD-862 006 6/17

ARMY ELECTRONIC PROVING GROUND FORT HUACHUCA ARIZ

ENGINEERING TEST OF PROTECTIVE HELMET SPH-4

(u)

DESCRIPTIVE NOTE: FINAL REPT. JUL-SEP 69.

OCT 69 66P MARTINEZ VICTOR S.

REPT. NO. USAEPG-5125

PROJ. USATECH-4-EI-820-PH4-001

UNCLASSIFIED REPORT

DESCRIPTORS: (HELMETS, PERFORMANCE[ENGINEERING]),

(HEADGEAR: FLIGHT CLOTHING), PROTECTION, EFFECTIVENESS,

ENVIRONMENTAL TESTS, FUNGI, FAILURE, HUMIDITY,

TABLES DATA), EARPHONES, SENSITIVITY, HEATING,

AGING(MATERIALS), MICROPHONES, ACOUSTIC IMPEDANCE,

RELIABILITY, MAINTAINABILITY, ACOUSTIC INSULATION, SHOCK

RESISTANCE, IMPACT SHOCK, SAFETY, ADHESIVES

IDENTIFIERS: SPH-4 HELMETS

THE U. S. ARMY ELECTRONIC PROVING

GROUND (USAEPG), FORT HUACHUCA, ARIZONA.

CONDUCTED AN ENGINEERING TEST OF PROTECTIVE

HELMET SPH-4 TO DETERMINE ITS TECHNICAL

PERFORMANCE, ENGINEERING ADEQUACY, AND SAFETY

CHARACTERISTICS. THIRTEEN TEST ITEMS WERE BENCH

TESTED AT USAEPG FROM JULY THROUGH SEPTEMBER

1969. WHITE SANDS MISSILE RANGE PROVIDED

SUPPORT AND FACILITIES FOR THE TEMPERATURE-SHOCK,

FUNGI, AND HUMIDITY SUBTESTS. THE REMAINING

ENVIRONMENTAL SUBTESTS WERE CONDUCTED AT FORT

HUACHUCA. ONE DEFICIENCY (FUNGI) AND FIVE

SHORTCOMINGS WERE FOUND DURING THE ENGINEERING TEST

PROGRAM. THESE FAILURES DID NOT AFFECT THEIR

OPERATIONAL PERFORMANCE. IT IS

CONCLUDED THAT THE TECHNICAL PERFORMANCE, ENGINEERING

ADEQUACY, AND SAFETY CHARACTERISTICS OF THE SPH-4

ARE SATISFACTORY. THE MASSIVE FUNGAL GROWTH FOUND

ON THE SPH-4 COMPONENTS RESTRICTS ITS USE IN

TROPICAL AREAS. IT IS RECOMMENDED THAT THE

DEFICIENCY AND SHORTCOMINGS BE CORRECTED AND THE

SPH-4 BE CONSIDERED SUITABLE FOR SERVICE TESTING.

(AUTHOR)

219

(1)
NAVAL APPLICATIONS OF MAN-IN-THE-SEA CONCEPTS - MISSION DEFINITION

DESCRIPTIVE NOTE: RESEARCH MEMO
DEC 68 169P BIEN ALBERT I McDONOUGH
REPT NO NWRC-RM-50
CONTRACT: N00014-68-A-0243-0002
PROJ: RF-018-02-04, NR-274-008

SUPPLEMENTARY NOTE: SEE ALSO ADDENDUM DATED DEC 68
AD-506 481L

DESCRIPTORS: (NAVAL OPERATIONS UNDERWATER), (UNDERWATER VEHICLES HUMANS), (UNDERWATER CLOTHING PERFORMANCE HUMAN), MILITARY REQUIREMENTS PRESSURE, SCUBA DIVERS SWIMMING DEEP SUBMERGENCE SALVAGE, RECOFTYR, MARINE ENGINEERING DIVING NAVAL PERSONNEL PERFORMANCE ENGINEERING, CONTINENTAL SHELVES PRESSURE VESSELS LIFE SUPPORT HYDROSTATIC PRESSURE
IDENTIFIERS: DIVERS MAN IN THE SEA PROJECT SEALAB CLASS VESSELS SWIMMERS

INVESTIGATION AND RECOMMENDATIONS CONCERNING PROTECTIVE CLOTHING AND EQUIPMENT FOR NAVY PERSONNEL ON FLIGHT AND HANGAR DECKS OF AIRCRAFT CARRIERS.

DESCRIPTIVE NOTE: FINAL REPT., JUL 70 235P SANDERS, JAMES H., JR.; PARKFR, JAMES F., JR.; CONTRACT: NO0014-70-C-0051; PROJ: NR-145-259

UNCLASSIFIED REPORT

DESCRIPTORS: (PROTECTIVE CLOTHING, AIRCRAFT CARRIERS), FLIGHT DECKS, HANGARS, EAR PROTECTORS, FIRE PROTECTIVE CLOTHING, SHOES, LIFE PREServers, UNDERWEAR, THERMAL INSULATION, HEADGEAR, Gloves, EYEGLASSES, ENVIRONMENT, STORAGE, LAUNDRY OPERATIONS, MAINTENANCE, NAVAL PERSONNEL, SAFETY, SHIP FIRES, HAZARDS, SURVIVAL (PERSONNEL), VULNERABILITY, CASUALTIES, WOUNDS AND INJURIES, COSTS, AIRCRAFT NOISE, QUESTIONNAIRES

IDENTIFIERS: THERMAL UNDERWEAR

THIS STUDY DETERMINED THE REQUIREMENT FOR AND PRESENTED RECOMMENDATIONS CONCERNING USE OF PROTECTIVE CLOTHING AND EQUIPMENT BY PERSONNEL WORKING ON THE FLIGHT AND HANGAR DECKS OF AIRCRAFT CARRIERS. A REVIEW OF THE LITERATURE AND A COMPUTER ANALYSIS OF 3560 INJURY REPORTS, DEFINED THE NATURE AND EXTENT OF THE HAZARDS FOR EACH WORK STATION. SHIPBOARD VISITS AND STRUCTURED QUESTIONNAIRES PROVIDED INFORMATION REGARDING CARRIER OPERATIONS AND USE OF AVAILABLE PROTECTIVE EQUIPMENT. CURRENT EQUIPMENT WAS EXAMINED WITH RESPECT TO ADEQUACY, AVAILABILITY, AND COST. SPECIFIC PROTECTION REQUIREMENTS WERE IDENTIFIED FOR EACH PART OF THE BODY. ON THE BASIS OF THESE, RECOMMENDATIONS ARE MADE FOR AN INTEGRATED PROTECTIVE SYSTEM SUITED TO THE NEEDS OF FLIGHT AND HANGAR DECK PERSONNEL, INCLUDING SUCH ITEMS AS COVERALLS, LIFE VESTS, THERMAL UNDERGARMENTS, HEADGEAR, GLOVES, AND BOOTS. SOME OF THE ISSUES INVOLVED IN IMPLEMENTING THESE DESIGN RECOMMENDATIONS ALSO ARE DISCUSSED.

(AUTHOR)
UNCLASSIFIED

DESCRIPTORS: (PROTECTIVE CLOTHING, TEST METHODS), SAFETY, ACCEPTABILITY, HUMAN FACTORS ENGINEERING, VALUE ENGINEERING, ENVIRONMENTAL TESTS

IDENTIFIERS: *COMBAT UNIFORMS, COMMODITY SERVICE TEST PROCEDURE

THE ARMY SERVICE TEST PROCEDURE DESCRIBES TEST METHODS AND TECHNIQUES FOR EVALUATING THE CHARACTERISTICS OF COMBAT UNIFORMS, AND FOR DETERMINING THEIR SUITABILITY FOR SERVICE USE BY THE U.S. ARMY. (AUTHOR)
STUDIES ON DECONTAMINATION AND ON PERCUTANEOUS PROTECTION AGAINST CHEMICAL AGENTS WERE CONDUCTED. NEW OR IMPROVED CHEMICAL AGENT DECONTAMINANTS WERE INVESTIGATED, WITH SELECTED METAL SALTS AND COMPOUNDS, PHENOLS, AND PLASTICIZED ION EXCHANGE RESINS SHOWING THE MOST PROMISE. ATTEMPTS TO CATALYTICALLY DECONTAMINATE AGENTS BY FREE RADICAL INITIATED OXIDATION WERE NOT SUCCESSFUL. SILICONES AND SILAZANES WERE ALSO NOT EFFECTIVE. THEORETICAL AND EXPERIMENTAL VARIABLES WERE CORRELATED FOR PREDICTING THE PERFORMANCE OF FABRIC IMPREGNANTS AS VAPOR BARRIERS. THE INTERACTION BETWEEN FABRICS OR SOLID SORBENT AND LIQUID CHEMICAL AGENTS WERE DEFINED. (AUTHOR)
UNCLASSIFIED

ROCKET PROPELLANT HANDLER’S SUIT

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. SEP 69-JUL 70; OCT 70-SEP 70

CONTRACT: F04611-69-C-0102

PROJECT: AF-3058

MONITOR: AFRPL TR-70-135

UNCLASSIFIED REPORT

DESCRIPTORS: (*PROTECTIVE CLOTHING, DESIGN), (*ROCKET PROPELLANTS, HANDLING), WEIGHT, MOBILITY, GLOVES, LEAKAGE (FLUID), HELMETS, SAFETY BELTS, VALVES, DROP TESTS, MAINTAINABILITY, HALOCARBON PLASTICS

IDENTIFIERS: ROCKET PROPELLANT HANDLER SUIT, TETRAFLUOROETHYLENE RESINS

THE REPORT COVERS THE DESIGN, DEVELOPMENT, FABRICATION AND TESTING OF ONE ROCKET PROPELLANT HANDLER'S SUIT. THE SUIT ON COMPLETION OF FABRICATION WAS DELIVERED TO THE AIR FORCE ROCKET PROPULSION LABORATORY FOR FUEL TESTS. PRESENTED IN THE DOCUMENT ARE THE DESCRIPTION OF THE SUIT, ITS OPERATION, THE TEST REQUIREMENTS, PROCEDURES AND DOCUMENTATION PROBLEMS, AND RECOMMENDATIONS. (AUTHOR)
UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0NO8

AD-877 249 6/17
AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO

WINDBLAST TEST OF HIGH-ALTITUDE FLYING OUTFIT A/P22S-4.

DESCRIPTIVE NOTE: TECHNICAL REPT.
AUG 70 48P
HOCHWALT, JOHN R.
REPT. NO. ASD-TR-70-11
PROJ. AF-412A

UNCLASSIFIED REPORT

DESCRIPTORS: (*FLIGHT CLOTHING, PERFORMANCE (ENGINEERING)), (*WIND, FLIGHT CLOTHING), FLIGHT TESTING, HIGH ALTITUDE, TAPES, SIMULATION, EJECTION

AN INVESTIGATION WAS UNDERTAKEN TO DETERMINE THE EFFECT OF WIND BLAST ON THE A/P22S-4 HIGH ALTITUDE FLYING OUTFIT DURING SIMULATED PILOT EJECTION AT A MAXIMUM SEA-LEVEL FLIGHT MACH NUMBER OF 0.91 (600 KNOTS). TWO A/P22S-4 OUTFITS WERE TESTED. THE INTEGRITY OF BOTH OUTFITS WAS SATISFACTORILY DEMONSTRATED, ALTHOUGH SLIGHT DAMAGE RESULTED. THE TEST FURTHER DEMONSTRATED THAT VELCRO TAPE IS A SATISFACTORY SUBSTITUTE FOR THE LACING CORD CURRENTLY USED FOR FASTENING THE EXTERIOR COVER AND RESTRAINT LAYER AT THE VENTILATION PORT, ALTIMETER, AND CONTROLLER LOCATIONS. (AUTHOR)

225

UNCLASSIFIED /Z0NO8
NONFIAMMABLE PBI FABRICS FOR PROTOTYPE AIR FORCE FLIGHT SUITS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. AUG 69-MAR 70, NOV 70 39P SCHULMAN, STANLEY Istanton.
REPT. NO. AFML-TR-70-178
PROJ: AF-7320
TASK: 732002

UNCLASSIFIED REPORT

DESCRIPTORS: (*FIRE RESISTANT TEXTILES, *FLIGHT CLOTHING), (*HEAT RESISTANT PLASTICS, SYNTHETIC FIBERS), FIRE PROTECTIVE CLOTHING, AIRCRAFT FIRES, FLAMMABILITY, TEST METHODS, COTTON TEXTILES, NYLON, BENZIMIDAZOLES, POLYMERS (U)
IDENTIFIERS: *BENZIMIDAZOLE POLYMERS, NOMEX POLYMERS, POLYIMIDE RESINS (U)

CANDIDATE FLIGHT SUIT FABRICS HAVE BEEN EVALUATED ALONG WITH CURRENT AIR FORCE ISSUE FLIGHT SUIT FABRICS FOR PERSONNEL PROTECTION IN SIMULATED AIRCRAFT ACCIDENT FIRES. MANNEQUINS CLOTHED IN THE VARIOUS COVERALL FABRICS WERE EXAMINED FOR AVERAGE PERCENT BODY AREA BURNED WHERE SECOND DEGREE OR WORSE BURNS OCCURRED. USE OF COTTON AND FIRE RETARDANT TREATED COTTON FLIGHT SUITS RESULTED IN AN AVERAGE OF GREATER THAN 60 PERCENT BODY AREA BURNED. NOMEX COVERALLS RESULTED IN GREATER THAN 30 PERCENT AVERAGE BODY AREA BURNED. POLYBENZIMIDAZOLE (PBI) RESULTED ON THE AVERAGE, LESS THAN TEN PERCENT BODY AREA BEING BURNED. (AUTHOR)
EVALUATION CRITERIA FOR HEATED DIVER SUITS

THE CRITERIA FOR EVALUATING HEATED SUITS FOR DIVERS ARE DESCRIBED. THE MOST STRINGENT REQUIREMENT IS THE ENSUREMENT OF CRITERIA FOR TESTING SELF-CONTAINED HEATED SUIT SYSTEMS TO PROTECT A DIVER THERMALLY IN 28 DEG F WATER TO 1000-FOOT DEPTHS FOR DURATIONS OF 6 HOURS. SYSTEMS UTILIZING REMOTE HEAT SOURCES VIA AN UMBILICAL CORD TRANSFER SYSTEM ARE INCLUDED AND REQUIREMENTS FOR THREE CATEGORIES OF TESTING CRITERIA ARE DESCRIBED: (1) PREOPERATIONAL TESTS, (2) OPERATIONAL TESTS (MAN SIMULATED), AND (3) OPERATIONAL TESTS (MANNED). THE DOMINANT EVALUATION CRITERION REQUIREMENT FOR ALL TESTS IS SAFETY AND STRESS IS PLACED ON THE REQUIREMENT FOR BACKUP CONTROLS AND FAIL-SAFE COMPONENTS FOR ALL SYSTEMS.
IN THIS REPORT THE DESIGN REQUIREMENTS, DESCRIPTION AND FUNCTIONAL OPERATION OF THE A/P22S-4 AND A/P22S-6 OUTFITS ARE PRESENTED. THE BASELINE MODEL WAS THE IMPROVED A/P22S-2 HIGH ALTITUDE, FULL PRESSURE, FLYING OUTFIT. PERTINENT ASPECTS OF THE PROGRAM ARE PRESENTED. IN ADDITION, PRODUCTION OF AN IMPROVED OUTFIT, IDENTIFIED AS A/P22S-6A, IS DISCUSSED.
UNCLASSIFIED

AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO

THERMAL PROTECTION CAPACITY OF THE A/P22S-4 HIGH ALTITUDE FLYING OUTFIT.

DESCRIPTIVE NOTE: TECHNICAL REPT.
AER 71-38P
HOCHWALT, JOHN R.
REPT. NO: ASD-TR-71-3
PROJ: AF-412A

UNCLASSIFIED REPORT

DESCRIPTORS: (FLIGHT CLOTHING, THERMAL INSULATION), (AVIATION SAFETY, FIRE PROTECTIVE CLOTHING), FIRES, JET ENGINE FUELS, TESTS, ARMY RESEARCH

IDENTIFIERS: JP-4 FUEL

THE REPORT DESCRIBES AND ILLUSTRATES THE THERMAL PROTECTION PROVIDED BY THE A/P22S-4 HIGH ALTITUDE FLYING OUTFIT. IT INDICATED THAT AN INDIVIDUAL SUBJECTED TO A JP-4 FUEL FIRE WITH TEMPERATURES FROM 1800 TO 2300 DEGREES FAHRENHEIT FOR A PERIOD OF THREE SECONDS, WOULD NOT HAVE BEEN BURNED IF HE WERE WEARING THIS OUTFIT.

(AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM08

AD-866 642
AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO

DESIGN AND DEVELOPMENT OF A HIGH ALTITUDE
PROTECTIVE ASSEMBLY. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
APR 71 41P GILLESPIE, KENT W.
REPT. NO. ASD-TR-71-8

UNCLASSIFIED REPORT

DESCRIPTORS: (*PRESSURE SUITS, FLIGHT CREWS), HIGH
ALTITUDE, LIFE SUPPORT, BAROMETRIC PRESSURE, HELMETS,
DIAPHRAGMS (MECHANICS), EXPANDABLE STRUCTURES,
VENTILATION, OXYGEN MASKS, PROTECTION, RESPIRATION, HEAT
TRANSFER, NYLON, OXYGEN EQUIPMENT, PARACHUTES,
INFLATABLE STRUCTURES, LIFE PREServers, EXPOSURE
SUITS (U)

IDENTIFIERS: CWU-3/P ANTIGRAVITY SUITS, CWU-12/P
ANTIEXPOSURE SUITS, HAP(A HIGH ALTITUDE PROTECTIVE
ASSEMBLIES), *HIGH ALTITUDE PROTECTIVE ASSEMBLIES,
LPU-3/P LIFE PREServers, MA-3 VENTILATION GARMENTS,
PARACHUTE HARNESS, PARTIAL PRESSURE SUITS (U)

THIS REPORT PRESENTS EXCERPTS FROM A DESIGN STUDY
REPORT AND INFORMATION REGARDING THE REQUIREMENT FOR
AND THE DEVELOPMENT AND FABRICATION OF A HIGH
ALTITUDE PROTECTIVE ASSEMBLY. (U)

230

UNCLASSIFIED /ZOM08
EVALUATION OF Swimmer Exposure Suits in Subfreezing Waters, (U)

JUL 71 34P JENKINS WALLACE T.
REPT NO. NSRDL/PC-3471
PROJ NO. S4619
TASK 11897-10

UNCLASSIFIED REPORT

DESCRIPTORS: (Exposure suits, underwater), polar regions, temperature, synthetic rubber, protection, gloves, acceptability, naval research, diving (U)
IDENTIFIERS: Swimmer exposure suits (U)

Three types of exposure suits for underwater swimmers were evaluated in the Arctic Ocean at water temperatures between 28.9°F and 30.6°F: a 3/8-inch thick, closed cell neoprene standard wet suit; a 1/4-inch thick, closed cell neoprene dry suit worn over full nylon fur underwear; and a 3/8-inch thick wet suit fabricated of noncompressible material. Four diver-oceanographers used and evaluated the suits in subfreezing water beneath the ice. It was concluded after a series of 40 dives, ranging in duration from 37 to 115 minutes, that the dry suit affords more protection and is more satisfactory than either wet suit. The wet suit of noncompressible material provides more protection at depth than the standard wet suit. None of the gloves or mittens, or any combination, afforded adequate protection for the hands. (Author) (i)
THE EXPERIMENT EVALUATES THE PERFORMANCE OF A MODIFIED MINE RECOVERY SUIT UNDER VARIOUS WORKING CONDITIONS TO A DEPTH OF 99 FEET. THE OUTFIT CONSISTED OF A HUNCHBACK CANVAS LIGHTWEIGHT DIVING DRESS WITH AN INTEGRATED FACEMASK HAVING A HINGED FACEPLATE. A MINE RECOVERY SUIT (MRS) BREATHING APPARATUS SUPPLIED BREATHING MEDIUM TO THE FACEMASK BY MEANS OF A VENTURI JET WHICH METERED THE SUPPLY AND PROVIDED RECIRCULATION OF THE BREATHING MEDIUM THROUGH A CARBON DIOXIDE ABSORBENT. A NECK YOKE BREATHING BAG PROVIDED A RESERVOIR FOR HIGH BREATHING RATE DEMANDS. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM08

AD-893 971 6/17 6/11
NAVY EXPERIMENTAL DIVING UNIT WASHINGTON D C

SECOND SERIES U.S. RUBBER COMPANY
LIGHTWEIGHT DIVING OUTFITS WITH AIRLINE AND
DEMAND SUPPLY. (U)

DESCRIPTIVE NOTE: FINAL REPT.
JAN 53 17P WOLFE, T. R. III; DYER, J. V.
REPT. NO. NEDU-8-52
PROJ. NS-185-005

UNCLASSIFIED REPORT

DESCRIPTORS: (UNDERWATER CLOTHING, DIVING), (BREATHING
Masks, Underwater Clothing), Design, Nylon, Rubber
Coatings, Fastenings, Shoes, Textiles, Leakage(Fluid),
Moistureproofing, Shallow Water, Underwater Equipment,
Underwater Communication Systems, Underwater Telephones,
Hazards, Electricity (U)
IDENTIFIERS: Canvas, Electric Shock (U)

THIS EVALUATION CONCERNS THE SUITABILITY OF THE
COMPONENTS OF THREE EXPERIMENTAL LIGHTWEIGHT DIVING
DRESSES AS DETERMINED BY A SERIES OF DIVING RUNS,
IN GENERAL, THE DRESSES AND THEIR INTEGRATED
FACEMASKS ARE SATISFACTORY. (U)
The foamed-in-place helmet process evaluated in this test and evaluation was an attempt to correct the deficiencies that existed in the former helmet. Life support technicians are capable, with practice, of local fabrication of acceptable foamed-in-place helmets. Most of the material and equipment provided were satisfactory; however, some were unacceptable and considerable supplies were required that were not provided. Instructions for the helmet liner foaming process, issued by Aeronautical Systems Division, were found to be adequate. The instructions should be refined and photographs and illustrations should be added. Instructions for the helmet fabrication were inadequate. Participating aircrews rated the test helmet superior to the previously used helmets in the areas of comfort (82 percent) and stability (80 percent). No significant difference was noted in restrictions to visibility. Noise attenuation was rated acceptable.
UNCLASSIFIED

EVALUATION OF LIGHTWEIGHT DEEP SEA DIVING DRESS

DESCRIPTIVE NOTE: SUMMARY REPT.
APR 71 9P
CHANDLER, DONALD R. REIMERS
REPT. NO. NEDU-LR-1-71

COMMERICAL DEEP SEA DIVERS IN JAPAN AND ON THE U.S. WEST COAST USE A DEEP SEA DRESS MADE OF A LIGHTER WEIGHT, MORE FLEXIBLE MATERIAL THAN THE STANDARD USN DEEP SEA DRESS. THREE OF THE LIGHTWEIGHT DRESSES WERE TESTED AT NAVY EXPERIMENTAL DIVING UNIT AND NAVAL SCHOOL, DIVING AND SALVAGE OVER A PERIOD OF 6 MONTHS.
The objective of this program was the development of PBI fabric for evaluation in summer weight flying coveralls. The work was carried out in two phases. During Phase I a group of spun PBI fabrics was designed, woven, evaluated in the laboratory and twenty coveralls fabricated for evaluation by AFML. In Phase II 600 coveralls were fabricated and distributed to various Air Force, Army, Navy, and NASA installations for in-service O.T. and E. (Operational Test and Evaluation). A laboratory process was developed to minimize the thermal shrinkage of spun PBI fabric resulting from high temperature exposure. Further development must be conducted to refine and optimize the process to prevent darkening of the fabric. The PBI fabric ultimately chosen for the 600 coveralls was woven from 21's singles cotton count) 3x6 twist multiplier yarn. The fabric selected was a 69x64, 2x1 twill weighing 4.7 ounces per square yard. The coveralls were single layered throughout, except in areas containing pockets. Based on flammability tests conducted in the laboratory and in simulated aircraft fuel fires, this PBI fabric was found to be superior to the flying suits currently used by the Air Force in preventing dangerous thermal penetration and destruction by fire.
UNCLASSIFIED

CORPORATE AUTHOR - MONITORING AGENCY

*ACUREX CORP MOUNTAIN VIEW CALIF
AEROTHERM DIV

- ANALYSIS OF THE THERMAL RESPONSE OF PROTECTIVE FABRICS
  (AFRL-TR-73-17)
AD-759 525

*AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO

- INTEGRATED BACK-PACK MANEUVERING UNIT PROPULSION STUDY
  AND EXHAUST PLUME HEATING ANALYSIS
AD-609 206

- WINDBLAST TEST OF HIGH-ALTITUDE FLYING OUTFIT A/P225-4
AD-877 249

- DESIGN REQUIREMENTS, DESCRIPTION AND FUNCTIONAL OPERATION
  OF THE A/P225-9 AND A/P225-6 HIGH ALTITUDE, FLYING
  OUTFITS.
AD-885 304

- THERMAL PROTECTION CAPACITY OF THE A/P225-9 HIGH ALTIITUDE
  FLYING OUTFIT
AD-885 575

- DESIGN AND DEVELOPMENT OF A HIGH ALTIITUDE PROTECTIVE
  ASSEMBLY
AD-880 641

*ACUREX CORP MOUNTAIN VIEW CALIF
AEROTHERM DIV

- THERMAL PROTECTION OF PROTECTIVE FABRICS FOR USE IN
  HIGH TEMPERATURE OUTFITS
AD-424 497

*ACUREX CORP MOUNTAIN VIEW CALIF
AEROTHERM DIV

- CONCEPTUAL DESIGN FOR A PERSONAL THERMAL CONDITIONING SYSTEM
AD-670 212

*AEROSPACE MEDICAL RESEARCH LAB WRIGHT-PATTERSON AFB OHIO

- SENSIBLE HEAT TRANSFER IN THE GEMINI AND APOLLO PRESSURE SUITS
AD-647 820

- EXPERIMENTAL SPACE WORKER'S GARMENT AND HELMET ASSEMBLY
AD-738 080

- EMERGENCY BREATHING AND SUIT PRESSURIZATION SYSTEM
AD-608 088

- HEIGHT-WEIGHT SIZING OF PROTECTIVE GARMENTS, BASED ON
  JAPANESE AIR SELF-DEFENSE FORCE PILOT DATA; WITH FIT-TEST RESULTS
AD-656 039

- MOMENTS OF INERTIA AND CENTERS OF GRAVITY OF THE LIVING HUMAN
  BODY ENCUMBERED BY A FULL-PRESSURE SUIT
AD-609 843

- THE USE OF LINES OF DESIGN AND DEVELOPMENT OF NO
  NONEXTENSION TO IMPROVE MOBILITY IN FULL-PRESSURE SUITS
AD-610 819

- STUDY AND DEVELOPMENT OF MATERIALS AND TECHNIQUES FOR
  PASSIVE THERMAL CONTROL OF FLEXIBLE EXTRAVEHICULAR SPACE GARMENTS
AD-624 086

- A STUDY OF TECHNIQUES AND EQUIPMENT FOR THE EVALUATION OF

01

UNCLASSIFIED
EXTRAVENICULAR PROTECTIVE GARMENTS
AD-635 206

AMRL-TR-69-143
RESEARCH AND DEVELOPMENT OF
EXTRAVENICULAR PROTECTIVE ASSEMBLY
AD-647 197

AMRL-TR-69-183
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AS A PRESSURE TECHNIQUE FOR
PROTECTIVE ASSEMBLIES
AD-652 653

AMRL-TR-66-193
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HPLNET FACEPIECES FOR SPACE
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AD-652 248

AMRL-TR-66-193
RESEARCH TO ADVANCE
EXTRAVENICULAR PROTECTIVE
TECHNOLOGY
AD-652 964

AMRL-TR-67-59
PRESSURE SEALING CLOSURES FOR
FULL PRESSURE PROTECTIVE SUIT
ASSEMBLIES
AD-668 204

AMRL-TR-67-190
TECHNIQUES AND MATERIALS FOR
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AND FLEXIBLE EXTRAVENICULAR SPACE
ENCLOSURES
AD-668 940

AMRL-TR-67-190
VARIABLE THERMAL CONDUCTIVITY
HEAT TRANSFER RESEARCH FOR PERSONAL
PROTECTIVE ASSEMBLIES
AD-668 765

AMRL-TR-67-190
FULL PRESSURE SUIT FOR SPACE
CREW
AD-639 225

AMRL-TR-67-235

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UNCLASSIFIED

AN AUTOMATIC ANALOG BREATHING
SYSTEM FOR MULTICELL PRESSURE
SUITS
AD-687 436

AMRL-TR-68-74
A PORTABLE TEST BATTERY FOR
COMPARATIVELY EVALUATING OPERATOR
PERFORMANCE IN FULL-PRESSURE SUIT
ASSEMBLIES
AD-680 825

AMRL-TR-68-56
METEOROID THREAT TO
EXTRAVENICULAR SPACE SUIT
ASSEMBLIES
AD-691 441

AMRL-TR-68-87
SURVEY OF THERMAL CONTROL
TECHNIQUES FOR EXTRAVENICULAR SPACE
SUITS
AD-687 149

AMRL-TR-68-94
SLIP NET MOBILITY JOINTS FOR
PRESSURE SUITS
AD-698 805

AMRL-TR-68-122
ENGINEERING DESIGN STUDY OF A
SPACE SUIT WITH AN INTEGRATED
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AD-668 825

AMRL-TR-68-187
VORTEX TUBE AS A THERMAL
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AD-705 659

AMRL-TR-69-6
ANTHROPOMETRIC DIMENSIONS OF
AIR FORCE PRESSURE-SUITED PERSONNEL
FOR WORKSPACE AND DESIGN CRITERIA
AD-697 022

AMRL-TR-69-64
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AD-726 076
AMRL-TR-69-55
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AD-702 537

AMRL-TR-69-64
EXPLORATORY DEVELOPMENT OF PRESSURE SUIT MOBILITY JOINTS, GLOVES AND HELMET.
AD-711 676

AMRL-TR-69-112
INVESTIGATION OF VIBRATION AND IMPACT PROTECTION OF THE HUMAN HEAD AND NECK.
AD-712 124

AMRL-TR-69-127
ZOOM BAG SCENARIO.
AD-647 455

AMRL-TR-69-132
INTEGRATED MANEUVERING LIFE SUPPORT SYSTEM.
AD-714 577

AMRL-TR-70-3
ANTHROPOLOGICAL APPLICATIONS IN HIGH ALTITUDE FLIGHT SYSTEMS.
AD-716 886

AMRL-TR-70-111
EXPLORATORY DEVELOPMENT OF PARTIAL PRESSURE HELMET AND MOBILITY JOINTS FOR EMERGENCY PRESSURE SUIT OUTFITS.
AD-720 278

AMRL-TR-70-120
DESIGN AND FABRICATION OF A PASSIVELY PRESSURIZED SUIT.
AD-720 827

AMRL-TR-71-60
CENTRIFUGE VALIDATION OF A TACTILE TACTILITY WARNING DEVICE.
AD-732 194

AMRL-TR-72-65
COLD WATER EVALUATION OF

ENVIRONMENTAL MARINE DIVING SUITS.
AD-754 278

AMRL-TR-72-45
EVALUATION OF FIRE RETARDANT FABRICS.
AD-754 935

AMRL-TR-72-77
BACKGROUND AND DEVELOPMENT OF BOYLE'S LAW ALTITUDE SUITS.
AD-761 797

AMRL-TR-73-42
PHYSIOLOGICAL EFFECTS OF WEARING THE FIRE PROXIMITY SUIT ON CRASH TRUCK ALERT STATUS IN HOT-DRY AND HOT-HUMID ENVIRONMENTS.
AD-773 828

ANRL-TR-69-6b AD-754 935
EXPLORATORY DEVELOPMENT OF PRESSURE SUIT MOBILITY JOINTS, GLOVES AND HELMET.
AD-702 537

AMRL-TR-69-127
ZOOM BAG SCENARIO.
AD-647 455

AMRL-TR-69-132
INTEGRATED MANEUVERING LIFE SUPPORT SYSTEM.
AD-714 577

AMRL-TR-70-3
ANTHROPOLOGICAL APPLICATIONS IN HIGH ALTITUDE FLIGHT SYSTEMS.
AD-716 886

AMRL-TR-70-111
EXPLORATORY DEVELOPMENT OF PARTIAL PRESSURE HELMET AND MOBILITY JOINTS FOR EMERGENCY PRESSURE SUIT OUTFITS.
AD-720 278

AMRL-TR-70-120
DESIGN AND FABRICATION OF A PASSIVELY PRESSURIZED SUIT.
AD-720 827

AMRL-TR-71-60
CENTRIFUGE VALIDATION OF A TACTILE TACTILITY WARNING DEVICE.
AD-732 194

AMRL-TR-72-65
COLD WATER EVALUATION OF

UNCLASSIFIED
UNCLASSIFIED

AIR-AIR

MOBILITY OF PRESSURE-SUITED SUBJECTS UNDER WEIGHTLESS AND LUNAR GRAVITY CONDITIONS
AD-666 577

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AMRL-TR-65-186
ACOUSTICAL EVALUATION OF X-20A DYNA-SOAR FULL-PRESSURE SUIT ASSEMBLIES
AD-618 715

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AMRL-TR-65-197
BIOCHEMICAL AND PHYSIOLOGICAL EVALUATION OF HUMAN SUBJECTS WEARING PRESSURE SUITS UNDER SIMULATED AEROSPACE CONDITIONS
AD-626 419

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AMRL-TR-66-179
OPERATIONAL CHARACTERISTICS OF THE 1964 EXTRAVEHICULAR RESEARCH MODEL FULL PRESSURE ASSEMBLY
AD-619 324

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AMRL-TR-66-235
EVALUATION OF MANNED ORBITING LABORATORY DESIGN DEFINITION PRESSURE GARMENTS
AD-642 833

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AMRL-TR-67-124
APPLICATION OF THE RANQUE-MILSCH VORTEX TUBE TO AIRCREW COOLING PROBLEMS
AD-673 345

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AMRL-TR-67-234
PRINCIPLES OF THE BOYLE'S LAW EMERGENCY PRESSURE SUIT AND THEIR APPLICATION
AD-685 720

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AMRL-TR-68-274
CLEANANCE AND PERFORMANCE VALUES FOR THE RARE-HANDED AND THE PRESSURE-GLOVED OPERATOR
AD-681 457

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AMRL-TR-68-193
DESCRIPTION AND OPERATING INSTRUCTIONS FOR A 7-CHANNEL TELEMETRY SYSTEM FOR PHYSIOLOGICAL TEMPERATURES AND THE ELECTROCARDIOGRAM
AD-666 067

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TR-69-126
A COMPARISON OF THREE FULL-PRESSURE SUITS IN TERMS OF CONTROL ACTIVATION TIME
AD-613 597

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AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

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AFML-TR-70-178
NONFLAMMABLE PBI FABRICS FOR PROTOTYPE AIR FORCE FLIGHT SUITS
AD-680 047

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AFML-TR-71-195
DEVELOPMENT OF PBI FABRIC FOR FLIGHT SUIT WEAR TEST
AD-814 019

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AFML-TR-72-247
DEVELOPMENT OF REFLECTIVE MATERIALS FOR FIRE FIGHTER'S HOURS
AD-662 544

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AFML-TR-73-17
ANALYSIS OF THE THERMAL RESPONSE OF PROTECTIVE FABRICS
AD-759 525

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AIR FORCE OFFICE OF SCIENTIFIC RESEARCH ARLINGTON VA

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AFOSR-69-0847TR
A COOLING HOOD IN HOT-HUMID ENVIRONMENTS
AD-684 582

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AFOSR-69-237TR
PROCEEDINGS OF THE SYMPOSIUM ON INDIVIDUAL COOLING MARCH 17-18, 1969
AD-694 130

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AFOSR-TR-71-1364
WATER COOLED HOOD AFFECTS CREATIVE PRODUCTIVITY.
UNCLASSIFIED

AD-724 020

APPLIED PSYCHOLOGICAL SERVICES INC
WAYNE PA SCIENCE CENTER

AD-606 039

A PORTABLE TEST BATTERY FOR

COMPARATIVELY EVALUATING OPERATOR

PERFORMANCE IN FULL-PRESSURE SUIT

ASSEMBLIES

(AHRL-TR-68-74)
AD-600 825

ARCTIC AEROMEDICAL LAB FORT
WAINRIGHT ALASKA

AAL-TDR-64-33

PROJECT COLD CASE
AD-442 767

ARMY AEROMEDICAL RESEARCH LAB FORT
RUCKER ALA

USAARL-71-19

ENGINEERING TEST OF LIGHTWEIGHT

UNDERWEAR OF THE WINTER FLIGHT

CLOTHING SYSTEM: THERMAL

PROTECTION,
AD-733 429

USAARL-71-24

THE TESTING OF THERMAL

PROTECTIVE CLOTHING IN A

REPRODUCIBLE FUEL FIRE ENVIRONMENT;

A FEASIBILITY STUDY;
AD-729 342

ARMY AEROMEDICAL RESEARCH UNIT FORT
RUCKER ALA

USAARU-49-1

USER EVALUATIONS OF TWO AIRCREW

PROTECTIVE HELMETS;
AD-674 104

ARMY ARMOR AND ENGINEER BOARD FORT
KNOX KY

SERVICE TEST OF FUNCTIONAL

UNIFORM FOR ARMORED VEHICLE CREWMEN
(SUMMER)

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UNCLASSIFIED
ARMY-ARM

AD-856 281

SERVICE TEST OF FUNCTIONAL UNIFORM FOR ARMORED VEHICLE CREWMEN
AD-856 914

*ARMY CONCEPT TEAM IN VIETNAM SAN FRANCISCO CALIF 96243

EVALUATION OF CREW MEMBER'S IMPROVED FIRE RESISTANT FLIGHT COVERALLS
AD-814 368

TROPICAL COMBAT UNIFORM (PONCHOS AND GROUNDCLOTHS)
AD-815 865

*ARMY CONCEPT TEAM IN VIETNAM SAN FRANCISCO CALIF 96243

EVALUATION OF FIRE RETARDANT FLIGHT GLOVES (Nomex) (ACA-63/671)
AD-876 388

*ARMY ELECTRONIC PROVING GROUND FORT Huachuca ARIZ

USAEPG-FR-525
ENGINEERING TEST OF PROTECTIVE HELMET SPH-4
AD-862 006

*ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE VA

FSTC-HT-23-368-71
FUNCTIONAL SPECIAL CLOTHING FOR BUILDERS
AD-742 816

*ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER WASHINGTON D.C.

FSTC-HT-23-352-68
STORAGE OF CHEMICAL AGENTS (II)
SPECIAL CLOTHING FOR WORKING IN WAREHOUSES (II)
AD-841 293

FSTC-HT-23-787-68
WORK CLOTHES
AD-688 057

*ARMY GENERAL EQUIPMENT TEST ACTIVITY
FORT LEE VA

ENGINEERING TEST OF SPIKE RESISTANT INSOLE
AD-474 986

ENGINEERING TEST OF PONCHO, LIGHTWEIGHT (LINCOLNE)
AD-817 192

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AD-835 403

ENGINEERING TEST OF BOOT, COMBAT, MOUNTAIN AND SKI
AD-835 549

ENGINEERING TEST OF CLOTHING SYSTEM (SUMMER UNIFORM) FOR ARMY AVIATION CREWMEMBERS
AD-850 180

ENGINEERING TEST OF FUNCTIONAL SUMMER UNIFORM FOR ARMORED VEHICLE CREWMEN
AD-856 438

*ARMY LAND WARFARE LAB ABERDEEN PROVING GROUND MD

LWL-TR-74-13
UH-1 DOOR GUNNER PROTECTION
AD-782 112

*ARMY LIMITED WAR LAB ABERDEEN PROVING GROUND MD

LWL-TR-66-07
VENTILATED FLIGHT SUIT
AD-644 611

*ARMY NATICk LABS MASS

MODERN COUNTER-SURVEILLANCE IN COMBAT CLOTHING
UNCLASSIFIED

**AD-713 573**
*Microclimate-controlled (thermalarium) clothing systems for military applications.*

**AD-713 561**
*USA-NLAS-TR-66-3-CM Thermal-physical parameters of materials.*

**AD-651 225**
*USA-NLAS-TR-67-5-CM Research and development of blast protective footwear, fabrication and proof testing.*

**AD-648 417**
*USA-NLAS-TR-67-45-CM Development, fabrication and proof testing of optimum foot protection against antipersonnel mines using a supplementary device.*

**AD-813 643**
*USA-NLAS-TR-67-63-CM Advances in the development of head protection for aircraft crews.*

**AD-665 368**
*USA-NLAS-TR-68-21-CM Engineering research prototype thermalarium systems for thermalarium clothing.*

**AD-666 266**
*USA-NLAS-TR-68-44-CM Flow of heat and vapor through composite perm-selective membranes under simulated conditions.*

**AD-671 681**
*USA-NLAS-TR-68-58-CM Micrometeorite-controlled (thermalarium) protective clothing system for military applications.*

**AD-672 715**
*USA-NLAS-TR-68-63-CM Development of a lightweight backpack for the military.*

**AD-677 110**
*Buty1-coated stretch fabric.*

**USA-NLAS-TR-69-31-CN**
*Investigations of heat and mass (water vapor and liquid) movement through clothing systems.*

**AD-691 144**
*USA-NLAS-TR-69-48-CE Protective clothing and life support equipment for explosive ordnance disposal personnel.*

**AD-702 246**
*USA-NLAS-TR-70-37-CE Development of a personal cooling system for explosive ordnance disposal personnel.*

**AD-708 679**
*USA-NLAS-TR-71-32-CM Flow of heat and water vapor through protective clothing.*

**AD-712 994**
*USA-NLAS-TR-71-40-CM The behavior of protective uniforms in large-scale simulated fires.*

**AD-724 648**
*USA-NLAS-TR-72-2-CE Investigation of methods for improving the frictional properties of rubber compounds used in footwear.*

**AD-733 312**
*USA-NLAS-TR-72-26-CE Thermoelectric heating and ventilating system.*

**AD-737 720**
*USA-NLAS-TR-72-41-CE Ventilating backpack for the military.*
SUIT SYSTEM: TOXICOLOGICAL
PROTECTIVE MICRO-CLIMATE CONTROLLED
(CH Protective System for EOD
PERSONNEL)*
AD-748 838

C/OM-48
DEVELOPMENT OF A LIGHTWEIGHT
BUTYL-COATED STRETCH FABRIC*
AD-677 110

ARMY NATICK LABS MASS MECHANICAL
ENGINEERING DIV

USA-NLABS-TR-73-57-CE
FOOTWEAR FOR INUNDATED AREAS*
AD-746 684

C/OM-56
INVESTIGATIONS OF HEAT AND MASS
(WATER VAPOR AND LIQUID) MOVEMENT
THROUGH CLOTHING SYSTEMS*
AD-691 144

ARMY NATICK LABS MASS CLOTHING AND
ORGANIC MATERIALS LAB

C/OM-45
ADVANCES IN THE DEVELOPMENT OF
HEAD PROTECTION FOR AIRCRAFT
CREW Members
(USA-NLABS-TR-67-53-CM)
AD-665 388

C/OM-54
PASSIVE THERMAL CONTROL SYSTEMS
FOR ADVANCED SPACE SUIT CONCEPTS*
AD-714 224

ARMY NATICK LABS MASS CLOTHING AND
PERSONAL LIFE SUPPORT EQUIPMENT LAB

C/OM-16
THERMAL-PHYSICAL PARAMETERS OF
MATERIALS*
AD-631 294

C/OM-56
INVESTIGATIONS OF HEAT AND MASS
(WATER VAPOR AND LIQUID) MOVEMENT
THROUGH CLOTHING SYSTEMS*
AD-691 144

ARMY NATICK LABS MASS CLOTHING AND
PERSONAL LIFE SUPPORT EQUIPMENT LAB

C/OM-37
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DISTRIBUTION SYSTEMS FOR
THERMALIBRIUM CLOTHING*
AD-666 276

C/OM-56
INVESTIGATIONS OF HEAT AND MASS
(WATER VAPOR AND LIQUID) MOVEMENT
THROUGH CLOTHING SYSTEMS*
AD-691 144

ARMY NATICK LABS MASS CLOTHING AND
PERSONAL LIFE SUPPORT EQUIPMENT LAB

C/OM-45
FLOW OF HEAT AND VAPOR THROUGH
COMPOSITE PERM-SELECTIVE MEMBRANES
UNDER SIMULATED CONDITIONS*
AD-671 681

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AR-ARM

USA-NLAS-25-CE
PASSIVE THERMAL CONTROL SYSTEMS
FOR ADVANCED SPACE SUIT CONCEPTS.
(C/PLSEL-78)
AD-712 249

USA-NLAS-73-16-CE
DEVELOPMENT OF LIGHTWEIGHT
(COLD-WET) INSULATED FOOTWEAR.
AD-766 690

ARMY NATICK LABS MASS PIONEERING RESEARCH LAB

USA-NLAS-67-44-PR
RESEARCH ON ACOUSTICAL PROBLEMS OF THE MILITARY: A REVIEW AND FUTURE ASPECT.
AD-660 165

ARMY RESEARCH INST OF ENVIRONMENTAL MEDICINE NATICK MASS

THE ARCTIC SOLDIER: POSSIBLE RESEARCH SOLUTIONS FOR HIS PROTECTION.
AD-613 189

USA-NLAS-75-764
SUB-DRY SUIT APPROACHES TO WATER IMMERION PROTECTIVE CLOTHING.
AD-666 042

ARMY TEST AND EVALUATION COMMAND

USA-NLAB-75-40-CE
TACTICAL IMPLICATIONS OF THE PHYSIOLOGICAL STRESS IMPOSED BY CHEMICAL PROTECTIVE CLOTHING SYSTEMS.
AD-713 530

USA-NLAB-76-59-CE
A METHOD OF RELATING PHYSIOLOGY AND MILITARY PERFORMANCE: A STUDY OF SOME EFFECTS OF VAPOR BARRIER CLOTHING IN A HOT CLIMATE.
AD-672 874

USA-NLABS-TR-70-59-CE
DEVELOPMENT OF LAMINATED FABRIC PARTS OF CLOTHING.
AD-756 167

USA-NLABS-TR-75-172
THE BEHAVIOR OF PROTECTIVE UNIFORMS IN LARGE-SCALE SIMULATED FIRS.
AD-774 498
UNCLASSIFIED

TESTING AND DEVELOPMENT CENTER

- EVALUATION OF ONE PIECE WET SUIT
  AD-699 330

- CORNELL AERONAUTICAL LAB INC BUFFALO NY
  CAL-HM-2972-Z-1
  FIRE FIGHTER'S EXPOSURE STUDY
  AD-722 774

- DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)
  DND-AM-416
  COVERALLS, CN PROTECTIVE STORGE AND PACKAGING
  AD-761 520

- DEFENCE RESEARCH INFORMATION CENTRE ORPINGTON (ENGLAND)
  DRLC-BS-30070
  ASSESSMENT OF THE THERMAL RESISTANCE OF CLOTHING
  AD-750 830

- DRALC-BS-30094
  CALCULATION OF THE THERMAL RESISTANCE OF THE AIR LAYERS IN AIR-PERMEABLE CLOTHING
  AD-746 037

- DRIC-TRANS-2717
  CALCULATION OF THE THERMAL RESISTANCE OF THE AIR LAYERS IN AIR-PERMEABLE CLOTHING
  AD-746 037

- DRIC-TRANS-2920
  ASSESSMENT OF THE THERMAL RESISTANCE OF CLOTHING
  AD-750 830

- DOUGLAS AIRCRAFT CO INC HUNTINGTON BEACH CALIF W2MISSILE AND SPACE SYSTEMS DIV

CNS-DOU
EDG-GEN

UNCLASSIFIED

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PROTECTIVE SMOKE HOOD STUDIES, AD-727 021

FLYING PERSONNEL RESEARCH COMMITTEE
LONDON (ENGLAND)

FPRC-1387
A LABORATORY COMPARISON OF
THREE METHODS OF PERSONAL
CONDITIONING,
AD-722 857

FOREIGN TECHNOLOGY DIV WRIGHT-
PATTERSON APB OHIO

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AD-761 309

FTD-HT-64-683
SPACE SUITS - SPACE FASHION
(RAUMANZUEGE - MODE DES KOSMOS),
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FTD-HT-65-604
SPACE CLOTHING OF SUBJUGATORS
OF OUTER SPACE,
(TT-65-63351)
AD-620 099

GAGLIARDI RESEARCH CORP EAST
GREENWICH R I

DEVELOPMENT OF CHARCOAL
IMPREGNATION PROCESS FOR CW
PROTECTIVE OVERGARMENT,
AD-605 099

FEDERAL AVIATION ADMINISTRATION
WASHINGTON D C OFFICE OF AVIATION
MEDICINE

FAA-AM-67-9
A PROTECTIVE PASSENGER SMOKE
HORSE,
AD-667 416

FAA-AM-70-20

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**GRACE (W R) AND CO CLARKSVILLE MD RESEARCH DIV**

**RES-70-41**

RESEARCH AND FEASIBILITY STUDIES ON CLOTHING AND DECONTAMINATION.
AD-676 647

**HAMILTON STANDARD WINDSOR LOCKS CORP WINDSOR LOCKS CONN**

ENGINEERING DESIGN STUDY OF A SPACE SUIT WITH AN INTEGRATED ENVIRONMENTAL CONTROL SYSTEM.

(AMRL-TR-68-122)
AD-680 826

INTEGRATED MANEUVERING LIFE SUPPORT SYSTEM.

(AMRL-TR-69-132)
AD-714 577

**HAMILTON STANDARD DIV UNITED AIRCRAFT CORP WINDSOR LOCKS CONN**

WSER-3471

A STUDY OF TECHNIQUES AND EQUIPMENT FOR THE EVALUATION OF EXTRAVEHICULAR PROTECTIVE GARMENTS.

(AMRL-TR-68-41)
AD-685 206

**HONEYWELL INC ST PAUL MINN RESEARCH DEPT**

12045-FRI

AUTOMATIC TEMPERATURE CONTROL FOR LIQUID-COOLED FLIGHT SUITS.

(NADC-AC-67-202)
AD-669 634

**IIT RESEARCH INST CHICAGO ILL**

RESEARCH AND DEVELOPMENT OF BLAST PROTECTIVE FOOTWEAR, FABRICATION AND PROOFTesting.

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